CONVENTIONAL AND MORE RECENT THEORIES
OF THE BALANCE OF PAYMENTS
WITH SPECIAL REGARD TO THE DANISH CAPITAL ACCOUNT

A Thesis in Economics

Presented to the Department of Economics
of the European University Institute.

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PREFACE

When I took up the challenge of joining the first brood of postgraduate students at the EUI, I did it with some reservations. Partly because I left an interesting job at the Council of Economic Advisors in Copenhagen and partly because of my total uncertainty about what the European University Institute was to prove.

In the beginning, everything was a bit chaotic and, if I may state the matter straightforwardly, some of us felt as "lonely riders", who had to rely mainly upon ourselves and the very positive atmosphere within the department. On the other hand, such a situation gave us much more liberty to fill out the framework of the study on our own.

I consider the aim of a thesis as twofold: One is to show the audience that the relevant literature has been read and properly digested; the other is to contribute with an independent piece of work within one's field. Regarding the former, this cannot be of much interest in itself, but, as far as the two aims are interwoven, the thesis is to be considered as a single, coherent presentation of my research.

The thesis has been undertaken under Professor L. Duquesne de la Vinelle's kind supervision. I also wish to mention the help and encouragement which I received from Professor Pierre Salmon, EUI, and Professor Niels Thygesen of the University of Copenhagen. While working on the empirical part of my dissertation, I stayed at the latter University, and I want to express my gratitude to the Institute of Economics which, without hesitation, gave me a superb opportunity to carry out my work.
I appreciate very much the helpful attitude which Danmarks Nationalbank took towards my need for more detailed statistical figures than those available in the official publications.

The computations are carried out at RECKU with the use of the econometric program package 'TSP' implemented by cand. polit. Torben Warnich-Hansen and stud.polit. Arne Facius. The drawings are made by cand.polit. Tyge Vorstrup Rasmussen's plotter-program, which I am grateful for having got access to.

English is not my native language and without the help of Mrs. Jo Ann Meredith this thesis would hardly have been readable.

Finally, a grant from Kjøbenhavns Handelsbank's Studierejselegat eased my financial constraint while staying abroad, which is gratefully acknowledged.

Copenhagen, May 1979

Jesper Jespersen.
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CHAPTER 1: INTRODUCTION

The overall aim of this dissertation is to investigate from a theoretical and empirical point of view the determinants of the capital account of the balance of payments with special regard to a small, open economy. As an empirical case study, I have chosen Denmark, which I know particularly well, but, unfortunately, Denmark is somewhat atypical to the textbook models, because of its rather tight capital controls.

Capital flows have to be seen as just one partial element in the entire economy. I have, therefore, devoted quite a number of pages to a description of how I think capital flows fit into a small, open economy. One aspect involves the financial sector, where international capital flows are an unavoidably integrated part of its functioning. The other aspect concerns capital flows as a part of the balance of payments, and one cannot analyze balance of payments adjustment without taking into consideration the current account as well as the capital account. In fact, this integration has not until recently been made in analytical models, wherefore a great deal of previous discussions concerning balance of payments adjustment was partial in a double sense.

Before going into a more detailed discussion of the theory of capital flows, I have felt it necessary to initiate this thesis with a methodological chapter. When reading balance of payments theory, I am struck by the fact that, broadly speaking, all contributions are held within the general equilibrium framework and have many neoclassic traits. It is as if the neo-Keynesian revolution had left no mark on that field of economic thinking. To clarify the crucial distinction between the neoclassic and neo-Keynesian research programs (cf. Leijonhufvud, 1974), we have to consider some of the more basic concepts in economic methodology, which also gives me a welcome opportunity to present my gestalt concerning how I regard the functioning of the economic system.
Unfortunately, this methodological digression will leave the reader somewhat frustrated, because I have not been able to set up a satisfactory neo-Keynesian alternative — neither in the theoretical section nor in the empirical specifications. The nearest I have been able to provide is a somewhat dynamic process-description, which is rather halfbaked and has a groping appearance.

It is especially unsatisfactory that I have been so conventional in the empirical section. But there is not enough support from the literature to obtain a basis for a discussion of the problems involved when estimating behavioural equations related to a market in disequilibrium. I believe the problems are of fundamental character and even question the possibility of obtaining reliable data at all. More regarding this later, but the inconsequence is apparent.

The empirical section begins with a short survey of the development of the Danish economy within the analyzed period: 1967-1976. One characteristic feature has been that the capital flows were subject to rather firm regulation at the beginning of the period. These have gradually been eased, especially in relation to the Danish participation in the EEC from 1973.

Quite a number of resources have been utilized in the construction of data on a quarterly basis. The most ambitious and audacious project has been the construction of figures for private financial wealth.

The regression analysis can be divided into three parts:

First, I investigate total capital im- and export aggregated as well as disaggregated into 5 or 6 subcomponents.

Second, I have taken out the most important and least regulated

---

1 Fair & Jaffe, 1972 and Jaffe, 1978 are a few exceptions.

2 This gives rise to another fundamental question: Whether a basically free market oriented theory can form a reasonably foundation for the empirical tests and to what extent regulations are simply correctives which can be handled by dummies.
part of the capital flows -- the trade credit -- and made a monthly study.

Third, the forward premium on foreign exchange has been analyzed, and somewhat more success has been obtained insofar as exchange rate expectations are concerned.

All the estimations have been carried out with the method of Ordinary Least Squares (OLS), which does not correct the simultaneity bias. This is, of course, a weak point in the analysis which, on the other hand, can be defended by reference to the short period of estimation, especially when monthly data are used.

As a final point, I have drawn some conclusions. They comprise an appraisal of the lack of correspondence between theory and reality as well as some policy recommendations derived from the empirical results. These point at the fact that the monetary policy has been more austere than what can be explained by the need of private capital import only.
CHAPTER 2: THE THEORETICAL FRAMEWORK.

SECTION 2.1: METHODOLOGICAL REFLECTIONS

2.1.1. Introduction

When reading the established literature on the theory of the balance of payments, I have been struck by the apparent general consensus of analysis within the framework of a general equilibrium model (which, for convenience, I will call the neoclassic approach). For instance, at the 1975 Stockholm conference, organized by the Institute for International Economic Studies, on flexible exchange rates and stabilization policy, two of the participants in the general discussion concluded\(^1\) that the relevant model was one of general equilibrium within which Walras' Law and certain homogenous postulates were contained. This conclusion was unquestioned and should be regarded as one characteristic of the present method of analyzing international economics.

Although we are now in 1979, the situation has changed little and discussions are still centered around the differences between the three "classical" approaches: 1) the elasticity approach, 2) the absorption approach, and 3) the monetary approach\(^2\) \(^3\).

In searching for an alternative theoretical basis to the conventional analysis of external relations, we may turn our attention to the discussion of disequilibrium economics.

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2 As long as there is now an established convention of meaning, I find it often more misleading than clarifying to use these labels: neoclassic and Keynesian. Thus, I will take the liberty of using the predicate neoclassic for equilibrium economics.

3 For a few exceptions, I will refer back to this in section 2.4. below.
2.1.2. The Challenge to Neoclassic Macroeconomics

The economic analysis of a closed economy has undergone remarkable development in the last decade. Until the mid 60's, the established macroeconomics of a closed -- and for that matter, an open -- economy was held within an equilibrium model. Broadly speaking, there were two such models (the ISLM\(^1\) and the Patinkin (1965) model), both of which were characterized by concentrating on the equilibrium values. Sometimes the analysis of the equilibrium was supplemented by a stability analysis following the Correspondence principle (Samuelson, 1947), which was then called a dynamic analysis.

This approach to macroeconomic theory was challenged by a number of writings, which more or less drew their inspiration from a reinterpretation of Keynes' works. The discussion was opened by Closer's now classical article, "The Keynesian Counter-revolution: a Theoretical Appraisal", wherein he showed that Walras' Law was not as general as hitherto assumed. In fact, it only seems to hold good in cases of general equilibrium; when the economy is out of equilibrium, there can be e.g. excess labor supply without excess demand in any other market. Then we cannot rely on an adjustment mechanism in the market, which will automatically bring the economy back into equilibrium. This analysis inspired and stimulated a number of researchers to re-read Keynes' contributions more carefully and give them an up-to-date interpretation detached from the general equilibrium framework.


\(^1\) Hicks, "Mr. Keynes and the Classics," 1937. I will include a more rigorous critique in section 2.2.
By "Keynesian Economics" Leijonhufvud refers mainly to the conventional ISLM model developed by Hicks in 1937, wherein he gave the theme of "the General Theory" an equilibrium interpretation -- and e.g. unemployment could only be explained by so-called imperfections: upper and lower bounds for the interest rate, rigid wages caused by the monopoly power of trade unions, and minimum wages or unwillingness to work.

In "Keynesian economics", the main conclusion is that because of 1) lack of information, 2) uncertainty, 3) constraints, 4) imperfect markets, it is illogical to assume that market clearing forces will secure general equilibrium. This approach is discussed more thoroughly below, in an attempt to see what elements have relevance for the theory of the balance of payments.

Leijonhufvud, 1977 (and Clower & Leijonhufvud, 1975) has given a more explicit formulation of what he thinks is the fundamental theme of economic analysis, which is the coordination of economic activities within a decentralized economic system. This, of course, points do the market as the pivotal element in understanding the functioning of a modern mixed economy. How are the different markets organized? What types of agents participate, and how to they react when encountering one or more constraints? How is information transmitted, and how are expectations formed?

Davidson stresses three themes in his book: 1) The market, 2) Uncertainty, and 3) The special role of money. Concerning the market, he drives home the point that the functioning of a market can differ widely, so one can never speak of a common market adjustment mechanism (e.g. flex-price or fix-price). For each market the specific reaction pattern of the agents has to be analyzed. This ideal is in accordance with Leijonhufvud, and both have to some extent revived the Marshallian market adjustment theory, wherein the driving force consists of the

---

1 Davidson, "Disequilibrium Market Adjustment, Marshall Revisited", 1974 (and Leijonhufvud, "Maximization and Marshall", which he refers to several times but which has not yet been published). In a Danish context H.Estrup, 1977 should be mentioned as one who has revived the interest for Marshallian price theory.
discrepancy between the supply and demand prices, contrary to the Walrasian auctioneer.

Uncertainty is one of the keywords in understanding disequilibrium economies. For the sake of clarification, one can say that uncertainty is related to those events which are unmeasurable. Uncertainty is caused by the lack of perfect knowledge\(^1\) of the economic agents, and, if the behavior of the agents is dominated by this uncertainty, Davidson concludes that it is extremely difficult to rely on the assumption of stable behavioral equations for the economic analysis. In fact, he challenges the approach of using a formalized model as long as the factors of uncertainty remain unexplained. The critique goes to the heart of empirical analysis because if reasonably good results cannot be obtained, then the immeasurable uncertainty is, perhaps, the explanation for this.

One qualitative measure of the state of uncertainty is the liquidity preference. The best protection against the unknown is money (or other financial assets with high marketability and a predictable price) or, to put it positively, the best way of being able to take advantage of favorable future events (e.g. investment opportunities) is to be liquid (money at hand). Therefore, the demand for liquidity will increase in a period of more pronounced uncertainty, even in periods with significant inflation rates.

This is a very significant observation in relation to the interplay between uncertainty and money. But there is an enormous jump between this and the statement that money is the main cause of uncertainty, and I find that Davidson widely overplays the role of money when searching for the origins of disequilibrium. It is, of course, correct to underline the fact that a shift in

---

1 In this context perfect knowledge includes cases where it is only the probability distribution of a certain event which is known, whereas the exact outcome is unknown. (Cf. section 2.2.3 below).
the demand from producible goods to money will choke off the effective demand, but this effect will take place whenever the demand for goods with a vertical supply curve increases at the expense of goods with a price elastic supply\(^1\).

The above mentioned real world obstacles to a smooth-functioning of the general equilibrium model are simply meant to indicate what this discussion will be centered around. But, it is remarkable that no such thorough disequilibrium approach in international economics has been made until now. Even the most recent approach -- "the Monetary" -- is very conventional in the sense that it uses the equilibrium model as the framework for its analysis.

In a following section, we shall see to what extent the established theories of the balance of payments can be reconsidered within this framework in which the disequilibrium factors are stressed.

2.1.3. The Anatomy of Disequilibrium

It would be much easier if we could assume that the adjustment mechanism works quite well, so that the transitory period before a new equilibrium is reached is of an insignificantly short duration. In the Walrasian world\(^2\) the adjustments take place in a salesroom where the auctioneer shouts a price and then counts offers for sale and demand. If they differ, no trade takes place and a new price is shouted. This process continues until demand and supply are equal for all goods and, at this point

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1 I shall come to this later on, but one misunderstanding must be avoided, namely, that money should be the cause of disequilibrium. Without money, the functioning of the markets will be much more impeded and thus increase the number of imperfections and constraints, making the problem of disequilibrium even more serious (Hahn, 1977).

2 To avoid another misunderstanding, it should be emphasized that by Walrasian economics, I refer mainly to the general equilibrium model of the neoclassic economists, i.e., Arrow-Debreu model. There might be some misinterpretation compared to the original contribution by Walras. This theme of the history of theories will not be dealt with here.
trade supposedly takes place. When this process is assumed to take no time, we have instantaneous equilibrium, and adjustment is unimportant.

However, except for very few markets of financial assets and raw materials, the auctioneer does not exist and some kind of trial and error procedure has to be assumed. The instantaneous equilibrium will only be a relevant description of the market if the economic units possess perfect knowledge regarding future equilibrium prices. Furthermore, it should be assumed that this knowledge can be obtained in a costless manner, immediately and independently of the actual prices.

Under perfect competition, the supply and demand curves for each economic unit are infinitely elastic, since the prices are regarded as parametrically given. In this case, the above mentioned assumptions seem to be fulfilled, but then nobody will have the incentive to change the price. Once again, we are caught by the missing auctioneer.

As early as 1959, Arrow observed that perfect competition with one price on each market is only possible in equilibrium. Elsewhere, buyers and sellers have some monopolistic power, because the price is not parametrically given by the market, but within limits is a result of optimal planning by the agents. As a rough generalization one may assume that it is the side of the market with less participants that is most likely to be the price setter and the more atomistic side adjusts the quantity. Accordingly, firms have often the price setting function, and imperfect knowledge regarding the future demand, one cannot expect that the flow of goods between the firm and the customers will clear through price variations only. If no common price for goods is established, then searching becomes a rational action. So, in practice, there is no beforehand perfect knowledge concerning equilibrium prices. The transactors have to react to the actual prices because they are one of the main sources of information concerning the state of the market and the other transactors' plans. This information can be obtained neither costlessly nor be independent of the actual prices. In addition,
the adjustment process takes time, which means that states of disequilibrium are not the exception, but the rule.

The concept of "false prices" (and, for that matter, "false quantities") has been tied to the price of disequilibrium. Basically, the Keynesian multiplier process can be regarded as caused by the lack of instantaneous price adjustment, which gives space for "false trading". A fall in real demand should be matched by a change in relative prices which could immediately restore the initial level of demand. But price adjustments are not so quick, and false prices will prevail and aggravate the fall by the derived effects: Falling real income, depressed expectations and further unemployment.

Instead of correcting and establishing changes in the relative prices, we observe a destabilizing fall in quantities and, hence, in real income. This happens because the information available concerning the actual and future events is ambiguous and creates expectations that contribute to making the state of disequilibrium even more pronounced. This is not to say that all price changes will be destabilizing, but that the lack of instantaneous adjustment makes the relevance of continuous equilibrium analysis rather restricted.

One more factor should be observed. A given series of events can create very different expectations which make the knowledge about the intentions of other transactors, even within one market, very limited, e.g. how will other producers react to a 300 per cent rise in oil prices?

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1 See Hicks, 1939, p. 128-129. He does not, however, attach any importance to this concept of false trading for the equilibrium adjustment process -- only a second order magnitude.
2.1.4. Walras' Law Reconsidered

Throughout the 1950's a long discussion continued about Walras' Law (W.L.) and Say's Law (S.L.). In short, W.L. says that, by definition, the sum of excess demands on all markets is zero, whereas S.L. states that this sum is zero for all real markets — the old "money is a veil" discussion. I will only concentrate on W.L. in an attempt to show that this "Law" is also closely connected to the state of equilibrium, if not merely a tautology. It is essential to distinguish between planned demand and supply and effective demand and supply. Taking a single economic agent, it is reasonable to assume that he acts rationally in the sense that he will never plan an expense without also planning the source which will finance it. This means that if we cumulate all planned demand and supply of this agent, it will sum zero. Furthermore, if we cumulate over well-defined sectors, we will obtain the same result, in that Walras' Law is valid insofar as planned quantities are concerned. However, when one considers effective demand and supply, the situation changes. By effective, we mean that the excess demand can influence the market clearing variable. If two sectors have made mutually inconsistent plans, then we can no longer expect the sum of the excess demands to be zero. To take Clower's example, for instance: If the household sector plans to buy more goods and supply more labor than the business sector has planned to produce and employ, then the planned excess demand for goods cannot be effective because there is no finance to back it. The firms will not be aware of this potential excess demand for goods and, therefore, receive no stimulus to increase employment. We see that there is no effective excess demand at the goods market, but we will observe effective excess supply at the labor market (unemployment — people willing to work at the ruling wage level) and the sum of effective excess demand will differ from zero.

1 Ex post demand is equal to supply at each market, and then the cumulated sum of excess demands is identical equal to zero.

2 Planned variables are derived from individual experiments, independence of an event mutual inconsistency, whereas effective variables are derived from market experiments.
Accordingly, Walras' Law is not valid for effective quantities outside equilibrium. One might ask if this state of disequilibrium can continue unchanged, but naturally it cannot. The effective excess supply will influence the market clearing mechanism, i.e., the (real) wage, but, for a number of reasons, the adjustment process will be slow. One of these is that the firms do not feel inclined to change as long as they believe that they are maximizing profit (they do not know the planned demand, only realized quantities). The workers will hesitate before accepting a fall in wages. Furthermore, there is the danger of setting off a wage-price spiral (cf. Keynes' warning against wage deflation in "the General Theory". During the 1960's and early 1970's a parallel warning against wage inflation would have been useful). To give a more thorough picture of the dynamic process characterizing the state of disequilibrium, we have to wait for the discussion of the "Corridor Model", section 2.2.6. below.

Looking at the single individual agent, the main obstacle he encounters in an attempt to make the planned demand effective is when he tries to break the actual budget constraint. In the short run, this constraint is primarily related to the liquidity position. Whatever the agent possesses in liquid assets (money, demand deposits, short term bonds, etc.) and automatical credit lines can back the planned demand. Thus, in the short run, it is relevant to talk about a **liquidity constraint**. In the medium run, the liquid funds will be exhausted (even if the liquidity concept is broadened in this time perspective) and demand must be backed by income (or new borrowing). Thus, we find an **income (flow) constraint**. In the long run, the agent will experience a creditability crisis if his wealth continues to stay in the red; sooner or later the creditors will ask for their money back and the **wealth constraint** becomes real.

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1 Clower, 1967, holds a partially parallel view, but he stresses the point that effective demand has to be backed by money.

2 The analogy of a single country in the international monetary environment seems quite obvious.
Following Streissler, 1977, market imperfections also put constraints on the participants. He mentions that lack of price variation makes the quantities rationed. The instance he cites is the aversion of banks to raise and lower the lending rate to the extent that neither unsatisfied demand for loans nor excess reserves arise. This bank behavior can be explained by some long run optimalization, but in the short run, it creates constraints on investors' activities.

Similarly, the partial situation of the investor prevents him from being aware of the mutual interdependence existing between the creation and the fulfillment of expectations. When entrepreneurs expect a rise in real demand and, therefore, begin some investment plans, the first step in increasing the effective demand is realized. This could be called the constraint of partiality.

This discussion of constraints shall be closed by stating that "uncertainty leads to a cascade of constraints," (Streissler, 1977, p. 101), a general but, nonetheless, very important observation.

Constraints are active in disequilibrium, so there is no necessary compatibility between the realization of individual plans. This leads, at the aggregate level, to the knowledge that the nth market is not merely a mirror of (n-1) other markets. Thus, the conventional procedure in neoclassic macroeconomics of suppressing the analysis of one market, with reference to Walras' Law, seems inconsistent with the disequilibrium assumption.

2.1.5. The Concept of Equilibrium

With time, I am more and more coming to doubt whether the concept of equilibrium is relevant to positive economic analysis. Macroeconomics was at the time of Walras aggregated microeconomic relations, so the concept of equilibrium steals easily upon this area.
The use of equilibrium in macroeconomics is still defended. One line of argument follows the postulate: "sure we all know that the economy is never in equilibrium; but this is the least arbitrary assumption which can make our economic theory (as a logical and consistent system) operational." Another school of thought stubbornly continues to assert that "the full employment economy is the only relevant framework for analysis." This school is probably blinded by the experiences of the fifties and sixties.

Equilibrium as such seems to be a very large abstraction when applied to the real world. The meaning of the concept has somewhat developed but one common feature is that equilibrium can be described by the solution of a mathematical model. In its more primitive form it is a state of economics wherein all participants are satisfied and merely want to endlessly repeat their transactions, and all economic variables are unchanged or predetermined with time. This is a long term stationary state. In growth theory, the concept of equilibrium is elaborated to imply constancy of growth rates rather than levels, but this is substantially the same kind of abstraction. Many refinements have been proposed: For instance, the very polished Arrow-Debreu model, wherein equilibrium is extended into the future. Here, the market clearing values are given the possibility of differing over time in accordance with the change in exogenous variables; yet still, all transactions and equilibrium values are assumed to be established the very first day through a system of perfect spot and future markets.

There are a number of explanations as to how and why this concept of equilibrium penetrated economic theory and thought. Looking at the rural society of the Eighteenth Century, when economic thought began, the idea of everything repeating itself year after year was not so far-fetched. Later, the idea of equilibrium survived in the microeconomic analysis -- especially good examples were markets for agricultural or mass produced goods.
Hahn has, with time, changed his view on the concept of equilibrium, moving from an Arrow-Debreu conception to: "an economy is in equilibrium when it generates messages which do not cause agents to change their theories which they hold or the politics which they pursue". (Hahn, 1973, p. 25). This seems to be a great improvement because here the equilibrium concept is not related to a certain state of the economy but related to the stability of the behavioral (or structural) functions.

Sometimes a seemingly different approach is employed, whereby the long run equilibrium is dressed up with leads and lags according to the correspondence principle. In this case, the model is given some arbitrarily chosen initial values and the question of the stability of the equilibrium is watched with great earnestness. One should be aware that the working of such a model is determined by the postulated equilibrium conditions in connection with the assumed market adjustment variables. Within the neoclassic tradition, it is always the price variables (e.g. Patikin's price, rate of interest diagram. In Keynesian "unemployment equilibrium", one of the adjustment variables is real output. Cf. the ISLM diagram).

In theoretical economics, the movement away from this stereotyped interpretation of the equilibrium concept has more or less followed two very distinct lines. One is an attempt to redefine the concept's content by relaxing the assumption of general market clearing within each period, and the level of abstraction of the long run state is reduced by introducing the instantaneous (short run) or intermediate (longer run) equilibria. The so-called temporary equilibrium method is developed in this background. The other line implies a rejection of the general equilibrium concept, and partial equilibrium is considered only as a practical tool in some cases.

The temporary equilibrium approach has redefined the concept of equilibrium in the sense that situations where trade takes place in the market are called states of equilibrium even if
agents are constrained. Depending on the scope of the analysis markets may be assumed to be exogenous and undisturbed by the development on the endogenous markets. The distinction between endogenous and exogenous markets is primarily related to the length of the period of the analysis.

If prices are perfect flexible (for instance on some financial markets), the market clears instantaneously and no quantities are kept involuntarily. The realized price may entail revisions of the expectations concerning the future prices which will cause a change in the price the next period.

Another representative of the temporary equilibrium method is Malinvaud, 1977. He defines a market equilibrium where, at fixed prices, the short end of the market determines the trade (equilibrium) quantity. Then, the planned quantities will be changed in the next period in accordance with the realized sales and the development of stocks. Within that analysis, the above discussed unemployment disequilibrium may be regarded as a constrained equilibrium which is part of a general equilibrium model. This approach seems to me to be very similar to the "instantaneous equilibrium" method, only with fixed prices and rationing instead of fixed quantities and disappointed price expectations.

So, with a very modest intellectual effort, but with heavy mathematical complications, these models of instantaneous equilibrium can form a synthesis by letting both types of variable have some degree of flexibility according to the different characteristics of the markets under consideration. This will result in very tough expectation adjustment functions -- an advanced clockwork system. But basically, it is still an equilibrium model. It is assumed that some kind of market clear-

1 Cf. section 2.1.9. for a discussion of the different adjustment behavior behind the assumption of flexible prices cfr. quantities

2 For other critical comments on Malinvaud's method, see Andersen & Nielsen, 1977 and Kahn, 1978
ing takes place during each period and the adjustments are
towards a well-defined state of long run equilibrium where
perfect foresight and lack of uncertainty reign.

The second line can be identified by the way in which the post-
Keynesian -- Cambridge (UK) -- school uses the concept of
equilibrium in its theoretical writings. "(To) use the
equilibrium concept one has to keep it in its place, and
its place is strictly in the preliminary stages of an analytical
argument, not in the framing of hypotheses to be tested against
the facts, for we know perfectly well that we shall not find
facts in a state of equilibrium", (J. Robinson, 1961, p. 78,
my italics).

General equilibrium is rejected\(^1\), especially as a basis for
empirical work, but partial equilibrium is kept as a useful
tool for showing and analyzing specific phenomena. The most
prominent example is Keynes' use of a comparative static picture
of the goods market to show the importance of effective demand
for the level of production\(^2\). This is, of course, not to in-
timate that Keynes should have considered perfect foresight or
uncertainty as unimportant. On the contrary, only for a few
chapters of "the General Theory" these state of things are
assumed to be unchanged -- not to confuse the analysis of
effective demand at a preliminary stage. The fundamental
problem is, so to speak, to "tame" the economy and, at the same
time, to avoid employing both inconsistent and too unrealistic
assumptions.

In summary, my opinion is that the concept of general equilibrium
is irrelevant in empirical analysis and an undue constraint
on many theoretical models. On the other hand partial equilibrium

\(^1\) Cf. Kaldor, "The Irrelevance of Equilibrium Economics",
where he refers to general equilibrium, 1972, p. 1237.

\(^2\) See Kregel, 1976.
seems to be an applicable tool for the analysis of how single markets with a high speed of adjustment develop or to isolate specific phenomenon of special concern.

2.1.6. Tendency towards Equilibrium

From our previous discussions of how the economy functions without an auctioneer, imperfect information about other transactors' plans concerning price and quantity, and the costs of transaction, it hardly seems useful to assume that the economy is in instantaneous equilibrium, or to accept the statement: "Actual disequilibria never occur" (Mussa, 1976, p. 134). Instead, one should perhaps talk about the tendency towards equilibrium (Hicks, 1965, pp. 17-18). If there is a theoretically well-defined equilibrium which the automatic market forces are driving the economy towards, then it seems meaningful to use the concept of a tendency towards equilibrium. For instance, in analyzing the financial markets, one could apply this partial method when the short run development of the rates of interest is described. If the demand for one kind of financial assets rises and causes a fall in the own rate of this asset, there will later be a chain of adjustments which, given the institutional framework, will result in a tendency to equalize the own rates.

In macroeconomics, as differing from partial- or microeconomics, it is difficult to employ this concept because 1) no well-defined equilibrium exists -- the target is, at best, continually moving and 2) the adjustment mechanisms would, in any case, be obscured by lack of sufficient information. "No one would deny that to speak of a tendency towards equilibrium that itself shifts the position towards which it is tending is a contradic-

1 Professor Garegnani, 1977, p. 382, uses the term "a centre of gravitation" which, although tempting for metaphorical reasons, has the association of a clockwork system of (natural) science.

2 Lindbech, 1976, in his methodological introduction to the above mentioned Stockholm conference touched upon this theme without taking into consideration the full consequences of the critique for the usefulness of the general equilibrium framework.
tion in terms. And yet it still persists. It is for this reason that we must attribute its survival to some kind of psychological appeal that transcends reason" (J. Robinson, 1961, p. 79).\footnote{Although basically a correct statement - according to our discussion - Mrs. Robinson exaggerates by talking of a "contradition" - we prefer to talk about the redundancy of the concept.}

One ought to distinguish between history and equilibrium. At any time, economic development is a consequence of historical events up to that specific point in time in relation to e.g. capital accumulation, expectations, institutional framework, political encroachment, etc. Even if, for instance, on a particular evening everyone felt economically satisfied, it is inherent to this situation that someone would change his transactions the next day because of the dynamic forces in the economy. These forces are, among others, ever-changing technology (productivity), inflation, the supply of factors of production (capital and labor), and lastly, but most importantly, expectations.

We have touched upon expectations in connection with equilibrium methods. There, these expectations only changed at the conjunction between one period and the next; they were then held with certainty until the end of the period. But "as soon as the uncertainty of expectations that guide economic behavior is admitted, equilibrium drops out of the argument and history takes its place" (J. Robinson, 1974, p. 2; Cf. Hicks, 1965, p. 70 -- but he argues that uncertainty can be represented by a probability distribution. Later, however, Hicks modified this viewpoint, see Hicks, 1974 & 1977).

2.1.7 The Concept of Uncertainty

"By 'uncertain' knowledge, let me explain, I do not mean merely to distinguish what is known for certain from what is only
probable... The calculus of probability was supposed to be capable of reducing uncertainty to the same calculable status as that of certainty itself.... About (uncertainty) there is no scientific basis on which to form any capable probability whatever. We simply do not know." (Keynes, 1937, pp. 216-217, my italics).

Uncertainty permeates all of man's activities, not only the economic. It originates from lack of information about the past, constraints of the present, and the unknown future. In our daily routine, we do not so strongly feel the heaviness of uncertainty because our activities are guided by a kind of normality which keeps us from reconsidering a number of transactions.

Normality should be clearly distinguished from equilibrium because the concept only represents the fact that not everything is floating. Yet, economic agents are subject to some kind of psychological and sociological "laws". Some stability of behavior "in the small" is assumed. Looking at the empirical evidence for this assumption, I think that the relatively stable and well-fitted consumption functions as compared to investment functions support this point.\(^1\) The consumers' demand for non-durable goods is a weekly repetition, whereas the firms' investment has far-reaching consequences for the unknown future.

As mentioned in the beginning, stocks provide protection against the consequences of uncertainty, not simply as money for a rainy day, but in a wider sense: Stocks of raw material (oil), filled order books, liquid assets, forward contracts, etc. But the introduction of stocks is a double-edged device -- if the state of confidence is unshaken, small disturbances can be parried by running down stock. Otherwise, the result is an increased demand

\(^1\) On the other hand, the increasing marginal propensity to save, which has been observed in many countries during the 70's (and especially in 1975), is, to a large extent, left unexplained by econometric studies, perhaps because there has been a creeping rise in the feeling of uncertainty.
for largely unproducible assets which will aggravate the effect of the initial shock. So, introducing stocks makes the possibility of demand failure even greater. Stocks are claims on future production, often very vaguely specified. The lack of forward markets makes it necessary for the transactors who want to postpone their effective demand for goods and services to buy stocks of financial (or real) assets for the transitory period. But it is not easy for a producer of, say, automobiles to know that the demand for cars will go up in two years time because the demand for two years bonds has risen today. Investments in real stocks are guided by expectations about the future effective demand for final goods for which it is impossible to give any firm information today -- "we simply do not know." Money is another example. When the demand for money increases, there will be a tendency towards higher rates of interest and a lower demand for real goods.

The organization of the market also plays a particular role when considering uncertainty. The better a market functions, the more easily one can buy and sell the specific goods, but if the price of the goods is very vivid (perhaps because of the speculators' activity), then trade in this good is still burdened with (price) uncertainty.

When analyzing investment, one must clearly distinguish between real and financial investment. A financial investment can often be reconsidered every day, so the future is near and the possible events relatively certain. But a real investment will have consequences many years after a decision is reached. Therefore, the "state of confidence" is of the greatest importance. For instance, just after the oil price rise confidence was shaken because investors simply did not know what was going to happen. When tracking down the possible dynamic path, which the economy will conditionally follow, we must describe the specific historical development and the likely reaction of the economic agents.
I feel uncertain if this point of the critique forces us to abandon use of the Walrasian framework. (From the preceding discussion, it should at least be evident that the Walrasian equilibrium is irrelevant to our purpose.) Davidson and Shackle seems to argue that this is the case because uncertainty makes coordination between different sectors and markets so weak that we can no longer assume that a change in effective demand in one market or by one sector changes the effective supply as well, which is a cornerstone of Walrasian analysis. On the other hand, e.g. Leijonhufvud continues using the Walrasian framework, but with great care.

At this stage of the analysis, I will leave this question open, and want only to stress that when the intertemporal aspect of economic action is taken into consideration, it is even more likely that the concept of equilibrium has very little effect on positive economics. The real world can much better be described as a continuous process wherein the disequilibrium aspect is underlined because the economic transactors are squeezed by the realized past and the uncertain future.

2.1.8 Stock ctr. Flow Specification of Models

No specific consideration has been given to the dimensions of variables. Investment and saving are flows, but wealth is a stock. If net savings and investment are different from zero, then wealth will change and, in any case, it is not satisfying to speak about a general equilibrium (cf. McKinnon, 1969). One short-cut is to assume that in equilibrium all stocks are constant, so all flows have to be consumed during the time period under consideration, and net saving is then zero.

Conceptually, a stock variable is defined without regard to the time dimension, but it can never be perceived without precise reference to one, and only one, moment in time, which is determined by the historical development up to that specific moment. A stock is nothing but the historical cumulation of flows. In that
sense, a flow variable can be regarded as a change in a stock variable. Then the flow can equally well be defined without reference to a certain time period, but simply as the speed of change of the considered stock variable at a given point in historical time. It is not, therefore, necessary to specify a period for analyzing flows -- this is only a matter of convenience. But the procedure of cutting the continuous time into periods creates a number of other limitations regarding the analysis because of the ceteris paribus assumptions that then have to be made. This aspect especially concerns the endogenous variables which are treated as though they were exogenous when the adjustment lag for these variables is longer than the specified length of the period.

For instance, it is a flaw in the construction of the ISLM-model not to consider the stock adjustment. This cannot be defended by the assumption of a short run analysis, where changes in stocks caused by flows are relatively so small that they do not count because changes in the demand and/or supply of stocks can cause a change within a given wealth or a desire for augmentation of real capital which is huge compared to the actual or previous size of flows.

In the analysis of an open economy, it is even more important to recognize the necessity of stock variables. Looking at the balance of payments, one can, roughly speaking, say that the current balance consists of flow items, whereas the capital balance comprises changes in stocks which should be seen partly in connection with current transactions (trade credit, etc.) and partly with portfolio readjustment. The latter type of transactions can be regarded in a broader context when realizing that each sector of the considered economy can either have a financial surplus or deficit, which must be offset somewhere else. But

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1 I have dealt with this problem in some length in the 2nd chapter of my thesis for the University of Copenhagen. Jespersen, 1975.
even for a constant financial wealth, there can easily be a
desire for changing the composition of the portfolio in ac-
cordance with shifts in relative rates of interest, expecta-
tions, holding period, institutional surroundings, etc.

As long as the current account is in deficit or surplus, the
aggregate wealth cannot remain unchanged, and one must analyze
the effects. But an ex post finding of balance of payments
(current account) equilibrium does not necessarily represent
any kind of equilibrium in ex ante sense. This can, by chance,
be a result of several counterbalancing constraints working on
the agents' transactions.

Furthermore, according to the above discussion regarding the
validity of Walras' Law, it should be mentioned that it is only
in the ex post (national accounting) sense that the overall
balance of payments always remains in balance -- because of the
bookkeeping principle. Ex ante the sum of effective demand and
supply in relation to the foreign sector can easily differ, which
will lead to constraints, changes in prices and expectations and
further readjustments.

In building a model which will form the framework for an analysis
of the balance of payments, one must be careful to specify the
stock as well as the flow relations in such a way that they
logically fit together. A stock can only change in consequence
of a flow (except for capital gains and losses), but a flow can
vanish if it is consumed.

In the 1950's there was a long debate as to whether flow or
stock specification was the most convenient description of
differing markets. After emphasizing that in a full analysis
both would be present, it can perhaps, for the purpose of making
the analysis more simple, be useful to take up this old dis-
cussion.
2.1.9. Speeds of Adjustment and Market Clearing

Before doing this, however, it may be clarifying to formulate some remarks on the significance of the market clearing variable and the speed at which different kinds of markets can clear. This also has something to do with the length of the time period which is chosen for the analysis. A general observation seems to be that the longer one makes the time period, the more reasonable it is to assume that the market(s) under consideration will clear.\(^1\)

To take two extreme cases, one can distinguish between flex-price and fix-price models (the distinction is borrowed from Hicks, 1965). In the flexprice model, the adjustment variable is the price on all markets. This assumption leads to a concept of "instantaneous equilibrium", where demand equals supply on all markets (ctr. above). If the realized prices differ from the expected prices, there is a basis for a change in expectations at the junction of the next period. The extreme opposite model assumes an exogenous given price level with the quantities providing the adjustment variables. When effective demand differs from effective supply, there have to be some changes in the stocks or inventories, which in subsequent periods can cause further adjustment.

This distinction between adjustment variables seems relevant only for very short run analyses. In the longer run, there should be time for price, as well as, quantity adjustments. Within the framework of a macroeconomic analysis, one must be careful not to necessarily apply the same type of adjustment to all markets. In this connection, the organization of the markets

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\(^1\) That a market clears is to say that planned demand is equal to planned supply which, in a stationary context, will imply that the same amounts and price will be -- ceteris paribus -- experienced the next period.
is important. For instance, considering some of the financial markets, it is recognized that, to some extent, they work in accordance with the auction principle. There is an auctioneer that actively changes the price until equilibrium is reached. This price will have repercussions on 1) expectations for the price the next day, 2) the value of the financial wealth, which especially influences the stocks of external assets (foreign and government bonds), and 3) the real activity. Each of these repercussions influences the demand and supply of financial claims with a shorter or longer lag.

On the other hand, if the considered market is badly organized, i.e., information about the equilibrating price, and the initiative to change the price is lacking among potential transactors, then it is difficult to imagine that the price should immediately equalize demand and supply, and a fix-price description can be more relevant. This seems the case in regard to many finished goods. But again, one ought not to generalize too much because e.g. in relation to many of the big investment projects, the price is fixed when tenders have been invited. The realized quantity will have repercussions on 1) the planned quantities in the next period, 2) the size of real stocks inventories, etc. and 3) the future price.

As long as we are considering just one single market, the length of the period should be chosen in accordance with the shortest adjustment lag -- on the financial markets, the expectations shift every day; whereas on the real markets it can be months before any change materializes. In a multi-market analysis, one has to decide which market or variable is the most important and choose the time period against this background.

2.1.10 Stock ctr. Flow Specification of Markets

One is familiar with the statement that at every instant of time, all stocks should be voluntarily held. This statement,
however, does not give credit to the fact that it takes time and is costly to change one's stocks of real and financial assets at the micro level. At the macro level, the society cannot get rid of the stocks without consuming them, which is (if you'll excuse me) time consuming.

Should a stock or flow specification be applied when different markets are analyzed?

a. Financial Markets

If the market is highly organized and we have a special interest in tracking the price (interest rate) day by day, there can be little doubt that a stock specification is most convenient -- what Foley (1975) calls "beginning of the period" specification. When the financial sector is a part of a total macro model, where the real markets are in focus, then it must be specified as to how the financial flows fit into the price determination.

b. Fixprice Markets

At fixprice markets (mainly real markets) where flows are relatively larger than stocks e.g. consumer goods, it might prove tempting to use a flow specification, as has been done in the ISLM (Equilibrium-Keynesian) model. But a flow equilibrium without stock equilibrium will give an ambiguous result because the equilibrium path will, in each individual case, depend on the state of stock disequilibrium. Therefore, if flows are of a significant size, they must be incorporated into the stock specification in a consistent manner. This does not imply that we have to work with an instantaneous stock equilibrium model.
because the time period should still be chosen in accordance with the expectational or adjustment lags.

2.1.11. Conclusion

Allow me to initiate the conclusion of this section on methodology by the following observation recently made by Hahn, 1977, p. 25:

"To many economists Keynesian economics deals with important relevant problems and General Equilibrium theory deals with no relevant problems at all.... This is quite simply that General Equilibrium theorists have been unable to deliver one half at least of the required story: how does General Equilibrium come to be established? Closely related to this lacuna is the question of what signals are perceived and transmitted in a decentralised economy and how?"

This statement summarizes quite well the problems I have been dealing with in an attempt to rid ourselves of the very restrictive assumptions which are more or less explicitly visible in the persuasive general equilibrium analysis. Unfortunately, the critical discussion of the underlying assumptions has not been handled in a very systematic manner, but the aim has been to cast some serious doubts on the usefulness of the general equilibrium model as a framework for empirical analysis. My method has been to take some relevant phenomena, such as uncertainty, lack of information, adjustment sluggishness, etc., and see how they fit into the framework.

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1 The latter form of specification is what Foley, 1975, calls "end of the period" equilibrium, which, if there is perfect foresight in the economy, is only equivalent to the beginning of the period specification. This is, I think, because Foley employs the same specification at all markets and then, unrealistically, specifies all markets with a beginning of the period stock equilibrium. This makes room for a wide spectrum of flow specifications in which the stock prices are para-
At this background I still ask myself why so much economic analysis, especially within international economics, is dominated by the general equilibrium assumption. Not even the argument of securing consistency within the model seems important as long as the economic agents do not make ex ante consistent plans! My preference is to begin the work of modelling from the real world, and if this ends up as an equilibrium model because that part of the real world, which I am modelling generates equilibrium, fine. But, there seems to me no reason a priori to constrain the model by forcing it into the equilibrium framework, even though the latter "neat and tidy".
2.2. Conventional Models used for Balance of Payments Analyses

2.2.1. Introduction

In this section, concentration will be centered on the frameworks often used for balance of payments analyses. Although we run the risk of anticipating some of the arguments concerning the theory behind the model, it is indispensable to know the strength and limitations of the analytical framework.

The development of the modern\(^1\) theory of balance of payments has followed a certain pattern. This is initiated by a pure flow model, wherein the real part of the balance of payments, i.e., the current account, is in focus. In the wake of the removal of capital control, increased importance is related to capital flows as an integrated part of the portfolio selection theory (Branson, 1968). This approach is built upon a stock analysis of the optimal portfolio composition and is developed more or less independently of the current account adjustment. "The Monetary Approach," (Johnson, 1959 & 1972), focuses on the interdependence of the two accounts, but in a peculiar way by assuming that whatever goes on at the current and capital account has to have its counterpart on the market for foreign exchange, i.e., the items below "the line". As a final point, growth models, which take into account the expanding effect of positive investments and savings, should be mentioned.

The main distinction of these theories is the time horizon of the analysis.

\(^1\) I am omitting the approaches of the classical economists, even though they are currently having a renaissance, especially Hume's specie-price-flow theory.
2.2.2. Analytical Models and Time Periods

The portfolio model can be interpreted as having the shortest time period of analysis. This is so if we assume "beginning of the period equilibrium" (Foley, 1975). To some extent, it seems reasonable to assume that financial markets clear quite easily, which means that the speed of adjustment is high. In addition, these markets are often organized in such a way as to render the picture of an auctioneer as not too unrealistic. When we accept this point-of-time analysis, it follows that flows can be disregarded in the sense that, although they are not without significance for clearing values, they remain constant within a point of time and cannot, therefore, cause any major disturbance in the analysis.

The flow model exists in two versions: The fixprice (Keynesian) and the flexprice. The Keynesian presentation is often illustrated within the framework of an extended ISLM-model. In this context it is, perhaps, somewhat misleading to call it a purely flow model. An important part of the model is derived from the money market where, of course, the stock of money plays a significant role. But, as we shall see, the rudimentary treatment of the bond market, in addition to no explicit consideration of the wealth constraint, justifies the designation. The time period for the analysis is determined by the assumption that the market for real flows clears (investments equal savings).\(^1\)

This takes place concurrently with equilibrium of the money market, and we find ourselves with "end of period equilibrium."

The flexprice presentation takes full employment for granted and, therefore, only analyzes changes in relative prices. This is of course, closely related to the general equilibrium tradi-

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\(^1\) Without going into the somewhat semantic discussion of what Keynesian Economics really concern, I simply want to stress that this model leaves room for unemployment, and changes in unemployment are generated solely from the demand side.
tion represented by i.a. Patinkin. One could also label it: Price elasticity approach without production effects.

In the wake of these two theoretical flow models, a number of attempts were made to synthesize the approaches. But no real theoretical innovation was achieved before the interdependence between the real flows and the capital account was stressed (Johnson, 1958). Yet even though this interrelationship was emphasized at such an early date, we find that the flow tradition survived in a somewhat undisturbed condition — especially in empirical studies — until the late 60's. At that time, two approaches developed which took stocks into account. The portfolio approach (Branson, 1968), which is of a partial nature, has already been mentioned.

But Oates & McKinnon, 1966 and McKinnon, 1969, broke a new path by setting up a model — although a very simple one — which, on the one hand, explicitly shows the simultaneity between real and financial flows, and, on the other, real and financial stocks. The time period of the analysis is lengthened to allow for the sluggishness of the adjustment of real stocks. Hence, a logically consistent model is developed which, unfortunately, proves a somewhat unhandy instrument for empirical analysis.

As a simplification, real stocks are omitted in the analysis, and the road is paved for the so-called "Monetary Approach". It is difficult to discover exactly what length of time period is implicitly assumed. On the one hand, the approach claims to be a general equilibrium theory, which points to a long adjustment period; on the other, the approach focuses to such a degree on the money market, which has a rather high speed of adjustment, that "the advocacy of a monetary approach to the balance-of-payments necessarily involves the assertion that these 'long-run consequences' materialize within a time horizon of two or three years." (Mussa, 1976a, p. 193).
2.2.3. **Portfolio Model**

Following the above outline of dividing the models in accordance with the assumed period of analysis, a logical consequence is to start with the point-in-time adjustment implicit in the portfolio selection model.

As far back as Keynes, 1923, we find the very first reminiscence of a portfolio consideration in international financial theory. Here, Keynes shows that the composition of the financial wealth between foreign and domestic assets depends upon the relative expected returns. This theory was established as part of the discussion of the interest rate parity, where the forward market plays a significant role by removing the risk related to exchange rate changes. Except for this lonely swallow, the contemplation in the direction of portfolio selection model was taken under the assumption of a closed economy (Keynes, 1936, and Hicks, 1935).

The modern portfolio theory is derived from a dissatisfaction with the Keynesian liquidity theory because of its inability to explain diversified portfolios -- given single valued expectations about future relative returns. The reaction to this -- the modern portfolio theory, i.a. Tobin, 1958, 1965, and Hicks, 1967 -- can be regarded as an attempt to advance a more general theory to explain the downward sloping demand function for money and the rationality of having diversified portfolios at the micro level.

The basis for the theory is a probability theoretical one. Here, it is assumed that each single wealth-owner attaches a probability distribution to the expected return of an asset. This subjective distribution is characterized by its higher order factors (such as variance, skewness and kurtosis), and to the extent that the

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wealth-owner pays attention to these factors, they must be explicitly considered in the analysis. Tobin, 1958, assumes that only the mean and the variance are of importance to the average wealth-owner; hence either the utility function of the wealth-owner is quadratic or the probability distribution is normal. In that case, the first factor (the mean) represents the expected return from investment in the specific asset, and the sector factor (the variance) the attached risk.

Efficient Combinations of Risk and Riskless Assets and Investor Optimum (adapted from Jensen, 1972, p. 360)

In Figure 2.1, an indifference map is drawn for a wealth-owner, who is assumed to be a risk averter. It is further assumed that at least one risk free asset (F) exists i.e., a certain return ($R_F$) and no price variability.

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1 See, e.g. Samuelson, 1970, for a more complete argument

2 This only affirms that the asset is risk free in a nominal sense.
The wealth constraint CC' is determined by 1) the size of the wealth and 2) the expected returns on the risk free asset and the composite asset ($\bar{R}$). The possibility area below CC' is of a subjective nature because the expected return, as well as the related risk, differ from one wealth-owner to another. The optimum point is reached when the marginal substitution between return and risk equals the slope of the wealth constraint. In Figure 1, the composition of the portfolio will be a mixture of the risk free asset BA and the risky assets AD. In other cases, however, the optimum point might be a corner solution although, given the assumption of perfect market conditions, this is not very likely. In cases where costs of transactions are introduced, a certain threshold value must be passed before changes in the composition are profitable (Hicks, 1967, pp. 31-32).

Two incidences are of special concern: Namely, (1) when the expected rate of return changes, and (2) when the degree of risk changes.

Re (1) If it is the return of the risk free asset that e.g. rises, then -- ceteris paribus -- the wealth constraint becomes flatter. When the return of the risky assets increases, the hatched area will expand vertically, thus making the BD line steeper. With a normally shaped indifference map, both events will result in a higher level of "utility" or "welfare".

Re (2) If the risk attached to the assets is enhanced, a number of possibilities exist because the shape of the hatched area depends upon the correlation between the considered assets. When the correlation is assumed to remain unchanged, then the area will move horizontally to the right. The BD line becomes flatter and, in normal cases, the risk free asset will take a greater share of the portfolio.

1 Hicks, 1967, chap. 6, and Tobin, 1965, are useful sources for a more thorough discussion.
As a final point, it will be noted from Figure 2.1. that only in special cases does an enlargement of the wealth lead to a proportionate increase in the concerned assets.

Before the portfolio model is adopted for empirical investigation, it is necessary to underline the very restrictive assumptions underlying it (See Lybeck, 1975, pp. 201-202).

1. All investors seek to maximize expected utility of wealth at the end of each period, when the choice among portfolios depends only upon the mean and variance of returns.

2. All investors can borrow and lend at a risk free rate.

3. All assets are perfectly marketable and there are no transaction costs.

4. The tax structure is disregarded.

5. Capital markets function according to the perfect competition model.

One of the crucial points remain whether or not risk can be treated satisfactorily within the probability set-up. Do wealth-owners have enough information to estimate their individual distribution and, even if they have, will they then trust it? The answers to these questions relate to our former discussions regarding risk vs. uncertainty. My personal opinion is that for real investments, the term of uncertainty is absolutely relevant. Concerning financial investment, it would probably be advantageous to separate big financial institutions (e.g. banks, insurance companies, etc.) from households & firms.

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This reminds me of Napoleon at Waterloo: Even though the former might have had a high mean value for winning, he would have had few opportunities for repetition.
It seems likely that the behavior of the former is influenced to a larger extent by probability considerations. The latter will typically lack information and invest relatively smaller amounts. If private persons place their available means in an investment fund, then the portfolio approach still applies. In all other cases, the mean-variance approach seems to be much too refined to describe the behavior of an ordinary household or firm.

Another set of problems emerges when the portfolio approach is applied to markets for financial assets rather than to only one investor. If it assumed that "all investors have identical subjective estimates of means, variances and covariance of returns", (Lybeck, 1975, assumption 3), then there is no substantial difference between the conclusion derived from the individual experiment and that of the market. But, in that case, it is possible to make an exact calculation of the risk, and there is no reason why people should not be able to insure themselves. This market situation is quite similar to a lottery, and is rightly described by Davidson, 1972 (pp. 197-202), as one of perfect certainty.

But, if the subjective probability distributions for a given asset differ from one investor to another, then there is always someone who is taken by surprise by the market, and we can no longer speak about perfect knowledge. On the other hand, the aggregation of different distributions will create a very complicated total demand for financial assets which cannot necessarily be represented only by mean and variance. Especially when the distributions are initially interrelated, due to expectations, for instance, no simple conclusions are immediately available.

A final problem of the mean-variance approach is that analysis concerning more than one period is hardly manageable. This means it is implicitly assumed that the composition of the portfolio can be reconsidered at the beginning of each period. Thus, only assets with a high degree of liquidity are, in fact, comprised by the theory.
2.2.4. The Flow or Short Run Model

The aim of this section is to draw attention to some of the weaknesses of the flow model represented by the ISLM model. This model is chosen as a typical representative for the traditional flow analysis of the balance of payments where the trade balance is in focus.

Quite recently Kuska, 1978, has pointed at a number of deficiencies, which make the popular Keynesian balance of payments model of more limited value than the extensive use up till now seems to justify. This model is in fact merely an extended ISLM model, where imports of goods are a function of domestic absorption and exports are either treated exogenously or as a function of the exchange rate.

The model:

\[
\begin{align*}
(2.1) & \quad Y = C + I + EX - IM \\
(2.2) & \quad C = C(Y, r) \\
(2.3) & \quad I = I(r) \\
(2.4) & \quad M = L(Y, r) \\
(2.5) & \quad IM = g(C + I, e) \\
(2.6) & \quad EX = h(e),
\end{align*}
\]

where \( Y \) is income, \( C \) is consumption, \( I \) is investment, \( r \) is the rate of interest, \( M \) is supply of money, \( EX \) is exports of goods, \( IM \) imports of goods, \( e \) is the exchange rate and the price level of goods is assumed to be constant and set equal to unity.

One is struck by the fact that two prices in this model are arguments in the behavioral equations (\( r \) and \( e \)) without anything being said about the markets where they supposedly are determined. As mentioned by Kuska, the rate of interest must be derived from a 'hidden' bond market\(^1\) on which the excess demand function \( (E_A) \) can be constructed by reference to Walras' Law.

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\(^1\) See also Hansen, 1970, for a discussion following those lines.
The aggregate (ex post) budget constraint for the economy may be written as:

\[(2.7) \quad [C + I + EX - IM - Y] + \frac{1}{r}[H(\ldots) - A + L(Y,r) - M] = 0\]

where \(A\) is the quantity of bonds, \(\frac{1}{r}\) the price of bonds and \(H(\ldots)\) is the unspecified demand function for bonds. From (2.7) we may derive a consistent demand function for bonds:

\[(2.8) \quad H = f(Y,r) + A + r \cdot M\]

Unfortunately, this demand function is rather peculiar in the sense that "any exogenous increase in the quantity of bonds (\(A\)) will be willingly held no matter what the values of the level of income, the rate of interest or the quantity of money" (p. 660). But perhaps of even more importance we see that the implicit demand function for bonds (2.8) is established under the assumption that Walras' Law is applicable, which has been shown in Section 2.1., only to be the case when the entire economy is in equilibrium. In all other states this model leaves us without an explicit description of how the bond market is supposed to react.

In addition the determination of the exchange rate is left unexplained. Often it is assumed that the rate is fixed by the authorities, but then the supply of money can no longer consistently be treated exogenously. This leads to a third deficiency, namely that the model does not give leeway for any balance of payments disequilibrium as long as the money market is assumed to be in equilibrium (cf. (2.4)) and no currency flows are allowed for.

The model specified in equation (2.1)-(2.6) is often given a geometrical exposition where two partial equilibrium lines represent the real market (IS) and the money market (LM). The external balance as a subsection of the real sector can be shown separately (XB).^{1}

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^{1} The \(XB\) line may be positive sloped if there is a negative effect on exports from rising interest rates, Cf. Almenren-Hansen, 1978.
Extended ISLM model

As long as this figure merely is used as a simplifying device for finding the equilibrium solution of the model I think there is general agreement of the consistency of the individual lines. Therefore the exposition may be useful for a comparative static exercise, but problems arise when the figure is used for any disequilibrium analysis. It has been quite popular in the Patinkin tradition to inlay arrows indicating the direction of change of the endogenous variables when the economy is kicked out of equilibrium. Taking into consideration that we are analyzing a simultaneous model, each market equilibrium line can only be interpreted as showing partial equilibria which depends on the situation and values of variables on all other markets. For instance, when the economy is out of equilibrium, the bond market is left unexplained and hence the development of the rate of interest.

1 Varian, 1977, has set up a disequilibrium model, where the rate of interest explicitly is determined on the bond market. This leads under certain assumptions concerning the interdependence of the market to a kinked IS-curve.
A proper disequilibrium model requires that not merely is every market separately specified, but in addition a reaction function showing the adjustment procedure must be specified. These functions are supposed to describe how the agents react when they are confronted with different constraints caused by the disequilibrium situation. Hereby it is possible to come across the 'spill-over' effects from the markets where the agents find themselves rationed into unrationed markets.

Without reiterating our discussion of the equilibrium assumption of the structural model, some other methodological problems relating to the arithmetical exposition of the ISLM model remain.

Firstly, the stock/flow relation is omitted. McKinnon, 1969, pointed out that the above model was only consistent with a zero growth rate in the stock of capital. Otherwise, an increased stock of real capital would call for either a rise in the rate of interest or an increased amount of money. Both are incompatible with an unchanged flow equilibrium.

Secondly, it is a point of criticism that the assumption of perfect substitution of bonds and real capital is not discussed at more length. Among other things, this assumption has quite far-reaching consequences for the policy conclusions drawn from this comparatively static analysis: The private sector regards real capital and government bonds as having equal properties within the portfolio.

Thirdly, the labor market seems to be suppressed in the sense that any change in real income is immediately mirrored as a change in the demand for labor and, thus, for the number of employed persons. If there are decreasing returns to labor, the real wage must adjust instantaneously, either through price or wage changes, neither of which are discussed thoroughly.

In summary, this evaluation of the popular flow-equilibrium model represented by the ISLM model has unveiled a number of shortcomings. The geometric exposition is only valid for the equilibrium points, which makes any analysis of the dynamic adjustment
impossible. Even looking at the structural model, it reveals a number of weaknesses and, according to our previous methodological discussion, the usefulness of an equilibrium model to expose the dynamic characteristics is questionable.

2.2.5. The Long Run or General Equilibrium Model

In the preceding section we saw that one of the shortcomings of the structural short run model was the lack of consideration regarding stocks. The method has often been defended by stating that the period is so short that changes in stocks are unimportant. As was shown in the portfolio model, stocks matter, even in a point of time model.

The long run model can take full account of the interdependency between stocks and flows. No equilibrium is achieved before all actual stocks equal the desired ones. This requirement proves a time consuming demand for real stocks, and I am uncertain if the 2-3 year period recommended by Mussa is sufficient.

In the most rigid form (e.g. McKinnon, 1969), a general equilibrium assumes a zero rate of net saving, which implies a stationary state. As long as net savings are positive, the real wealth is growing, and thus will cause repercussions in the financial sector.

Another source of disturbance involves sector imbalances. Even in a situation where the real net investment is zero and, hence, the wealth unchanged, one subsector can pile up financial claims issued by other subsectors. In a closed economy, this aspect is best illustrated by a public sector deficit. In this situation, the private sector will increase its financial wealth, and financial flows from the public sector must finance the deficit. If the composition of the financial flows does not exactly match the demand structure in the private sector, further repercussions will ensue -- typically, the rate of interest changes to equalize supply and demand. But, it is often overlooked that a change in
the interest rate has implications for the valuation of the entire wealth, not only the marginal increase in financial wealth.

Looking at an open economy, the same sources of disturbance can arise from foreign relations. A current account deficit reduces the financial net wealth of the domestic sector and entails capital flows of an exactly equal amount. These capital flows influence the financial markets as well as the exchange market. Thus, the interest rate will be affected. In addition, only by firm public intervention will the exchange rate remain unchanged. Otherwise, it will probably fall, thus giving rise to a revaluation of the foreign debt.

These factors are taken into consideration in a logically consistent manner in regard to a foreign sector in the general equilibrium model, but "logical consistency of the basic model is not, however, the only requirement of an economic theory. Empirical relevance is another." (Leijonhufvud, 1968, p. 62).

The stock equilibrium model is not either especially helpful when economic policy is appraised. 'The need for stabilization policy is predicated on the assumption that from time to time the economy will be jostled off its full employment equilibrium perhaps with cumulative effect. Stabilization policy is designed to offset or at least to mitigate these disturbances. But if stabilization policies will not work (under fixed exchange rates), as indicated by this class of stock equilibrium models, neither will they be necessary, for exogenous disturbances will also lose their ability to affect aggregate demand. Adjustment of the economic system will automatically nullify them.' (Cooper, 1976 p. 152).

2.2.6. The Theory of the Corridor

Through these pages of methodological discussion we have turned down a number of macroeconomic models as giving an inadequate
picture of the 'real world'. I will not say that I, at this state, can offer an alternative; but inspired of Leijonhufvud I will give a short and sketchy outline of what could be a more dynamic approach to macroeconomic analysis.

Leijonhufvud, 1973, has introduced the concept of a corridor through which the economy is moving when there is no erratic exogenous disturbances. He does in fact only analyze the corridor around the full-employment economy and fails to see that a corridor can arise around any level of unemployment. So it is better to talk about a bunch of corridors determined by the effective demand. The idea behind the corridor is, that the labor market reacts within certain limits of changes in effective demand rather stiffly and slowly. So in the centre of the corridor is a historical given level of employment - and not necessarily full employment\(^1\) - around that level the effective demand for goods and services can fluctuate.

We have to be careful, because a given amount of goods and services can be produced with less and less input of labor over time according to technological improvements and growth of capital equipment. So a fixed number of people employed need a growth in effective demand that equilibrate the increased productivity.

Besides this needed secular growth in effective demand for real goods, all kinds of cyclical changes in the effective demand can happen, caused by information failure, stochastic events, etc. One further limitation of this approach should be mentioned, namely, that even if the number of employed is constant, the unemployment rate will increase because of the secular growth of the labor force.

\(^1\) Cf. also his more recent comments on the corridor model, Leijonhufvud, 1977, p. 295 and 283.
Why this special interest in the labor market? From a methodological point because it has the longest functional adjustment lag\(^1\).

The demand for labor is a derived demand and the labor force has in many industries become a (semi) fixed factor of production. So the firms are hesitating before changing the number of people being employed, because the fixed labor costs are relatively too high to be considered as variable\(^2\).

\(^1\) From a personal view, because the end of economic analysis should be to improve the situation of employment.

\(^2\) And if capital and labor in the short run are complementary factors of production, it is not only a matter of the fixed costs of labor but also of capital that should be considered.
In those industries the entrepreneurs have to change their expectation about the growth rate of production in the longer (medium) run, before they change the demand for labor. The short run expectations about the production (supply) are rather static in the sense that past experiences concerning the effective demand are prolonged. One can mention several factors which can explain why short run divergencies between effective demand and supply do not shift the level of the corridor, i.e. the effective demand for labor.

1) In the modern Western economies the public sector has a considerable size and its activities often create built-in stabilizers. When income slows off, so does the tax revenue, and the expenses increase.

2) Firms are willing to accumulate undesired stocks of inventories. This assume that either the firms have some available funds or the supply of finance can be expanded endogenously.

3) That the consumption is a function of the permanent (expected) income. This concerns especially the entrepreneurs (because the employment is assumed to be constant).

The existence and acceptance of stocks make it possible, within certain limits, to adjust for differences between effective demand and supply. These stocks can be regarded as 'buffers' that catch accidental changes in demand. Nothing precise can be said about how wide the corridor will be. It depends on a number of factors, e.g. past experiences, the size of the stocks, how the economy is organized, etc.

On the other hand it can as well be the demand for stocks that knock the economy out of a corridor. For instance, a change in long term expectations concerning the marginal efficiency of

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1 Of course there can be given a lot of examples of production processes, where labor is considered as a variable factor of production, e.g. construction, agriculture. But it is important that these industries are a declining part of the GDP.
capital, or it can be a change in the demand for money, or a persistent change in the exogenous demand (the oil price rise or the cut in the growth of public expenses).

All this should not be taken too literally; but later on, when the macroeconomic consequences are discussed, I will try to keep the analysis within this Corridor-framework. This is an advantage compared with the more conventional model, because we can evaluate the conclusions within a dynamic and historical model, which on the other hand is more sketchy and yet qualitative of nature - more so than usually seen within international economics.

At last a more doctrinal point should be touched: The connection to the economics of Keynes. Chapter 5 in 'The General Theory' is reserved a discussion of 'expectation as Determining Output and Employment'. Here we are presented for 'short-term expectations' and 'long-term expectation'. The first is concerned with the price which can be obtained for the finished product - the process of production takes time - and that determines the level of production. 'Now, in general, a change in expectations will only produce its full effect on employment over a considerable period'. Keynes, 1936, p. 47. Here we have the corridor!

The second is concerned with what the entrepreneurs hope to get in return, if he purchases real capital, which has consequences for the effective demand - and will, maybe, change the corridor. It was cyclical movements within the full-employment corridor that occupied Keynes when writing "Treatise on Money", whereas it was the level of and the change of the corridor that mainly are described in the 'General Theory'. That is one reason why the 'General Theory' so easily was interpreted into a comparative static framework, where one level of the corridor was compared with another. Unfortunately, the more complicated and apparently superfluous concepts - such as uncertain expectations, lack of information, the denial of W.L., slow adjustment - were soon slipping into the background of the economic analysis.
SECTION 2.3.: THE FINANCIAL FRAMEWORK

2.3.1. Introduction

The growing interest in the analysis of international capital flows has emerged from a recognition of the increased integration of economies not only within Europe, but all over the world. This post-war phenomenon did not begin until the late 1950's when the integration of western economies sped up. From that time onwards, trade barriers were reduced through the establishment of customs and free trade unions in Europe and the "General Agreements on Trade and Tariffs" within the OECD area. Simultaneously with the facilitation of trade flows, financial flows were eased. This happened partly because of the introduction of free-convertibility of currencies and partly because of reductions in the restrictions on capital movements. During the last two decades, the number of transactions across the frontiers has increased immensely.

From a global welfare economic point of view, there are many sound reasons for this development. The international division of production creates a larger amount of goods and services for a given number of employed factors of production. The free movement of capital contributes to an allocation of real investment where the profitability is highest. On the other hand, this situation of countries becoming more economically interdependent implies that the single national state is now more vulnerable to events disrupting the external balances. A country can no longer isolate itself from the economic environment without experiencing immediately a very painful adjustment process.

What results from this changed international interdependence is a growing interest in how the external adjustment mechanism can work as smoothly as possible, thus reducing the vulnerability of the economic system. A sustained deficit on current account must be financed one way or another. Thus, the financial flows play a very significant role in this respect. But items on capital account can also have a reason of their own through real investments or portfolio decisions.
Financial flows are only one way of closing an external imbalance. Between sovereign states, there is also the possibility of changing the relative price between the national currencies. But neither changes in the exchange rate nor the financial flows can be analysed independently of each other. A mutual interdependence exists which will be discussed thoroughly later.

2.3.2. The Aggregation of the Economy

The main concern of this thesis involves the financial flows between countries. Thus, a financial framework must be set up which can be used for an adequate analysis. It seems sensible to start with the theory of national financial markets and then widen the scope to comprise the effects of international flows.

The private sector is the focal point of our analysis. Thus, the behaviour of the economic units within this sector will be our main topic. In a market economy, the political authorities are very seldom able to decide the actions of the economic units directly. They have to rely on reactions caused by different initiatives, such as changes in relative prices, taxes/subsidies and effective demand for goods and services. It is of great importance, therefore, to investigate the economic behaviour of the private sector. How this sector will be disaggregated is a difficult task, and will depend on the specific purpose of the analysis.

Looking at financial flows, it is natural to single out the financial sector consisting of banks and other financial intermediaries (OFI). Banks can issue liabilities which are regarded as money by non-banks (OFI), and the public.

The non-financial sector will be further subdivided into households and firms. Households can use their income for consumption and financial saving, and will normally be assumed to have a financial surplus. On the contrary, firms undertake the real investment decisions and will, therefore, have a financial deficit. This division will be discussed in further details later on; but one border case should be
mentioned in advance, namely, households buying their own homes. I am inclined to regard these households as being in a position equivalent to that of a firm: producing their own accommodation and having a financial deficit in the period of buying the home.

In addition to the private sector, we shall consider two external sectors. The first is the government, which will be regarded as being entirely exogenous. No attempt will be made to put forward reaction functions of the central political authorities. The autonomous political initiatives are jointly decided by the politicians and the board of governors of the Central Bank. In some respects, the local authorities can also be regarded as exogenous (e.g., the impact on the effective demand for goods and services), but in regard to financial relations, they will be treated as a part of the private sector. The second external sector is the foreign, which will be considered as fully aggregated - except in cases where it clarifies to make other assumptions.

2.3.3. The Supply of Money

2.3.3.a. Some Crucial Properties of Money

If one regards financial assets as a fan where those with the highest degree of liquidity are placed at one end and those with the lowest at the other, then we will find money at the very end, with the highest degree of liquidity. But it is hazardous to speak of money without a precise definition which avoids misunderstandings. "Money is what money does" (Hicks, 1967), which is traditionally considered as 1) means of payment, 2) store of value, 3) unit of account. This is a functionalist breakdown which, I think, has its roots in the different motives for demanding money.

The crucial property of the medium which is supplied as money in a monetary economy should be the ability to bridge the information gap between the buyer and the seller of goods. In a world where the credit-worthiness of the buyers is uncertain and the division of labour prevents one from
settling a deal through barter, there is an urgent need for a reduction of this uncertainty. This is where the role of money comes in, namely, as a financial asset which is guaranteed by somebody whose "credit-worthiness" is generally known to be without doubt.¹

The second important property is some kind of predictability of the value of the means of payment. This will, to a large extent, prevent uncertainty towards the relative price of the money assets and the goods and services which are exchanged for it. There can be little doubt that if some kind of index-unit of account were defined, it would oust the use of a nominal unit of account during the periods of fluctuation in the price level.²

The smaller and more homogenous the considered society, the larger the number of assets which can be used as money. For instance, in an agricultural society, bills denominated in barrels of wheat could be circulated as money. Thus, within a narrow society (sector), there are more possibilities of definitively clearing an account.³ This aspect is crucial for an appraisal of the possibility of creating of monetary union.

As regards the private sector as a whole, bank liabilities can be used in a manner parallel to Central Bank money. But payments between the private sector and the government have to be made in high-powered money⁴ as long as the government uses the Central Bank as the only bank (connection).

¹ If a guarantee is not enough, the authorities can make a special asset "legal tender"; then a seller or a creditor cannot refuse to accept the money.
³ See Clower and Shackle, 1971. The discussion regarding trade credit as money is enlightening.
⁴ High-powered money and primary liquidity are often used synonymously and cover all fully liquid assets of the Central Bank and the government which can be used to settle an account with those institutions, whereas secondary liquidity is private bank money.
Finally, there is the foreign sector, where every single deal is assumed to be settled in the currency in which it is denominated. If there is an aggregate deficit, it must be settled in the currency of the surplus country. Thus, in the international environment, even high-powered money cannot be regarded as an adequate means of payment - disregarding reserve currencies. Within the national state (currency area) the monetary authorities will find no difficulty in being the lender of last resort. Internationally, however, the government will encounter difficulties when it commits itself to maintaining a fixed parity, just as a private bank will have to keep the parity between high-powered money and deposits.

In summary, it can be said that the characteristic of money is that the transfer of the asset called money is regarded as the final transaction between debtor and creditor or buyer and seller.\(^1\) This is the distinction between money and various kinds of credit arrangement. Therefore, trade credit should not be considered as money - unless the endorsed bills start to circulate among firms as final payment.

2.3.3.b. The Control of the Money Supply

The sources of high-powered money supply to the private sector are the current and capital accounts dealing with the external and government sector. Within the private sector the essential source consists of the banking system liabilities.

In principle, the supply of high-powered money could be determined by the monetary authorities if they possessed sufficient statistical material to get information about government accounts and balance of payments day by day. In any event, this would mean sacrificing at least one other potential goal of the economic policy, e.g., rate of interest or disposable income. Contrary to this, the supply of secondary liquidity is, in the short run, outside the control of the monetary authorities.

\(^1\) Cf. Goodhart, 1975, chapter 1.4.
This can be observed in the banking practice which fixes the rate of interest on loans and deposits, and then passively\footnote{Cf. the discussion in section 2.1, about the constraining behaviour of the banks.} accepts the derived quantities of loans and deposits. Particularly in countries with an established banking practice of overdrafts, the potential money supply is endogenous in the short run.

Looking at the actual figures for "the money supply", I think it is worth mentioning a number of limitations regarding what is conventionally considered as showing the development in the money supply. 1) All statistical figures are of \textit{ex post} character where the economic theory is almost exclusively concerned with \textit{ex ante} behaviour. 2) If the considered market is not assumed to be in equilibrium, the actual figures could be determined by demand, as well as, supply factors - and will probably show a mutual impact of both. 3) Even within a so-called equilibrium state, we shall have difficulty in identifying the actual figures as either demand or supply determined. Only when one of the variables is entirely exogenous can we, with reasonable certainty, identify the figures as determined by that specific variable.

It can be, therefore, rather difficult to find exact figures for the supply of high-powered money within a country which has fixed exchange rates, the statistics might prove misleading because the transactions with the foreign sector are influenced by demand factors and hence, endogenous. Changing the focus towards M1 or M3, the demand factors seem to be still more predominant, so that one could presumably better identify the monthly or quarterly statistics with the demand for money, rather than the supply of money (cf. next part). Only in those rather rare situations where deposits and loans to the private non-financial sector are quantitatively regulated (plus strict foreign exchange control), we can use the statistics of M1 or M3 as figures for the supply of money.
2.3.3.c. The Supply of Secondary Liquidity

In the following, we will consider a closed private sector or given external balances. This means that the amount of high-powered money is constant, which has some implications for the banks' behaviour.

The secondary liquidity consists of those liabilities which are issued by financial intermediaries and accepted as final payment. When the buyer hands the liabilities over to the seller, his commitment is cleared. Thus, the definition of secondary liquidity is vague and depends entirely upon what is accepted as final payment. For instance, an often discussed question is the kind of deposits within banks which can be regarded as money. I see only one solution: it must be discovered empirically. The answer will probably differ from country to country, depending on specific restrictions on saving deposits such as average binding period, possibilities of making short term loans in the bridging period, etc., and traditions for payments.

Broadly speaking, it is only the deposits at clearing and saving banks that can be regarded as generally accepted means of payment. Those deposits can be created in three different ways:

1) The private non-financial sector reduces the amount of high-powered money it wants to keep.

2) Banks acquiring more assets - but here we have to distinguish between: a. establishing a new bank loan and b. buying financial (or real) assets in the market.

Ad 1) Concerning the first point, not much can be said because it depends on the habits of the households and firms, e.g., how wages are paid (in cash or as bank deposits). In general, it is assumed that the use of high-powered money outside the financial sector is on a downward trend. Perhaps one day "the (high-powered) moneyless society" will come into being. Among other things, this will have consequences for the
privacy of society because "high-powered money does not smell". As long as our main interest is the short and medium run, I will not pursue these structural and moral aspects further.

Ad 2) Every time a bank loan is established, the amount of bank deposits is simultaneously increased. Surely if the loan has the character of a right to make overdrafts, then the deposits do not grow statistically before that right is used. When a bank customer draws his loan for paying some bills, the exact amount comes back again as deposits. This is so because the aggregate banking system cannot avoid receiving the money which it itself creates. It is only a shift in the high-powered money ratio of the public or in the external balances that can cause a leak in this process of money making. Bank loans are normally established at the request of the customer, and if the habit of the banks is to keep the rate of interest constant in the short run, then the change in the amount of secondary liquidity is determined by the change in the demand for loans.

In many countries the banking sector seems to be dominated by a small number of large banks, which can be regarded as forming an oligopoly. It is further assumed that there is some kind of agreement among the banks of non-price-competition, e.g., using a principle of price leadership, then there can be a discrepancy between the marginal cost of creating a new bank loan and the marginal income from this loan. The demand for bank loans from the non-financial sector will, therefore, play a crucial role in determining the amount of secondary liquidity. Depending on how interest-elastic this demand is, changes in the rate of interest will have a smaller or larger effect on the profit of the banks. If it is assumed that the elasticity is rather low and significantly smaller than 1, then we can conclude that it is not exclusively the wish for profit maximization which guides the behaviour of the bank system. Banks would increase the total profit by rising the rate of interest up to the point where the demand elasticity reaches 1.

1 This is, of course, an entirely empirical matter. Some evidence has been given in previous studies to support the assumption of a low elasticity of interest.
The demand elasticity of bank loans will be affected by the institutional framework. If a well-organized market for short and medium term commercial bills exists, then firms can substitute the bank loans more easily than otherwise. But the banks can as well substitute their supply of funds from giving bank loans to buying commercial bills, which will also increase the secondary liquidity. In this case, one should look at the interest elasticity of the joint demand for loans and bills to see if it is appropriate to aggregate the markets.

In one respect, there is an important difference in the structure of the markets for bank loans and that for commercial bills.

When a bank's loan is established, the rate of interest is not fixed for the entire lending period, but will change concurrently with the changes in the bank rate. This factor explains some of the hesitation which banks seem to have toward raising - and even more pronounced, lowering\(^1\) - the rates of interest too abruptly. But all this depends very much on the institutional constraints differing from country to country.

On the contrary, the rate of interest is fixed for the entire period of duration when the loan is raised through the commercial bill market. It is only the marginal borrower who is affected by a change in the interest rate. Thus, in periods when the rate of interest of commercial bills is regarded as unusually high, bank loans will be more attractive, and vice versa. Therefore, these two types of rather differing ways of borrowing should be recognized, and can probably best be analyzed jointly.

\(^1\) Some Danish evidence can be cited that the discrepancy between the rate of interest on bank deposits and bank loans has increased during the period of rising level of interest. On the other hand, this period was also characterized by quantitative restrictions on the amount of bank loans.
In countries with a predominant market for short term paper, it seems likely that changes in the bank rate occur more frequently, due to competition. Later, we will look at the interest rate of the Treasury Bills market, which has consequences for the amount of high-powered money and to some extent, therefore, for the creation of secondary liquidity.

2.3.4. The Demand for Money

2.3.4.a. A Disequilibrium Concept

In the previous sections, we have discussed some aspects of the money supply theory. One obvious difference between the supply and demand for money is that the supply can, in theory, be rationalized by the seignorage which it gives its supplier. The Central Bank, as well as the private banks, gain the difference between the printing and administration costs (plus interest eventually) connected to their liabilities and then, the earnings form their assets.

No such direct or concrete gain can be particularized as the basis for the demand for money. From an unreflective viewpoint, holding money looks like sacrificing either consumption or interest. In fact, this is the problem in the general equilibrium theory, where one can hardly find a reasonable explanation for the existence of a demand for money.

As early as in 1932, Hicks stated that "the use of money is inconsistent with economic equilibrium" (Hicks, 1973, p. 4). We must, therefore, search in disequilibrium economics for the theory of the demand for money. As emphasized in the methodological section, the analysis of "the real world" is essentially a disequilibrium analysis, where uncertainty caused by lack of information concerning actual and future transactions is one of the main factors explaining the behaviour of economic units. In the following, we will attempt to elaborate the motives for demanding money as a function of the desire to reduce this uncertainty.
Traditionally, the motives for demanding money have been separated into transaction and speculation motives, a very important but somewhat confusing distinction. The two properties of money behind this division are, of course, means of payment and a certain store of value. That the distinction is relevant can be seen, for instance, in that the demand for high-powered money by firms and households can only be rationalized from the quality as special means of payment because there are other stores of value which are equally certain but give a yield, e.g., time deposits. On the other hand, this separation should not be overstated. In a more thorough analysis of the demand for money, two further motives, which tend to blur this distinction, should be stressed.

2.3.4.b. The Precautionary Motive

This motive is closely linked to the concept of uncertainty - that "we simply do not know" what will happen in the future. Liquid funds are kept, not only for a rainy day, but as an insurance against uninsurable events.

2.3.4.c. The Finance Motive

It is not only the actual transaction, but also planned transactions, which can affect the demand for money. When a firm plans to undertake some real investments, it must collect a basis of liquid funds and establish credit lines in advance. Thus, the money is held today with the purpose of buying some real goods in the future.

An other substantial difference between the motives should be emphasized: that the demand for money as means of payment has a more intermediate character and is more closely linked to the real flows, whereas money as a store of value is a part of the portfolio and is, therefore, a much closer substitute for other stock variables, e.g. financial assets.

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2 This motive is neglected in textbooks, but origins from Keynes, 1937a and Keynes, 1937b and has been revived by Davidson, 1972.
One would perhaps say that money as means of payment facilitates the communication of flow-information through the economy. The number of transactions and the amount of information concerning relative prices are reduced when all goods are exchanged for the same object, i.e., money. On the other hand, as we saw in the Clower model, the use of money can, in some cases, also block the relevant flow-information. The unemployed are not able to communicate their demand directly to the firms. Unfortunately, those who want more bread cannot go to the bakery and offer so much work in exchange for so many loaves. But, in general, it is wrong to claim that money is the cause of missing uncertainty about relative prices and the low chance of double coincidence of wishes will always make a barter economy inefficient compared to a money economy (Brunner & Meltzer, 1971, p. 801).

2.3.4.d. A Certain Store of Value

In some ways the demand for money as a store of value is caused by its intrinsic value. Purchasing power stored in money is transferred in liquid form into the future. The use of money reduces the capital uncertainty as far as possible\(^1\) because the store of value can at any time be changed into means of payment at par without any uncertainty. This is a decisive property behind the finance motive. When holding money, firms do not run the risk that the value will fall before the real investment is executed. Much the same can be said about the precautionary motive, which explains why money is kept as a safety belt. If the value of the funds were uncertain, it would then be necessary to keep a larger amount of the wealth for this purpose.

As a final point, there exists the 'speculative' demand for money, derived from a desire to obtain the highest yield\(^2\) from the idle part of the wealth, i.e., those assets which are kept for optimization of the financial portfolio.

\(^1\) How price expectations can affect this statement will be discussed later.

\(^2\) Cf. p. 70 below.
Thus, money as a store of value can be much more broadly defined than as means of payment. The crucial characteristic is the certain value of capital. Quite a number of assets come into consideration. A three-month Treasury Bill will have a safe value if the funds are not planned to be used before three months' time. There is, of course, no clear-cut border line between the three motives for demanding money as a store of wealth. To some extent, they reinforce one another - for instance, when the uncertainty towards the expectations of the future yield of bonds increases.

A counterpart to the role of means of payment as an intermediary of flow-information is difficult to find in the stock context. In classical theory, it was assumed that a rise in the rate of interest was a sign of investment running ahead of savings, i.e., a change in the intertemporal preferences of the society. But since the introduction of the Keynesian portfolio selection theory and the more elaborated demand for money, a rise in the rate of interest proves a very equivocal sign. A change in the rate of interest can, of course, still convey change in the intertemporal preference, but it can, as well, be caused by a shift in the liquidity preference or by a change in the expectations concerning the rate of inflation.

To summarize, the demand for money can be derived from the imperfect functioning of the market economy, but the two different qualities should be clearly distinguished. The demand for means of payment is a consequence of the market participants' limited knowledge concerning relative prices and other participants' preferences and creditworthiness. The demand for an asset as a certain store of value results from the lack of forward markets and the limited knowledge of future events. In the latter respect, we can work with a much broader definition of 'money' than merely as means of payment. Here the time dimension is important - depending especially on the planning period, because all assets with a shorter period before maturity than the holding period can be regarded as safe assets.
2.3.5. The Supply of Other Financial Claims

Above, we have rather thoroughly analyzed the properties of money. We will now more sketchily describe the other components which can form the wealth of a society. First, the fundamental difference between real and financial assets will be discussed. Later, the motives for supplying non-monetary claims will be analyzed, with special reference to the distinction between stock and flow variables.

2.3.5.a. The Private Non-Financial Sector

The wealth of the private sector is made up of real assets within this sector and the net-claims on external sectors. Real assets differ from financial ones in that there is a creditor, but no debtor. The creditor is, of course, the owner, and the real assets add to his wealth. In so far as his net wealth is smaller than the value of the real assets, he needs to obtain finance from outside. This can be realized by issuing a financial claim wherein he is the debtor, and the buyer of the claim is the creditor.

An obvious disproportion exists when one looks at the real amount of capital in comparison with the financial strength of a single firm in modern business. These financial constraints can be relaxed by issuing equities, which make the real capital more liquid and divisible and, as a result, more attractive to households.

When the price of equities or real assets changes, the owners make capital gains or losses which are not counter-balanced by the opposite experience of any debtors. This means that the wealth of the private sector fluctuates in relation to the development of the stock market.¹

¹ In the FMP-model of the American economy, the change in equity prices significantly affects the behaviour of the consumers.
The motives for supplying financial assets other than equities can be divided into two categories: 1) to obtain finance which makes effective the demand for some real assets, and 2) the reallocation of the financial portfolio. Ad 1) At the micro level, a firm or a household will seldom issue a bond (or some other financial claim) merely to increase the cash balance. The purpose will be to obtain the necessary finance to undertake some real investment (or durable consumer goods) which cannot be paid for out of the current profit (income). At the macro level, this increased supply of bonds will - ceteris paribus - show up either as a (slight) tendency towards higher interest or an increased amount of money. The latter will be the case when the financial (or external) sector buys the bond.

The normative theory of how business should finance its real capital is a difficult task which will differ from country to country, depending on the specific institutional frameworks and traditional behaviour. As a general observation, one may say that it can reduce the uncertainty by issuing claims with a time until maturity of approximately the same length as that of the real asset. Then the financing costs are known (assuming it is a fixed interest bond) and the size of the repayment of the loan is tied to the depreciation of the real assets. The latter is an advantage as long as the financial system is not efficient enough to make it possible to continuously correct a discrepancy between the repayment and the depreciation. The proportion of own capital (equities) to borrowed capital is conventionally regarded as important, but, following the Modigliani-Miller Theorem (cf. Goodhart, p. 75), the demand side will equalize the returns, making the choice of financial source unimportant. However, this theorem relies on a number of restrictive assumptions, the following of which, at least, should be mentioned: the firm's future earnings can be described by a probability distribution; the firm cannot go bankrupt; and the tax laws are neutral towards different financial patterns.
In general, the household sector will have a financial surplus in connection with its status as a net-saving sector, and, therefore, does not, at the macro level, need to supply financial claims. At the micro level, purchases of either a home or some durable consumer goods, will make the single household run a financial deficit.

How home building is financed differs enormously from country to country. In the Danish case, the main part of the cost is financed by issuing bonds through special institutes. These bonds have a period between ten and thirty years until maturity, and their marketability is high because the institutes have standardized the terms, and the debt-issuers (home owners) have a common responsibility for the debt. The remaining costs have to be financed either through previous savings or by issuing personal claims, which have a lower degree of liquidity than the bonds.

Durable consumer goods are financed by drawing on the households' own resources (e.g., bank deposits), by a hire-purchase arrangement, or by a bank loan. In the last case, the amount of money will - ceteris paribus - increase.

The private non-financial sector can also issue claims with the purpose of portfolio readjustments. Then the economic units act more or less as a financial intermediary, except for buying equities with the aim of gaining command over the actual business - which, in fact, is more like a real (second hand) investment.

2.3.5.b. Financial Intermediaries.

The financial intermediaries owe their raison d'être to the fact that the future is uncertain and the information limited. They can bridge the different wishes of households and firms.

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1 This makes private bonds as secure as Treasury Bonds.
by investing in information gathering and utilizing the law of large numbers. They supply claims on themselves which have the characteristics of being rather liquid. This quality satisfies the wishes of a large number of small households with a more or less temporary financial surplus in which the actual yield is of secondary importance. On the other side of the intermediary balance sheet, we find firms (and the like) with a financial deficit which they wish to have financed over a longer (even indefinite) period, with a relatively low security backing, but are willing to pay a somewhat higher rate of interest.

The banks, of course, are the classical example of a financial intermediary. In addition, in a modern society a number of specialized financial intermediaries exist who obtain specific knowledge within different fields of business activity. They gain the necessary funds either by accepting deposits or by issuing equities.

Contrary to firms and households, the transactions of the financial intermediaries are only related to balance sheet (stock) readjustment or expansion, but are not caused by flows of financial surplus or deficits.¹

2.3.5.c. The Public Sector

In principle, the budget of the public sector could be regarded as similar to the balance of payments. The current account is matched by the public demand for goods and services minus net tax receipts. The items in this part of the budget affect the income formation of the private sector. When the account is in the red, it shows a financial deficit, i.e., that public investment is larger than public savings. Somehow this deficit must be financed. Here we should distinguish between local authorities and the central government.

¹ Normally, financial intermediaries will have a financial surplus consisting of retained profits. If they have a rather large portfolio of assets with variable values, the size of capital gains/losses can fluctuate greatly from period to period, but these changes do no have to affect the financial position because such changes in the value are automatically invested in the assets which actually change in price if no discretionary actions are made.
The former have no direct access to the printing press and are, therefore, in a financial situation somewhat similar to a private firm: it can only close the financial gap by issuing claims (e.g., bonds and bank loans) or run down accumulated funds.

In the following, we will consider the actions of the government and the Central Bank together because in most countries there is a high degree of coordination. When the government buys goods and services, it normally has to pay with high-powered money; thus, if no preliminary actions are taken, the amount of money will increase. To the extent that statistical figures are available, the authorities can undertake countervailing sales of bonds, depending on the preferred development of liquidity and rates of interest. Besides the entailed change in the wealth of the private sector caused by the imbalance of the current account of the public budget, it is difficult to distinguish between the effect of the supply of money and bonds coming from a public sector borrowing requirement (PSBR) and the Central Bank portfolio readjustment. Both should be guided by the intended monetary policy.

2.3.5.d. Claims Denominated in Foreign Currencies

Here we will look at a small, open economy. The supply of financial claims coming from abroad is taken as an exogenous variable and covers more or less all differing kinds of currencies and maturities.

Our main concern will be the supply of financial claims by national firms, financial intermediaries, and the public sector. In regard to the latter, this supply has to be seen in relation to the exchange rate system. If the country (government) has committed itself to maintaining fixed parities towards other currencies, then it must insure that there is always a sufficient reserve of foreign exchange.

\(^1\) From country to country there can, of course, be difference e.g., in the U.S.A. the full amount of the federal deficit has to be covered by the sale of Treasury Bills (cf. B. Hansen, 1973).
One way of obtaining this is to sell financial claims on the international markets or to create foreign short term assets through, e.g., SWAP - arrangement or international organizations, etc. This is an exogenous supply of claims determined by politicians, but, to some extent, derived from the private sector's excess demand for foreign exchange.

The financial intermediaries' supply of claims in foreign currency will frequently be derived from the private non-financial sector. Only large and internationally well-known firms have any chance of obtaining funds directly in the international markets. Thus, when a small or medium-sized firm wants to supply claims in a foreign currency, it has to go through financial intermediary.\(^1\)

In addition to this custom-derived supply, there are the so-called Euro Banks. These accept deposits denominated in foreign currency and form the basis of the Euro-currency market which we deal with later. (The supply of Euro-currencies are unimportant in the Danish case).

Firms may have two main motives for supplying claims denominated in foreign currency. One is to obtain cheaper finance if the interest rate is lower abroad than at home. But the firms must take the exchange rate risk into consideration. The difference in the level of interest rates can merely reflect the expected development of the exchange rate. Thus, if the exchange rate does change (e.g. 5%) during the period, a short term loan (e.g. three months) can prove very expensive even when the coupon is low, while a longer term loan is not as burdened by the same exchange rate risk (a 5% change within a 5 year period should not be considered a serious threat). On the other hand, a 3 month open position can much more easily be covered in the forward market than a 5 year one - where the market is very thin. When the position is closed at the forward market, there will be little to gain by seeking a foreign loan (cf. chapter 7).

\(^1\) In the Danish case, banks are rigidly restricted as to the amount of foreign debt they are allowed to have. Thus, even small firms borrow internationally with a bank guarantee.
A second motive involves the wish to match foreign assets and liabilities. If a firm exports a considerable part of its production to, e.g. the American market, then it can reduce some of its exchange rate uncertainty by obtaining loans denominated in dollars. As a general observation, the high covariance between the value of the assets and liabilities is one important way of reducing the uncertainty (cf. chapter 6.7).

Thirdly, firms can be forced to seek abroad to obtain the necessary finance. This is particularly the case when the domestic monetary policy is restrictive, e.g., if there is a ceiling on the amount of bank credit or supply of commercial bonds.

As final point, it should be emphasized that the decision of supplying claims denominated in a foreign currency can never be separated from an overall portfolio evaluation. This point of view is, in addition, closely related to the demand for financial assets. On the other hand, this viewpoint is of minor importance when taking into consideration the fact that the aim of most firms is not to be financial investment funds but, rather, organizations combining factors of production in the most efficient manner.

2.3.6. The Demand for Financial Assets

As we have seen, the motives for supplying financial claims and demanding financial assets are quite different. In the following section, we will discuss some characteristic features of economic units with a financial surplus. Later, we will consider how the composition of financial wealth can be determined. The demand for money has already been analyzed. Here, we will look at money only as a store of wealth and, hence, one possible vehicle of transferring wealth from the present to the future.

From a demand point of view, what is a financial asset? The predominant property is the ease of marketability. No institutional limitations normally exist on the secondary market; thus, a single investor knows that without any
practical delay he can get rid of a financial asset.\footnote{This is a micro-argument, because the society as a whole cannot rid itself of its financial wealth from one day to another.}

Surely, the uncertainty of the selling price will depend on the specific asset, but the important point is that there can be no doubt about immediately finding a buyer. This is so because of a number of institutional arrangements: 1) homogenous goods (most of the assets have no debtor risk; others can be made riskless by bank guarantee or mutual responsibility), 2) highly organized marketing, either by daily auctions\footnote{In this respect, financial markets can be quite similar to the Walrasian marketing procedure - discussed above p. 9-11.} or by "buffer dealers" who take up normal excess supply and meet normal excess demand (e.g., the Central Bank ironing out the daily swings of the bond market).\footnote{Under severe inflation, some real assets, e.g., stamps, antiques, and land may be regarded and handled as financial assets.}

A financial surplus must take a concrete form. The composition will depend upon a number of factors, important among which is the expected date of using the surplus to buy real goods. A suitable starting point could be Hick's "A Suggestion for Simplifying the Theory of Money", in which it is recognized that the total portfolio should be allocated in such a way that the expected yield is maximized under the constraint of the wealth and the transaction costs of changing the composition.

To clarify this issue, we will further investigate exactly what is meant by the yield and the holding period, including the uncertainty concerning these two concepts.
2.3.6.a. The Total Yield

The total yield can be divided into 4 elements: 1) the concrete return, e.g., the interest of a bond, 2) the expected ap-/depreciation, 3) the liquidity return and 4) storing and transaction costs.

The concrete nominal rate of return is determined for the entire lifetime of a bond once the price is known. Quite the opposite exists with, e.g., a time deposit, where the return can change from one day to the next, but the capital value remains certain. One might also mention the equities which have an uncertain return as well as selling price. The expected ap-/depreciation is a very subjective element of the yield. In the literature, one distinguishes between the bulls and the bears. The bulls expect the price to rise in the future and are ready to buy at the actual price, whereas the bears act in the opposite manner, and the market price emerges as a result of the interaction between these two groups.¹

The liquidity return is another very subjective component, and should be regarded in close relation to the expected holding period of the financial asset. If the time until maturity is matched by the holding period, there is no nominal uncertainty related to the financial asset. When the holding period is uncertain, e.g., the firm has no concrete plan for undertaking reinvestment and, in the meantime, accumulates a depreciation fund, then one way of avoiding the capital uncertainty is to buy assets with a known capital value - typically bank deposits. On the other hand, this will increase the income uncertainty because the interest rate may change with time. The latter can prove a nuisance to people who live from the return form their financial wealth (widows and orphans). When the exchange rates move, financial assets denominated in a foreign currency will be burdened by capital as well as by income uncertainty.

¹ If the bears expect the price to fall only a little, it may prove worthwhile to keep the bond and obtain the concrete return, if it is larger than the expected depreciation.
In periods of inflation, equities may have a relatively higher liquidity premium than nominal assets because of high covariance with the price of real goods. The importance of the liquidity premium's effect on the interest rate is not so much one of absolute size (how to measure it?) as of the relative magnitude compared with money. The subjective estimate of the liquidity premium on money is closely related to the concept of uncertainty.

Transaction and storing costs do not play a significant role when analyzing financial assets. Naturally, they prevent investors from rearranging their portfolios every day but, due to the highly organized markets, there are limits to the fees for dealing on the Exchange. The same applies to storing costs, which are negligible and consist mainly of theft insurance.

The tax system does influence the net-yield of the financial assets. The composition of the yield on, respectively, the concrete return and the expected capital appreciation affects the market price and is determined by the marginal rate of the predominant buyer (or seller).

2.3.6.b. The Holding Period

The holding period for a real asset is assumed to be its entire economic lifetime. But, for a number of reasons, a financial asset is seldom kept until maturity. The demand for financial assets is a derived demand, in the sense that financial assets give no satisfaction in and of themselves, but merely provide a temporary abode for future real demand. The lack of forward markets makes it impossible to immediately realizing the transactions connecting the future demand. In any event, this lack of perfect knowledge concerning the future would make such forward markets rather superfluous.

It has sometimes been stressed (Robinson, 1953, p. 9f) that the portfolio - apart from transaction cost - can be reconsidered every day. This is a dubious argument because the wealth, unless it is used, must be reinvested. Therefore,
the wealth owner will make up his mind for the entire holding period of the financial wealth and then decide on the optimal portfolio in regard to the total yield. I consider it important to underline this close relationship between portfolio preference and holding period.

Within the traditional framework of portfolio theory (cf. Tobin, 1958, and Hicks, 1967), uncertainty is treated as a measurable risk. This concept is represented by the variance of a probability distribution concerning the expected return of the portfolio. In addition to the fact that all theory is a generalization and stylization, it seems to me that the uncertainty of the concrete yield (the ap-/depreciation of financial assets, inclusive) is reasonably treated in this manner. Information about the distribution can, to some extent, be derived from historical experience. Concerning foreign assets, I am unsure because the development of the exchange rate regime can hardly be deduced from the past. But I disagree with the concept that the liquidity return can be satisfactorily described by any mathematical approximation. The liquidity return of an asset is dependent on the holding period. As long as the economic unit has only a vague idea as to how and when it will use its financial wealth, it is impossible to treat it as a probability distribution. We dealt with the same problem when discussing the precautionary demand for money. This was guided by the same vague attitudes towards an uncertain future, which is best described by the now familiar "we simply do not know". In the empirical section, we can perhaps find some probable explanation as to what kind of event creates optimism and pessimism among real investors and consumers; but I doubt it will prove a stable relationship.

What emerges from the above analysis is that the expected variance and covariance between financial assets play a role in the allocation of the portfolio, but they do not allow for the full affect of the uncertain future. Even for a financial intermediate, it would be dangerous to rely exclusively on the probability approach because unforeseeable events can
frustrate any calculations. Thus, although we have not used a strict probability theoretical approach, the outcome will be mixed portfolios.

The shorter the expected holding period of the financial asset, the more emphasis is placed on capital certainty. Firms producing in tranquil environments seldom have a long holding period, and will prefer access to overdraft facilities rather than maintain huge financial funds. During a recession, when the basic spirit to undertake new real investments is lacking, this picture, of course, may alter. Households which save for the purpose of self-pension, etc. have a rather long holding period, whereas to demand durable consumer goods creates the opposite holding period.

When talking about holding periods, it is always important to distinguish between micro and macro reasonings. When the preceding reflection concern the individual firm and household, it is more difficult, in regard to banks, to utilize a micro viewpoint. The aggregate banking sector has a macro-economic position, i.e., although their liabilities from a formal viewpoint are extremely short, they can regard them as more or less without a time limit. This also affects their preference for a longer holding period of assets, and we shall see that banks, in addition to loans, have some financial assets with a rather long period until maturity.

2.3.6.c. Expectations.

The expected return from a financial investment must be related to the entire holding period. The question is: What kind of available information forms these expectations? If the considered market is not dominated by professional speculators, then Keynes' observation still sounds reasonable: "Our usual practice being to take the existing situation and project it into the future, modified only to the extent that we have more or less definite reasons for expecting a change". (Keynes, 1936, p. 148).

1 If the Central Bank has obliged itself to be a lender of last resort, then a safety net beneath the banks is created which may make them act as if the future was calculable.
Hicks, 1939, pp. 144-50, was rather sceptical about this simple "psychological" theory, feeling that the rate of interest was then kept hanging by its own bootstraps. He preferred to postulate that the long term rate was an average of the expected short term rates over the considered period. He regarded this as an improvement because he assumed that the short term rate was exogenous and determined by the monetary authorities, by means of which the expectations gained a peg on which to hang.

Kaldor elaborates this approach in realizing that from the demand point of view, the liquidity premium is higher on a short than a longer term bond. Thus, the long term interest rate cannot simply be an average of the expected short term rates. He proposes that some kind of risk discount (for the uncertainty of the capital value until the time of maturity) should be subtracted from the yield of long term bonds. This risk discount will rise with the length of the bond, which explains the shape of the yield curve. The risk discount makes up a part of the liquidity premium discussed above.

**figure 2.4.** interest rate

![Diagram of interest rate curve](image)

The "normal" interest rate curve.

When the length exceeds a certain number of years, the risk discount is assumed to be constant, which explains the curve becoming horizontal.
One could add that full understanding of the interest rate is not achieved before supply factors are also analyzed. This gives further support to the shape of the "normal" curve because of the suppliers' fundamental preference for a relatively long duration of liabilities.

2.3.6.d. Speculation

Speculation as an economic activity should now be discussed in order that the difference between financial investor and speculator can be established. In my opinion, speculation is an attempt to benefit from knowing, better than the market, what will happen in the future. A pure example is when forward markets exist because then we do not confuse the issue by the use of funds. In the forward market for foreign exchange, the speculator may buy or sell currency without possessing one single penny. (In many countries, this activity is regulated by margin requirements, etc.) This situation constitutes gambling, and I think one must be a risk-lover to participate in the game. Where forward markets do not exist, the speculator must invest some funds, which can place a limit on the extent of the activity. The speculator is only interested in the day-to-day capital gain; he has no ultimate real goal other than increasing his living standard or wealth. Therefore, asset markets dominated by speculators can - from a real point of view - act quite irrationally because of the psychological game of who knows best, what the average thinks that the average thinks of the future price (Keynes, 1936, chapter 12).

The Keynesian concept of a speculative motive for demanding money is, therefore, hardly compatible with this view of speculative activity. Holding money may help one avoiding a loss, but seldom yields a capital gain. Only in cases of general price deflation is this possible. On the other hand, for the financial investor who tries to maximize the total yield (inclusive of the subjective liquidity premium), it is rational to keep a varying part of the portfolio in money. But to call this a speculative demand is a semantic twist, obscuring the subjective nature of the money demand, which ranges much further than merely an estimate of tomorrow's
price of asset.

2.3.6.e. Capital gains/losses

As a final point of this section, we will deal with capital gains/losses. This may be done at different levels of abstraction. One observation, however, is crucial: No matter what kind of capital gains individuals experience, the country as such is no richer for the same.¹

Capital gains on real assets result from a relative price increase, as compared to consumption goods or wages. But, to the extent that the assets are perishable, the owners will reinvest at the higher price level. Land and buildings are almost perpetual, so here one may experience a capital gain/loss. However, certain difficulties in realizing these gains exist because if many people want to take advantage of the higher prices, it will immediately lower them. The individual equity or land owner may feel richer,² but he is, in a sense, trapped by a locking-in effect which forces him to invest the wealth increase in the specific asset which has risen in price. Take, for instance, the rather drastic increase in the price of private homes, which does not make the owner any richer as long as he wants to keep his housing standard unchanged. On the other hand, he can improve his welfare (compared with an equally situated tenant) by substituting his consumption towards goods which have fallen relatively in price.

¹ This statement must be modified in two respects. First and most obviously, the net claims of the private sector on the external sector prove the basis of capital gains/losses. But the claims on the government are tricky because the real level of future taxes can be changed in accordance with the real value of the public debt. Thus, only net claims on foreign countries provide a clear-cut case.

² Leijonhufvud, 1968, has some subtle arguments regarding a positive wealth effect of a fall in the real interest rate - indentified as the intertemporal preference. This is so because the assumed lifetime of real capital (equities) is longer than the individual household's consumption plans.
Between debtors and creditors, considerable capital gains/losses can occur. The habit of fixing the nominal value of the debt creates a background in which unanticipated changes in the interest rate and inflation can influence the wealth (and income) distribution of a society.

In an inflationary society, the nominal interest rate should mirror the sum of the expected real interest rate and the inflation rate over the holding period for the holder, and the period until maturity for the supplier. If either the period or the expectations differ, the agreed nominal rate may be favourable to both. When the actual events diverge from the expectations, there is a basis for capital gains and losses. The typical situation until recently was an underestimation of the actual inflation rate, which made the fixed interest rate look ridiculous, and provided huge capital gains to the owners of the real assets who had borrowed at fixed rates.1

In a society with unpredictable rates of inflation, a financial system in which the nominal interest rate is fixed for the entire redemption period will increase the uncertainty for the borrower, as well as the lender. The best way of reducing this uncertainty would be to link the capital value of the debt to the underlying real asset and, conversely, link the capital value of the creditor's claim to the consumer price index.2

Such a change in the financial system would imply that the uncertainty was only related to the prediction of the real interest rate. In that case a fixed real rate system would minimize the uncertainty in relation to the borrowers who have undertaken a real investment, but then the lenders are burdened by uncertainty to the extent that they estimate the development in the real rate of interest wrongly. The latter effect will be more pronounced the more the holding period differs from the redemption period of the financial asset. The situation is

1 The Danish Economic Council has calculated that a family who bought its house in 1960 is today approximately 30% better off than a similar family who remained as tenants during the same period.

2 The public sector could guarantee any discrepancy.
quite the opposite when also the real interest rate is flexible, e.g., on bank loans. Then it is the real investor who take the risk of capital gains/losses.

2.3.7. Summary

In this section we have been approaching some crucial properties of the financial sector in relation to the characteristics of claims, agents, and institutions.

Concerning claims we have circled around a proper definition of money and are tempted to conclude that this concept should only be used for means of transactions which settle an account definitely. Whereas the property of being 'a certain store of value' depends to such an extent on the planned holding periods that no firm definition can be given, thus the identification of specific assets as money in that respect cease to be meaningful.

International financial transactions should be seen in the light of being one integrated part of the functioning of the financial sector. Firms borrow abroad when they can obtain a better composition of their liabilities - either through lower expected costs or by reducing the mis-match of future receipts and costs with regard to the exchange rate risk. Likewise, households (surplus units) can increase their total utility from their portfolios by demanding foreign assets.

In fact, as a part of our search for welfare improving (uncertainty reducing) institutional changes international capital flows may have some positive contributions by reducing the covariances within the balance sheets of the individual economic units. But this financial aspect of international transactions has to be appraised in a more total setting which points at an investigation of balance of payments theory.
2.4. CONVENTIONAL AND MORE RECENT THEORIES OF THE BALANCE OF PAYMENTS ADJUSTMENT

2.4.1. Introduction

In an attempt to place capital flows in a more comprehensive framework, we will look at a number of theories concerning the balance of payments. This will be done with the purpose of avoiding the pitfalls involved in a partial-model analysis of capital flows, which omits simultaneous effects. In many senses, a parallel problem exists when investigating the total balance of payments without taking into account that such an analysis cannot be done satisfactorily without being part of a full scale macroeconomic model. Accordingly, some of the preceding theories will be criticized for not being "general" enough in their approach.

In addition, the logic of the balance of payments accounting system implies that no single item can be regarded separately. Because of the ex post character of the balance of payments figures, one item can never be registered without a simultaneous recording of another. Only supply and demand which has been effective will appear in the balance of payments, together with the financing source. For this purpose, it would have been useful if the national accounting system had been constructed on the same principle, insofar as it also has an ex post character.

Within this ex post system, we encounter a requirement for over-all balance, i.e., the aggregate sum of outlays and receipts equals zero. Apparently, no such restriction works on ex ante behavioral equations. The link between ex ante relations and

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1 Some countries do publicize yearly flow-of-funds tables, but that is not the case in Denmark
ex post observations can be created either by making one item on the balance of payments residually determined or by interpreting a discrepancy as an unexplained (perhaps stochastic) difference. Sometimes, the bridge between the deterministic (ex post) world and the behavioristic (ex ante) world is extremely difficult to make in a consistent manner and, therefore, is a source of much confusion.

Furthermore, the items for import and export of goods should not be considered independently of the national market for tradeable goods. The imported amount of internationally traded goods can only be explained as a result of the interplay between the total demand and the total supply, of which foreign producers form a part. Correspondingly, the capital import cannot be regarded independently of the total demand and supply of finance. Thus, the working of the domestic financial sector is a necessary element in explaining capital flows.

To make a planned demand for a foreign good effective, internationally accepted means of payment are needed. These are obtainable in the currency market for convertible exchange. If the exchange rate is free, the price of foreign currency is a private "problem", whereas fixed rates require public intervention and a currency reserve (which is a public "problem").

One final remark concerning the institutional framework behind the balance of payments remains: Normally, it shows the transaction between the considered country and the world around it. Our main interest is only the private sector or, more precisely, the private capital import. Thus, the public sector's transactions must be separated. This distinction is made partly in an attempt to limit the scope of the work and partly because the motives behind the public sector's actions are quite different from those of the private. This is not to say that we will omit an analysis of how different political initiatives influence the private sector, but only that this will be done more systematically at a later stage (cf. Chapter 8).
2.4.2. The subdivision of the balance of payments

The balance of payments will be considered in three categories: 1) the current account, 2) the capital account, and 3) changes in the reserves of foreign exchange.

The current account contains all items which affect the level of income and thus represent the influence on actual welfare. It consists of flows of real goods and services which occupy factors of production and flows of interest and dividend payments, which also represent real transfers.

The capital account is determined partly by the wealth (portfolio readjustment) and partly by adjustments to changes in the wealth which, among other things, are derived from the balance of the current account. Therefore, the capital account should be seen as a mixture of stock adjustment and continuous flows.

Conceptually, the changes in the reserve of foreign exchange are a part of the capital account. But, as in the previous section (2.3.), where we considered the supply and demand of money separately, it proves convenient to look very carefully at this item. This division is particularly useful when discussing the "Monetary Approach to the Balance of Payments".

At various times, different sub-balances have been emphasized as most important in the analysis of the adjustment process towards equilibrium. A common feature of these theories of the balance of payments adjustment is the utilization of either a static or comparatively static model as the framework for the analysis. For this reason, these theories could be criticized

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1 "Equilibrium" is here used somewhat differently than in Chapter 2.1., where it was regarded as a behavioral presumption for the analysis of a steady economic situation, whereas equilibrium in relation to the balance of payments more precisely expresses equality between outlays and receipts at one of the sub-balances. It would, perhaps, be better to use the term "balance" instead of "equilibrium", but "balance of payments balance" sounds a bit awkward.
in accordance with our discussion in Section 2.1. and 2.2. above. However, for the sake of simplicity, I will concentrate the exposition of the theories on the assumption that equilibrium models provide useful tools for the balance of payments analysis, and postpone the discussion of this assumption until the end of this chapter, asking the reader to keep in mind the arguments of the previous sections.

Furthermore, to render the investigation of the conventional theories comprehensible, I will utilize a number of designations for the different theories of adjustment of the sub-balances.

**Current account:**

1. Purchasing Power Parity
2. Elasticity Approach
3. Income Power Parity (Absorption Approach)

**Capital account:**

4. Portfolio Readjustment Approach (stock adjustment)
5. Wealth Power Parity (continuous flow adjustment)
6. Money Power Parity (Monetary Approach)

1-3 are concerned with the adjustment of the current account, 4-5 treat the adjustment of the capital account as the main factor, whereas 6 focuses on the money market and the flows of foreign exchange.

Even though some of these designations are self-invented, they all have a firm basis in the literature, although sometimes under another heading, which is indicated in brackets.

Before moving on to a detailed discussion of the different remedies for restoring balance of payments equilibrium it
should be mentioned that the assumption concerning the exchange rate system is, unless otherwise noted, that of a fixed or adjustable exchange rate. Within a regime of free floating exchange rates, there will, in a narrow interpretation, be no balance of payments imbalance. However, a number of resultant difficulties may develop in the wake of floating exchange rates, which I shall mention later.

2.4.3. Purchasing Power Parity

The crude version of the Purchasing Power Parity hypothesis is a very straightforward way of calculating the assumed equilibrium exchange rate. The basic idea comes from Cassel ("the rate of exchange between two countries will be determined by the quotient between the general levels of prices in the two countries" - 1916, quoted from Balassa, 1964, p. 192). Taking two countries with quite similar economic structures and per capita real income, it sounds reasonable that the price level in country A multiplied by the exchange rate will approximate the price level in country B to secure equilibrium at the current account.

\[ P \times e = P^*; \]  

where \( P \) - country A's price level; \( e \) - the exchange rate; and \( P^* \) - country B's price level.

Equation (1) states the absolute version of the Purchasing Power Parity hypothesis, but when the countries differ in size, openness, and economic structure, there can hardly be reason to expect the absolute version to hold good. Therefore, a relative hypothesis may prove useful. Within this, only changes from some basic period are considered to affect the balance of payments and the equilibrium rate of exchange.

\[ dp \times e + p \times dp + de = dp^* \]

It is not immediately obvious what price index should be used to fulfill the hypothesis. If only the price index of inter-
nationally traded goods is used, it is of little importance to demonstrate that the price, except for transportation costs and duties, is equal around the world. This is merely a sign of an effectively organized market. To give the hypothesis some content, either the consumer price index\(^1\) or a unit cost index\(^2\) should be used.

Balassa, 1964, emphasizes that the calculation of the "equilibrium" rate of exchange from consumer prices would be biased if no correction were made for the differences in the price level of non-traded goods. He demonstrates that within a country, the relative price of traded and non-traded goods depends on the level of per capita income. In countries with a low level of income, non-traded goods and, particularly, services are relatively cheaper compared to high income countries (pp. 195-200). Thus, a calculation based on consumer prices will lead to an overvaluation of the currency of the high income countries\(^3\).

\[
(3) \quad e = \left( \frac{P}{P^*} \right) \times \left( \frac{\theta}{\theta^*} \right); \quad \text{where} \quad \theta = \frac{P_T}{P}.
\]

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\(^1\) The wholesale price index is relatively more affected by traded goods and, therefore, not very representative.

\(^2\) Often unit labor cost is recommended, but this index does not take into account normal profit or the interest rate. Thus, the GDP-deflator is a better index of the "unit value-added".

\(^3\) Accordingly, income comparison between countries based on "equilibrium" values for the exchange rate will underestimate the real income level in low income countries, precisely because of this difference in relative prices within countries at different real income levels (cf. David, 1972).
With time, due to the tendency towards equal wage rates within a country, there seems to be a positive correlation between growth in productivity and the consumer price rises (Balassa, 1964). In this respect, the relative hypothesis is also misleading, distorting the picture of how the exchange rate should be changed in order to restore the balance of payments equilibrium.

Depending on the school of thought to which one belongs, the Purchasing Power Parity hypothesis can be formulated in more elaborate ways which take into account some of the weak points of the unsophisticated versions.

The monetary school claims that nominal disturbances come only from the money market. They assume the quantity theory to hold good and, hence, there is no money illusion in the demand for money equation. In this case, the money market can be described by the following relation:

\[(4) \quad M = P \times L(\ldots), \text{ where } M \text{ is the nominal money supply, and } L \text{ the real demand for money}\]

Substituting the expression for the price level into equation (3), we get:

\[(5) \quad e = \left(\frac{M}{L} / \frac{M^*}{L^*}\right) \times (\theta / \theta^*)\]

From this equation, we can see that pure nominal disturbances mirrored by changes in the money supply will result in a need for a proportional change in the exchange rate; but changes in the real part of the economy reflected by the demand for money can, as well, entail a correction of the equilibrium rate.

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1 The development of the dollar within the last decade can, to some extent, be explained more accurately by the differences in productivity gains. When using the consumer price index, the development seems confusing.

2 An entire issue of the Journal of International Economics, 1978/2 is devoted to further theoretical and empirical discussions of the validity of the PPP-hypothesis, but without being conclusive (cf. below)
Correspondingly, if the nominal disturbances are assumed to originate in the labor market, the equation can be circumscribed, utilizing the real wage \( w = \frac{W}{P} \), where \( W \) is the nominal wage

\[
(6) \quad e = \left( \frac{W}{w} / \frac{W^*}{w^*} \right) \times (\theta/\theta^*)
\]

Again we see that the nominal factors can affect the equilibrium rate, but real changes mirrored by the real wage, e.g. productivity gains, cannot be overlooked (cf. Dornbusch & Krueger, 1976).

In relations (5) and (6) we have highlighted the factors in which changes could call for an exchange rate correction. This implies a one way causality from money, wages and/or the real structure of the economy to the exchange rate; but before any useful conclusions can be drawn, the repercussions of the exchange rate changes should be investigated. The theory of the elasticity approach, which we shall discuss next, takes into consideration how the balance of payments is affected by a devaluation (or revaluation) and to what extent the assumption of one price for internationally traded goods is crucial to the conclusion (the terms of trade effect)\(^1\).

In fact, until now only the trade balance has been considered, and all other items of the balance of payments have been assumed to be out of the picture or in permanent balance. Some structural disequilibria at e.g. the capital account would call for a countervailing state of the trade balance. It is also important to detect eventual dependencies between the exchange rate and the other items of the balance of payments.

The two relatively modern originators of the PPP-hypothesis (Cassel, 1916, and Keynes\(^2\)) were both well aware of most of these reservations regarding the simple version of the theory. But

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1 For a more comprehensive survey, see Officer, 1976

2 Keynes, 1923, pp. 80-86
they both wrote in the World War I era, where the pure nominal changes within the countries predominated\(^1\), and, therefore, gave the main explanation to the development of the exchange rate.

For a more recent proposal regarding the practical use of the PPP-hypothesis, it should be mentioned that the OPTICA-group recommends the use of wholesale price indices for the computation of intervention rates within the European Community (See Thygesen, 1978a).

In sum, the usefulness of the PPP-hypothesis in calculating the "equilibrium" rate of exchange -- if it exists at all -- is conditioned by the rather strict assumptions associated with it. We have seen that extensive overall inflation resultant from fiscal and monetary shocks or large wage/cost increases may fulfill these assumptions. Yet, many biases are present\(^2\). Firstly, the problems related to the base-year. In theory, this year is assumed to be characterized by "equilibrium". Secondly, structural changes within the economy during the considered period affect the trade balance. Finally, the development of other sub-balances\(^1\) may, at least for a transitory period, cause a surplus/deficit on the trade balance to be desirable.

The most recent development within this area has revealed that the use of PPP-theories is no longer only a question of how the

\[^1\]The English Consumer price index \((1913 = 100)\) went up to 310 in March 1920, then down again to reach 156 in September 1922 (Keynes, 1923, p. 84). Here we also find one explanation as to why contributors to the above mentioned special issue of Journal of International Economics arrive at such differing empirical results. Frenkel, 1978, works with figures for the period 1921-1925, when the variance of price fluctuations dominated the variance of real fluctuations, and hence provides evidence supporting the PPP-hypothesis; whereas Kravis & Lipsey, 1978 use 1950-1973 as their testing period, and here we have only two digital figures of inflation at the beginning of the period (Korean War) and at the end (Vietnam War), and real changes are relatively much more important. Another difference is that Kravis & Lipsey try to avoid the use of price indices, which should make the results much more reliable.

\[^2\]Artus, 1978, pp. 297-299, provides a useful summary of these biases.
the exchange rate and relative prices move together, but also, that the adjustment of both variables must be analyzed within a macroeconomic framework before policy recommendations can be concluded.

2.4.4. Elasticity Approach

One thing is to demonstrate that the same price prevails in competitive markets, but quite another to analyze how a change in the exchange rate will affect the single items at the balance of payments. The elasticity approach considers this investigation of the trade balance and how, under different assumptions, it will react to changes in the terms of the trade.

Looking at export and import competing industries, a devaluation, without any derived inflationary effects, will make production more profitable. To the extent that the traded goods are contracted in international currencies, the receipts from the export will immediately rise. This is particularly the case when the small country assumption is a realistic approximation of the actual situation. The price, counted in national money, will rise with the same percentage as the currency is devalued. Later, the quantity of exported goods goes up, depending on the steepness of the supply curve in the short and longer run. This will add to the improvement of the trade balance.

The effect on the import outlays counted in national currency is more equivocal. If the demand for imported goods is inelastic, then the outlays will go up -- when the prices are parametric and fixed in foreign currency, this is even more likely. The price elasticity depends on, among other things, the opportunities for substitution of import towards domestic production. This is the case with many manufactured goods, whereas specific raw materials can be very difficult to substitute. In any event, this process of substitution takes time to materialize. Thus, in the short run, the price elasticity may be rather low.

\[1\] Dornbusch & Jaffe, 1978, p. 160
These reflections lead to the famous "elasticity condition": That an improvement of the trade balance in connection with a devaluation will only take place when the sum of the price elasticities of the domestic demand for export is numerically larger than unity; otherwise, a devaluation will deteriorate the trade balance (see Robinson, 1937, p. 219). When the trade balance is analyzed in this static manner, one can even define an optimum exchange rate which will maximize the net receipts. This optimum rate is achieved when the sum is exactly equal to unity. Thus, when the sum is above the optimum, the country would gain from continuous devaluation until the sum falls to unity and, conversely, if the sum is below unity (Robinson, 1937, p. 222).

As has been emphasized, things are not that simple. There is a number of problems involved in reaching the above result:

1. It is a partial analysis
2. Elasticities are point estimates
3. Elasticities change with time
4. Export and import are assumed to be initially equal
5. Supply curves can be less than infinitely elastic

The most basic criticism of the simple elasticity approach -- as well as other single balance approaches -- is its partial nature, which never can tell the entire story.

The trade balance, for instance, cannot be analyzed independently of the capital account because most international trade is not on a barter basis. Any "disequilibrium" at the trade balance has consequences for the net wealth and hence for the flows of financial assets. (Not to mention the resultant affects on wages and domestic prices from a devaluation.)

The above is merely to indicate the dimensions of the partiality problem. We will return to the subject after the discussion of the "single balance" approaches. We can then better evaluate
the usefulness of some of the theories as building blocks in a more general analysis.\(^1\)

Lord Balogh, 1951 (Chapt. 13), very strongly emphasizes that the usefulness of "elasticities" as an analytical concept is very limited. Given that the demand curve as such is well defined, then the elasticity changes along the curve (except for the special case of a hyperbolic curve). Thus, the elasticity will be a function of the size of the devaluation. In addition, the possibility of a kinked demand curve should be realized. This is particularly so in oligopolistic markets where the competitors follow one another when the price is lowered, but not when it is raised. Therefore, a low elasticity which rules out the beneficial effects of a devaluation does not necessarily imply that a revaluation will improve the trade balance.

Much has already been said in the literature about the J-curve effect which, in fact, was discussed in J. Robinson's original contribution concerning the elasticity approach. In any event, one important point should be stressed: Elasticities are functions of the time period used within the analysis. In the short run, the quantitative changes will have difficulty in being realized; but even the price effects may be sluggish if the price of the goods is contracted in the domestic currency.\(^2\) One must also underline the different effects, depending upon whether the country is a price taker or price setter. In the longer run, the elasticities will probably be more favorable for the devaluing country.\(^3\)

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1. Dornbusch, 1975, has alleviated some of the partiality problems related to the elasticity approach by taking into consideration the substitution between traded and non-traded goods and the income effect. Nevertheless, the financial aspect is missing.

2. Even for a small country like Denmark, this is the case for appr. 50 per cent of the export and 25 per cent of the import, which makes the adverse effect more likely (cf. Danmarks Nationalbank, Annual Report, 1976, p. 33, table 6).

3. Some recent studies of the British and Italian devaluations point in the direction of an increased risk of being squeezed between the J-curve effect and a self-defeating inflation.
Lastly, there seem to be two more technical assumptions upon which the simple elasticity rule relies: 1) that export and import are of equal size in the initial situation, and 2) that the supply curve for goods is horizontal (cf. Haberler, 1949, p. 117).

re 1) Normally, the import will be larger than the export when a country contemplates devaluation. In this case, a sum of elasticity of perfect unity will only lead to an increase of the trade deficit measured in national units of account. Thus, the sum must be somewhat higher than unity in order to improve the trade balance. Following Haberler, p. 126, the condition may be put this way:

(7) \( e_{\text{imp}} \times \frac{M}{X} + e_{\text{ex}} > 1 \) - for an improvement measured in foreign currency

(8) \( e_{\text{imp}} + e_{\text{ex}} \times \frac{X}{M} > 1 \) - for an improvement measured in domestic currency

\( e_{\text{imp}} \) - demand elasticity of import

\( e_{\text{ex}} \) - demand elasticity for export

\( X \) - absolute initial value of export

\( M \) - absolute initial value of import

Which condition is the important one depends on the nature of the problem under consideration. If the main question is to reduce the use of foreign reserves, then, of course, it is an improvement measured in foreign currency that matters\(^1\). Whereas, when the unemployment problem is in focus, the national income is of more interest (although the related development of the income distribution is important), and one should regard the trade balance in national units of account.

\(^1\) Perhaps an example will prove useful. Assume that the demand elasticity for import is unity and the elasticity for export is zero. Then both the export and import revenue measured in domestic currency will be unchanged by a devaluation -- and thus the trade deficit. If \( M > X \), then the conversion into a more expensive foreign currency will entail that the amount of foreign currency used for import will decrease more than the amount earned on export falls, and so the absolute trade deficit in foreign currency diminishes.
(9) \( B = Y - A \), where \( B \) - trade balance  
\( Y \) - total production of goods and services  
\( A \) - total absorption of goods and services

Changes in these quantities may be denoted by corresponding small letters, so that:

(10) \( b = y - a \)

It is then argued that the change in absorption can be divided into a real income dependent factor \( (c) \) and a factor \( (d) \) consisting of other changes in absorption (cf. above).

(11) \( a = c \cdot y - d \quad b = (1 - c) \cdot y + d \)

This is not a satisfactory way in which to analyze the trade balance because 1) changes in \( d \) will lead to multiplier effects so that \( y \) is not independent of \( d \), 2) changes in production cannot in and of themselves change the trade balance but will, more likely, entail undesired increases in inventories, and 3) the causality between absorption and import is not clearly defined.

It is only in a situation with no idle resources, i.e., full employment in connection with no terms of trade effect, that equation (11) proves useful: when the country devalues, the real production is assumed to stay constant. In that case, the \( d \) is only affected by changes in real cash balances, redistribution of income from wages to profit and, eventually, higher taxes.

This is, of course, why the absorption approach is quite popular.

\footnote{NB! It is no longer an identity but rather an equilibrium condition.}
The above stated condition for improvement of the trade balance in connection with a devaluation has resulted from the assumption that the supply elasticities are infinite. Nothing unambiguous can be said about how a smaller supply elasticity will affect the trade balance. The results will depend upon supply and demand elasticities. When the demand for export has a low elasticity, it is advantageous to have as small a supply elasticity as possible. On the contrary, when looking at the demand for import, the more inelastic the demand, the better it is to have an inelastic supply curve $S_2$ for import. Then the foreign producers must give up a part of the gain from higher prices by a smaller reduction in output $P_1 > P_2$.

Figure 2.5.

The importance of the elasticity of the supply curve

Thus, even if one could calculate the "equilibrium" exchange rate from the purchasing power parity, the adjustment of the trade balance would still not be straightforward. When the elasticities are small or the assumptions of no derived inflation are too unreliable, then we cannot draw any straightforward conclusion about the relationship between trade imbalances and the size of devaluation either in the short or long run.
2.4.5. **Income Power Parity**

Let us consider two countries which are identical in relation to factor endowment, price and wage level and all marginal propensities (inclusive of import). The only difference is that Country A has full employment, whereas Country B has 10 per cent of factor underutilisation\(^1\). In this case, Country A will run a trade balance deficit towards Country B because there is no equality in income power. However, calculating the "equilibrium" exchange rate from the PPP-hypothesis, there is no guide as to how much the exchange rate should be changed in order to restore the external balance. Hence, we observe a real phenomenon which the PPP is unable to handle.

2.4.5.a. **Different Kinds of Income Effects**

In the following section, we shall investigate the interrelationship of changes in the current account and the income derived from a devaluation. This aspect was omitted in the elasticity approach, and has since provided ammunition to the critics of that approach\(^2\). The total income effect can be divided into four components which, as a matter of convenience, will be analyzed separately.

1) Trade balance effect  
2) Terms of trade effect  
3) Income distribution  
4) Capital gain/loss effect

---

\(^1\) For instance, due to the differences in the fiscal policy which are practiced.

\(^2\) Cf. the long dispute between the elasticity and the absorption approaches, which were later synthesized (Alexander, 1959, among others - but since Alexander began the dispute with his 1952 article, it remains particularly remarkable). However, the challenge to the original contribution by J. Robinson was unfair because she also analyzed the income effect of changes on the exchange rate. Her only sin of omission was that she did not formalize the income effect related to a change in the relative prices, like Alexander,
1) The trade balance income effect derives from the fact that if the trade balance is improved, computed in national currency, then the national income increases. The multiplier effects will be drawn in the wake of the initial trade balance improvement and, to some extent, modify it.

2) The terms of trade effect are tied to the change in relative prices of flows, i.e., export and import of goods (and services). One aim of a devaluation is to change the terms of trade -- to make import more expensive, and export cheaper (measured in foreign prices) -- in order that the domestic production may be more competitive. If the small country assumptions are firmly applied, then the terms of trade will not change. However, when looking at a small country with a rather specialized export or a large country which can affect the total supply of the world market\(^1\), the terms of trade will deteriorate. In an international comparison, this implies that the value of the country's productive resources has decreased, and most obviously for wage earners who, for unchanged nominal wage rates, experience a fall in real income because of the higher prices of imported goods. The situation is less observable for other factors or production because the real profit will most likely rise in export and import competing industries, but probably diminish in home industries.

A rough calculation of the welfare loss -- in economic terms -- induced by a fall in the terms of trade can best be handled by the following: Let us say that import and export are equal, amounting to 40 per cent of the GDP. A 5 per cent deterioration in terms of trade will reduce the international exchange value as a percentage of production by 2 per cent. If the devaluation causes a rise in the income and production of, say, another 2 per cent, is the country then equally well situated? The answer is both yes and no. Yes, if the expected deficit on the trade balance provides a political constraint to the increase in production and lowering the unemployment rate; otherwise, the two situations are not alternatives, and one should maintain the welfare loss as real.

\(^1\) See Whitman's, 1975, references to calculations by Qwack for the U. S.
As indicated above it is difficult to analyze the income effects without taking into consideration the distribution of income. Still assuming there are no derived effects on the domestic price and wage level, a devaluation will lead to a rise in profit for the traded goods industries. In addition to the price effect, later there will also be a quantitative effect leading to a rise in production, thereby increasing employment. Thus, the aggregate income of labour as a group may rise, but, on the average, the real income of full-time workers will be lower and must fall, if the devaluation is to be successful.

A change in the income distribution affects the size of the effective demand. The consumption from wages is normally higher than profit. Thus, a change in the direction of higher profits will lower the level of consumption. On the other hand, there can be an offsetting effect in regard to the demand for investment goods, resulting from changes in the expected profit. A rise in actual profit as such will only raise the investments to the extent of easing financial constraints or changing the expectations concerning the future profit.

Capital gains and losses can affect the size and the distribution of the wealth within the private sector. In this respect, for the individual economic unit, such changes are very similar to income (cf. the discussion in Section 2.3.6.). In addition to the fact that a trade balance (current account) deficit reduces the wealth compared to a situation without deficit, the wealth-redistribution effect of a devaluation must be considered. The price rise reduces the real cash balances and gives the private sector a capital loss. In regard to financial assets which carry interest, the development is confused because the result depends very much on whether the devaluation and price rise were foreseen — and then reflected in

1 If the analysis is elaborated so as to not treat labor as a homogenous factor of production, it is also relevant to discuss distribution within the labor force.

2 Also see Hahn, 1976, p. 249, for the importance of this point.
advance in the interest rate — or not. The immediate conclu-
sion that the burden of a net debt denominated in foreign
currency will grow as the aftermath of a devaluation does not
necessarily hold true\(^1\).

If the foreign interest rate is so much lower than the domestic
that it equalizes the difference in inflation rates, there will
be no loss. Correspondingly, the growth in profit in traded
goods industries may easily counterbalance the immediate deter-
oration of the balance sheet in a longer perspective. Therefore,
reasonable firms should match their liabilities to the extent that
they have foreign receipts. A devaluation increase the value
of the foreign debt but raises contemporarily the future
earnings from foreign trade. Accordingly, it is important only
to urge firms in the traded goods industries to borrow abroad,
unless a reasonable exchange rate insurance is present (cf. 2.3.6.)

Above, we have discussed in some detail the income effects of a
change in the exchange rate. This is important when the endo-
genous changes in the trade balance (current account) are con-
sidered. The traditional analysis distinguishes between changes
in production = real income and other kinds of income changes
(terms of trade, redistribution, capital gains/losses, etc.).
If the absorption of a country is assumed to be an increasing
function of real income, then changes in the other income com-
ponents can be interpreted as shifts in the absorption level
(i.e., the average propensity to absorb), but not necessarily the
marginal propensity to absorb.

2.4.5.b. The Absorption Approach

The Absorption Approach, established by Alexander, 1952, should
now be evaluated. The starting point is the demonstration of
the ex post relation of the trade balance (current account) as
identical to the difference between domestic production and
absorption (demand):

\(^1\) Lapan and Enders, 1978, turn this argument upside down by
concluding that a necessary condition of a (temporarily)
positive effect at the current account of a devaluation is
that the private sector experiences a capital loss. This
will make actual wealth less than desired wealth and hence
with neoclassic economists who analyze the effects of a devaluation within a full employment framework.  

2.4.5.c. A Synthesis of the Elasticity and Absorption Approaches

But with idle resources and, perhaps, terms of trade effects, it is difficult to understand why the absorption approach should be more useful than the elasticity approach. Both suffer from the use of partial analysis.

During the fifties, a number of attempts were made to unite the elasticity and absorption approaches to an integrated analysis of devaluation. In this discussion, we shall only mention the instructive treatment Harry Johnson, 1958, gave to this union.

---

1 In recent years, the absorption approach has been given a boost by the New Cambridge School, which cannot be accused of neo-classicism. The New Cambridge Approach to the balance of payments assumes that the private sector has a permanent "savings equal to investment", i.e., an absorption rate equal to unity. Thus, the balance of the government will be mirrored by the foreign account. This assumption has serious consequences for the implication of conventional policy initiatives. For instance, expansive fiscal policy will lead to a deterioration of the foreign balance of an equal amount. Conversely, a change in the exchange rate will not — given the balance of the government — change the trade balance, but rather the level of employment. The policy recommendations have changed entirely from the traditional approaches. Unfortunately for this new approach, the following criticism seems correct: "the hypothesis that the private sector spends what it earns has no theoretical underpinning (and) it rests only on limited empirical evidence in Great Britain" (Spaos, 1977, p. 103, n.5). One could add that in the light of the development during 1977 when Great Britain experienced a surplus of the current account contemporary with a still considerable government deficit, even the empirical evidence proved week. On the other hand, if there is a tendency towards a marginal absorption coefficient of approximate unity, then the above mentioned implications should be included when the economic policy is contemplated. Furthermore, the full importance of the government sector to the foreign balance cannot be developed before the capital account is included.

Although verbal, it appears much more precise than many of the other highly complicated mathematical expositions\textsuperscript{1}. He begins by stressing that production is a function of nothing but the effective demand. Therefore, one should concentrate an analysis on the demand determining factors. He distinguishes between expenditure-switching and expenditure-reducing effects of different political initiatives. The switch effect can be caused by a devaluation, and is best analyzed by the appropriate elasticities plus a relevant multiplier analysis of the derived income effect. In the case of high or full employment, the switch policy will lead to inflation\textsuperscript{2} and should be followed up by an expenditure-reducing policy as well\textsuperscript{3}.

\textsuperscript{1} The fundamental result was that the elasticity condition for a positive effect of a devaluation changes into a requirement that the sum of the elasticities being greater than unity plus the marginal propensity to import (\(m\))
\[
\text{e}_{\text{imp}} + \text{e}_{\text{ex}} > 1 + m.
\]
The reason why \(m\) must be included is precisely because of the terms of trade effect (Stern, 1973, p. 209). See also Johnson, 1956, for an early recognition of this result.

\textsuperscript{2} In accordance with the above discussion of the absorption approach, this inflationary development may automatically lead to a reduction in the absorption, but all of these effects assume some kind of asymmetry in the reaction of the involved "sectors".

\textsuperscript{3} Full justice cannot be given to Johnson's contribution before the monetary aspect of the balance of payments adjustment has been brought into the analysis.
2.4.5.d. Temporary Equilibrium Analyses of a Devaluation

A new model for the analysis of the trade balance has recently been developed\(^1\). In an attempt to escape the general equilibrium strait jacket, temporary equilibrium in the tradition of Malinvaud, 1977 (cf. p. 16 above), is assumed. Hence, there seems to be room for uncertainty regarding the future. The model is kept in the fix-price tradition by assuming that the exchange rate, the price of non-traded goods, and the wage level are constant throughout the period. Accordingly, the market clearing variables are the quantities. This means that agents at the long end of the market are rationed and must recalculate their supply and demand in other markets. Therefore, planned and effective demand (and supply) may differ in this model, and Walras' Law must not necessarily be fulfilled. This approach further implies that not only future prices, but also future quantitative constraints, must be considered during the current period.

Neary, 1978, sets up a 3-sector model: 1) Households, 2) Traded goods industries, 3) Non-traded goods industries, with entirely conventional behavioral equations. Therefore, if prices were allowed to move freely, this model would be exactly like any general flow equilibrium model (the only stock variable taken into consideration is money; thus, unsold goods are perishable, and no credit system is considered).

The important innovation is that households and the non-traded goods industries can be constrained in the short run, a factor upon which we shall concentrate. Neary distinguishes between three different labor market situations:

1) Classical unemployment
2) Keynesian unemployment
3) Repressed inflation

\(^1\) Cf. Gordon, 1977, Dixit, 1978, and Neary, 1978. The latter has the most elaborate model, which is why I mainly refer to his results.
re 1) Classical unemployment derives from too high a wage level. Thus, only households are constrained; they cannot sell as much labor as they desire and so are forced to undertake a dual decision process, leading to a cut in effective demand compared to planned demand. Both industries are assumed to be in "equilibrium", so employment is exclusively determined by the demand for labor -- given the real wage.

re 2) Keynesian unemployment derives from too high a price of non-traded goods, which leads to a constrained supply of non-traded goods ($\bar{Y}_1$)

Figure 2.6.

Constrained supply of non-traded goods

This has repercussions for the labor market where the demand and, hence, the realized employment is constrained ($\bar{l}$) (cf. Figure 2). Only the traded goods industry is in "equilibrium". Both the markets for non-traded goods and for labor have a notional excess supply.

Figure 2.7.

Constrained demand for labor
Repressed inflation means excess demand for labor; thus, the industry which cannot obtain the necessary labor is constrained. This situation will not be analyzed here.

Our chief concern is, of course, the implication for the trade balance adjustment. The trade balance is determined by the discrepancy between the demand \( Y_2 \) and the supply \( X_2 \) of traded goods:

\[
(12) \quad \text{Trade balance, } s = Y_2 - X_2
\]

\[
(13) \quad Y_2 = y_2(p_2, w, k)
\]

\[
(14) \quad X_2 = x_2(1, X_1, p_1, p_2, w, I)
\]

- \( p_1 \) - price of non-traded goods
- \( p_2 \) - world price level multiplied by the exchange rate
- \( w \) - wage level
- \( k \) - technology parameter
- \( \bar{1} \) - constrained labor supply
- \( \bar{X}_1 \) - constrained demand for non-traded goods
- \( I \) - public demand

A devaluation is considered:

\[
(15) \quad \frac{\delta s}{\delta p_2} = \frac{\delta^+ Y_2}{\delta p_2} - \frac{\delta^+ X_2}{\delta p_2} - \frac{\delta^+ X_1}{\delta p_2} \cdot \frac{\delta I}{\delta p_2}
\]

In the case of classical unemployment, a devaluation will always improve the current trade balance. This is revealed by inspecting the signs and magnitudes of the terms in Equation (15). The first term is the price effect, which improves the trade balance by making profitable a larger production of
traded goods. The second term also improves the balance by lowering the domestic absorption of traded goods. Only the third term has a negative effect on the trade balance in that, due to higher employment (and income), it causes an increased demand for traded goods. But, employment increases only in the traded goods sector (non-traded goods industries are assumed to be in a short run "equilibrium", which an increased demand will not change) and, at the most, therefore, counterbalances the first term (in case of a marginal propensity to absorb traded goods equal to unity, which is very unlikely).

If Keynesian unemployment prevails, the situation differs somewhat, and the positive effect of a devaluation on the trade balance is not as clear-cut. The main difference is that the non-traded goods industries are constrained (not in "equilibrium"). Thus, an increased demand for non-traded goods will raise the employment in this sector. The aggregate income effect from both industries is stronger, thus a smaller marginal propensity to absorb than unity may lead to a deterioration of the trade balance

The effect of fiscal and monetary policies on the trade balance is less ambiguous because expansive policies will, without exception, entail a deterioration of the balance through higher absorption of traded goods.

Neary, therefore, ends up advocating that the exchange rate policy be used for employment purposes, whereas demand managing policies should be mainly devoted to the external balance. This is so because the effect of a devaluation on employment is less equivocal than on the trade balance. Although the theoretical foundations are quite different, this division of policy instruments appears quite similar to the New Cambridge Approach.

---

1. It is observed that no terms of trade effects are present in this model. They would modify the results.
2.4.6. The Capital Account

Up to now, by putting aside all financial transactions, we have considered only the real part of the balance of payments. This is, of course, unsatisfactory because a "disequilibrium" on the current account must go hand in hand with financial transactions in order to equalize the overall balance. This is the conventional flow aspect of the capital account. Whenever the current account is unbalanced, then the amount of saving differs from the real investments undertaken within the country. The financial (or external) wealth changes, thus requiring that the size of the external portfolio be adjusted to the new level.

In addition to this current account generated flow effect, a similar effect arises from the ever-growing wealth in the private sector, which will cause a continuous flow demand for different assets. This development may entail an increasing demand for foreign assets in order to maintain the optimum composition of assets within the expanding wealth.

The stock aspect arises from a change in one of the variables, which determines the composition of the portfolio. This results in a once-and-for-all adjustment of the demand and/or supply of financial claims. One special stock aspect is the emphasis upon the demand and supply of money as the essential portfolio variable. Under the label "the Monetary Approach to the Balance of Payments," a bulk of literature has emerged which focuses on the money market - whatever that might be - as the modus operandi of the balance of payments.

Account should also be made for the increased interest payments which will affect the future current account and, thus, the growth in wealth.

A representative collection of this literature is to be found in Frenkel and Johnson, 1976.
When rates of exchange and interest change, the value of the portfolio is affected. We have already in Section 2.3.6. discussed how capital gains and losses arise. It will only be noted that these changes also have a derived effect on the composition of the portfolio, which leads to a stock adjustment as well.

Before going into a more detailed analysis of the capital account adjustment, it is essential to emphasize that the investigation is still kept within the equilibrium tradition. This is also the case because the mainstream of the literature in that field -- as well as that of the current account -- takes the equilibrium model as the self-evident framework. Instead of dismissing this substantial quantity of literature for methodological reasons (cf. Section 2.1. and Section 2.2.), we will see if some of the adjustment mechanisms can also have validity outside the equilibrium framework. It is important, therefore, to survey the established equilibrium theory of the capital account adjustment. Comparative static conclusions will be lightly treated as they are of little use at this stage of our discussion.

2.4.7. The Portfolio Model

In Section 2.2.3. utilizing the Tobin tradition, we set up the basic principles for the portfolio model. Here we will concern ourselves with a subset of the equations, namely, the demand for foreign assets and the foreign demand for domestic ones.

The single economic unit who wants to improve his welfare as much as possible must choose between yield and risk. From the maximization procedure, we can derive his net-demand functions for financial assets. By an appropriate aggregation, these functions can be used to represent the private non-financial sector. From a theoretical point of view, it is unsatisfactory to aggregate households and firms, but the available statistics require this aggregation. At the least, the non-financial and the financial sectors should be separated as their behavior is
fundamentally different with regard to capital flows. In addition, the actions of the government sector must be isolated and discussed separately.

From a statistical viewpoint, the explanation of the foreign demand for domestic assets is even more difficult, because no figures show who the holders of Danish assets are. The demand function can only properly be a fully aggregated one. Alternatively, one could work with net domestic demand functions and let the foreign demand be undetermined, which from a theoretical point of view is less satisfactory.

The stock demand for foreign assets can thus be given a specification in the following form:

\[
F_{a1} = f_1(r_1 \ldots r_i \ldots \sigma_1^2 \ldots \sigma_i^2 \ldots \sigma_{ij}^2 \ldots , X_1 \ldots X_m, W_a) \quad i \quad 1, \ldots , n
\]

- \(F_{a1}\) - the planned stock demand for the foreign asset number \(i\) by sector \(a\).
- \(r_i\) - the expected yield of asset \(i\)
- \(\sigma_i^2\) - the expected variance of the expected yield
- \(\sigma_{ij}^2\) - the covariance of the expected yields of assets \(i\) and \(j\)
- \(X\) - other relevant explanatory variables
- \(W_a\) - wealth of sector \(a\)

If the demand for assets is of first degree homogeneity in nominal terms -- implying a constant marginal utility of the wealth -- then the equation can be interpreted as showing the

1 In the Danish case, banks are very closely restricted and do not play an important role in this respect (cf. Chapter 3. And Danish households were not allowed to hold foreign assets until very recently.

2 Understood as demand - supply.
fraction of the wealth kept in that specific asset for alternative values of other variables.

The planned capital flows are obtained by looking at the changes in the stock demand:

$$\Delta F^*_{ai} = \Delta g_{ai}(...) \cdot W_a + g_{ai}(...) \cdot \Delta W_a$$

The first term on the right hand side is the stock-readjustment generating term. For instance, a change in relative yields can explain a certain level of capital flows. The second term shows the continuous flow caused by changes in the wealth. If the adjustment is sluggish, we must allow some time for the adjustment to work itself out:

$$\Delta F^*_{ai} = a \cdot (F^*_{ai} - F^*_{ai}(t-1))$$, the actual shape is dependent upon what kind of assets is under consideration and the chosen time period.

One further point should be mentioned in connection with the continuous flow effect, namely, that if the considered country experiences a significantly higher growth rate of the wealth than the world average, then there will be an excess demand for foreign assets. This will lead to an equivalent balance of payments deficit unless the increased earnings from foreign assets improve the current account to the same extent.

---

1 Cf Bryant, 1975, p. 330.

2 Normally it is assumed that $a$ can only take values between zero and unity, but the empirical results related to trade credit (cf. Chapter 6, Table 6.5.) seem to indicate that within the first month more credit goes (for institutional reasons?) together with trade flows than what is optimal in a longer perspective.

The total yield of an asset is determined by the concrete return, the liquidity premium, storing and transaction costs, plus the eventual reduction for taxes, etc.\(^1\). For the investor, it is crucially important that the expected yield from a foreign asset is also burdened by the exchange rate uncertainty. Not only the concrete yield, but also the liquidity premium suffer from exchange rate variations. The more volatile the exchange rate and the more disorganized the international financial markets, the more disastrous the effect on the liquidity premium. The latter cannot be entirely differentiated from the risk variables; but the way in which risk is normally treated within the portfolio model is merely as the calculated variance of the observed previous yield. That procedure does not take into account the subjective attitude of uncertainty towards the future, which a high liquidity premium can help reduce.

In any event, a change in the variance of the exchange rate will -- in this approach -- lead to a change in the demand for foreign assets. The transition of the exchange rate system from fixed to floating rates may have increased the risk connected with holding foreign assets. On the other hand, the floating system has probably reduced the covariance between exchange rates\(^2\). Taking both tendencies into consideration should imply a smaller but more diversified portfolio as far as foreign assets are concerned. Another instance illustrating the significance of the risk variable is that a stabilization of the internal interest rate level would -- ceteris paribus -- lead to a smaller demand for foreign assets\(^3\).

Again, it should be emphasized that within a system of floating exchange rates, there is also an interdependence between the current and capital accounts, which makes the partial analysis of the demand for foreign assets less general.

\(^{1}\) This division of the yield has been more fully discussed in Section 2.3.4. above.

\(^{2}\) See Wihlborg, 1977, for an excellent discussion.

\(^{3}\) Cf. Blomgren-Hansen, 1976, for a persuasive mathematical treatment of this aspect.
One observation regarding the covariance is that simultaneous with the integration of the international financial markets, the rates of interest will be more correlated. In fact, the assumption of perfect capital mobility also makes the covariance perfect and, in this respect, removes any benefit from diversification of the portfolio.

As a final point, the X's in Equation (16) should be mentioned. They are meant to take into account special conditions which may affect the demand for a specific asset. For instance, the size of the export of goods (and services) influences the amount of trade credit which is held. In addition, different political initiatives in the shape of restrictions on capital movements, internal credit rationing, etc. play a role, but that role may be very difficult to measure empirically.

2.4.8. Direct Investment

In the preceding, we have not been very precise in our discussion as to whether the portfolio model is applicable to all kinds of foreign investments. The major distinction lies between financial and direct investment. The latter term covers acquisition of real capital goods, either by undertaking real investments abroad or by buying a dominant share of the equities in a going business.

In principle, one can assume that it is only firms which make direct investment. Thus, in addition to specific external factors, they will be guided more or less by the same motives as domestic real investment. In particular, firms with a considerable production for export to one particular market can, in a number of respects, reduce their uncertainty by direct investment. A disturbing factor is, of course, exchange rate fluctuations, which can change the price/cost relationship as long as costs are denominated in domestic currency and the price is a foreign one. Moving the production to the export market makes
the exchange rate less disruptive, but still the profit must be compared with that obtainable from an alternative domestic investment. Direct investments also reduce the risk of tariff and quota restrictions levied on the trade in specific goods. (On the other hand, restrictions can be imposed on the repatriation of the investment and the current profit).

Large companies can benefit from diversification of their real assets, which factor has, in fact, led to the emergence of multinational firms. They benefit by producing and selling in a worldwide market which gives a lower covariance than when their activities are geographically more concentrated.

Basically, there seems no substantial difference between the contemplations of foreign direct and financial long term investment. Thus, if the portfolio model is found suitable for financial flows, it should also be possible to use it as a framework for explaining the direct investment pattern. But the extra explanatory variables (X's) are extremely important, and will probably, if carefully specified, be the main part of a statistical explanation.

2.4.9. The Asset Approach

2.4.9.a. A Simple Model

For practical purposes, the microeconomic approach indicated in Equations (16) - (18) is hard to handle. At such a disaggregated level, the empirical investigation is particularly difficult. However, in many analytical models, a number of simplifying assumptions can be made. For instance, Branson, 1976, cuts the number

1 The motivation behind multi-national corporations spreading their activities is not exclusively economic. In the above context, I have only dealt with this aspect, but to give a full explanation of their strategies, one should also carefully analyze the political aspects.
of assets down to three: Money (M), a domestic (non-traded) Bond (B), and a Foreign (traded) Bond (F)\(^1\).

In a very condensed form, the equilibrium condition can be indicated by the following:

\[
\text{Supply} = \text{demand}
\]

\[
\begin{align*}
\tilde{M} &= m(r, r^*, \bar{Y}, W) \quad \text{Money market} \\
\tilde{B} &= b(r, r^*, \bar{Y}, W) \quad \text{Domestic bond market} \\
e \cdot \tilde{F} &= f(r, r^*, \bar{Y}, W) \quad \text{Foreign bond market measured in national currency} \\
W &= \tilde{M} + \tilde{B} + e \cdot \tilde{F} \quad \text{Balance sheet constraint}
\end{align*}
\]

\(r\) - domestic interest rate  \\
\(r^*\) - foreign interest rate  \\
e - exchange rate  \\
\(\bar{Y}\) - national income  \\
W - private financial wealth

The usefulness of this model depends very much on the assumption of instantaneous stock equilibrium, which implies immediate adjustment within the financial sector (cf. the discussion in Section 2.2.3. above). Against this background, we find only three independent equations and, hence, three variables are determined endogenously. In a world with flexible exchange rates, they are: The domestic rate of interest, the level of wealth, and the exchange rate. Accordingly, the exchange rate may be considered as a purely financial phenomenon.

---

\(^{1}\) See also Hendersen, 1977, and Black, 1977, for a similar presentation. Isard, 1978, however, has a somewhat elaborate version: "A Streamlined Model of Financial Equilibrium," Appendix to Chapter 3.
Any change in the exogenous variables, e.g. the supply of financial assets, entails a change in all three endogenous variables. Thus, we will experience a substitution as well as a wealth effect.

Due to the substitution effect, the impact of an expansionary monetary policy will be to lower the domestic interest rate. Then, the demand for foreign bonds must be adjusted, which can only happen via exchange rate adjustment because the latter will change the supply of foreign bonds (e·F). Thus, the exchange rate depreciates until the exogenous supply F finds rest without any additional capital flows because the current account is assumed not to be influenced by the monetary expansion in the "point-of-time".

2.4.9.b. Wealth Effects

Wealth effects are derived from changes in the exchange and interest rates. In Equation (22) we see that if a country has a positive net foreign wealth, the value increases when the exchange rate depreciates. Increased wealth leads to larger demand for all financial assets, but the supply of foreign bonds denominated in domestic currency will rise faster than the demand for foreign bonds:

\[
\frac{\delta(e \cdot F)}{\delta e} = F, \quad \frac{\delta f}{\delta W} \cdot \frac{\delta W}{\delta e} = \frac{\delta f}{\delta W} \cdot F
\]

It is assumed that:

\[
\frac{\delta m}{\delta W} + \frac{\delta b}{\delta W} + \frac{\delta f}{\delta W} = 1 \Rightarrow \frac{\delta f}{\delta W} < 1 \Rightarrow F > \frac{\delta f}{\delta W} \cdot F
\]

A parallel situation occurs if capital gains and losses are considered in relation to the bonds. Above, we assumed that the bonds matured each period. Thus, no room remained for valuation changes. But, the value of longer term bonds fluctuates with the
development of the interest rate. This means that if the interest rates fall, the private sector (assumed to be net creditor) will experience a capital gain. The supply of bonds, therefore, increases more than the demand, and there will be some modification in the fall of the interest rate.

Two additional wealth effects should be mentioned, both of which probably work in the very short run. Firstly, the price of the traded goods goes up when the domestic currency depreciates, causing a real balance effect which may or may not be neutral in as far as the composition of the financial wealth is concerned. Secondly, any influence of trade flows has its immediate counterpart in a change in the size of the financial wealth.

Kouri, 1976, integrated these wealth effects in a short run analysis (in fact, a series of momentary equilibria) of the external adjustment to a stationary state. Here, the trade balance is allowed to respond passively to the capital account imbalance. Domestic absorption DD in Figure 2.8 depends on the size of the wealth.

Figure 2.8.

Stock and Flow adjustment caused by wealth effects

Note: Adapted from Kouri, 1976, p. 288, Figure 1.
A surplus on the current account leads to greater wealth through the accumulation of foreign bonds but, as we have seen, this requires an appreciation of the exchange rate in order that the supply of foreign bonds can be decreased (cf. Figure 2.8). Both effects lead to higher domestic absorption, which moves the DD-line to the left. In every momentary equilibrium wealth will be growing. This continues until absorption equals the predetermined production. How much wealth will increase and, accordingly, the exchange rate appreciate, depends significantly on the magnitude of the marginal propensity to absorb from wealth, and the substitution between foreign and domestic assets.

2.4.9.c. Asset Model with a Forward Market

The asset model has been extended with a forward market by Dornbusch, 1976\(^1\). In it, the exchange risk of foreign bonds is removed, but other risk factors may still exist, e.g. political risks, which will prevent domestic and foreign bonds from providing perfect substitutes. In any event, Dornbusch assumes that the interest arbitrage is perfect:

\[(25) \quad r - \lambda = r^*, \quad \text{where} \quad \lambda = \frac{e - \bar{e}}{e} \]
\[\lambda \equiv \frac{e - \bar{e}}{e} \]
\[e - \text{forward rate} \]
\[\bar{e} - \text{spot rate (the domestic price of 100 units of the foreign currency)} \]

Money market equilibrium implies that the interest rate is determined by Equation (19):

\[(26) \quad M = P \cdot L(r, r^*, Y, W) \rightarrow r = L^{-1}(M/P, \ldots) \]

Then substituting (19) into (26) gives:

\[(27) \quad r^* + \frac{\bar{e}}{e} - 1 = L^{-1}(M/P, \ldots) \]

---

\(^1\) Among others, see also Wihlborg, 1977, p. 72
Then Dornbusch differentiates (27), expressing the variables in percentage change.

\[ \hat{e} = \frac{\hat{L}}{L} - \hat{L} \cdot \hat{M}, \quad L_r = \frac{\delta L}{\delta r} < 0 \]

In this simplified asset model, we find a one-to-one relationship between a change in the forward rate and a change in the spot rate, whereas the effect of a change in the money supply crucially depends on the size of the inverse interest elasticity. If, as indicated by Dornbusch, it is low, then the effect on the spot rate is magnified.

Above, the forward rate was assumed to be exogenously fixed. Without going into a detailed analysis of the determination of the forward rate (which will be considered in Chapter 7), we can obtain additional results by assuming that the forward rate is set by speculators in a perfectly elastic manner at the level of the expected future spot rate. Hereby, the expectations take the stage and play an important role in the asset market equilibrium. Dornbusch proposes an adaptive specification of the expectation formation:

\[ \hat{e} = \pi \cdot e + (1-\pi) \cdot e(t-1), \quad 0<\pi<1 \]

The impact of the spot rate depreciation is a less than proportional rise in the expected rate. Thus, the foreign exchange will stand at a discount in the forward market. The higher the "\( \pi \)", the smaller the discount (expected appreciation of the domestic currency). Accordingly, when (29) is substituted for (28), the following is obtained:

\[ \hat{e} = - \frac{1}{(1-\pi)} \cdot \frac{L}{L_r} \cdot \hat{M} \]

---

1 The derivation of (28) from (27) only holds true for equilibrium values. Thus, we are dealing with comparative static analysis.
The expectations, therefore, fortify the impact of the monetary expansion on the exchange rate. The closer $\pi$ comes to unity (expected spot rate equal to actual spot rate), the bigger the devaluation needed to equilibrate a certain increase in the money supply.

2.4.9.d. The Importance of Expectations

Adaptive expectations is only one hypothesis concerning the formation of expectations but, from what we have observed of volatility in the exchange market over the past 4-5 years, the significance for the short run determination of the exchange rate seems apparent. Mussa, 1976c, has shown that even in cases where the expectations are consistent with the underlying structural model (the so-called "rational expectations") one cannot hope to avoid large swings in the expected spot rate. In fact, he illustrates in a very simplified model that utilizing the assumption of rational expectations, the present expectation of next period's spot rate depends critically on the expected values of the entire future time path of all variables which affect the money market equilibrium. This implies that if expectations of the future time path are volatile or any of the exogenous variables change abruptly, then in this ideal situation the exchange rate may fluctuate wildly.

This analysis points towards one tentative conclusion concerning economic policy, namely, that if the policy is supposed to be accommodating or "market conform", then it is less damaging to the smooth formation of expectations to gradually change the variable, perhaps even announcing such a change. Whereas, it is much more forceful to take the market by surprise if the aim is to counter the market solution, even though such a policy may create a wake of disappointed expectations.

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1 In Chapter 7 below, we will discuss how to measure the expected exchange rate for empirical purposes.
2.4.9.e. Concluding Remarks

One puzzling feature of this asset approach is that the exchange rate is not determined at the foreign exchange market, but as an interrelated result of portfolio shifts. "It is rather astonishing that the most concrete macroeconomic market -- the foreign exchange market -- does not exist from an analytical point of view and that the most concrete and homogeneous macroeconomic variable -- the exchange rate -- is determined by some or all other markets", (Claassen, 1978, p. 25).

This observation, of course, parallels the traditional analysis of the interest rate, without specifying the bond market (cf. Kuska, 1978, and our discussion in Section 2.2.4.). But, in the next section where the "Monetary Approach to the Balance of Payments" is analyzed, we will find the obscurity even more pronounced when the bond market, as well as the foreign exchange market, are missing.

Finally, the asset approach has been accused of effectively eliminating trade flow from the instantaneous adjustment process (Niehans, 1977)\(^1\). This is correct but also defensible if it is reasonably realistic to assume that financial markets equilibrate very quickly (cf. Section 2.3. above). This is mainly a matter of transaction costs because the international financial markets are so closely interlinked that immediate contact between buyers and sellers presents no problem. When a somewhat longer perspective is contemplated, the importance of changes in relative goods prices and real flows is apparent.

This aspect has been considered in several of the above mentioned models. For instance, Dornbusch, 1976a and Kouri, 1976 (cf. fig. 2.8) do build the financial subsector into a full scale macroeconomic model with real goods markets. These are assumed to adjust

\(^1\) But, unfortunately, Niehans goes to the other extreme, assuming instantaneous reaction of trade flows to changes in the exchange rate (p. 1256).
more slowly and are only considered in the longer run. But, a characteristic feature of the extended analysis is that the long run equilibrium value of the exchange rate (e.g. Dornbusch, 1976a, p. 1164, where even the equilibrium price level is known in advance) is one of the predetermined variables in the adjustment equation. Furthermore, the "dynamic" analysis is often held within a diagram, in which partial equilibrium lines divide the space into subsections where arrows indicate the direction of the market forces. According to our previous criticism of this analytical procedure (cf. Section 2.2.4.), some reservations exist regarding just how much insight such exercises provide.

2.4.10. Money Power Parity

The Monetary Approach to the Balance of Payments\(^1\) stresses the adjustment of the external balance through the money market. Basically, this approach distinguishes only between money flows (the items below "the line") and all other flows at the balance of payments. One can say that we are looking at an extreme portfolio model with just one asset. The adjustment at the money market will continue until stock equilibrium is achieved. In this respect, the monetary approach emphasizes an important aspect of the adjustment process, namely that full equilibrium requires not only flow demand equal to flow supply, but also stock demand equal to stock supply.

One of the originators of this "Monetary Approach" is Harry Johnson. But he, as well as his colleagues, stress that the underlying idea of stock equilibrium has its roots in the classical theories of the Eighteenth and Nineteenth Centuries. In particular, Hume's "price-specie-flow" theory is mentioned. In any event, there seems to be a substantial difference in relation to the mechanisms of transmission. In the classical theory\(^2\), the money (gold) flows from a deficit country to a

---

\(^1\) A number of representative articles are collected in Frenkel and Johnson, 1976.

surplus one affected — according to the quantity theory — the price level of goods. The change in relative prices automatically produced the necessary restuaration of the equilibrium of the trade. In the Monetary Approach, however, the money flows do not cause changes in the price level (often fixed by the assumption of a small, open economy), so the entire adjustment must come through the money market.

Accordingly, the demand equation for money is the central element of the Monetary Approach. A representative specification can, for instance, be found in Johnson, 1972, p. 155:

\[
M^d = p \cdot f(y, i)
\]

This is a very traditional specification:

1) No money illusion
2) The transaction motive represented by real output
3) The store of wealth motive represented by the interest rate

Recalling our previous discussion of the demand for money (cf. 2.3.4.) we know that the objects which can fulfill the above mentioned motives must be generally accepted means of payment and a certain store of wealth.

Within a monetary union or in the hay day of the gold standard, one can perhaps say that domestic money and foreign currencies are perfect substitutes, so that both objects can satisfy the demand for money. But this perfect substitution relies on the fact that the central banks have obligated themselves to buy and sell, at a given rate, an infinite amount of foreign currencies. Even in a situation where the monetary union is declared and hence, by definition no balance of payments problem in a narrow sense exists, it will be years before attitudes will change enough for the substitution to become perfect.
When the condition of unchangeable exchange rates is omitted or distrusted by the economic agents, then it cannot be assumed that domestic money and foreign currencies are perfect substitutes.

1) As a means of transaction, foreign currency will simply not be accepted as final payments. One must change the foreign currency into national money at an uncertain exchange rate before it represents generally accepted means of payment.1

2) Money has been identified as having the property of being the certain store of value in a portfolio. In a regime with changeable exchange rates, this is not the case with foreign currency, which is burdened by a pronounced capital uncertainty.2

Accordingly, except in special cases, it is very doubtful to interpret Equation (31) as a demand for domestic money and foreign currency. The demand for foreign currency must be specified separately, taking into consideration the elasticity of substitution towards domestic money as well as other financial assets.3

Within the Monetary Approach, the domestic supply of money is regarded as exogenously determined. Any excess demand for money is satisfied through import of foreign currency. This is, by assumption, the only adjustment mechanism because of full employment (constant y), perfect capital mobility (constant r)4 and given prices from abroad (constant p). In addition, all

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1 Naturally, if prices are settled in the foreign unit of account, foreign exchange will still be used as a means of payment in the foreign trade. And likewise, if the expected internal rate of inflation is so high that the relative price between goods and foreign exchange seems more stable (predictive) than between goods and the national unit of account.

2 Foreign currency may be regarded as a certain asset insofar as liabilities denominated in foreign units of account are concerned.


4 The paradox of an interest rate and no specified relations for the demand and supply of bonds is discussed in Sec. 2.2.5.
other domestic markets are assumed to be in equilibrium, so the excess demand for money must be equalized to its full amount from abroad.

The demand equation is claimed to remain stable throughout a 2-3 year period (Mussa, 1976b, p. 193). Thus, the longer run results -- given the above assumptions -- are immediately obvious.

To label this approach "monetary" seems to me a tautology, reminding me, in its nature, of the "sham dispute" of the rate of interest (Hicks, 1939, p. 170). When one assumes all other markets to be a priori in equilibrium, of course, the only market which is left to adjust will settle the balance of payments. But if other markets are allowed to be in disequilibrium, the theory would only be monetary in the sense that we are analyzing an economy where money is used in an essential way (Hahn, 1977).

Thus, the use of the Monetary Approach is restricted by the following: 1) the demand equation for money and foreign currency is awkwardly specified, 2) all variables in the demand equation for money are assumed to be given a priori, 3) the domestic supply of money is treated as being entirely exogenous, and no real assets are considered, which, in the long run, is very limiting.

2.4.11. **Summary**

This chapter has attempted to give a short survey of different adjustment models of the balance of payments. The rather dichotomized form of the presentation of theories should not lead one to believe they are alternatives. The most fruitful way of summarizing the chapter is to regard each suggested channel for adjustment as just one element of the total balance of payments adjustment process.
Perhaps one aspect has not been sufficiently emphasized, namely the importance of the exchange rate regime. In the extreme case of free floating exchange rates, any disturbance in the external environment will be reflected in the exchange rate, and then in the price of export and import, as well as the yield in foreign bonds. So, the initial adjustment will be of price character which, of course, can be followed by further price and quantity adjustments. The other extreme case is a monetary union, where the initial adjustment will be of quantitative character.

When considering the exchange rate regime, therefore, one should also investigate how the economy is prepared to cope with price or quantitative disturbances. In the case of fixed parities without a common currency deficit, countries can easily exhaust their foreign reserves, which must be regarded as a definite constraint. In that situation, the government must undertake further quantitative initiatives, sometimes in combination with a change in the exchange rate.

Recalling our discussion in Section 2.1. concerning the speed of adjustment, it should be noted that the time period of the analysis is crucial to the results. In the short run, financial markets which react most promptly can make the adjustment process look more like a financial than a real phenomenon. For instance, floating rates of exchange will, in the very short run, look as though determined by the monetary forces and the strength of speculation; but, if the main concern is a medium or long run, this hardly provides a satisfactory explanation.

Finally, a few words should be said concerning equilibrium. Firstly, this survey has shown that the conventional balance of payments theory is generally maintained -- with the exception of a few skeptics -- to lie within the equilibrium framework and stresses the comparative static results. But, one improvement has here been added: That the flow equilibrium is now replaced by the more general stock equilibrium approach.
This has entailed a more consistent treatment of the current and capital accounts. Secondly, in an attempt to avoid the "equilibrium trap", we have concerned ourselves with the proposed adjustment mechanisms. To a large extent, these have concentrated around the repercussion of a change in the rate of exchange, leading to price, income and interest effects. As a consequence of this analysis, it can be said that a full understanding of the balance of payments can never be reached without a dynamic picture of the entire process of adjustment, which requires a total macroeconomic model.
PART II

AN EMPIRICAL ANALYSIS OF THE DANISH CAPITAL ACCOUNT.

CHAPTER 3: THE ECONOMIC AND INSTITUTIONAL BACKGROUND

3.1. A Brief Survey of Internal and External Development

The sixties were quite a prosperous period for the Danish economy. Full employment (i.e., unemployment rates of 1%) was reached in 1960 and, with only minor deviations, kept at that level until 1967/68. On the other hand, an inflationary pressure developed in the wake. Hence, prices rose by approximately 3% in the beginning of the sixties, accelerating to a rate of 6% in 1968. And the current account of the balance of payments was in permanent, but modest deficit for the entire period with the exception of 1963 when a tiny surplus occurred.

A certain slack in the economy emerged during 1967, and when the U.K. devaluated, it was felt Denmark must follow to some extent. So, in November 1967 the Danish krone was devaluated 7.9%, an event which coincides with the starting point of this study.

The development from 1968 until 1973 was a period of relatively high real growth rates, moderate deficit at the current account, of approximately the same size as in the sixties\(^1\); but the accu-

\[^1\] Measured as a percentage of GDP
mulated foreign debt gave rise to an increasing number of warnings. In fact, in the second quarter of 1969, when the official reserves were nearly exhausted, there seems to have been a rather serious exchange crisis, and from then on more and more emphasis was placed on establishing a secure and stable private capital import.

This semi-stable development stopped in 1974 when Denmark experienced a significant worsening of external balances (Cf. figure 3.1), contemporary with a slump in demand, production and employment, and a dramatic jump in the rate of inflation. The situation throughout 1975-77 did not change this overall picture of high external deficit and low internal real growth rates which were now paired with a high but falling rate of inflation and high but stable unemployment rate.

Table 3.1

<table>
<thead>
<tr>
<th>Indicator</th>
<th>1967-73 average</th>
<th>1974-77 average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentage change in GNP</td>
<td>4 1/4</td>
<td>1 1/4</td>
</tr>
<tr>
<td>constant prices</td>
<td>4 1/4</td>
<td>1 1/4</td>
</tr>
<tr>
<td>Unemployment</td>
<td>1 3/4</td>
<td>5 1/2</td>
</tr>
<tr>
<td>Percentage change in</td>
<td>6.4</td>
<td>11.2</td>
</tr>
<tr>
<td>consumers' price index</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Deficit in current account as</td>
<td>2.</td>
<td>3.</td>
</tr>
<tr>
<td>percent of GNP, current prices</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net foreign debt as percent of</td>
<td>10.3</td>
<td>13.7</td>
</tr>
<tr>
<td>GNP, current prices</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Sources: *) Hoffmeyer & Hansen, 1978
All other figures: Statistisk tiårs oversigt 1978

To understand the external imbalance, it can be of some help to look at the figures (Cf. figure 3.2). In the late fifties there was no net debt at all. Then, during the years of a persistent

1 Number of unemployed as a percentage of the total labor force
BALANCE OF PAYMENTS (PRIVATE SECTOR)

NET PRIVATE CAPITAL IMPORT

NET PUBLIC CAPITAL IMPORT


-1000 1000 2000 3000 4000


-1000 0 1000 2000 3000 4000
Public net debt (except the currency reserves)
Private net debt
the currency reserves (excl. gold)
current account deficit in the sixties, the accumulated debt amounted to approximately 1 billion dollars ult. 1962, rising to 9 billion dollars ultimo 1977. These figures have a double significance because they strain the current account with the interest payments, amounting to more than half a billion dollars in 1977, and with repayments. The size of the current amortization is mainly determined by the mixture of redemption periods for assets and liabilities. The division of the debt into borrowing institutions also plays a significant role in this respect.

As a general principle, the public (government and local authorities together with public utility companies) foreign debt is of long term character (i.e., the original redemption period between 5 and 10 years). Ult. 1977 the public net debt amounted to $5.5 billion. The net debt of the private non-financial sector was approximately of the same size, but here one third is on a decidedly short term basis (redemption period of less than 1 year). To some extent this proportion is a change compared to the beginning of the period when about one half of the net debt was short term. As a last point, the position of the financial sector should be mentioned. The central bank, together with the private banks, had a net asset of $2.25 billion ultimo 1977, which covered the private short term debt to the full amount.

We see that half the foreign net debt is public and, therefore, of quite another character than the private one. This is a very important distinction when analyzing economic policy because public borrowing in itself can be regarded as a policy instrument, whereas private capital flows are only indirectly affected through changes in policy instruments.

The official exchange rate policy throughout the period was to keep fixed parities\(^1\) -- in the beginning (1967-72) towards the

\(^1\) Despite the external deficit and the internal slack, which from a more naive point of view could have led to a recommendation for a considerable Danish devaluation. The risk of further inflation and the deterioration of the external balance sheet were apparently considered more serious problems.
sterling, and from 1973 onwards, towards the DM. Given this exchange rate policy, it became apparent that the external development had to engage more political attention than hitherto; especially the problem of getting the external debt revolved and extended was a matter of the greatest importance in determining the way in which monetary policy was formed.

With this background, it is not surprising that the monetary policy in Denmark during the period was devoted more and more exclusively to the external balance (or lack of it). But if monetary instruments are accepted as having a significant influence on capital flows, then there cannot, at the same time, be strict exchange regulations. Accordingly, throughout this period we see continuous liberalization of the conditions for external financial flows; capital import is especially encouraged.

3.2. Institutions in the Financial Sector

Commercial and savings banks (from now on simply referred to as "banks") are dominating the short and medium term lending to firms and households. This should be seen in connection with a lack of any market for commercial papers. Trade credit is, of course, extended between firms, but the bills are not sold in an open market, but rather discounted in the banks.

Longer term lending is undertaken through mortgage institutes, which issue bonds of a very high degree of liquidity from a marketability point of view. This is so because an owner (firm or household) of real estate can, within certain limits, obtain these standardized bonds in exchange for a personal liability to the institute. These bonds have as the main principle a period until maturity between 10 and 30 years. Besides the private mortgage bonds, there has been supplied, in recent years, a considerable amount of government bonds with a somewhat shorter expiration period. The supply of shorter bonds has helped to make the spectrum of maturities more homogeneous. The nominal value of circulating bonds with high marketability is approximately equal to the yearly GNI in 1976 (35 billion dollars or $7,000 per capita).
In addition, it should be mentioned that the equity market has a rather modest size compared to the bond market. The magnitude is about one to twenty.

During the 70's an interbank market has grown up. This market facilitates the liquidity smoothing within the banking system. Not until recently has the Central Bank taken any active part in dealing in this market.

### Table 3.2. Credit Expansion through Main Sources of Finance

<table>
<thead>
<tr>
<th></th>
<th>Central Govt.</th>
<th>External Trans.</th>
<th>Banks</th>
<th>Mortgage Credits</th>
<th>Total Credit Expansion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average 1965-73</td>
<td>-0.7</td>
<td>0.1</td>
<td>4.1</td>
<td>8.0</td>
<td>11.5</td>
</tr>
<tr>
<td>Average 1974-77</td>
<td>8.1</td>
<td>-3.9</td>
<td>6.8</td>
<td>16.4</td>
<td>27.4</td>
</tr>
</tbody>
</table>

Source: Hoffmeyer & Hansen, 1978, p. 5, Table 2, and Annual Reports from Danmarks Nationalbank.

### 3.3. Monetary Policy: 1967-1976

When evaluating the monetary policy, the distinction between quantitative rationing and market intervention is of crucial importance. If the financial sector consists of only well-functioning markets and the agents have full information about future actions, the same results can be obtained either through aiming at a certain amount or a certain price (rate of interest). But markets are not perfect and agents do not necessarily react symmetrically towards a rationing and intervention, even if the rate of interest stays the same. Some instruments can be difficult to classify in this context, for instance Open Market...
Operations can have the aim of pursuing a certain level of the interest rate or a certain change in the liquidity position of the private sector.

Until the mid-sixties, the two main instruments of the monetary policy were: 1) Discount rate policy, and 2) Open market intervention in long term bonds. The aim of a change in the discount rate was the influence it had by institutional arrangements on the banks' lending rate. OMO was used to recycle the liquidity that was drained from the private sector through balance of payments deficits and government surpluses and, of course, also to affect the long term rate of interest.

In 1965 these instruments were supplemented by a Deposit Agreement between the Central Bank and the private banks. Quantitative features which should limit the magnitude of bank lending formed the main content of this agreement. This was one of the first signs that the central bank chose not to rely exclusively on the price mechanism; if so, the logical thing would have been to raise the discount rate until the bank lending had an appropriate size. In addition, there was put into effect a restriction on private bond issues, also with the aim of reducing the credit expansion without the necessary rise in the rate of interest. These quantitative restrictions were primarily caused by domestic considerations in relation to the desire of keeping the long term rate of interest at an artificially low level.

Following a severe exchange crisis in 1969 "external considerations have since held top priority in monetary policy formulation." (Hoffmeyer and Hansen, 1978, p. 11). The discount rate has been changed in such a way that there has always been a certain incentive for firms to borrow abroad and, in addition, a ceiling on the amount of bank lending was imposed.

This ceiling which, of course, is a typical quantitative instrument has since become the most important instrument in the monetary policy of pursuing the external goal. It is based
on the banks' lending commitments and not actual lending, which makes it nearly impossible to relax in intermediate periods, when no restrictions are needed.

Until 1974 there was a surplus in the government budget which made the regulation of the primary liquidity rather easy. But secondary liquidity was expanded through purchases of bonds by private banks. When the lending ceiling was in function, the most appropriate immediate substitute for lending was to buy bonds and, in addition, there was no limit on the amount of liquidity, banks could borrow from the central bank at a rather low rate of interest (compared to the bond rate).

Despite the fall in the net reserve position during the sixties and the first third of the 70's, there was not much incentive for the banks to reduce their demand for assets as long as their gross reserve position was scarcely without any limitation and generally at a lower interest rate than the market rate. In May, 1975, this situation came to an end and narrow limits were set on the amount banks could borrow at a market determined rate of interest at the margin. But this fall in the elasticity of the supply of reserves came contemporarily with the change in the governmental budget into a considerable deficit which was not matched by the sale of government bonds. That came not before 1976, except for a smaller amount in 1975 which all went into the vaults of the banks. Then, considering bank reserves, the crucial question is: Is the government prepared to let the rate of interest on these bonds rise when banks are demanding extra reserves? If not, banks can obtain primary liquidity by selling these bonds (cf., the discussion on this point in "Redegørelse fra arbejdsgruppen vedr. etablering af et marked for kortfristede værdipapirer, betænkning nr. 763, Copenhagen, 1976).

The period of observation is still too short for judging the point, but one can say that rates of interest have fluctuated more within the last 5 years than before, and reserve liquidity has become more expensive, priced at a market rate. In connec-
tion with the last point, it should be added that the inter-
bank market for reserves has grown fast since 1975
and the central bank has (except for very short periods) left
it alone.

In summary, one can say that the outcome of the monetary policy
and the employed instruments has been a liberalization of the
determination of interest rates on the bond market as well as
on private banks borrowing and lending. But, more emphasis has
been put into the obtainment of the external goal through push-
ing up short term rates of interest by discount policy and inter-
vention in the short bond market in conjunction with quantitative
regulation on bank lending.

3.4. The Exchange Regulations

Current payments are free of any restrictions as far as they
are related to import or export of goods and services, and
follow a normal pattern for payments within the particular
industry. Until 1969 Danish importers were allowed to reserve
foreign exchange up to one year in advance; in May, 1969 any
payment in advance of more than 14 days was banned, in 1973 the
period was extended to 30 days. These rules for payments in
advance also count for amortization of loans, etc.

Commercial loans and credits have been liberalized since 1961.
Credit related to import, as well as export, may be financed
through foreign loans. Until late 1972 the maximum length of
these trade credits was 1 year (5 years for ships and larger
plants). From 1972 onwards, imports and exports could be
financed by foreign loans not exceeding 5 years (8 years for
larger items). An importer can alternatively choose to have
revolving loans never amounting to more than the average of
his import over the last 12 months.

In addition to the possibility for an exporter to refinance
any trade credit abroad, there was established in 1975 an Export
Financing Fund which grants longer term loans on more favorable terms than the domestic interest rate. Quite recently this Fund has started to borrow abroad to counter-balance lending. In 1973 banks received permission to finance export by lending within certain limits. These limits were originally 250 mill. kr.; they increased to 400 mill. kr. in 1974 and to 600 mill. kr. in 1975. This activity is not restricted by the lending ceiling and opens the possibility for a single bank to have a negative netposition not exceeding 5 per cent of its own capital.

In accordance with the OECD agreement, a special credit facility for financing the export of ships built in Danish shipyards has also been created.

**Finance loans.** From July 1, 1968 a general permission to borrow between 100,000-1,000,000 kroners each year with a redemption period of not less than 5 years was granted and included practically every kind of firm. In 1971 the maximum amount was increased to 5 mill. kr. But in 1974 this general permission was narrowed down to cases wherein the loan had a specific real investment purpose. On the other hand, the limit was raised to 20 mill. kr.

**Portfolio investment.** Until 1971 there was no liberalization of trade in financial papers. When it was decided that Denmark would join the EEC, restrictions on foreign purchases of Danish bonds and shares were gradually relaxed. From January, 1975 onwards, portfolio investments were liberalized, as far as the papers were quoted by the Stock Exchange, and were not regarded as money market papers. Danish inhabitants have not until very recently (Jan., 1978) been allowed to make any foreign portfolio investments.

**Direct investment.** In principle, any direct investment exceeding a certain small amount needs authorization from the Central Bank, but the official attitude towards these investments has been relatively liberal. The concept of direct investments
covers, among other things, the setting up of a new factory, buying a dominant part of the equities in an existing firm or loans lasting more than 5 years between the mother firm and the subsidiary.

Banks (and other authorized exchange dealers, i.e., brokers, etc.) have subsequently been restricted in their foreign activities. As a part of the agreement between the Central Bank and the banks in 1965, they were asked not to increase their net foreign indebtedness. In 1969 they were, in addition, asked not to improve their net position to an amount larger than the average of 1st half of 1968. On December 1, 1971 the regulations were changed. Now the banks' net position should lie between 0-15 per cent of their own capital\(^1\). Dispensations from this rate have been granted in cases of heavy demand for forward exchange, which the banks were willing to supply if they were allowed to cover on the spot market to an extent exceeding the 15 per cent.

3.4.1. **Forward Contracts for Foreign Exchange**

As early as 1953 permission was granted to supply and demand forward exchange when the transactions had a commercial basis. Until 1968, however, there was only a sterling forward market in Copenhagen, which made forward contracts in other currencies expensive and awkward to establish. Until December 1975 any asset or liability denominated in a foreign currency with a fixed amount and not exceeding 1 year was allowed to be matched by forward purchase or sale. These forward contracts could have any length of time up to 1 year. Since December 1975, the time period has been extended to 2 years when contracts are against Danish kroners and without any limitation if the forward contract is established between two foreign currencies. Concerning forward contracts where Danish kroners are involved, the same rates hold good for foreign firms.

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\(^1\) "Ansvarlig indskudskapital" (own capital) raised abroad is excluded.
3.5. **The Institutional Exchange Rate Regime**

Denmark has been linked to a fixed parity regime since the Bretton Woods Agreements. Until 1973, when the IMF surveillance of the exchange rates broke down definitively, Denmark took part in the world-wide fixed exchange rate arrangement. In 1949 and 1967 the Dkr. was devaluated, contemporary with the Pound Sterling (£), and not until quite recently has the Dkr. been detached mentally from the Pound (which, of course, has also something to do with the declining role of the British market for Danish export).

In connection with the approaching Danish membership in the EEC, Denmark took part in different attempts to create a monetary union through exchange rates arrangements. These began in 1969 when the band for deviations from the fixed parities between the European currencies was intended to be narrowed, compared to the general IMF rules. After the Smithsonian Agreement in December 1971, when the IMF band was widened to comprise a 2-1/4 per cent deviation to both sides of the parity rate, the European countries agreed to keep the daily deviations with 1-1/8 per cent. This arrangement received the nickname "Snake in the Tunnel" (not to forget the "Worm" established between the Netherlands and Belgium-Luxembourg of only 3/4 per cent deviation; this reptile died on March 15, 1976) (DN, 1976, p. 91). The Tunnel was abandoned in the beginning of 1973, whereas the Snake survived, but without the participation of the UK (who left in 1972), Italy, and, for periods of time, France. This means, in reality, that a number of minor European currencies were linked to the D-mark in some kind of a currency block, which made a joint float towards other currencies. Within the D-mark block, discretionary changes in the parities have been undertaken. This happened in 1973, 1976, twice in 1977, and again in October 1978. In figure 3.3. the Danish exchange rate towards the two most important currencies (US$ and DM) is shown.
Figure 3.3.

- 138 -
From January 1979 the European Monetary System (EMS) was supposed to start. In many senses this arrangement is similar to the original Snake in which all the EEC-countries took part. At the time of writing Britain has chosen to stay outside the EMS, while France and Ireland participate on equal terms with the old Snake-countries. Italy has obtained a special-case position, which allow the lira to deviate up to 6 per cent from the parity.

Finally, in March 1979 the last disagreements concerning the EMS were removed and the formal start of the extended European currency collaboration could take place.
CHAPTER 4: PREVIOUS STUDIES OF THE DANISH CAPITAL ACCOUNT.

There are very few empirical studies of the Danish capital account. I have, in fact, had access to only four, two of which have been published (Economic Survey, 1964 and Thygesen, 1971). The other two are unpublished dissertations (Flemming Larsen, 1973 and N. Blomgren-Hansen, 1975).¹

The two published studies deal exclusively with trade credit. This is, of course, understandable in light of the strict Danish capital regulations which existed until the late 60's.

The analysis in Economic Survey is mainly a descriptive investigation of the development of the stocks of trade credit in the period 1949-62. The main conclusion of the work is that export related credit is more elastic with regard to amount of trade than import credit.

Professor Thygesen makes a regression analysis of the development in trade credit on quarterly figures for the period 1960-68. The main results are given in table 4.1 below.

¹ In addition, a number of tentative working papers, especially within the Denmark's Nationalbank, have been produced. Due to their unofficial nature, I have chosen to leave them out of this chapter and will refer to them in more concrete situations where a direct comparison with results obtained in this study can be made.
<table>
<thead>
<tr>
<th>Relation No.</th>
<th>Dep. var.</th>
<th>Lagged dep.</th>
<th>MGST</th>
<th>XGST</th>
<th>EUR</th>
<th>FORW</th>
<th>IRL</th>
<th>RUR</th>
<th>Intercept</th>
<th>R^2</th>
<th>S.e.</th>
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<tr>
<td>LIAB 1</td>
<td>LIAB</td>
<td>.9046</td>
<td>.2957</td>
<td>-</td>
<td>-.1289</td>
<td>-.1789</td>
<td>.1126</td>
<td>645.4</td>
<td>.998</td>
<td>132.8</td>
<td>(2.21)</td>
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<tr>
<td></td>
<td></td>
<td>(.0427)</td>
<td>(.0746)</td>
<td></td>
<td>(.1959)</td>
<td>(.7194)</td>
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<td></td>
<td></td>
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</tr>
<tr>
<td>ASS 1</td>
<td>ASS</td>
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<td>(.0479)</td>
<td>.2434</td>
<td>.0785</td>
<td>.2626</td>
<td>-.1300</td>
<td>-.0402</td>
<td>-502.3</td>
<td>.995</td>
<td>103.5</td>
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<td></td>
<td></td>
<td>(.4079)</td>
<td>(.4405)</td>
<td>(.1570)</td>
<td>(.5903)</td>
<td>(.0918)</td>
<td></td>
<td></td>
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<tr>
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<td>-.2612</td>
<td>.3871</td>
<td>-.4008</td>
<td>-.5225</td>
<td>.1757</td>
<td>365.7</td>
<td>.416</td>
<td>152.1</td>
<td>2.48</td>
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<tr>
<td></td>
<td></td>
<td>(.1215)</td>
<td>(.1436)</td>
<td>(.6426)</td>
<td>(.2287)</td>
<td>(.8270)</td>
<td>(.1329)</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>NCI 2</td>
<td>NCI</td>
<td>.2691</td>
<td>-.2431</td>
<td>(.1211)</td>
<td>(.1386)</td>
<td>(.1204)</td>
<td></td>
<td></td>
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</tbody>
</table>

LIAB: Stock of short-term commercial liabilities to the rest of the world
ASS: Stock of short-term commercial claims on the rest of the world
NCI: Net capital imports related to goods and services
MGST: Imports of goods and services
XGST: Exports of goods and services
EUR: Euro-dollar deposit rate
FORW: Premium on three-month forward dollars
IRL: Bank-loan rate
RUR: Unborrowed reserves ratio

Equation LIABl and ASSl are specified in stocks, whereas NCIl and NCI2 are flows specifications.1 Except for the influence of imports and exports, no conclusive results are achieved. Thygesen summarizes his findings in the following manner:

"It would be idle to pretend that we have made much progress in making the flows of trade credits endogeneous in our model. The persistent influence of current trade flows in shaping the levels of commercial assets and liabilities has been further clarified. This influence, though in itself enough to justify a careful analysis, is stable and not markedly different as between imports and exports. But the additional element of endogeneity through a linkage to domestic interest rates did not make itself significantly felt prior to the end of 1968."

For reasons of comparison with the work presented later on, it should be mentioned that Thygesen refers to a large number of computations made on monthly data, where he has obtained more encouraging results with regard to monetary variables, and, of particular note, the influence of the forward premiums is stable; but the $R^2$ rarely rises above .4 in the first difference version of the monthly regressions.

As a part of N.Blomgren-Hansen's financial sector model (N.B-H, 1975!, pp. 208-13), the demand of the private non-financial sector for the stock of foreign net debt has been estimated. He uses the portfolio selection approach, although in an elaborated manner. Here, the foreign debt, FDP, as a fraction of the total need of short term finance in the private non-financial sector, FDP+BLOP, depends on (i) the margin between the domestic bank lending rate, IL, and the foreign interest level represented by the Euro-dollar deposit rate, $T_\$, and (ii) "automatic" trade credit associated with net imports of goods and services, DFOT.

---

1 This observation is made by Flemming Larsen, pp. 95-98, who points out the lack of discussion concerning the different interpretations of the two specifications.
The results indicate that a quarter of the need for short-term finance (FDP+BLOP) is covered by external borrowing. N. Blomgren-Hansen himself mentions that the specification of net debt as a fraction of gross demand for short-term loans may appear unwarranted, for what reason we have chosen in the present study a measure of the net financial wealth instead. The influence of the interest rate at the end of the estimation period is about 600 million kr. for each percentage point the differential changes.

The most detailed study of the capital flows is, without exception, that made by Flemming Larsen. He applies the portfolio approach to disaggregated quarterly figures of capital account for the period 1960-69. The most promising results are achieved for trade credit, where the author succeeds, contrary to Professor Thygesen, in demonstrating the significant effect of changes in domestic interest rates and the Euro-dollar rate on trade credit assets. For trade credit liabilities, the results are less encouraging, a factor explained by reference to the fundamentally different positions between a Danish exporter and a foreign one with regard to their access to international financial markets. Mr. Larsen concludes his study in the following way:

"For the long-term portfolio investment the results were very much as expected. Obviously, the restrictions have prevented the proper functioning of the portfolio adjustment forces. For the short-term portfolio investment in general, the results were more promising. Thus, significant relationships were obtained be-
between changes in domestic interest rates and flows of capital. For liabilities, changes in the euro-dollar rate were also significant. Apart from interest rates, also changes in trade flows, income velocity and in some instances also the forward premium, were significantly related to flows of short-term capital. Of the different models, the Branson and Hill approach especially yielded satisfactory results." (pp. 114-115).

As shall be seen, these conclusions have been further supported by the present study. But two critical comments should be noted: (i) full adjustment is assumed within the quarter, taking into consideration Thygesen's result showing very slow adjustment of desired to actual stocks (5-9 quarters) this assumption should at least have been tested, and (ii) the Branson and Hill approach appears to have been used mechanically in the sense that all variables are multiplied by the "wealth variable". Strong arguments can be forwarded (Cf. N.Blomgren-Hansen, p.211, and section 6.6) that the trade flows represent a need for "transaction"-credit, contrary to "speculative"-credit, and should, therefore, not be included in the portfolio selection function:

\[
\text{Demand of assets} = f(\text{interest rates, monetary indicators}) \cdot \text{WEALTH} + \text{TRADE FLOWS} 1
\]

In addition, it is worth mentioning that all the above referred results have been obtained by the OLS-technique. This means they are affected by simultaneity biases. In Thygesen's study, he includes a subsequent chapter in which a simultaneous model is set up. Here, all equations are estimated by the TSLS-technique. Unfortunately, this re-estimation leaves no significant coefficients, not even the trade variables! This forces Thygesen to conclude: "this relation remains in a most unsatisfactory state." (p. 265).

The overall impression is that the empirical explanation of capital flows still remains rather poor, although the disaggregated study by Flemming Larsen is encouraging in the sense that mone-

1 This is, perhaps, also the case with income velocity.
tary indicators appear in a significant manner. In any event, the period of estimation is far back in the 60's, which in itself suggests the need for a study on more recent material, especially when taking into consideration the fact that — apart from trade credit — the liberalization of capital flows did not begin before 1968.\footnote{\textit{B-H}, 1979 has presented an elaborated equation for the private net capital import estimated over the period 1963-1977. Basiclly the result are very similar to the previous ones - yet it has been possible to show a significant effect of the forward premium, and the domestic rate of interest is now the bond rate.}

Another general weakness of the studies lies in the lack of figures for the financial wealth of the private sector. Either this aspect is omitted in the analyses or the wealth is represented by the gross domestic product.

As a final point, a re-estimation of the equation on monthly figures is recommended for some of the studies. This shortening of the estimation period would probably help to establish more stable relationships between financial variables and capital flows.
5.1. The Ideal Case

Unfortunately one thing is a theoretical model, quite another is the empirical application. But let us start with the ideal case and then make the necessary modifications.

Ideally, we would have a continuous stream of figures showing how the stocks develop over time combined with flow observations that tell the speed at which the stocks are changing. In addition, figures for the non-accumulating flows are available, e.g. income, consumption, etc.

In this case there will always be an exact correspondence between the changes in the stocks and the registered flow which may consist of either a change in the quantity or in the price. The stock is assumed to be revaluated every point-of-time.

Above we are only considering ex post observations and we will still miss information about the expected values for the relevant variables. The proper way of obtaining these figures is to make an interview of the involved agents, but such a procedure will immediately cause that our ideal condition for information gathering breaks down for practical reasons.

Further there should also be made an effort to obtain demand and supply figures. Only when the markets clear (are in equilibrium) demand and supply are identical. Outside equilibrium we need separate observations of the demand and the supply, and how the actual transactions are related to these figures. The possibility of disequilibrium should be the normal case rather than the exception.
5.2. The Relation between Stocks and Flows in practice

In principle, there should be a direct correspondence between data showing stocks and flows. In practice, however, there can be rather large differences. Some of these may refer to different statistical methods: Stocks are measured in actual prices, so a change in the price will cause a change in the stock without registering any flow. Financial stocks do have a well-defined price which is frequently quoted and could form the basis for revaluation of the financial variables. Thus, changes are caused by either a shift in price or in quantity. The statistics of flows are traditionally only a registration of changes in the quantities at the actual price level.

On the other hand, stocks are often measured only once a year. Thus, interpolation must be made for certain information regarding quarterly changes in the value of the stocks.

A special problem arises from the calculation of a sector's debt when the price of the financial claim is variable. Traditionally, the debt is recorded at its nominal value because if, for one reason or another, the debt falls due, the full amount must be paid. As an asset, the claim is, more often than not, recorded at the market value because if the sector has to make a quick liquidation, one can only expect the actual market value. But, this procedure creates a discrepancy when calculating all sectors' assets and liabilities. We have, therefore, chosen to calculate the liabilities at market prices. In the main, bonds have a variable price, whereas loans, in the more traditional sense, have a fixed "market" price and, thus, a flexible debtor interest rate.

Quite another problem exists in that stocks are measured as point observations at the end of each quarter, which is, of course, more limiting than monthly or even daily averages. Interest rates are in this study mainly calculated as an average of end-of-the-month data. Thus, the price and the quantities cover slightly different periods.
By definition, the change in net financial wealth for each sector equals the excess savings, i.e., total savings minus total real net accumulation of external financial assets must, ex post, be identical to financial surplus/deficit. A number of statistical problems are involved in identifying this factor, a few of which will be mentioned:

a) Excess savings are calculated within the national account system and are regarded as a real stream, often without any consideration as to capital gains/flows.

b) The computation of real variables is, in general, more difficult because the markets do not function well and, therefore, no market clearing price exists.

When estimating the demand and supply equations for financial assets/liabilities, one should, whenever actual (ex post) figures are to be predicted, take into consideration the overall wealth constraint. This means, given the net wealth, the sum of the coefficients to one variable must be zero, which calls for some kind of constraint estimation technique.

5.3. The Period of Investigation

As indicated above in chapter 3, there is a number of reasons for the choice of the period of investigation: 1968.1 – 1976.4. The starting point is determined by two factors: 1) It has not been possible to compute reliable figures for the private financial wealth far back than 1968, and the disaggregation of the capital flow figures did not either start before then. 2) The liberalization of capital flows took an important step forward, when finance loans were permitted from 1st July 1968. Before that it was only trade credit which was unrestricted.
The point of termination was chosen from purely practical reasons, namely that at the time of making the calculations spring 1978, it was not possible to extend the time series any further. Of course, as a stability test the period of estimation will later on continuously be prolonged.

This period is one of dramatical changes in the institutional framework. Most important is that Denmark joined the EEC from January the 1st of 1973, and by this the integration of the Danish financial markets with the European ones sped up. In addition, the European exchange rate collaboration, which in the Danish case replaced the Bretton Woods agreements, has also played an important role.

With regard to the domestic monetary policy, we have also experienced quite a number of changes. Up to 1969 the main aim for the monetary authorities was to stabilize the long term bond rate; but from then on the aim seems to have changed in the direction of placing more emphasis on quantitative instrument on the expense of a more fluctuating interest rate.

5.4. Diaggregation into Sectors

In chapter 2.3, we have discussed in some length the theoretical arguments concerning the disaggregation of the domestic economy. With regard to a behavioural explanation of the capital movements, we have isolated the private sector. This is done so, because the determining factors behind the public capital import and export presumably are of a different character, e.g. related to the exchange rate policy - although public borrowing also to some extent is subjected to the conditions of the international financial markets. Finally, one can say that public capital import is determined by the market forces in the sense that they are residually in relation to private capital import, given an aim of a certain total amount of reserves.
According to our theoretical discussion the private sector should then be subdivided into three sectors: Households, firms and financial institutions (mainly banks).

To take the latter first, then we find that banks are very restricted in the foreign activity. As the main principle, they have to stay in a net position which ranges between 0 and 15% of their own capital. Even though there may be substantial changes in the gross position of banks, they have not much leeway for influencing the total international liquidity. In addition, the activity of banks are bounded by serving their customers with forward currency. Sometimes the Central Bank has granted exemption from the 15% limit to make the banks able to cover themselves in the spot market for an amount equal to their forward position.

Until very recently, households were not allowed to keep any foreign assets (or borrow abroad). This reduced the private sector in this respect only to comprise firms.

How the foreign sector should be treated is in fact more complicated, because normally the portfolio model is developed as an asset demand model, where the domestic sector demands foreign assets and the foreign sector domestic assets. But, as a net debtor nation, Denmark has a special interest in private capital import - liability supply functions. If the foreign sector can be regarded as independent of how the Danish actions influence their portfolios, then it may be acceptable to treat the foreign sector entirely exogenous. For given parameter values the foreign sector is willing to demand whatever liability that is supplied without changing the conditions (the small economy assumption).

For our purposes the number of relevant subsectors is reduced and comprises only the firms and the foreign sector. Firms were not allowed until 1st January 1978 to hold foreign assets - except for trade credit and smaller amounts in foreign banks for transaction purposes and direct investments in
foreign business. Firms may emit liabilities which are held by foreigners in the form of trade credit - or equivalent loans from a foreign bank - and finance loans, which have a minimum time until redemption of five years.

5.5. The Computation of the Net Financial Wealth of the Private Sector

One of the essential variables of a theoretical portfolio model is the net wealth which is, according to a number of, diversified into different types of assets and liabilities. For this reason, I have attempted to measure the private sector's net wealth, but such a project has proved somewhat difficult.

Firstly, there are no sources which show the wealth of the private sector. Thus, one must use an indirect accounting by adding all the external sector's net positions towards the private sector.

Secondly, the sources are not always consistent and do not provide detailed quarterly figures for these sectors' net wealth.

The external sectors with which I have chosen to deal consist of the following:

1) Foreign sector (containing all non-residential firms and person)
2) The Central Bank (Danmarks Nationalbank)
3) The Government (in addition to the central authorities as such, there is a number of central funds with special purpose: Sociale Pensionsfonds (SP) (Social Pension Funds), Arbejdsmarkedets tilskøbspension (ATP) (the Labour Market's extra pension), Postgirokonto (GIRO) (the Postal Transfer Bank), and Hypotekbanken (the Mortgage Bank).
4) The local authorities (kommunerne)
Quite often, the private sector is divided into two parts: the financial and non-financial. The former consists of commercial and savings banks, mortgage institutes and security companies, while the latter contains firms and households. However, as long as the scope is merely to measure the net wealth, there is not much point in such a division, because the financial institutions are, broadly speaking, in one way or another owned by the firms and households. When the net wealth of the banks increases, the bank shares gain in value, and so does the wealth of the non-financial sector. Naturally, these events imply distributional effects within the private sector which, in many other respects, are important.

Capital gains and losses within the private sector is then disregarded, and only nominal gains and losses towards the external sector influence the size of the net wealth. Among these changes in the rate of interest seems to have been the most important with the period of analysis. Due to the fact that the private sector has a net bond debt, a rise in the interest rate induces a capital gain for the sector and public sector (the Central Bank) has, broadly speaking, the equivalent loss. With regard to the exchange rate the private sector experiences a capital loss when the country makes a formal devaluation of the currency. In a regime of floating rates, it is less straightforward to give any statement, because the development depends very much on the composition of the assets and liabilities on different currencies. $ is still the dominant borrowing currency, although the importance has declined over the period (cf. table 6.11).

As discussed above the asset demand from the foreign sector is assumed to play a rather modest independent role in this study. Therefore, no attempt has been done to calculate the entire foreign net wealth, only the net wealth related to Denmark is computed and hence available for the empirical investigations. Often the development in the world GDP is used as an proxy, but this approach runs counter to our theoretical model and is not tried in the present study.
5.6. Explanations of the Statistical Figures

5.6.1. Stocks:

The nomenclature used herein has been chosen in order to simplify the various variables. The economy is divided into 6 sectors, each sector having its own letter of identification:

- B - private financial sector, commercial and savings banks
- H - private non-financial sector, households & firms
- P - the private sector = B & H consolidated
- N - the Central Bank
- G - the central government
- L - the local authorities
- F - the foreign sector
- Z - indication of an aggregation over several sectors.

For all financial variables, it is a rule that there must be a debtor as well as a creditor. The indication of a financial stock consists of 4 letters, the first of which is the creditor, and the last, the debtor. For instance, a foreign loan to the private sector will look as follows:

\[
\text{Type of financial claim}
\]

\[
\begin{array}{c}
F \\
\text{creditor} \\
\end{array} \quad \begin{array}{c}
\text{LO} \\
\text{debtor} \\
\end{array} \quad \begin{array}{c}
P \\
\end{array}
\]

The type of financial claim is indicated by the two central letters. Five main categories will be specified. Depending, however, on the specific analysis, there will be a need for more types of claims. In each case, this is indicated in the relevant part of the text.

- MB - Monetary base
- DE - Deposits
- LO - Loans with fixed capital value
- BO - Bonds with variable capital value
- VR - International reserves
In table 5.1 is given an illustration of the main assets and liabilities which form the background of the residually computation of the private wealth. Variables are defined as net holdings (in the sense net of redemptions over the period) in a few cases net-net holdings are recorded, these are cases, where assets and liabilities have not been possible to separate. For calculation of the net wealth, this is not a disadvantage as such; but establishing independent behavioural relations, it is more preferable that assets and liabilities are treated individually.

The table has been constructed with the main purpose to calculate the private sectors and foreign sectors net financial wealth. Therefore, some of the transactions between the public sector and the Central Bank are only treated rudimentarily, in the sense, that only important and relative easily available figures are recorded. This leads to that extraordinary condition that in 1976.3 the net wealth of the Central Bank is recorded as negative.

In the following table 5.2, one concrete example is given for the quarter 1968.1. This table, in addition to the list of identities on p.158f, should make the reading of the figures offered in annex 1 straight forward.

5.6.2. Flows

Financial claims are characterized by the fact that it is always possible to identify the debtor. It is more ambiguous concerning the creditor, because the claims can be traded; but one thing holds that they do not disappear, so someone must hold the entire supply. Changes in the holdings of a specific financial asset is derived from either a change in the quantity or in the price as long as we only consider the actual value. Accordingly, there is an unique relation between the changes in the financial stocks and the flow of funds. But the situation is quite different from the micro-level, because prices cannot be regarded as parametrically given, they are endogenous variables determined simultaneously with the changes in the amounts. The nominal
<table>
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<th>Liabilities</th>
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<tr>
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<td>Aggregate Liabilities</td>
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<tr>
<td>Net wealth</td>
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<td>PWE</td>
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\[ PWE = PWE - PWE \]
\[ NWEN = NWEN - NWEN \]
\[ GWE = GWE - GWE \]
\[ LWE = LWE - LWE \]
\[ FWE = FWE - FWE \]
<table>
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<td>2946+68</td>
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<tr>
<td>Bank NKC</td>
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<td></td>
<td>3014</td>
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</tr>
<tr>
<td>Government GLO</td>
<td>7490</td>
<td>1376</td>
<td>1364</td>
<td>10230</td>
<td></td>
<td></td>
</tr>
<tr>
<td>GBO</td>
<td>3426</td>
<td></td>
<td></td>
<td>3426</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local LDE Authorities LSO</td>
<td>2163</td>
<td></td>
<td></td>
<td>2163</td>
<td></td>
<td></td>
</tr>
<tr>
<td>LSO</td>
<td>445</td>
<td></td>
<td></td>
<td>445</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Foreign Sector F90</td>
<td>7436</td>
<td>1828</td>
<td>2337</td>
<td>21601</td>
<td></td>
<td></td>
</tr>
<tr>
<td>F90</td>
<td>258</td>
<td></td>
<td></td>
<td>258</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aggregate Liabilities</td>
<td>16574</td>
<td>2163</td>
<td>7971</td>
<td>1248</td>
<td>2285</td>
<td>2000</td>
</tr>
<tr>
<td>FWEF = -8577</td>
<td></td>
<td>785</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Net wealth FWEF = 8895</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
financial flow variable is indicated by 'A' followed by the letters indicating the financial stock.

Real flows (e.g. income, consumption, investment etc.) cannot be identified by debtor and creditor, because no such exist. Concerning real capital the debtor and the creditor is the same agent (i.e., the owner) and consumption evaporates during the period. The same terminology is, therefore, not suitable. One rather convenient procedure is to identify the real flows by their national account number. The current account of the balance of payments statistics is not, in the more detailed version, a part of the national account, and it has been chosen to initiate these variables by an 'L' followed by the relevant number and an indication of whether it is an expense or receipt.

5.6.3. Prices

Except for the 'A' a vowel indicates a price or price index. Interest rates are indicated by an 'I' followed by the considered financial claim, e.g. IBOP - the interest rate of private bonds, p.a.

Exchange rates are indicated by an 'E', e.g., EDOL. (The higher the exchange rate the more has the Danish krone devalued).

Prices of financial stocks are given by the letter 'O' which, of course, corresponds to the development of the interest rates.

Prices of real goods have the 'U' as indication.

5.6.4. Time periods

This study is intended to be mainly of quarterly relationships, but in a few cases it has been possible to set up monthly figures. These variables are identified by an 'M'.

5.7. **Balance Sheet of the Sectors**

1. **Net financial wealth of the private sector**:

\[ \begin{align*}
\text{PWEP} & = \text{PWE} - \text{WEP} \\
\text{PWE} & = \text{PMB} + \text{PDE} + \text{PLO} + \text{PBO} + \text{PVR} \\
\text{WEP} & = \text{LOP} + \text{DEP} + \text{BOP} \\
\text{PMB} & = \text{PMBN} + \text{PMBG} \\
\text{PDE} & = \text{PDEN} \\
\text{PLO} & = \text{PLOG} + \text{PLOL} \\
\text{PBO} & = \text{PBOG} + \text{PBOL} \\
\text{PVR} & = \text{PVRF} \\
\text{LOP} & = \text{NLOP} + \text{GLOP} + \text{FLOP} \\
\text{DEP} & = \text{LDEP} \\
\text{BOP} & = \text{NBOP} + \text{GBOP} + \text{LBOP} + \text{FBOP} 
\end{align*} \]

2. **Net financial wealth of the Central Bank**:

\[ \begin{align*}
\text{NWEN} & = \text{NWE} - \text{WEN} \\
\text{NWE} & = \text{NVR} + \text{NLO} + \text{NBO} \\
\text{WEN} & = \text{MBN} + \text{DEN} + \text{LON} \\
\text{NVR} & = \text{NVRF} + \text{GOLD} \\
\text{NLO} & = \text{NLOP} \\
\text{NBO} & = \text{NBOP} \\
\text{MBN} & = \text{PMBN} \\
\text{DEN} & = \text{PDEN} \\
\text{LON} & = \text{GLON} 
\end{align*} \]

3. **Net financial wealth of the government**:

\[ \begin{align*}
\text{GWEG} & = \text{GWE} - \text{WEG} \\
\text{GWE} & = \text{GLO} + \text{GBO} \\
\text{WEG} & = \text{MBG} + \text{LOG} + \text{BOG} \\
\text{GLO} & = \text{GLOP} + \text{GLON} + \text{GLOL} \\
\text{GBO} & = \text{GBOP} 
\end{align*} \]
\[ MBG = PMBG \]
\[ LOG = FLOG + PLOG \]
\[ BOG = PBOG \]

4. Net financial wealth of the local authorities:

\[ LWEL = LWE - WEL \]
\[ LWE = LDE + LBO \]
\[ WEL = LOL + BOL \]

\[ LDE = LDEP \]
\[ LBO = LBOP \]

\[ LOL = FLOL + GLOL + FLOL \]
\[ BOL = PBOL \]

5. Net financial wealth of the foreign sector:

\[ FWEF = FWE - WEF \]
\[ FWE = FLO + FBO \]
\[ WEF = VRF \]

\[ FLO = FLOP + FLOG + FLOL \]
\[ FBO = FBOP \]

\[ VRF = PVRF + NVRF \]

6. Control:

\[ PWEP + NWEN + CWEG + LWEL + FWEF \equiv GOLD \]
5.8. List of Variables

5.8.1. ASSETS (All stocks are in mill. Dkr.)

1. The private sector:

PMB - Monetary Base held by the private sector
PMBN - notes and coins
PMBG - Post Giro accounts held by the private sector
PDEN - Deposits by private banks at the Central Bank
PLOG - loans granted to the government by the private sector
PLOL - - - - the local authorities by the private sector
PBOG - government bonds held by the private sector at market prices
PBOL - local authorities' bonds held by the private sector at market prices
PVRF - International liquidity held by private banks

2. The Central Bank:

NVR - International liquidity held by the Central Bank
NLO - Loans granted by the Central Bank to private banks
NBO - Bonds held by the Central Bank

3. The government:

GLOP - loans granted by the government to the private sector
GLON - the government's current account at the Central Bank
GLOL - loans granted by the government to local authorities
BGOP - private sector bonds held by governmental institutions (such as Hypotekbanken (the Mortgage Bank), Arbejdsmarkedets tillægspension (ATP) (the Labour Market's extra pension), Sociale Pensionsfonds (Social Pension Funds), Postgirokontoret (the Postal Transfer Bank) and building funds, etc.)
4. **Local authorities:**

LDEP - Deposits by local authorities at private banks  
LBOP - Bonds held by local authorities at market prices

5. **Foreign sector:**

FLOP - Net loans granted by foreigners to the private sector  
FLOG - - - - - - - - the government  
FLOL - - - - - - - - local authorities  
FBOP - Bonds held by foreigners at market prices
5.8.2. **LIABILITIES**  
(mill. Dkr.)

1. **Private sector:**

   LOP  - loans obtained by the private sector
   DEP  - deposits at private banks by other sectors
   BOP  - net supply of bonds from the private sector

2. **The Central Bank:**

   MBN  - monetary base (notes and coins) held by the private sector
   DEN  - deposits by private banks at the Central Bank
   LON  - the government's current account at the Central Bank

3. **The Government:**

   MBG  - Post Giro accounts held by the private sector
   LOG  - loans obtained by the government
   BOG  - supply of government bonds at market prices

4. **Local authorities:**

   LOL  - loans obtained by the local authorities
   BOL  - supply of local authorities' bonds at market prices

5. **Foreign sector:**

   VRF  - international liquidity held by private and central banks
5.8.3. **INTEREST RATES** (Per cent per annum)

- ILO - lending rate at private banks (monthly average)
- IDD - cheque and demand deposit rate (monthly average)
- ITD - time deposit rate at private banks (monthly average)
- IDISK - discount rate at the Central Bank (monthly average)
- IMAX - maximal lending rate at the Central Bank (monthly average)
- IMM - money market rate (day/day loans) (average of daily observations)
- IFORW - cost of inter-bank three months forward purchase of $ (average of daily quotations)
- IEUR - three months' Euro-dollar rate in London (average of daily quotations)
- IBOGL - long term government bond rate (monthly average)
- IBOGS - short term  -  -  -  -
- IBOPL - long term private sector bonds  -  -

5.8.4. **EXCHANGE RATES**

- EDOL - the Dkr./$ rate (average of daily quotations)
- EDM - the Dkr./DM rate  -  -  -  -
5.8.5. **Balance of Payments** (Mill. Dkr.)

1. **Current account (at transaction basis):**

   L11 - exports of goods (fob)
   L12 - imports - - -
   L1 - merchandized balance (L11 - L12)

   L21 - maritime transport (net)
   L22 - tourism and travel -
   L23 - European Economic Community (net)
   L24 - other services (net)
   L2 - balance of services (L21 + L22 + L23 + L24)

   L31 - receipts of interest and dividend
   L32 - outlays of interest and dividend
   L3 - interest and dividend (net)

   L - current account (L1 + L2 + L3)

2. **Capital exports:**

   C1 - direct investment
   C2 - commercial loans and credits
   C3 - other capital payments
   C5 - changes on the foreign accounts of private firms
   C6 - unrecorded capital exports
   CP - total private capital exports
   CØ - public capital exports
   CA - total capital exports

3. **Capital imports:**

   K1 - direct investments
   K2 - commercial loans and credits
   K21 - recorded trade credit
   K22 - finance loans
   K3 - other capital payments
   K4 - portfolio investments
   K6 - unrecorded capital imports
   KP - total private capital imports
$K_0$ - public capital imports

$K$ - total capital imports

5.8.6. **Miscellaneous:**

- **PTEB** - private banks' net position in the forward market for currency (monthly average)
- **BTEN** - The Central Bank's net position in the forward market for currency (monthly average)
- **OBOG** - price of government bonds
- **OBOPK** - price of private mortgage bonds with first priority
- **OBOPN** - price of private mortgage bonds with second priority
- **OBOP3** - price of private mortgage bonds with third priority
- **OBOPS** - ABOPH and ABOP3 lumped together after the reform in 1971
- **OBOL** - price of local authorities' bonds
APPENDIX 1: SOURCES OF THE DATA

As the main principle, the relevant sources are given for the entire time series, but, especially, the latest figures in the series will be covered with a precise description that will make it possible for the reader to up-date the material himself/herself.

List of publications:

1. QN - Monetary Review, quarterly publication from the Central Bank (Danmarks Nationalbank)(DNB)
2. AN - Annual report from DNB
3. SE - Statistiske Efterretninger from Danmarks Statistik (DS)
4. AG - Statistical Yearbook from DS.
5. QG - Quarterly statistical survey from DS
6. 10S - Statistical survey for periods of 10 years - special publication from DS
7. IFS - International financial statistics issued by the International Monetary Fund (IMF)

Financial Stocks:

PMBN - Notes: 1967-74, QN, table 1; 1974- same source, but incl. coins

Coins: 1967-74, yearly figures in AN table 4 (annex) - linear interpolation for quarterly figures.

PMBG - Residual calculation: the difference between 'total notes coins and giro' - QN, p. 26 and PMBN.

PDEN - 1) Mainly deposits that can be withdrawn on demand. table 13 & 14 AN (annex)(incl. deposits made in respect of lending exceeding the credit ceiling).
2) Less-liquid deposits: credit certificates and deposit of certificates from 5/11/75.

PLOG - Yearly observations in QN, p. 16 - Quarterly changes is obtained from QG, table 36 'Statens låntagning og -givning', p. 52.
PLOL - QN, p. 17: 'Kommuner, værker og havne m.v.: Gæld og låntagning'

PBOG - QN, p. 16 nominal amounts. Prices are obtained from AN, annex, tabel 31: a simple average of the prices is calculated - except for the period after 1/4/76, where the bond with 10% nominal interest and 7 year until redemption is regarded as representative. (All government bonds are assumed to be held by the private sector).

PVRF - QN, p. 6: 'Danmarks Internationale Likviditet'.

NVRF - QN, p. 6: 'Officiel likviditet (netto) + guldbeholdning'.

NLO - QN, p. 18: 'Bankers og sparekassers mellemværeende med nationalbanken' - 'gæld til Nationalbanken'.

NBO - Yearly figures are obtained from QN, p. 5 - 'Nationalbankens vigtigste aktiver og passiver' ultimo the year at market prices. Quarterly flows at market prices is given in AN, table 29. Quarterly stocks are calculated by multiplying the existing stock with the actual price of bonds and then by adding the flow:

\[ NBO_{ult.} = NBO_{prim.} \times \frac{\text{new price}}{\text{old price}} + \text{flow} \]

As mentioned in connection with PBOG the market price for bonds can be calculated from a number of representative quotations given in AN, table 31 (annex). An average price for all bonds OBO is calculated using the actual amounts of the different types of bonds as weights. This price is a (very) rough indicator, because there is a continuous shift in the average nominal rate of interest and in the average period until redemption, which both influence the price.
I have tried to take these factors into consideration, but, for instance, the changes following the reform of the structure of the mortgage institutes in Oct. 1971 seems to have been miscalculated. This effect shows up in too high a jump in the price from 1971 to 1972 (which may call for a dummy or some correction later on).

GLOP - Yearly figures until 1974 QN, p. 16: 'Statens udlån'. Quarterly flows are calculated residually, because 'total domestic loans' are known from QG and figures showing loans to local authorities are given in QN, p. 17.

GLON - QN, p. 5: 'Nettomellemværende med staten'.

GLOL - QN, p. 17.

GBOP - Consists of bond holdings by the following institutions: Hypotekbanken (The Mortgage Bank) Arbejdsmarkedets tillægspengsion (ATP) (the Labour Market's extra pension) Sociale Pensionsfonds (Social Pension Funds) Postgirokontoret (Post Giro) Other funds. The method described in connection with NBOP is also applied in this case. Stocks are used in the beginning of the period - typical ultimo 1966. This stock figure is recalculated with regard to changes in the price and in quantity. A kind of control of the reliability of the calculated figures can be obtained by comparison with the actual figure for the holdings of bonds by the post giro, which is recorded in AN (annex), table 25. Quarterly changes are given in AN, table 29 - except for 'other funds' where only yearly figures are recorded in AG. OBO is used as the price - independent of how the actual portfolios may be compounded.

BLUP - J, p. 22 & 23: 'Bankers og større sparhekser util: Indenlandske, i alt'.
- QG, table 37, p. 53: quarterly figures of holding of cash, and deposits at banks. If correctly specified the cash holdings should have been separated, but they amounts to only D.kr. 200 mill. ultimo 1976. Before 1974, only annual observations from SE exist. Using a primitive seasonal correction procedure quarterly figures are interpolated.


- Yearly figures of stocks are taken from losS. Quarterly figures of flows used as indication for interpolation obtained from DNB's 'Grønne skemaer' ('Green sheets') except for the unrecorded capital flows. These are calculated as the difference between total imports and exports of goods and services recorded on transaction basis by DS and 'total payment for goods and services' recorded at 'The green sheet'.

This procedure of calculating the quarterly stocks leaves out a satisfactory consideration of changes in the exchange rate – these are spread equally throughou the year.

- Yearly figures of net stocks are calculated as the difference between total public borrowing abroad and local authorities borrowing. The quarterly flow figures are obtained from QG, tabel 36, p. 52: 'Statens lån-tagning og långivning'.

- QN, P. 17: 'Kommuner, værker, havne m.v., Gæld og låntagning'.

- Quarterly figures recorded on 'the green sheets' from DNB.

Rates of Interest

IDD - Simple average of the rates of demand deposits with and without cheques - the same source as for ILO.

ITD - Simple average of rates of time deposits (from 1 month till 12 months) - the same source as for ILO.

IDISK - AN (annex), table 16: 'Nationalbankens diskonto og rentesatser' - diskonto.

IMAX - The same source as for IDISK.


IEUR - IFS - code 11260D.


IBOGS - The same source as for IBOGL; government bonds 10%, 1983.

IBOPL - The same source as for IBOGL; private bonds 7%, 30 years until redemption is completed.

EDOL - IFS - code 12800af.

EDM - Calculated from the DM/$ rate, which has the code 13400af.

EEF - IFS - code 12800 amx (1970 = 100, a revaluation causes rising figures).
OBOG - AN (annex), table 31: 'Buying prices of selected bonds quoted on the Stock Exchange'. For each year the quoted prices - in the annual report (AN) related to that year - are averaged; except for the period beginning at 1976.2 where full weight is given to 10% - 1983.

OBOPK - Same calculation procedure as for OBOG without any exceptions. As mentioned above this method creates a number of difficulties - especially, at the transition from 1971-72 where too much weight seems to be given to the newly issued bonds with relative high nominal rate of interest.

OBOPH and OBOP3 - Mortgage with second and third priority were lumped together after the reform initiated on 1st Oct. 71 and from then on just named special mortgage - OBOPS. Problems and sources the same as for OBOPK.

OBOL - Prices of local authority bonds are recorded by N. Blomgren-Hansen.

**Balance of Payments**

a. Current account:

All data are taken from SE (recorded on transaction basis).

b. Capital account:

All data are taken from the 'green sheets' from DNB. Unrecorded capital flows (C6 and K6) are calculated as the difference between figures for import and export of goods and services at transaction respectively on payment basis.
Miscellaneous

PTEB - QN, table 16: 'Valutahandlernes terminspositioner' (1975-77). Before 1975: data are available from Blomgren Hansen: 'En bankmodel på månedsbasis'.

BTEN - QN, table 16. Before 1975, it was only possible to make some rough estimations of the intervention activity of DNB based on rather vague remarks in the annual reports.

BF.T - Net flow demand for forward exchange of firms (and foreign banks)

UDNYT - The ratio between permitted and actual bank advances.

SPEC - Speculation dummy,

S1,S2,S3 - Quarterly seasonal dummies.
CHAPTER 6: THE EMPIRICAL ANALYSIS OF CAPITAL ACCOUNT FIGURES FOR DENMARK

6.1. Introduction

The strategy of the empirical part of the thesis is first to introduce the magnitudes of the balance sheet and the capital flow figures. In the succeeding sections an empirical analysis of selected parts of the capital account based on quarterly observations will be offered. Then we will devote special attention to the determination of the trade credit using monthly data.

6.2. The Statistical Background

As a side effect of the Exchange Regulations, very reliable statistics showing capital flows in and out of the country exist. In principle, all external payments — above a minimum of 2000 kr. - 3000 kr. -- are recorded every month by the authorized exchange dealers (i.e. mainly banks) to Danmarks Nationalbank. The situation is less favourable in regard to the stocks of foreign assets and liabilities held by Danish residents and Danish assets and liabilities held by foreigners. Only Danish financial institutions publicise their stocks of foreign financial claims at book values. Every three months Danmarks Statistik asks 500 large firms about their foreign balance sheet, which indicates how the private sector has acted. From a theoretical point of view, one would expect that stocks could be derived from an accumulation of net flows.

But, in practice, changes in exchange and interest rates will — in addition to the 'error and omission' term — make these magnitudes different from the actual value of foreign claims. Capital flows are, therefore, in fact only one part (although a very important part) of the total change in the stocks or the net wealth.
Averages for quarterly figures of capital flows.

Table 6.1. Capital Import

<table>
<thead>
<tr>
<th>Mill.kr.</th>
<th>Long Term</th>
<th>Short Term</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct invest.</td>
<td>Portfolio invest.</td>
<td>Re- gistered</td>
</tr>
<tr>
<td>mean 1967-73</td>
<td>669</td>
<td>135</td>
<td>1398</td>
</tr>
<tr>
<td>mean 1974-77</td>
<td>719</td>
<td>266</td>
<td>4369</td>
</tr>
</tbody>
</table>

Capital Exports

<table>
<thead>
<tr>
<th>Mill.kr.</th>
<th>Long Term</th>
<th>Short Term</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Direct invest.</td>
<td>Portfolio invest.</td>
<td>Re- gistered</td>
</tr>
<tr>
<td>mean 1967-73</td>
<td>265</td>
<td>34</td>
<td>29</td>
</tr>
<tr>
<td>mean 1974-77</td>
<td>527</td>
<td>53</td>
<td>217</td>
</tr>
</tbody>
</table>

1) 1969-73

Source: Danmarks Nationalbank and own calculations.

Private capital import and export is drawn in figure 6.1.

In Table 6.1, some rough averages of the main items of the Danish capital account are given. One can see that the capital import is much bigger than the export, and, until recently, private capital import has been more important than public.

Before going into further detail, the differences between registered and non-registered capital flows should be explained. As mentioned above, Danmarks Nationalbank (DN) registers all payments, i.e., foreign transactions where currency is involved. For instance, the payments for goods and services are recorded on the current account. Contrary to this principle of registration, Danmarks Statistik (DS) records figures of the transactions on the current account which actually take place, i.e., when specific goods are passing the Danish border, it is regarded as export or import and recorded as such at the current account figures from DS, independently of how the transaction is financed. The non-registered capital flows are then calculated as the difference

2 Calculated for the total current account and are not immediately comparable with the figures used in section 6.6 below.
between the current account figures from DS and from DN. This difference shows what is often called "trade credit". For instance, if recorded transactions and payments are of equal size, the stock of non-registered trade credit is unchanged. When the difference is positive all goods imported in the period are not paid immediately and the amount of trade credit must be increased.¹

6.2.1. The time Period.

The time period chosen for this analysis is a quarter of the year. Several reasons fortify this choice:

1) Looking at financial markets, a 3 month period seems sufficiently long to make the assumption of equilibrium a realistic one, whereas, in a longer period, important "ups and downs" are truncated.

2) Quarterly figures are immediately available from the Danmarks Nationalbank (the so-called "green sheets"). These quarterly statistics are based on monthly reports which are not made public, and only to a limited extent, is there access to these figures.

3) Looking at the explanatory variables, there are also constraints on the data available. Financial variables are mainly recorded either monthly or quarterly, whereas real national account variables normally only exist on an annual basis. Therefore, when planning the time period of the analysis, it could not be made shorter than is possible to construct the relevant data.

The construction of the wealth variable was especially problematic. To keep the analysis on a quarterly basis, it was not possible to include real wealth. Thus, only the financial wealth

¹ This principle of calculating the trade credit is described very carefully by Thygesen, 1971, as well as in an unpublished paper from the DN (Hansen, 1972).
of the private sector has been calculated, and that with great difficulty. In addition, it should be stressed that private banks are included in the private sector. Therefore, this variable cannot be used for a more detailed study of the financial sector. On the other hand, private banks are owned by the stockholders, so the net worth is, in fact, a part of the private non-financial sector's wealth.

6.2.2. Disaggregation of the Capital Account

A difficult question is: How disaggregated the analysis should be. The theoretical viewpoint is that as we are in search of stable behavioural relationships, disaggregation should be continued until this goal is reached. But, in practice, the available data often set the limit for disaggregation and, sometimes, the purpose of the study must play a role in the sense that only at a great cost can macro-economic forecasts be derived from a genuine micro-model, even if it is theoretically more satisfactory. In summary, one can say that if the same explanatory variables are used in each of the disaggregated equations, not too much information is wasted by estimating only one aggregate equation.

Considering this background, we have made aggregate, as well as, disaggregate analyses. The capital flows are split into export and import, long term and short term, and a special study of trade credit has been made.

6.3. The Theoretical Models Used for the Empirical Analysis.

6.3.1. The Portfolio Model.

In chapter 2.4 different and, to some extent, alternative theories of balance of payments adjustment were appraised. Despite a number of shortcomings, the portfolio selection model was judged applicable, and will form the basis for the investigation.

As a consequence of the different speeds of adjustment on the
Markets for foreign capital transactions, the portfolio model is initially supplemented by the stock adjustment principle. Thereby, the sluggishness in the adjustment can be detected when the capital flow is regarded as a portion of the difference between the actual stock of the specific financial claim at the beginning of the quarter and the desired stock at the end of the quarter.

\(FK_t = \alpha(SK^*_t - SK_{t-1})^1\)

\(SK^*_t = f(IDOM, IEUR, FORW, SPEC, FIN. VAR., RISK, PWEP)\)

FK\(_t\) - actual capital inflow or export in period \(t\)

SK\(_t^*\) - desired stock at the end of the period

SK\(_{t-1}\) - actual stock at the beginning of the period

\(\alpha\) - adjustment parameter, indicates the portion of the total desired adjustment which will take place within the period (\(\alpha = 1\) - full adjustment)

IDOM - relevant domestic rates of interest

IEUR - eurodollar rate (3 months)

FORW - forward premium on 3 month dollar in Copenhagen

SPEC - dummy variable in speculative periods

FIN.VAR. - selected quantitative financial variables

RISK - exchange rate changes, exchange control, etc.

PWEP - the financial net wealth of the private sector.

The portfolio model should be extended with some extra variables.

1 It has been pointed to me by professor Tarantelli, EUI, that a change in the specification following the identity:

\(FK_t = SK_t - SK_{t-1} \Rightarrow SK_t = \alpha SK_t^* + (1-\alpha)SK_{t-1}\)

would entail a less biased estimate of the coefficient to the \(SK_{t-1}\) variable. The estimated equations in table 6.2. have been repeated according to this changed specification and are shown in table 6.2a and 6.2b, after without any lagged stock variable because the change unveiled that full adjustment took place within one quarter of the year.
when specific events seem to play a significant role. One can point to the current account deficit. For instance, in the first period an increasing deficit is often financed through short term trade credits.

Within the portfolio model, the total size of the net wealth is very important. In (2) above, a quite traditional relationship between the net wealth (PWEP) and the demand for financial assets is given — a constant marginal propensity to hold a specific asset is assumed. Alternatively, one could have specified the equation in such a manner that it was the average propensity which was assumed constant and determined in the equation:

\( \text{SK}_{t}^{*}/\text{PWEP}_{t} = g(\text{IDOM, IEUR, FORW, SPEC, FIN.VAR., RISK, PWEP}_{t}) \)

6.3.2. An Alternative Approach

In recent years a number of empirical studies based on the monetary approach to the balance-of-payments have been made.\(^1\) The main idea is, as discussed in some length in chapter 3, that the net capital inflow is solely determined by the excess demand for money. This approach is in clear contrast to the portfolio model, where changes in relative rates of interest (prices), not changes in quantities, are the determining factors.

In this approach the real markets are regarded as exogenous. If, in addition, it is assumed that in each period the money market clears, the following reduced model for determining the capital flow can be established:

\( M^{d} = h(y,r) \)
\( M^{s} = \text{PMB}+\text{VRF} \)
\( \text{FK} = \Delta M^{d}-(\Delta \text{PMB}+(\Delta \text{VRF}-\text{FK})) \)
\( \text{FK} = \Delta h(y,r) - \Delta \text{PMB} - (\text{CURSUR} + \text{KOCO}) \)

---

\(^1\) Among the earliest contributions are the works of Kouri in collaboration with Argy and Porter. Frenkel & Johnson, 1976,
where

\[ FK \] - private net capital inflow
\[ Y \] - gross domestic product (determining the transaction demand for money)
\[ r \] - the domestic rate of interest (speculative demand for money)
\[ M^d \] - demand for money
\[ M^s \] - supply of money
\[ PMB \] - domestic sources for the supply of money
\[ VRF \] - foreign sources for the supply of money (the exchange reserve)

\[ \text{CURSUR} \] - current account surplus
\[ \text{KOCO} \] - public net capital import

If the demand equation for money is linearized, the following equation (8) can be directly estimated.

\[ FK = a_0 - a_1 \cdot \Delta r + a_2 \cdot \Delta Y + a_3 \Delta PMB - a_4 (\text{CURSUR} + \text{KOCO}) \]

According to this approach one would expect, a priori, that a rise in the rate of interest would lead to a reduced capital import, caused by the reduced demand for money. This a priori expectation is contrary to the expected sign of the coefficient to the rate of interest in the portfolio model. The apparent contradiction is often circumvented in monetary models by the assumption that the domestic rate of interest is exclusively determined by the foreign one, because of the assumed perfect substitution between domestic and foreign financial claims. This assumption, of course, has to be tested empirically (what has seldom taken place), and in the Danish case, the assumption is obviously unrealistic when one takes into account the rather strict exchange regulations.

The theoretical model of the monetary approach has been critical-
ly discussed (cf. p.119), but the empirical method also has some defects.¹

1) Equation (8) is a demand equation for money supplemented by an identity rather than a test of a special monetary adjustment mechanism:

\[ \text{CURSUR} + \text{KOCO} + \text{FK} = \Delta \text{VRF} \]

and

\[ M_d^d - \text{VRF} = \text{PMB} \]

2) The money supply is treated exogenously in assuming that the central bank abstains from any sterilization actions in the capital flows. (In fact, even foreign central banks have to abstain; otherwise, there would be repercussions, De Grauwe, 1975).

3) Fratiani, 1977, has more explicitly pointed to the government budget as a source of disturbance in the money supply, which is also not considered.

4) As assumed in the monetary approach, exchange rates are not unchangeable. In fact, in recent years they have become very flexible. This prevents foreign and domestic financial claims from being perfect substitutes. As we have seen in chapter 2.4. even if the market for forward exchange were perfect enough to cover all lengths of maturity, the interest rate parity cannot be expected to hold good.

I have not yet made any estimations on Danish figures to show how poor the explanatory power of the monetary approach is. Lybeck, Häggström & Järnhäll have made some attempts regarding Swedish data. In the latter case equation (8) showed astonishingly good results, although the hypothesis that it was just an

¹ For a fuller discussion of different defaults of the empirical verification, one can refer to, among other sources, Magee, 1976, Fratiani, 1977 and Jespersen, 1978.
identity could not be refused. But when the simultaneous bias was corrected by using the TSLS-estimation technique, the equation broke down entirely. This can be interpreted as heavy support for the hypothesis that strong simultaneity due to the identity is the real cause of reasonably good results obtained by the OLS-technique.¹

6.4. Empirical Results

Using equation (2) as a starting point, a number of experiments with alternative specification have been tried. The most important explanatory variables should be briefly described. The net wealth of the private sector (PWEP) is only financial wealth,² in principle, measured at market values and actual exchange rates concerning bonds and foreign debt. The speculation variable (SPEC) takes the value of (1) during periods when the central bank intervenes in the exchange market to support the exchange rate from falling below the minimum rate. This kind of intervention is assumed to be observed by the market participants and will affect their expectations towards the optimum composition of the portfolio. In a Danish context it is mainly dispositions, related to the fear of a devaluation, that have been actual. In speculative periods the capital import will fall and capital export increase. The exact value the speculation variable takes depends on how many months within the quarter the central bank has intervened.³ The interest variable has been normalized with the wealth to take into account the fact that a one point change in the rate does not have the same impact at the

¹ Taking into consideration the fact that all empirical results referred to in this chapter have been obtained by the OLS-technique, I should be less exultant.

² Besides the practical arguments for this definition, there is, of course, the theoretical implication that financial and real assets are considered to have a low degree of substitution within the portfolio (cf. chapter 2.3).

³ Another measure of the speculative strength is the activity on the market for forward exchange. Alternatively the net position of private banks on the forward market has been used in the equations.
beginning of the estimation period as at the end. Finally the amount of the bank advances (BLOP) (although endogenous) was tried in the equation on a rather ad hoc basis. This has been done in regard to seeing if the substitution caused by quantities is more pronounced than that caused by interest rates.

6.4.1. **Total private net capital import (AKPCP)**

It is planned to state the empirical result starting with the most aggregated variable KPCP, and then disaggregate more and more into import vs. export, long term vs. short term, etc.

Concerning KPCP, the result is referred to in equation (i), table 6.: There it can be seen that nearly all the adjustment to the desired level of the net foreign assets (liabilities) does take place within a quarter of the year. The coefficient of the lagged variable (KPCP1) is not significantly below unity.

The wealth variable is also rather significant and the interpretation of the coefficient is that an increase in private financial wealth by 1 mill.kr. will reduce the capital inflow by .25 mill.kr.1

A change in the financial wealth can come through three channels:

1) current account of the balance of payments
2) current account of the public budget
3) change in the level of the interest rate (and/or the exchange rate)

Thus, an increased wealth derived from channel 1) (e.g. 1 bill. kr. surplus) will lead to a capital outflow of 1/4 bill.kr., but where does the rest go? In a fixed exchange rate system,2 the central bank has to buy the excess foreign exchange and through this action the money supply increase. Therefore, some repercus-

1 Blomgren-Hansen, 1975, p.188, has reached a similar result, even from solving a simultaneous model.

2 Where the private sector is prevented from holding foreign exchange.
(i) \[ \Delta KPCP = 476 - .80 KPCP 1 + .78 \Delta IMEX = 1.44 \Delta IEURW - .28 \Delta PWEP = 738 \Delta BLOPS - 167 \Delta SPEC \]

\[ t-values (2.2) (6.2) (3.7) (4.0) (2.0) \]

\[ R^2 = .79 \quad s = 667 \quad (DW = 2.5) \quad n = 36 \quad (1968.1 - 1976.4) \]

(ii) \[ \Delta KPCP = 548 - 1.0 KPCP 1 + .59 \Delta IMP = 4.42 IEURW - .24 \Delta PWEP = 378 \Delta BLOPS - 204 \Delta SPEC \]

\[ t-values (2.7) (7.3) (5.2) (1.5) (4.1) (2.0) \]

\[ R^2 = .81 \quad s = 658 \quad (DW = 2.5) \quad n = 36 \quad (1968.1 - 1976.4) \]

(iii) \[ \Delta KP = 373 - .90 K1 + .56 \Delta IMP = 3.68 \Delta IEURW = .23 \Delta PWEP = 205 \Delta BLOPS - 92 \Delta SPEC^2 \]

\[ t-values (2.1) (7.6) (5.9) (1.5) (4.6) (1.9) (3.2) \]

\[ R^2 = .85 \quad s = 554 \quad (DW = 2.4) \quad n = 36 \quad (1968.1 - 1976.4) \]

(iv) \[ \Delta KLT = 272 - .81 KLT 1 + 1.0 \Delta IBDIFW = .03 \Delta PWEP = 186 \Delta S1 - 165 \Delta S2 - 203 \Delta S3 \]

\[ t-values (5.0) (4.2) (1.5) (2.5) (2.7) (2.6) (3.4) \]

\[ R^2 = .68 \quad s = 115 \quad (DW = 1.6) \quad n = 36 \quad (1968.1 - 1976.4) \]

(v) \[ \Delta KSTCST = 397 - .87 KSTCST 1 + .72 \Delta IMEX = 1.15 \Delta IEURW - .21 \Delta PWEP = 241 \Delta BLOPS - 158 \Delta SPEC^2 \]

\[ t-values (1.9) (5.7) (3.6) (0.4) (3.4) (1.9) (4.9) \]

\[ R^2 = .78 \quad s = 659 \quad (DW = 2.4) \quad n = 36 \quad (1968.1 - 1976.4) \]

(vi) \[ \Delta KST = 217 - .86 KST 1 + .52 \Delta IMP = 3.2 \Delta IEURW - .20 \Delta PWEP = 183 \Delta BLOPS - 86 \Delta SPEC^2 \]

\[ t-values (1.3) (6.8) (5.4) (1.3) (3.9) (1.7) (3.0) \]

\[ R^2 = .83 \quad s = 560 \quad (DW = 2.5) \quad n = 36 \quad (1968.1 - 1976.4) \]

(vii) \[ \Delta CST = 169 - .90 CST 1 + .07 \Delta EX + .02 \Delta PWEP = 146 \Delta BLOPS + 11 \Delta SPEC^2 \]

\[ t-values (1.9) (4.9) (0.9) (0.7) (2.4) (0.7) \]

\[ R^2 = .41 \quad s = 300 \quad (DW = 1.9) \quad n = 36 \quad (1968.1 - 1976.4) \]

Note: In the following two tables the same equations are repeated except for a change in the dependent variable from the change in to the level of the capital flows (cf. note 7, p.178).

Equation (ii) is omitted because it does not give any further information than what is contained in equation (ia) and (ib).
Note: From table 6.2a it is seen that the changed specification only has implications for the coefficient of the lagged dependent variable, in fact it takes the value of 1 minus the coefficient found in table 6.2. Further, it is observed that the t-value to this coefficient falls drastically and leaves the estimate insignificant, accordingly $R^2$ falls somewhat.
| Equation | 
|----------|---|
| (iiib) | $KPCP = 537$  
| t-values | $(0.8)$  
| $R^2$ | $.64$  
| $s$ | $660$  
| $DW$ | $2.4$  
| $n$ | $36$  
| (1968.1 - 1976.4) |  

| (iib) | $KPCP = 537$  
| t-values | $(2.8)$  
| $R^2$ | $.64$  
| $s$ | $660$  
| $DW$ | $2.4$  
| $n$ | $36$  
| (1968.1 - 1976.4) |  

| (iiiib) | $KP = 438$  
| t-values | $(5.9)$  
| $R^2$ | $.73$  
| $s$ | $552$  
| $DW$ | $2.2$  
| $n$ | $36$  
| (1968.1 - 1976.4) |  

| (ivb) | $KLT = 302$  
| t-values | $(6.8)$  
| $R^2$ | $.40$  
| $s$ | $115$  
| $DW$ | $1.4$  
| $n$ | $36$  
| (1968.1 - 1976.4) |  

| (vb) | $KSTCST = 462$  
| t-values | $(3.6)$  
| $R^2$ | $.59$  
| $s$ | $655$  
| $DW$ | $2.3$  
| $n$ | $36$  
| (1968.1 - 1976.4) |  

| (vib) | $KST = 278$  
| t-values | $(5.3)$  
| $R^2$ | $.68$  
| $s$ | $561$  
| $DW$ | $2.2$  
| $n$ | $36$  
| (1968.1 - 1976.4) |  

| (viib) | $CST = -184$  
| t-values | $(2.2)$  
| $R^2$ | $.19$  
| $s$ | $298$  
| $DW$ | $1.8$  
| $n$ | $36$  
| (1968.1 - 1976.4) |  

Note: The specification used in these equations implies that full adjustment takes place within the current period (i.e. one quarter of a year).
sion on the domestic rate of interest should be expected. In the Danish case, a fall in the interest rate will diminish the private wealth because the outstanding external bond debt was approximately 46 bill.kr. ult. 1976. For each point the price of bonds rises, the private sector's debt will increase by 1/2 bill.kr. - implying a modification in the capital export.¹

Secondly, the coefficient of .25 is perhaps more a political than a behavioural decision. Throughout the estimation period, there has been a current account deficit (cf. figure 3.1), and it could have been a political decision that approximately 3/4 of this deficit should be financed by a public capital import imposed by a conscious open market operations policy and due to the ex post overall wealth constraint.

The above result should be appraised in close relation to the coefficient to changes in the trade balance (which can be interpreted more or less as changes in the current account and, thus, as a change in the private wealth). If the trade balance improves by 100 mill.kr. in one quarter, the capital export increases by 75 mill.kr., probably due to a transaction financing motive. But, in addition, the wealth has increased by the same 100 mill.kr., which leads to an extra capital export of .25 mill. Accordingly, in the quarter when the trade balance improves, no effect will be registered at the reserves of foreign exchange and, hence, the money supply. Conversely, a deterioration of the trade balance is to its full extent financed through private capital import during the first quarter. But, in subsequent quarters, the transaction demand falls off because the funds are revolving and only the wealth derived capital flows are of continuous flow character. This means that if the improvement in the trade balance is sustained, the exchange reserve will start to rise from the second quarter onwards, by 75% of the improvement.²

¹ This result is exceptional because it is often assumed that private financial wealth is positive, leading to increased wealth when the rate of interest falls. (This effect is reinforced by the development of the prices of real assets).

² For a more detailed study of the determinants of the trade credit, the reader is asked to wait until the subsequent section.
The third quantitative variable results from the advances from
the banks (BLOPS). Here we find an effect of approximately the
magnitude of one quarter. During each period when the advances
grow by 1 bill.kr., the capital export goes up by 265 mill.kr.
Within the Danish financial sector, the amount of bank advances
has been regulated since early 1970. The peculiar form of the
regulation has made it rather difficult for authorities to con­
trol the exact amount of actual advances because the limitations
have been mainly put on the amount of potential advances estab­
lished under a system of overdraft facilities. So the amount of
the actual advances is partly a policy variable and partly an
endogenous variable. The closer the actual and potential advan­
ces come together, the more the variable becomes a policy in­
strument in a narrow sense; but no direct effect of the variable
measuring the ratio between actual and potential advances has
been detected, rather, only the opposite causality: increased
capital export raises this ratio. Without knowing exactly what
has caused the endogenous rise in bank advances (e.g. with higher
foreign rates of interest, the correlation is +.33), it is dif­
ficult to judge whether we have found an instance of quantita­
tive substitution or whether the real cause is due to changed
relative interest rates (or other costs).

When answering this question, the effects of the changes in the
relevant interest rates are extremely important. Unfortunately,
no domestic rate of interest giving a significant contribution
has been detected, not even the interest rate difference be­
tween home and abroad. The only rate worth mentioning which
showed an effect on the aggregate net capital import was the
eurodollar rate. In equation (i) the effect at the end of the
estimation period is approximately 75 mill.kr. per percentage
point. But it is remarkable that in equation (ii) the effect is
approximately three times as large and decisively more signifi­

1 The details are explained above, cf. p. 132.

2 Later on we shall see that the results are slightly more en­
couraging concerning trade credit.
cant. The difference derives from the treatment of speculation.

The speculative periods are treated in an ad hoc manner. Alternatively, they should have been excluded from the sample because the speculative situations are often atypical. In any event, the manner in which they have been introduced is described above (p.), and the result can be taken as support for the hypothesis that speculative periods strongly affect the net capital import. In equation (i), taken at face value, a speculative period lasting a full quarter has, on the average, within the estimation period, caused a fall in the net debt of approximately 1.5 bill. kr. In equation (ii), the effect is only a fall of approximately 600 mill.kr. On the whole, the way in which expectations have been suppressed in this ad hoc variable is quite unsatisfactory, and provides an obvious area for further research — perhaps following the lines which have been marked out in the analysis of the forward premium on foreign exchange.

6.4.2. Total private capital flows disaggregated into export and import (CP and KP)

Equation (iii) shows that the total capital import is reasonably well determined and gives, without comparison, the substantial contribution to the explanation of the net import because the coefficients are very much of the same magnitude; whereas it seems difficult to estimate a separate equation for the total capital export. In addition to the lagged stock variable, only bank advances have a significant coefficient (of the magnitude of 150 mill.kr. per billion which advances increase).

6.4.3. Private long term capital flows (KLT)

Correspondingly, it has not been possible to estimate a separate relation for long term capital export, whereas the total long

1 Even this result is significantly smaller than what N.Blomgren-Hansen achieved.
term net import, as well as the gross import, look quite promising. They are very much alike. Thus, only the import relation is given in table 6.2.

The estimated results of the long term flows do take apart from the total flows: the adjustment period is somewhat longer; there seems to be a seasonal pattern wherein the fourth quarter dominates; and finally, it is the difference between the eurodollar rate and the long term bond rate that "comes out best", which points to the fact that a long term foreign rate of interest should have been tried. Only three percent of a change in the wealth will be used to change the long term foreign portfolio.

6.4.4. Private short term capital flows (CST and KST)

Since the short term capital import dominates the total import, one should a priori expect that the estimation results would have a strong resemblance to those which were achieved by the estimation of the total import. Broadly speaking, this expectation proves true (cf. equation (vi)). Accordingly, a parallel result is also found in the case of net capital import (cf. e.g. (v)), whereas the equation for the short term capital export is poor.

6.5. Concluding remarks

The above empirical results can be summarized in the following manner: namely, it has been possible to estimate fairly stable behavioural relations for the capital import by using the approach of the portfolio model. As the capital import dominates the net flows, there have also been found quite good results for the net capital import. On the other hand, the capital export remains unexplained, not even the wealth variable gives a significant contribution to the explanation of its development.

These results have been achieved with a background of relatively strict exchange regulations. The different successes of, respectively, the import and export equations can perhaps be re-
lated to these regulations. Throughout the estimation period, the policy has been to liberalize capital import much more quickly and to a larger extent than capital export, e.g. finance loans, portfolio investment, etc. The only exception is trade credit, where export and import have had equal terms since 1972. One may conclude that capital imports are quite free of regulation. Thus, the behavioural model is useful, whereas capital export is still regulated to an extent which makes it impossible to use the approach of a free market model.

The second main observation is that quantitative variables give the strongest contribution to the explanation of capital import. This statement concerns real variables (import of goods) as well as financial variables (wealth, bank advances). The latter category incurs a special interest for the policy conclusion because both variables can relatively easily be affected by economic policy. The size of the financial wealth can be changed through fiscal policy whereas advances are regulated through the credit ceiling when there is an excess demand for advances.

The effect of changes in the rates of interest was determined with great uncertainty. The coefficient of the eurodollar rate was unstable and of modest size. On the other hand, the detection of the influence of the bond rate on the long term capital import seems encouraging. All things considered, the results related to the rates of interest do give the impression that further work, including a more careful study of the simultaneous structure, would give a better picture of the importance of the different interest rates.

Correspondingly, the impact of the speculations has not been treated satisfactorily. Especially, the importance of the expected exchange rate changes is amputated by the speculative dummy variable. On the other hand the size of the private banks engagement in the forward market seems to be a quite good measure of the strength of the speculative expectations.
Finally, the partial character of the study should be stressed. A more systematic investigation of the interplay between the capital import, on the one hand, and the internal financial sector, on the other hand, will make it possible to remove a number of actual simultaneous biases and, in addition, demolish the residual position often assigned to capital flows.

6.6. A separate analysis of the trade credit related to the foreign trade on a monthly basis for the period 1971-77

In this section the development of the trade credit for the period 1971-77 will be analyzed. The reason for this special study is that, without comparison, trade credit counts as the biggest item in the capital account of the balance of payments. This is not to say that it also necessarily counts as the biggest item on the capital balance sheet. Trade credits are established on a very short term basis and have a larger standard deviation than other items on the capital account.

A main feature of this development has been that while the export related trade credit has grown by an average of 1.4 bill. kr. per year, the import related credit has stagnated throughout the same period. For both categories, however, it is the case that when they are split into one component representing the "automatic credit element" and one representing "changes in payment habits", it is seen that the automatic credit has grown fairly in line with the foreign trade whereas changes in payment habits have caused a capital export. Changed habits have resulted in a reduced capital import at an average of 120 mill. kr. per month, while the increased capital export has a magnitude of about 40 mill.kr. per month. Figures 6.2, 6.3 and 6.4 give a picture of the development in foreign trade and the above mentioned credit components.

Taking into consideration that the pronounced aim of the mone-

1 In many ways, this section is a continuation and prolongation of the analysis which cand.polit. N.Westerlund did for the period 1968-72.
Figure 6.2. Credit related to the export of goods.
Figure 6.3. Credit related to the Import of Goods
Figure 6.4. Import related Credit divided into two terms
tary policy has primarily been to secure a steady private capital inflow, a number of attempts will be made to clarify just why this seems to have been extremely difficult. Especially, an attempt will be made to elucidate the interrelationship between financial variables under control of the authorities and the changed payment habits.

6.6.1. Data and Method of Calculation

The first attempts to explain the development of the trade credit were made by the Economic Secretariat of the Danish Government in the beginning of the 60's. This study was followed by the work of Professor Thygesen (cf. chap.4), who devoted one chapter of his doctoral dissertation to the analysis of short term capital flows in the 60's, which proved, in fact, to be a study of the trade credit. Later, a more refined preparation of the data material took place within Danmarks Nationalbank by cand.polit. Leif Hansen in 1972. He proposed the method of splitting the total credit into two separate components.

The method of calculation is built on the condition that Danmarks Statistik registers the foreign trade on a transactional basis and Danmarks Nationalbank on a payment basis. The difference between these two figures for a certain period is a relatively good measure of the non-registered trade credit (cf. above). On the other hand, a number of situations will, of course, modify this statement. For instance, one can mention an exporter who grants three months credit to his client and, at the same time, borrows an equivalent amount in a foreign bank. Correspondingly, an importer will seemingly delay the payment by borrowing abroad. Both cases illustrate that the concept of trade credit is blurred, and it has been argued that these figures should be extended by the registered commercial loans and credits. Otherwise, there may be an artificial distinction between trade credits financed domestically and those financed abroad. Foreign loans will prolong the import credit and reduce the export credit compared to the credit periods calculated on a non-registered
In any event, the definition of trade credits seems a bit unusual. Ultimately, one cannot separate trade credit from other financial sources. It is only because of the Danish exchange regulations that it is possible for statistical use to see whether or not foreign loans have been granted with the stated purpose of refinancing a trade-contract.

Before the non-registered trade credit is calculated, we have to make sure that the figures recorded by Danmarks Statistik and Danmarks Nationalbank cover the same types and amounts of foreign trade. It has been the experience of Danmarks Nationalbank that 92% of the value of imports recorded on a transaction and cif-basis is comparable to the payments figures for imports. Correspondingly, it is 102% of the fob-value of exports recorded by Danmarks Statistik. These factors of correction are based on a calculation of the average value for a number of years, and may vary within one year and from one year to the next.

The division of the credit figures into an "automatic" element and an element caused by "changes in payment habits" is made on the assumption that it is possible to establish a normal pattern of payments which is related only to the value of the foreign trade, and unchanged from year to year. In the paper from Danmarks Nationalbank the year 1970 is regarded as the "normal" year, and it is postulated that changes in subsequent years from the 1970 pattern are token changes in the payment habits. This means that the relationship between credit terms and the value

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1 Anyhow, Danmarks Nationalbank has in the meantime provided me with figures for registered trade credit, hence an analysis of these figures is made in a subsequent section.

2 A more traditional definition would be that the trade credit is extinct when the client has paid for the goods received independently of what the financial source might be. Here, to make it clear, non-registered credit means that we only deal with foreign extended credit in relation to imports and domestically extended credit in relation to exports.

3 Cf. section 2.3. for a more thorough discussion of this problem.
of exports and imports of goods is used to calculate the "expected" (or "normal") payments for other years.

One cannot stress strongly enough that the choice of 1970 as the normal year is an arbitrary one. When changes in payment habits, therefore, are explained, they should be regarded as changes from the 1970 pattern. In addition, it may be mentioned that if the calculation were perfect, the "actual" and "expected" payments in 1970 should be identical. Unfortunately, there is some discrepancy regarding exports (annex 4 to the paper from DN) and imports (annex 5) which may be referred to as variations in the correction factor.

6.6.2. The Proposed Models

**Model 1**

$I.K_b = \Delta$change in the stock of credit caused by changes in habits

$= \Delta$expected payments-$\Delta$actual payments

The automatic credit is then calculated by substracting the changed habits from the total credit:

$I.K = \Delta$change in the stock of total credit

$= \text{total transactions}-\text{total payments} = I.K_a+I.K_b$

$I.K_a = \Delta$change in the stock of automatic credit

$= \text{total credit}-\text{change in habits}$

The idea behind this model is that, for institutional reasons, carrying out foreign trade needs a certain amount of trade credit -- the so-called automatic credit element. Here we deal with the old problem of relating a flow variable (foreign trade) to a stock variable (the amount of trade credit). This formula-

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1 The same problem regarding different dimensions is known from the demand equation for money, where the stock of money is related to the flow of income. (Cf. section 2.3.4.).
tion is quite similar to a multiplicative specification:

\[ TC = \alpha \cdot TF, \text{ where } \alpha = f(iDOM, iEUR, FORW, RISK, S^e, \text{credit ceiling, }...) \]

\[ \Delta TC = \alpha \cdot \Delta TF + \Delta \alpha \cdot TF + (\Delta \alpha \cdot \Delta TF) \]

TC - the stock of trade credit
TF - trade flow
\( \alpha \) - the share of trade flows which are financed by credit
iDOM - domestic rates of interest
iEUR - eurodollar rate
FORW - Forward premium
RISK - (mainly) exchange rate risk
\( S^e \) - expected spot exchange rate

Here \( \alpha \cdot \Delta TF \) can be identified by the automatic element: trade credit goes up because trade grows. \( \Delta \alpha \cdot TF \) is the discretionary change in payment habits caused in, broadly speaking, the financial situation or the monetary policy. The last element \( \Delta \alpha \cdot \Delta TF \) vanishes into the stochastic variable (and causes biased estimates). If a change in one of the financial variables takes place, we will then observe a change in \( I.K_d \) in the same period, but in the next period it is built into \( \alpha \) and will be regarded as influencing the size of the automatic credit element.

Model II Alternately, one could propose an additive model:

\[ TC = \alpha \cdot TF + (f(iDOM, iEUR, FORW, S^e, RISK, \text{credit ceiling, }...) \]

\[ \Delta TC = \alpha \cdot \Delta TF + \Delta f(...) \]

Here, \( \alpha \cdot \Delta TF \) is the automatic credit element, calculated as the difference between total trade flow and the expected payment. \( \Delta f(...) \) is measured as the difference between expected and actual payments.

Change in the stock of automatic credit \((II.K_d) = \) Total transactions-expected payments

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1 In fact, in this model, \( \alpha \) will also not be constant. It will vary together with the profile over time of the trade.
Change in the stock of credit caused by changes in habits

(II.K\textsubscript{b}) = Expected payments-actual payments.

6.6.3. A Test of the Models

DN has made figures available on a monthly basis which makes it possible to construct data series based on each model for the automatic as well as for the change in habits elements. For a better appraisal of the difference, simple correlation coefficients, in addition to mean and deviation for, respectively, im- and export credit for the period 1971.2 - 1977.7, have been calculated.

Table 6.3. Different Statistics of the Trade Credit Items\textsuperscript{1}

<table>
<thead>
<tr>
<th>Mill.kr.</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>IMK\textsubscript{a}</td>
<td>24.7</td>
<td>440.4</td>
</tr>
<tr>
<td>IIMK\textsubscript{a}</td>
<td>117.9</td>
<td>364.9</td>
</tr>
<tr>
<td>IXK\textsubscript{a}</td>
<td>102.9</td>
<td>377.2</td>
</tr>
<tr>
<td>IIXK\textsubscript{a}</td>
<td>79.3</td>
<td>309.0</td>
</tr>
<tr>
<td>IMK\textsubscript{b}</td>
<td>-24.1</td>
<td>373.4</td>
</tr>
<tr>
<td>IIMK\textsubscript{b}</td>
<td>-117.4</td>
<td>319.7</td>
</tr>
<tr>
<td>IXK\textsubscript{b}</td>
<td>27.8</td>
<td>268.9</td>
</tr>
<tr>
<td>IIXK\textsubscript{b}</td>
<td>51.3</td>
<td>232.1</td>
</tr>
</tbody>
</table>

Note: These are trade credit flows based on, respectively, Model I and Model II; a - automatic credit terms b - change in habits

Table 6.4. Correlation Matrices

\[
\begin{array}{cccc}
\text{IMK}_b & \text{IIMK}_b & \text{IXK}_b & \text{IIXK}_b \\
\text{IMK}_b & 1.00 & .58 & .36 & .24 \\
\text{IIMK}_b & .58 & 1.00 & .47 & \\
\text{IXK}_b & .36 & .47 & 1.00 & .64 \\
\text{IIXK}_b & .24 & .47 & .64 & 1.00 \\
\end{array}
\]

\[
\begin{array}{cccc}
\text{IMK}_a & \text{IIMK}_a & \text{IXK}_a & \text{IIXK}_a \\
\text{IMK}_a & 1.00 & .70 & .39 & .34 \\
\text{IIMK}_a & .70 & 1.00 & .56 & \\
\text{IXK}_a & .39 & .56 & 1.00 & .82 \\
\text{IIXK}_a & .34 & .56 & .82 & 1.00 \\
\end{array}
\]
If the correlation between the variables calculated from the two different models had been high, one could simply have chosen one of the time series and used it for further investigation. In fact, the relevant correlations are of the magnitudes of: .58, .64, .70, .82, which calls for further analysis.

Another observation is that one would have expected the change in habits component of import and export to have different signs and, therefore, negative correlation coefficients. We see in table 6.4 that the means are of different signs, but the correlation, although rather low, is positive (.36, .24, .20, .46). The automatic credit is mainly influenced by the development of foreign trade. The value of imports and exports has, broadly speaking, risen throughout the entire period and, therefore, one would expect this component to increase in both cases and have a positive correlation. In fact, the correlations are positive and somewhat higher than for the "change in habits" component.

I have tried to discover which one of the two proposed models gives the most reliable results. In an attempt to reduce the double work, the automatic credit has been estimated as a function of the foreign trade (and the lagged stock variable, to make an allowance for sluggishness in the adjustment). The outcome, if significantly different, will be used as the criterion for choosing only one time serie for further analysis.

Imports

\[
(viii) \quad \Delta IMK_a = 39.0 + 0.57 \Delta IMIP + 0.27 \Delta IMIP_1 + 0.27 \Delta IMIP_2 - 0.92 IMK_{a-1} \\
\quad t-val. (1.0) (7.6) (2.8) (3.6) (8.5) \\
\quad R^2 = 0.70 \quad s = 316.2 \quad (DW = 2.27) \quad n = 75 \\
\quad (1971.8-1977.10)
\]

\[
(ix) \quad \Delta IIMK_a = 16.7 + 0.65 \Delta IMIP + 0.26 \Delta IMIP_1 + 0.17 \Delta IMIP_2 - 0.66 IIMK_{a-1} \\
\quad t-val. (1.0) (19) (4.5) (4.1) (8.3) \\
\quad R^2 = 0.90 \quad s = 137.6 \quad (DW = 2.44) \quad n = 75 \\
\quad (1971.8-1977.10)
\]
Exports

\[(x) \quad \Delta \text{IXK}_a = 69.7 + 0.67 \Delta \text{AMEX} + 0.20 \Delta \text{AMEX}_1 + 0.12 \Delta \text{AMEX}_2 - 1.14 \text{IXK}_a 1 \]
\[t\text{-val.} \quad (2.4) \quad (9.9) \quad (1.9) \quad (1.8) \quad (9.8)\]
\[R^2 = 0.83 \quad s = 238.3 \quad (DW = 2.09) \quad n = 75\]
\[\text{(1971.8-1977.10)}\]

\[(x) \quad \Delta \text{IXK}_a = 37.5 + 0.65 \Delta \text{AMEX} + 0.39 \Delta \text{AMEX}_1 + 0.15 \Delta \text{AMEX}_2 - 1.19 \text{IXK}_a 1 \]
\[t\text{-val.} \quad (2.4) \quad (18) \quad (5.1) \quad (3.4) \quad (11)\]
\[R^2 = 0.92 \quad s = 128.0 \quad (DW = 2.15) \quad n = 75\]
\[\text{(1971.8-1977.10)}\]

From the above equation, it seems quite obvious that figures based on Model II give a more stable relationship with more significant coefficients and a strong reduction in the standard deviation.

This result is especially pronounced in regard to the import related credit.\(^1\) With this background, we will only use data from Model II for the more intensive analysis.

6.6.4. The Automatic Credit Term

The equation for automatic credit was elaborated by the use of the Almon lag technique and a more detailed lag pattern was detected. Monotonically decreasing weights seem to give the best description and are in accordance with a priori knowledge of the lag structure.\(^2\)

---

\(^1\) In thinking it over once again, I have realized that the test is somewhat unfair to Model I. The multiplicative character of the model simply implies that the coefficient to the trade variable has to be more unstable and hence less significant.

\(^2\) One should not expect to find an absolutely perfect relationship because of the slack caused by the instability of the correction factor and because of the difference in definitions (trade figures are inclusive of ships and aircraft whereas credit figures are not).
Table 6.5.  The lag structure of the import related credit

<table>
<thead>
<tr>
<th>Number of lags</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>sum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.62</td>
<td>.54</td>
<td>.46</td>
<td>.38</td>
<td>.30</td>
<td>.22</td>
<td>.14</td>
<td>.06</td>
<td>2.7</td>
</tr>
<tr>
<td>t-values</td>
<td>(20)</td>
<td>(20)</td>
<td>(19)</td>
<td>(16)</td>
<td>(13)</td>
<td>(9)</td>
<td>(5)</td>
<td>(2)</td>
<td></td>
</tr>
<tr>
<td>mean lag</td>
<td>2.2 months = 66 days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 6.6.  The lag structure of the export related credit

<table>
<thead>
<tr>
<th>Number of lags</th>
<th>0</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>sum</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>.70</td>
<td>.57</td>
<td>.43</td>
<td>.30</td>
<td>.17</td>
<td>2.2</td>
</tr>
<tr>
<td>t-values</td>
<td>(13)</td>
<td>(12)</td>
<td>(10)</td>
<td>(6)</td>
<td>(3)</td>
<td></td>
</tr>
<tr>
<td>mean lag</td>
<td>1.4 months = 42 days</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

After the determination of the lag structure for im- and export credit, the relations were re-estimated with one weighted variable representing im- and export, respectively.¹

(xi)  \[ \Delta M_a = -17.5 + 2.8 \Delta M_{IMPL} - 1.10 M_{K_a} \]  
\[ t-val. \ (1.0) \ (20) \ (24) \]
\[ R^2 = .91 \quad s = 133.5 \quad (DW = 1.76) \quad n = 73 \]
(1971.10-1977.10)

(xii)  \[ \Delta X_a = +13.1 + 2.13 \Delta M_{EXL} - 1.29 X_{K_a} \]  
\[ t-val. \ (.7) \ (14) \ (20) \]
\[ R^2 = .87 \quad s = 159.5 \quad (DW = 1.73) \quad n = 73 \]
(1971.10-1977.10)

Because the two equations are quite similar, the results will be discussed at the same time. The factor which immediately strikes the eye is that the coefficient of the lagged stock variable \( X_a (-1) \) is significantly larger than unity. This finding can be given a simple behavioural explanation: namely, that the agents,

¹ Symbols:  
\( M_K \) - automatic import related credit  
\( M_{IMPL} \) - monthly import of goods weighted (table 6.6)  
\( X_K \) - automatic export related credit  
\( M_{EXL} \) - monthly exports of goods weighted (cf. table 6.7)
for institutional reasons, are forced to grant more credit than they consider as optimal in a longer perspective. This situation is especially pronounced when looking at the export credit equation (\( \cdot \text{iii} \)), where the coefficient is 1.29 to the lagged stock. Perhaps the explanation can better be found in the manner in which the data are constructed. For instance, if the pattern of payments has changed in the meantime (the normal year is as far back as 1970 -- this can probably be checked by some material within Danmarks Nationalbank), a shortening in the institutionally determined credit terms will cause the above result.

Related to this argument, one may point to the apparent negative correlation between the two credit components (cf. figure 6.2 and 6.4).

These observations bring into question the assumption behind the disaggregation, and the method could probably be refined.

When the speed of adjustment is known, the long run automatic credit can be calculated. In the case of the import, a sustained increment of 100 mill.kr. per month will imply a growth in the foreign debt of 250 mill.kr. (\(100x^{2.8}/1.1\)). But the curve of the time profile (shown in table 6.5) prevents the imports from being "self financing" at any point in time. The maximum effect is reached after 7 months, when the accumulated increment in the import is 700 mill.kr. Correspondingly, a growth in exports of 100 mill.kr. will result in an institutionally determined rise in the stock of foreign assets of 160 mill.kr. (\(100x^{2.13}/1.29\)).

In addition, it is seen that a balanced growth in foreign trade of 100 mill.kr. per month will, after 7 months, have increased the exchange reserves by 90 mill.kr., a situation caused by the longer credit terms related to imports than exports of goods.

As a final point, one might mention that the constant term is insignificant, indicating that no unexplained trend element remains in the equation.
6.6.5. Change in payment habits

Following the principle of calculation in Model II, any change in the flow of credit which cannot be related to the trade flows is considered as a change in the payment habits. In addition, one should be aware that the changes are always related to the situation in the 'normal' year. This implies, among other things, that changes in the exchange regulations will be registered as changed habits.

Perhaps, it will be of some use to repeat briefly the regulations concerning trade credits\(^1\). Since the early 1960's, the general rule has been that of no restrictions within certain time limits. Import credit must not exceed 2 years, except for large items where 5 years was the upper limit, whereas export credit could not be longer than 12 months (a clear discrimination in favour of imports). When Denmark joined the EEC in 1973, the time limits were extended to 5 years for imports as well as for exports. Concerning payment in advance, the terms were tightened in May, 1969. From then on, it was only permitted to pay 14 days in advance of the ultimate payment date. This ruling has since been increased to 30 days.

Everything considered, the terms have been quite liberal throughout the expressed period, and have not faced important changes because very few contracts involve credit periods of two years or more\(^2\).

\(^1\) For a more detailed description of the exchange regulations, see above, p. 134f.

\(^2\) Here we must distinguish between non-registered and registered trade related credit. The latter is more often on a longer term than the former.
Before the empirical results are given, it is necessary to state some reservations. Firstly, the estimated equations suffer from the low quality of the data. It is only non-registered trade credit based on Model II which forms the dependent variable. Among the independent variables, the financial wealth and the future spot exchange rate are missing. Secondly, it is only a partial study, wherein the domestic financial sector is considered as exogenous. This is, of course, obviously unsatisfactory, but it is planned to be remedied at a later stage. For the time being, however, the results will be read as coming from single equations estimated by OLS (which does not correct the simultaneous bias).

6.6.6. Import related trade credit

After these preliminary reservations, it is hardly surprising that the empirical results are disappointing in the sense that it is difficult to establish strong and stable relations between changes in the financial variables (monetary policy) and the trade credit. Hence, the results are similar to those referred to by Westerlund, even though, the period is more up to date.

However, the most promising equation is the one for capital import (cf. (xiv)). Two factors are immediately noteworthy: namely, in this case, the coefficient of the lagged stock variable is also larger than unity and the coefficient of 'imports of goods' (MIMPORTL) is negative.

It seems to be a rather general phenomenon that in the short run more credit is related to foreign trade than what is regarded as an optimal financial structure in the longer run. This result, concerning the adjustment over time of the actual stock of capital to the desired one, is contrary to that of Westerlund, who found a monotonous growing relation and an average period of
adjustment of 5 months\textsuperscript{1}.

On the other hand, in relation to the change in payment habits, the hypothesis of over-reaction is less meaningful and may be attributed to some of the weaknesses mentioned above p.198. An additional sign in this direction is the very significant and negative coefficient to the import of goods, when one would have expected an insignificant coefficient\textsuperscript{2}. The sum of the coefficients related to imports of goods is, then, 1.6 = (2.8 (equ.(xii)) - 1.1 (equ.(xv))), which makes an import rise less self-financing.

A large number of experiments with different financial variables have been carried out. The previous results achieved by Westerlund are re-examined, but with less intensive use of the Almon lag technique\textsuperscript{3}. Our results are reported in table 6.7.

\textsuperscript{1} According to the arguments above p.178 the equation has been re-estimated with the flow variable (TMK) as the dependent variable (instead of the change in the flow (\Delta TMK)). Although the coefficient still was larger than unity, the significance felt drastically and the hypothesis of over-adjustment was no longer unequivocally supported by the statistical findings.

\textsuperscript{2} There is no wealth variable in the equation, so it is tempting to give the coefficient of the import this scale explanation. But, a parallel result is found in the credit granting equation, so that interpretation is hardly tenable.

\textsuperscript{3} Before I became aware of the basic difference between Model I and II, I tried a multiplicative specification which, of course, gave less significant results.
(xiv) \( \Delta MK_B = -20.0 - 1.36MK_B1 - 1.03\Delta IMPORTL - 139.5\Delta MLOPS - 145.2\Delta MSPEC - 70.2\Delta EEF \) (cf. Figure 6.9.)

\[
\begin{align*}
\text{t-values} & \quad (1.5) \quad (15) \quad (4.5) \quad (2.4) \quad (2.3) \quad (3.0) \\
\bar{R}^2 & = .78 \quad s = 230.4 \quad n = 73 \quad (DW = 2.08) \quad (1971.10-1977.10)
\end{align*}
\]

(xv) \( \Delta MK_B = -90.2 - 1.36MK_B1 - 1.12\Delta IMPORTL - 36.3\Delta MFORW - 131.2\Delta MSPEC - 65.9\Delta EEF \)

\[
\begin{align*}
\text{t-values} & \quad (2.8) \quad (14) \quad (5.0) \quad (2.1) \quad (2.0) \quad (2.7) \\
\bar{R}^2 & = .78 \quad s = 232.2 \quad n = 73 \quad (DW = 2.13) \quad (1971.10-1977.10)
\end{align*}
\]

(xvi) \( \Delta TMK = 3.8 - 1.11TMK1 + 1.63\Delta IMPORTL - 148.6\Delta MLOPS - 169.5\Delta MSPEC + 93.4\Delta MILO - 76.6\Delta MIEUR - 46.8\Delta EEF \)

\[
\begin{align*}
\text{t-values} & \quad (0.1) \quad (12) \quad (6.5) \quad (2.5) \quad (2.5) \quad (1.7) \quad (1.8) \quad (2.0) \\
\bar{R}^2 & = .69 \quad s = 236.7 \quad n = 73 \quad (DW = 2.29) \quad (1971.10-1977.10)
\end{align*}
\]

(xvii) \( \Delta TMK = -70.5 - 1.10TMK1 + 1.52\Delta IMPORTL - 28.4\Delta MFORW - 171.5\Delta MSPEC + 99.4\Delta MILO - 91.6\Delta MIEUR - 45.7\Delta EEF \)

\[
\begin{align*}
\text{t-values} & \quad (2.2) \quad (11) \quad (6.0) \quad (1.6) \quad (2.4) \quad (1.7) \quad (2.2) \quad (1.8) \\
\bar{R}^2 & = .67 \quad s = 242.9 \quad n = 73 \quad (DW = 2.33) \quad (1971.10-1977.10)
\end{align*}
\]

- **MIMPORTL** - imports of goods, weighted (cf. Table 6.5.)
- **MLOPS** - bank advances, seasonally adjusted
- **MSPEC** - speculation dummy
- **EEF** - effective exchange rate (May 1970 = 100, source: IMF's IFS)
- **MFORW** - forward premium on 3-month dollar
- **MILO** - rate of interest of bank advances
- **MIEUR** - 3 month eurodollar rate of interest in London (Source: IMF's IFS)
Two variables differ from the others in giving a significant and, from specification to specification, rather stable contribution to the explanation of the changes in habits. Firstly, we note that the advances form the private banks (seasonally adjusted) reduce the import credit by 140 mill Dkr. when the advances are increased by Dkr. 1 bill. On the other hand, no significant relationship was detected showing that the import credit goes up when the market for advance is tight, i.e., the amount of actual advances is close to the credit ceiling. The opposite causality dominated.

Secondly, the forward premium: An increase of one percentage point reduces the import credit by Dkr. 40 mill.  

A third relatively stable coefficient is that of the speculation dummy. This variable takes the value of unity in periods when the Central Bank has intervened in the market for foreign exchange to prevent the spot rate from falling below the minimum rate. When all speculative periods are given the same weight, the coefficient takes a rather uninteresting average value, in which not enough consideration has been given to the strength of the expectation of a Danish devaluation. In any case, the magnitude is of approximately Dkr. 150 mill, which is much smaller than the amount attributed to 'leads and lags' in connection with, e.g., the exchange crisis in the autumn of 1976. Surprisingly, it is also below the effect found for total capital import referred to above, p. 184. In addition, the speculative variable has been re-specified in level as indicated that an exchange crisis would permanently reduce the amount of the foreign debt; in this case, we also find a coefficient which, in every crisis, will reduce the amount of foreign debt by Dkr. 150 mill. In statistical criterium, it is impossible to discriminate between the two specifications, but it is remarkable that

1 Unfortunately, there are some simultaneity problems because the forward premium is, to some extent, determined by the eurodollar and domestic interest rates (cf. the chapter on the forward rate).
the constant-term is insignificant in the latter specification (cf. equ. (vii)).

Another measure of the speculative strength has been used. When an exchange rate crisis is approaching the firms are keen on securing their foreign liabilities on the forward market, if they are not able to settle them immediately. This implies that the amount of forward exchange which the banks supply mushrooms. A similar regression to equ. (xiv) where MSPEC is substituted by MBFWF (flow demand for forward exchange from firms) gives the result that the decrease in the trade credit is approximately 10% when changes in payments habits are considered. The maximum for the flow demand in any month was Dkr. 3210 mill. in September 1972, which caused a fall in the stock of import credit of approximately Dkr. 320 mill. (there has been detected no such effect related to export credit).

One of the reasons for the division between an automatic term and change in habits was to obtain more homogenous data, in order that the effect of the financial variables could be more precisely determined. Unfortunately, no significant relationship has been detected between interest rates and changes in habits, whereas the total import related credit is clearly negatively affected by rises in the eurodollar rate and reversed by rises in the domestic rate (cf. (xvi) and (xvii)).

As a final point, it should be mentioned that an increase of one percentage point of the effective exchange rate seems to reduce the debt by approximately Dkr. 50 mill. Presumably, this is mainly a statistical phenomenon because when, for instance, the Dkr./dollar exchange rate falls, a trade credit denominated in dollars represents a smaller amount measured in Danish kroner.  

1 The exchange rate variable has been further refined when the effective rate was calculated, using weight related to the currencies in which the trade credit (often the contracts) is fixed. This gave a less significant result because the Danish krone has an important weight which makes the time series rather stable compared with the trade weighted index. cf. appendix 1.
Looking at the aggregate effect of all variables, we see that even though the standard deviation is reduced by 50%, the financial variables contribute with only 10%. Before we discuss the results derived from the estimation of the total import credit, it should be stressed, once again, that, in fact, the two components \( \Delta MK_a \) and \( \Delta MK_b \) are extremely negatively correlated \((r = -0.62)\), a factor which tends to increase the sum of the variances compared with the variance of total import credit.

6.6.7. Total import credit

As mentioned above, the gain derived from dividing the total credit seems limited, and the estimation of just one equation for the import credit will be attempted because if this relation explains equally well the amount of import credit, the future work of calculation will be considerably reduced.

\[(\text{xviii}) \quad \Delta \text{TMK} = 8.5 - 1.1 \text{TMK} (-1) + 1.6 \Delta \text{MIMPL} - 167 \Delta \text{MBLOPS} - 176 \Delta \text{MSPEC} + 84 \Delta \text{MILO} - 84 \Delta \text{MIEUR}^2 \]

\( \bar{R}^2 = 0.67 \quad s = 241.7 \quad (DW = 2.2) \quad n = 73 \quad (1971.10 - 1977.10) \)

1 The exchange rate variable has been further refined when the effective rate was calculated, using weight related to the currencies in which the trade credit (often the contracts) is fixed. This gave a less significant result because the Danish krone has an important weight which makes the time series rather stable compared to the trade weighted index cf. appendix 1.

2 The coefficients of MILO and MIEUR has been constrained by using the difference \((\text{MILO}-\text{MIEUR})\) as independent variable, this did not change the findings in any substantial way.
As can be seen in (xviii), the main results are comparable to the one mentioned above. The coefficient to the lagged stock variable TMK(-1) is bigger than unity, and the longer run elasticity of an increment in the import of goods is approximately 1.5. It is satisfying to observe that the different rates of interest have significant coefficients, although the significance is not overwhelming. In table 6.7, a number of other experiments is shown, among them the effect of a change in the forward rate, which is also equivalent to the previously found results.

At this stage one cannot make an unambiguous appraisal as to which one of the methods will give the best results. We have to look at the equations forecasting abilities, why some ex-post forecasts have been calculated below.

6.6.8. Export related credits

As seen above, the stock of non-registered trade credit related to the import has been nearly unchanged during the analysed period, whereas the growth in the stock of export related credits has been rather pronounced, at a magnitude of Dkr. 8 bill. (1971.10 - 1977.10). This implies that the element of change in habits must have been positive and approximately Dkr. ¼ bill. per year. Taking into consideration that the monetary policy has been mainly devoted to the external balance in an attempt to prevent capital export, it is hardly surprising that the estimated equations have, in general, a low degree of explanatory power.
In spite of several experiments with different explanatory variables and lag structures, it has been extremely difficult to find some theoretically satisfactory results because there seems to be a rather pronounced tendency towards the reversed causality:

\[(xix) \Delta X_{K_b} = -43.8 -1.30 X_{K_b}(-1) + 1.66 \Delta MEXL - 34.8 \Delta MFORW + 137.2 MSPEC + 171.5 \Delta MILO \]
\[-34.8 (1.6) 137.2 (1.8) 171.5 (2.8)\]
\[-49.1 \Delta MIEUR + 136.5 \Delta MBLOPS \]
\[(1.2) (1.9)\]
\[R^2 = .75 \quad s = 248 \quad (DW = 1.92) \quad n = 73 \quad (1971.10 - 1977.10)\]

It is remarkable that all three financial variables, MFORW, MILO, and MIEUR, have the opposite sign of what was expected a priori. Hence, one cannot pay much attention to this equation.

The advances form the banks, seasonally adjusted, were the only financial variable which did get the expected sign. For each bill, Dkr. bank advances rise, 100 mill. of these are used for increase export credit. This is a rather poor result in as far as the mechanism behind the rise in the advance is unexplained.

\[(xx) \Delta X_{K_b} = 16.5 -1.2 X_{K_b}(-1) - .60 \Delta MEXL + 107.4 \Delta MBLOPS \]
\[16.5 (11) - .60 (3.0) \quad 107.4 (2.2)\]
\[(cf. figure6.10)R^2 = .67 \quad s = 211.0 \quad (DW = 2.2) \quad n = 73 \quad (1971.10 - 1977.10)\]

Similar to the procedure concerning the capital import, a relation describing the total capital export has been estimated. Here we again find the pattern of an immediate over-reaction - the coefficient to the lagged stock is 1.28. In addition, the forward rate has the right sign, but contribute with only Dkr. 40 mill. each time the premium increases by one percentage point.
\[
\Delta T\times K = 21.5 - 1.28 T\times K(-1) + 1.54 \Delta M\times E\times L
\]
\[
t-values (.5) (13) (6)
\]
\[
117 \Delta M\times B\times L\times O\times P\times S + 38 \Delta M\times F\times O\times R\times W(-1)
\]
\[
(1.9) (2.2)
\]
\[
R^2 = .73 \quad s = 256.4 \quad (DW = 1.95) \quad n = 73 \quad (1971.10 - 1977.10)
\]

In this equation, not even the speculation dummy was significant. This calls for a redefinition of the measure of the speculative pressure. The other candidate is the amount of forward contracts established, or, perhaps even better, the size of the disequilibrium in the forward market, measured by the amount of forward exchange the private banks (and sometimes Danmarks Nationalbank) provide to the market to establish equilibrium (cf. the chapter 7 on the forward rate for a more thorough discussion of this point).

Also in the case of export credit, it is not obvious that we benefit from the division of the total credit into the two subcomponents. The analysis, therefore, has been extended by ex-post forecasts to create a better background for judging the abilities of the estimated equations.

6.6.9. Ex post forecast

The equations under consideration have been re-estimated on a shortened period (1971.10 - 1976.12), which makes it possible to investigate the forecasting ability\(^1\), and, to some extent, the stability of the coefficients. As regards the latter, the result was mainly positive, with the coefficients showing a high degree of similarity.

In table 6.8, the residuals are given from forecasting the period 1977.1 - 1977.10. It should be noted that the table only contains static forecasts in the sense that the lagged stock variable always takes its historical value.

\(^1\) This procedure is biased in favour of the estimated equations because the forecasting period was originally included in the sample form which the variables were chosen. It would have been more correct to forecast extra the first sample, but unfortunately no figures were available at the time of calculation.
Table 6.8. Forecasting errors of import credit

<table>
<thead>
<tr>
<th>Year</th>
<th>ΔMK_a</th>
<th>ΔMK_b</th>
<th>ΔMK_a +ΔMK_b</th>
<th>ΔTMK</th>
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<td>187</td>
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<td>.3</td>
<td>155</td>
<td>135</td>
<td>290</td>
<td>324</td>
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<tr>
<td>.4</td>
<td>127</td>
<td>-167</td>
<td>-40</td>
<td>135</td>
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<tr>
<td>.5</td>
<td>-9</td>
<td>88</td>
<td>79</td>
<td>135</td>
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<tr>
<td>.6</td>
<td>76</td>
<td>-170</td>
<td>-94</td>
<td>8</td>
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<tr>
<td>.7</td>
<td>10</td>
<td>-249</td>
<td>-239</td>
<td>-157</td>
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<tr>
<td>.8</td>
<td>-219</td>
<td>18</td>
<td>-201</td>
<td>-123</td>
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<td>22</td>
<td>-218</td>
<td>-196</td>
<td>-169</td>
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<tr>
<td>.10</td>
<td>23</td>
<td>48</td>
<td>71</td>
<td>97</td>
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</tbody>
</table>

average errors 4  -49  -45  30
average abs. errors 78  164  170  147

root-mean-squared error 103  186  192  165

standard deviation of regression equ. (108) (230) (242)

The forecasting errors are calculated as the actual value minus the forecasting value. As the equation is estimated in 1. order differences, a negative error represents the fact that the change in the credit flow has been over-estimated. From the three mentioned criteria concerning the magnitude of the forecasting errors, the relation determining the total import credit (ΔTMK) is unambiguously the best for forecasting purposes. In addition, the quality of the forecasts seems satisfactory as long as the root-mean-squared error is smaller than the standard deviation of the original equation.
### Table 6.9. Forecasting errors of the export credit

<table>
<thead>
<tr>
<th>Year</th>
<th>ΔXK_a</th>
<th>ΔXK_b</th>
<th>ΔXK_a + ΔXK_b</th>
<th>ΔTXK</th>
</tr>
</thead>
<tbody>
<tr>
<td>1977.1</td>
<td>-164</td>
<td>403</td>
<td>239</td>
<td>309</td>
</tr>
<tr>
<td>.2</td>
<td>120</td>
<td>458</td>
<td>578</td>
<td>570</td>
</tr>
<tr>
<td>.3</td>
<td>74</td>
<td>-120</td>
<td>-46</td>
<td>30</td>
</tr>
<tr>
<td>.4</td>
<td>-205</td>
<td>287</td>
<td>82</td>
<td>122</td>
</tr>
<tr>
<td>.5</td>
<td>67</td>
<td>185</td>
<td>252</td>
<td>344</td>
</tr>
<tr>
<td>.6</td>
<td>111</td>
<td>-171</td>
<td>-60</td>
<td>2</td>
</tr>
<tr>
<td>.7</td>
<td>75</td>
<td>-55</td>
<td>20</td>
<td>-95</td>
</tr>
<tr>
<td>.8</td>
<td>198</td>
<td>-138</td>
<td>60</td>
<td>-131</td>
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<tr>
<td>.9</td>
<td>59</td>
<td>216</td>
<td>275</td>
<td>280</td>
</tr>
<tr>
<td>.10</td>
<td>-48</td>
<td>110</td>
<td>62</td>
<td>284</td>
</tr>
</tbody>
</table>

Average errors: 29
Average abs. errors: 112
Root-mean-squared errors: 125
Standard deviation of regression equation: (159) (211) (256)

The results in Table 6.9 indicate that changes in export related credit flows are predicted too low. The weak result can also be seen by the fact that the root-mean-squared error is larger than the standard deviation. Contrary to the above result, it appears as though, by dividing the total credit into the two sub-components, a reduction in the forecasting errors is achieved.

6.7. A Summary of the Results Related to Trade Credit

In this summary, taking into consideration the rather small gain achieved by splitting the total credit, we will concentrate on the results derived from the equations of total import and export credit.
In comparison with previous studies of trade credit, a significant difference in relation to the speed of adjustment has been found. Whether we have detected an over-reaction or merely a quick adjustment within the period of one month cannot be decisively resolved. As an indication of how different this result is, one may refer to Professor Thygesen, 1971, (p. 208), who found an average adjustment period of nothing less than 9 quarters for import credit and approximately 4 quarters for export credit (period of estimation was 1960.1 - 1968.4). Westerlund's results, estimated on monthly figures over the period 1968-72, indicate an average adjustment period of, respectively, 5 and 1 month.

Concerning the length of the credit period, the results are also different. In this study, the period related to a change in import, respectively, export corresponds with 45 days and 36 days, whereas Thygesen has found 3 quarters and 1¼ quarter, and Westerlund 90 days and 30 days. Thus, we have observed rather drastic shortening of credit periods.

Among the financial variables, the effect of changes in bank advances did have a significant coefficient in both relations. Within the analysed period, an increase of Dkr. 1 bill. would lead to a fall in import credit of Dkr. 130 mill. and a rise of Dkr. 90 mill. in export credit, which, taken together, reduces the net capital import by approximately a quarter of the change in advances. In comparison, Westerlund found as little an effect as Dkr. 60 mill., but, alternatively, a change in the credit ceiling of Dkr. 1 bill. increased net capital export by Dkr. 180 mill. Taken together, these findings indicate a rather good accordance with the present ones.

---

1 It must be said that Thygesen stresses his preference for estimatings on a monthly data bias because quarterly figures tend to blur a number of important relations. He also mentions that the preliminary results on monthly figures tend to be more stable relations in that, among other variables, the forward premium obtains a significant coefficient contrary to the quarterly results.
On the contrary, it has been impossible to detect anything as strong as the effect of changes in the rates of interest to which Westerlund refers. Again, this has to do with the different periods of adjustment in as far as the short run effects are much more alike, despite the fact that in the present study, such effects on the export credit have not been shown. A rise in the bank rate of one percentage point leads to an increase in import credit of approximately Dkr. 100 mill. Reversely, a rise in the eurodollar rate of one percentage point reduces the import credit by approximately Dkr. 75 mill. When the forward premium is considered, the partial effect is Dkr. 28 mill. per percentage point. But, as shown in chapter 7, there is a derived interrelation between the development in the eurodollar rate and the forward rate. Thus, it is not surprising that when both the coefficients are represented in the equation, their sum (cf. equation (xvii)) totals Dkr. 75 mill.

Finally, a weak effect of the forward premium on the export credit of a magnitude of Dkr. 40 mill. per percentage point has been revealed.

In addition, two more variables have been used, both of which have a rather technical character: 1) the speculation dummy which was introduced to improve the estimates of the other coefficients, rather than be given a separate interpretation, and 2) changes in the effective exchange rate which catch the cases wherein credit denominated in foreign currency changes its value when measured in Dkr., due to changes in the exchange rate.

All things considered, one can state that when estimating the equations for trade credit, the dominating variable is still foreign trade itself. Due to longer credit terms related to import of goods rather than export, a balanced growth in the foreign trade results - ceteris paribus - in a net capital import. In addition, it seems as though the speed of adjustment has increased drastically compared to the situation in the 1960's. Furthermore, the results point to a change
from the interest rate to quantitative financial variables as the dominate ones. In this case, one must make a reservation regarding the possibility that a simultaneous study of the effect of bank advances may change the conclusion.

In conclusion, it should be underlined that the introduction of registered trade credit may modify or improve the above results. A priori, one would expect a rather high degree of substitution. Thus, when considering both categories at the same time, one can hope for more stable relationships, this aspect is dealt with in the next section.
6.8. Registered Trade Credit

One of the peculiarities of our discussion of trade credit was that only non-registered credit was analyzed. Meanwhile, there has been created an opportunity to get access to more detailed material from Danmarks Nationalbank than normally is available. Here it is possible to sort out registered trade credit on a monthly basis from 1973 onwards.

In Figure 6.5. and 6.6. the development in total and non-registered credit is shown and in Table 6.10 some magnitudes are given. We see, that the standard deviation of registered credit is less than half the size of the non-registered credit:

<table>
<thead>
<tr>
<th>Mill kr.</th>
<th>Mean</th>
<th>Standard deviation</th>
</tr>
</thead>
<tbody>
<tr>
<td>TXKREG</td>
<td>-22</td>
<td>132</td>
</tr>
<tr>
<td>TMKREG</td>
<td>83</td>
<td>174</td>
</tr>
<tr>
<td>TMK</td>
<td>7</td>
<td>353</td>
</tr>
<tr>
<td>TXK</td>
<td>139</td>
<td>362</td>
</tr>
</tbody>
</table>


<table>
<thead>
<tr>
<th></th>
<th>TXKREG</th>
<th>TMKREG</th>
<th>TMK</th>
<th>TXK</th>
</tr>
</thead>
<tbody>
<tr>
<td>TXKREG</td>
<td>-</td>
<td>-.71</td>
<td>-.28</td>
<td>.05</td>
</tr>
<tr>
<td>TMKREG</td>
<td>-</td>
<td>-</td>
<td>.42</td>
<td>.04</td>
</tr>
<tr>
<td>TMK</td>
<td></td>
<td></td>
<td>-</td>
<td>.27</td>
</tr>
<tr>
<td>TXK</td>
<td></td>
<td></td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

The main question to be answered is to which extent registered and non-registered trade credit are substitutes. From the correlation matrix it seems obvious that no such substitution takes place. In both cases we find a positive correlation between the registered and non-registered figures, which indicates that these
<table>
<thead>
<tr>
<th>Table 6.11.</th>
<th>Registered and Non-registered Trade Credit</th>
</tr>
</thead>
</table>

(xxi) \[ \text{T}M_k = 5.3 + 1.61 \Delta \text{IMPORT}(L) - 165 \Delta \text{MBLOPS} - 0.15 \Delta \text{MBFWF} + 126 \Delta \text{MILO} - 54 \Delta \text{MIEUR} - 55 \Delta \text{EEF} \]

\[
\begin{align*}
\text{t-values} & \quad (1.1) (7.0) \\
\text{R}^2 & = 0.54 \\
\text{s} & = 230 \\
\text{DW} & = 2.6 \\
\text{n} & = 57 \\
(1973.1-1977.10) 
\end{align*}
\]

(xxii) \[ \text{T}_{M_k} = 114 + 1.90 \Delta \text{IMPORT}(L) - 215 \Delta \text{MBLOPS} - 0.19 \Delta \text{MBFWF} + 135 \Delta \text{MILO} - 10 \Delta \text{MIEUR} - 72 \Delta \text{EEF} \]

\[
\begin{align*}
\text{t-values} & \quad (2) (6.3) \\
\text{R}^2 & = 0.49 \\
\text{s} & = 301 \\
\text{DW} & = 2.2 \\
\text{n} & = 57 \\
(1973.1-1977.10) 
\end{align*}
\]

(xxiv) \[ \text{T}_{Nk} = 2.4 + 1.34 \Delta \text{MEX}(L) + 140 \Delta \text{MBLOPS} + 37 \Delta \text{MFORW}(-1) \]

\[
\begin{align*}
\text{t-values} & \quad (0.0) (4.9) \\
\text{R}^2 & = 0.35 \\
\text{s} & = 288 \\
\text{DW} & = 2.3 \\
\text{n} & = 57 \\
(1973.1-1977.10) 
\end{align*}
\]

(xxv) \[ \text{T}_{Nk} = -58 + 1.37 \Delta \text{MEX}(L) + 183 \Delta \text{MBLOPS} + 41 \Delta \text{MFORW}(-1) \]

\[
\begin{align*}
\text{t-values} & \quad (1.0) (4.8) \\
\text{R}^2 & = 0.38 \\
\text{s} & = 295 \\
\text{DW} & = 2.2 \\
\text{n} & = 57 \\
(1973.1-1977.10) 
\end{align*}
\]

Note: \text{T}M_k - change in the stock of non-registered import-related trade credit
\text{T}_{M_k} - change in the stock of registered and non-registered import-related trade credit
\text{T}N_k - change in the stock of non-registered export-related trade credit
\text{T}_{N_k} - change in the stock of registered and non-registered export-related trade credit

Full adjustment of the actual stock to the desired one is assumed within one month.
two kinds of credit go hand in hand - although in the case of export credit the correlation is low (+ .05). But the statement that the substitution should make the behavioral equation instable does not carry any evidence from the correlation output.

One further observation is, that registered export and import credit is strongly negatively correlated, which opens for the possibility that they are influenced by the same factors. On the contrary, the correlation between non-register export and import credit is very low, which also supports the fact that only one explanatory variable was found to be identical (bank lending).

As the final step it was investigated by regression technique, if the registered credit could be explained by the same variables as the non-registered credit. Concerning the import credit, hardly any of the variables do get a significant coefficient, cfr. equation(xxii) and the eurodollar rate (MIEUR) has the wrong sign. Therefore, one could not expect a considerable improvement of the equation by lumping the two types of credits together.

In Table 6.11 two equal regression equations are presented - only the dependent variable is different. According to the previous results presented in Table 6.7, it is assumed that full adjustment of the actual stock to the desired one takes place within the month. We see that the coefficients are very much alike - but as a general characteristic the marginal propensities are larger when total credit is considered compared to non-registered credit. For instance the impact of changes in bank loans (MBLOPS) rises from .165 to .215 in relation to import credit and from .140 to .183 in relation to export credit - taken together this means that in the analyzed period approximately 40 per cent of the expansion of bank loans have - ceteris paribus - substituted foreign credit.

The export credit equations are in a poor state. It is surprising that no term measuring the speculative pressure showed up to
be significant. This should better be taken as an indication that the speculative behavior has not been caught satisfactory and is probably not the same for exporters and importers.

The above results have unveiled that it does not make an important difference whether the registered trade credit is included or not; but from an analytical point of view it seems more satisfactory to study them together as long as the explanatory variables are more or less the same.
Appendix 6.1.: Dominating currencies in Danish foreign transactions

Table 6.12 shows how the Danish payments in the foreign current transactions are divided into different currencies. Table 6.13 shows the capital account payments.

From these two tables, it is obvious that the dollar is still the most important currency apart from the Dkr. itself. Capital and current transactions denominated in Dkr. can, of course, also give cause for demand and supply of forward exchange. Then it is the foreign agents that take the initiative through their banks. In the Danish Exchange regulations, it is stressed that also foreign demand and supply of forward Dkr. need a commercial or other kind of contractual origin to be accepted.

Table 6.12. Payments for goods and services divided into denominated currencies

<table>
<thead>
<tr>
<th>Year</th>
<th>Dkr.</th>
<th>Dm</th>
<th>SF</th>
<th>$</th>
<th>£</th>
<th>Skr.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r</td>
<td>o</td>
<td>r</td>
<td>o</td>
<td>r</td>
<td>r</td>
</tr>
<tr>
<td>1971</td>
<td>41</td>
<td>19</td>
<td>8</td>
<td>15</td>
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<td>4</td>
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<tr>
<td>1972</td>
<td>47</td>
<td>21</td>
<td>8</td>
<td>15</td>
<td>2</td>
<td>4</td>
</tr>
<tr>
<td>1973</td>
<td>52</td>
<td>22</td>
<td>9</td>
<td>18</td>
<td>2</td>
<td>4</td>
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<tr>
<td>1974</td>
<td>54</td>
<td>23</td>
<td>9</td>
<td>17</td>
<td>1</td>
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<tr>
<td>1975</td>
<td>54</td>
<td>24</td>
<td>9</td>
<td>17</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>1976</td>
<td>54</td>
<td>25</td>
<td>10</td>
<td>18</td>
<td>1</td>
<td>3</td>
</tr>
</tbody>
</table>

r = receipts, o = outlays.

Table 6.13. Capital payments divided into denominated currencies

<table>
<thead>
<tr>
<th>Year</th>
<th>Dkr.</th>
<th>DM</th>
<th>SF</th>
<th>$</th>
<th>£</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>r</td>
<td>o</td>
<td>o</td>
<td>o</td>
<td>o</td>
</tr>
<tr>
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<td>1976</td>
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<td>29</td>
<td>21</td>
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</tbody>
</table>

Source: Annual Reports from Danmarks Nationalbank (the Central Bank).
Table 6.14. Mean and standard deviation of the dependent variables and their mutual correlation.

### Correlation Output

<table>
<thead>
<tr>
<th>Mill. kr.</th>
<th>Mean</th>
<th>Standard Deviation</th>
</tr>
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<tbody>
<tr>
<td>KST</td>
<td>524.42167</td>
<td>907.3949</td>
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<td>KLT</td>
<td>101.5533</td>
<td>148.1444</td>
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<tr>
<td>CST</td>
<td>15.9333</td>
<td>331.7401</td>
</tr>
<tr>
<td>CLT</td>
<td>96.6111</td>
<td>71.9104</td>
</tr>
<tr>
<td>CP</td>
<td>112.4444</td>
<td>339.9947</td>
</tr>
<tr>
<td>KP</td>
<td>716.4200</td>
<td>1072.9066</td>
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<tr>
<td>CT</td>
<td>74.3900</td>
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<tr>
<td>KD</td>
<td>463.7778</td>
<td>881.4875</td>
</tr>
<tr>
<td>KPCP</td>
<td>603.5555</td>
<td>1094.6303</td>
</tr>
<tr>
<td>KPCG</td>
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<td>972.0003</td>
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<tr>
<td>KSTCST</td>
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<td>1125.4767</td>
</tr>
<tr>
<td>KLTCLT</td>
<td>94.9722</td>
<td>145.4767</td>
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</table>

### Correlation Matrix

<table>
<thead>
<tr>
<th></th>
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<th>CST</th>
<th>CLT</th>
<th>CP</th>
<th>KP</th>
<th>CT</th>
<th>KD</th>
<th>KPCP</th>
<th>KPCG</th>
<th>KSTCST</th>
<th>KLTCLT</th>
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<td>0.33</td>
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<td>-0.14</td>
<td>0.28</td>
<td>0.75</td>
<td>-0.41</td>
<td>0.11</td>
<td>-0.16</td>
<td>0.66</td>
<td>-0.54</td>
<td>-0.19</td>
<td>-0.19</td>
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<tr>
<td>CST</td>
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<td>-0.14</td>
<td>1.00</td>
<td>-0.54</td>
<td>0.27</td>
<td>0.07</td>
<td>0.36</td>
<td>0.09</td>
<td>0.28</td>
<td>0.09</td>
<td>0.33</td>
<td>0.33</td>
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<tr>
<td>CLT</td>
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<td>0.28</td>
<td>-0.54</td>
<td>1.00</td>
<td>-0.24</td>
<td>-0.32</td>
<td>0.07</td>
<td>0.09</td>
<td>0.34</td>
<td>-0.36</td>
<td>0.08</td>
<td>0.08</td>
</tr>
<tr>
<td>CP</td>
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<td>0.75</td>
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<td>-0.24</td>
<td>1.00</td>
<td>-0.24</td>
<td>0.27</td>
<td>0.30</td>
<td>0.32</td>
<td>-0.17</td>
<td>-0.16</td>
<td>-0.16</td>
</tr>
<tr>
<td>KP</td>
<td>-0.58</td>
<td>-0.41</td>
<td>0.07</td>
<td>0.07</td>
<td>-0.24</td>
<td>1.00</td>
<td>-0.37</td>
<td>0.27</td>
<td>-0.24</td>
<td>-0.27</td>
<td>0.11</td>
<td>0.11</td>
</tr>
<tr>
<td>CT</td>
<td>0.34</td>
<td>0.11</td>
<td>0.36</td>
<td>0.07</td>
<td>0.27</td>
<td>-0.37</td>
<td>1.00</td>
<td>-0.15</td>
<td>-0.24</td>
<td>0.15</td>
<td>0.16</td>
<td>0.16</td>
</tr>
<tr>
<td>KD</td>
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<td>-0.16</td>
<td>0.09</td>
<td>0.09</td>
<td>0.34</td>
<td>-0.24</td>
<td>-0.15</td>
<td>1.00</td>
<td>-0.16</td>
<td>-0.24</td>
<td>0.11</td>
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</tr>
<tr>
<td>KPCP</td>
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<td>0.32</td>
<td>0.27</td>
<td>-0.15</td>
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<td>-0.16</td>
<td>-0.27</td>
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Appendix 6.3.: More detailed information concerning the most important regression equations.

Table 6.15. ΔKPCP - equation (i)
Table 6.16. KPCP - equation (iib)
Table 6.17. ΔKP - equation (iii)
Table 6.18. KKP - equation (iiib)
Table 6.19. ΔKLT - equation (iv)
Table 6.20. KLT - equation (ivb)
Table 6.21. ΔKSTCST - equation (v)
Table 6.22. KSTCST - equation (vb)
Table 6.23. ΔKST - equation (vi)
Table 6.24. KST - equation (vib)
Table 6.25. ΔCST - equation (vii)
Table 6.26. CST - equation (viib)
Table 6.27. TMK - equation (xxii)
Table 6.28. TMK_r - equation (xxiii)
Table 6.29. TXK - equation (xxiv)
Table 6.30. TXK_r - equation (xxv)

Figure 6.7. ΔMK_a - equation (xii)
Figure 6.8. ΔXK_a - equation (xiii)
Figure 6.9. ΔMK_b - equation (xiv)
Figure 6.10. ΔXK_b - equation (xx)
Table 6.15. Net private capital import (AKPCP), equation (i)

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Mean of Dependent Variable is 81.4722

R-Squared = .8300 (Adj. for Degrees of Freedom) = .7948
Durbin-Watson Statistic (Adj. for 0 Gaps) = 2.4826
Number of Observations = 36
Sum of Squared Residuals = 1.2900698
Standard Error of the Regression = .666.970

Estimate of Correlation Matrix of Estimated Coefficients

Period: 1968.1 - 1976.4

Plot of Residuals(0)
Table 6.16. Net private capital import (KPOP), equation (1d)

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Durbin-Watson Statistic (Adj. for C Gaps) = 2.4064
Number of Observations = 36
Sum of Squared Residuals = .13088908
Standard Error of the Regression = 660.528
Estimate of Correlation Matrix of Estimated Coefficients

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Period: 1968.1 - 1976.4

Plot of Residuals(0)
Table 6.17. Private capital import (ΔKP), equation (iii)

**Mean of Dependent Variable is 64.055.**

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R-SQUARED = .8752 (ADJ. FOR DEGREES OF FREEDOM) = .8494

DURBIN-WATSON STATISTIC (ADJ. FOR 0 GAPS) = 2.4188

NUMBER OF OBSERVATIONS = 36

SUM OF SQUARES RESIDUALS = .89546407

STANDARD ERROR OF THE REGRESSION = 555.551

ESTIMATE OF CORRELATION MATRIX OF ESTIMATED COEFFICIENTS

Period: 1968.1 - 1976.4

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Plot of Residuals (O)
### Table 6.18. Private capital import (KP), equation (iiib)

Mean of dependent variable is 716.0

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R-Squared = 0.7726 (adj. for degrees of freedom) = 0.7347  
Durbin-Watson Statistic (adj. for gaps) = 2.2281  
Number of observations = 36  
Sum of squared residuals = 9161600.07  
Standard error of the regression = 552.618

Estimate of Correlation Matrix of Estimated Coefficients

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Period: 1968.1 - 1976.4

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Plot of Residuals (3)
### Table 6.19: Private long term capital import (AKLT), equation(iv)

**Mean of Dependent Variable is** 8.111

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R-Squared = .6798 (Adj. for Degrees of Freedom) = .6135

Durbin-Watson Statistic (Adj. for C Gaps) = 1.5885

Number of Observations = 36

Sum of Squared Residuals = 382675.

Standard Error of the Regression = 114.874

**Estimate of Correlation Matrix of Estimated Coefficients**

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Period: 1968.1 - 1976.4

**Plot of Residuals(u)**
### Table 6.20. Private long term capital import (KLT), equation (ivb)

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<th>T-Statistic</th>
<th>Mean of Variable</th>
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<td>S3</td>
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<td>2500000000</td>
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R-SQUARED = 0.4860 (ADJ. FOR DEGREES OF FREEDOM) = 0.4703

DURBIN-WATSON STATISTIC (ADJ. FOR 0 GAPS) = 1.4037

NUMBER OF OBSERVATIONS = 36

SUM OF SQUARED RESIDUALS = 394945.5

STANDARD ERROR OF THE REGRESSION = 114.736

ESTIMATE OF CORRELATION MATRIX OF ESTIMATED COEFFICIENTS

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<td>7114</td>
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Period: 1968.1 - 1976.4

PLOT OF RESIDUALS (O)
Table 6.21: Net private short term capital import (KSTG), equation (v).

**Mean of Dependent Variable**

<table>
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<tr>
<th>Dependent Variable</th>
<th>Estimated Coefficient</th>
<th>t-Statistic</th>
<th>Mean of Variable</th>
</tr>
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<td>1.200004370</td>
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<tr>
<td>EURO</td>
<td>-1.14588012</td>
<td>-6.486814</td>
<td>-6.58416757</td>
</tr>
<tr>
<td>WEP</td>
<td>-0.21074389</td>
<td>-3.44106181</td>
<td>-1.27479166</td>
</tr>
<tr>
<td>GLOPS</td>
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<td>1.88340646</td>
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</tr>
<tr>
<td>SPECX2</td>
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<td>0.000000000</td>
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</table>

**R-Squared** = 0.8171 (Adj. for degrees of freedom) = 0.772?

**Durbin-Watson Statistic** (Adj. for 0 gaps) = 2.4273

**Number of Observations** = 36

**Sum of Squared Residuals** = 1.2595608

**Standard Error of the Regression** = 659.023

**Estimate of Correlation Matrix of Estimated Coefficients**

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<th></th>
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<th>0.3766</th>
<th>0.2107</th>
<th>0.3598</th>
<th>0.2558</th>
<th>1.683</th>
<th>0.7488</th>
<th>0.4379</th>
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<tbody>
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<td>1.675</td>
<td>1.584</td>
<td>0.2310</td>
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<td>0.2107</td>
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<td>0.0725</td>
<td>0.1600</td>
<td>0.1600</td>
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<tr>
<td>0.3598</td>
<td>0.1600</td>
<td>0.0725</td>
<td>1.0000</td>
<td>0.1600</td>
<td>0.1600</td>
<td>0.953</td>
<td>0.1584</td>
<td>1.0000</td>
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<tr>
<td>0.2558</td>
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<td>0.0725</td>
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<td>0.2107</td>
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<td>0.1600</td>
<td>0.1600</td>
<td>0.1600</td>
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<td>0.0725</td>
<td>0.1600</td>
<td>0.1600</td>
<td>0.1600</td>
<td>0.1600</td>
<td>1.0000</td>
<td>0.953</td>
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<td>0.953</td>
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**Period:** 1968.1 - 1976.4

**Plot of Residuals**

---
**Table 6.22. Net private short term capital import (KSTCST), equation(vb)**

<table>
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<th>Independent Variable</th>
<th>Estimated Coefficient</th>
<th>t-Statistic</th>
<th>Mean of Variable</th>
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<td>3.5698463</td>
<td>1.00000000</td>
</tr>
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<td>JPWEP</td>
<td>-1.73201483</td>
<td>-0.63575470</td>
<td>1.00000000</td>
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<td>AnBOPS</td>
<td>-222.33421</td>
<td>-3.75232145</td>
<td>1.00000000</td>
</tr>
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<td>USFECX2</td>
<td>-259.2642069</td>
<td>-2.6484446</td>
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</table>

R-Squared = 0.6498 (Adj. for Degrees of Freedom) = 0.5915

Durbin-Watson Statistic (Adj. for 0 Gaps) = 2.2877

Number of Observations = 36

Sum of Squared Residuals = 1.28889+08

Standard Error of the Regression = 655.462

Estimate of Correlation Matrix of Estimated Coefficients

```
   1.0000  1.9926 -2.354 -2.721 -0.7500 -3224
-2.9926  1.0000 -1.666 -2.371 -0.843 1200
  2.354  1.666  7.574  6.764  7.564  2579
  2.721 -1.666  7.574  6.764  7.564  2579
  0.7500 -0.843  7.564  7.564  7.564  2579
  3224  1200  2579  2579  2579  2579
```

Period: 1968.1 - 1976.4
### Table 6.23: Private short term capital import (A11ST), equation (vi)

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<tr>
<th>BUILDING</th>
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<th>T-STATISTIC</th>
<th>MEAN OF VARIABLE</th>
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R-SQUARED = .8559 (ADJ. FOR DEGREES OF FREEDOM) = .8269
DURBIN-WATSON STATISTIC (ADJ. FOR GAPS) = 2.4829
NUMBER OF OBSERVATIONS = 36
SUM OF SQUARED RESIDUALS = 559.473
ESTIMATE OF CORRELATION MATRIX OF ESTIMATED COEFFICIENTS

```
   1.0000 -0.3310  0.0495  0.3508 -0.1726  0.1706 -0.3517
 -0.3310  1.0000 -0.1671 -0.3220 -0.1706  0.3517 -0.3580
  0.0495 -0.1671  1.0000 -0.2550  0.1731 -0.3220 -0.1731
  0.3508 -0.3220 -0.2550  1.0000 -0.3220 -0.1731  0.0495
 -0.1726 -0.1706  0.1731 -0.3220  1.0000 -0.3220  0.3508
  0.1706  0.3517 -0.3220 -0.1731 -0.3220  1.0000 -0.3310
 -0.3517 -0.3580  0.0495  0.3508 -0.1726  0.1706  1.0000
```

**Period:** 1968.1 - 1976.4

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<thead>
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<th>RESIDUAL</th>
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<td>-225.9</td>
<td>-487.1</td>
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<td>-487.1</td>
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**Plot of Residuals:**

- **Actual:** X 1
- **Fitted:** X 2
- **Residual:** X 3
Table 6.24. Private short term capital import (KST), equation(vib)

Mean of dependent variable is 524.416

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<th>Estimated Coefficient</th>
<th>T-Statistic</th>
<th>Mean of Variable</th>
</tr>
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</tr>
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<td>394.50000000</td>
</tr>
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<td>RSEF</td>
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<td>-1.68925390</td>
<td>-0.58416757</td>
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<td>-4.13745677</td>
<td>-1.274.91668711</td>
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<td>1.03000000</td>
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</tbody>
</table>

R-Squared = .7293 (Adj. for degrees of freedom) = .6941

DURBIN-WATSON STATISTIC (Adj. for O Gaps) = 2.1931

Number of observations = 36

Sum of Squared Residuals = 942608.97

Standard Error of the Regression = 560.536

Estimate of Correlation Matrix of Estimated Coefficients

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<th>-5.3858</th>
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Period: 1968.1 - 1976.4

Plot of Residuals
Table 6.25. Private short term capital export (\(ACST\)), equation(vii)

Mean of dependent variable is \(-19.138\)

<table>
<thead>
<tr>
<th>Independent Variable</th>
<th>Estimated Coefficient</th>
<th>T-Statistic</th>
<th>Mean of Variable</th>
</tr>
</thead>
<tbody>
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R-Squared = 0.4971 (Adj. for degrees of freedom) = 0.4133

Durbin-Watson statistic (Adj. for 0 gaps) = 1.9266

Number of observations = 36

Sum of squared residuals = 0.27176807

Standard error of the regression = 300.981

Estimate of correlation matrix of estimated coefficients

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<td>1.0000</td>
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Period: 1968.1 - 1976.4

Plot of residuals:...

ID | ACTUAL | FITTED | RESIDUAL |
---|--------|--------|----------|
 1 | -455.0 | -233.6 | 318.6    |
 2 | -268.0 | -464.0 | 323.2    |
 3 | -167.0 | -210.0 | 113.0    |
 4 | -234.0 | -123.0 | 111.0    |
 5 | -73.0  | -190.0 | 117.0    |
 6 | 118.0  | 68.0   | 49.0     |
 7 | 144.0  | 250.0  | 106.0    |
 8 | 151.0  | 250.0  | 100.0    |
 9 | 211.0  | 250.0  | 38.3     |
 10 | 211.0  | 250.0  | 38.3     |
 11 | 133.0  | 250.0  | 117.0    |
 12 | 133.0  | 250.0  | 117.0    |
 13 | 211.0  | 250.0  | 38.3     |
 14 | 211.0  | 250.0  | 38.3     |
 15 | 133.0  | 250.0  | 117.0    |
 16 | 133.0  | 250.0  | 117.0    |
 17 | 133.0  | 250.0  | 117.0    |
 18 | 133.0  | 250.0  | 117.0    |
 19 | 133.0  | 250.0  | 117.0    |
 20 | 133.0  | 250.0  | 117.0    |
 21 | 133.0  | 250.0  | 117.0    |
 22 | 133.0  | 250.0  | 117.0    |
 23 | 133.0  | 250.0  | 117.0    |
 24 | 133.0  | 250.0  | 117.0    |
 25 | 133.0  | 250.0  | 117.0    |
 26 | 133.0  | 250.0  | 117.0    |
 27 | 133.0  | 250.0  | 117.0    |
 28 | 133.0  | 250.0  | 117.0    |
 29 | 133.0  | 250.0  | 117.0    |
 30 | 133.0  | 250.0  | 117.0    |
 31 | 133.0  | 250.0  | 117.0    |
 32 | 133.0  | 250.0  | 117.0    |
Table 6.26. Private short term capital exports, (CST), equation (viib)

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R-SQUARED = .2869 (ADJ. FOR DEGREES OF FREEDOM) = .1949
DURBIN-WATSON STATISTIC (ADJ. FOR 3 GAPS) = 1.7633
NUMBER OF OBSERVATIONS = 36
SUM OF SQUARED RESIDUALS = .274690407
STANDARD ERROR OF THE REGRESSION = 297.674

ESTIMATE OF CORRELATION MATRIX OF ESTIMATED COEFFICIENTS

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Period: 1968.1 - 1976.4

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PLOT OF RESIDUALS (J)
DURBIN-WATSON STATISTIC (ADJ. FOR GAPS) = 2.5866
NUMBER OF OBSERVATIONS = 57 MEAN OF DEPENDENT VARIABLE IS 3.0702
STANDARD ERROR OF THE REGRESSION = 230.468

ESTIMATE OF CORRELATION MATRIX OF ESTIMATED COEFFICIENTS

R-SQUARED = .5902 (ADJ. FOR DEGREES OF FREEDOM) = .5410

SUM OF SQUARED RESIDUALS = 265576 + 0.7

FITTED RESIDUAL PLOT OF RESIDUALS(U)
### Table 6.28. Total import related trade credit (TMt^x) - equation (xxiii) -

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<th>Estimated Coefficient</th>
<th>T-Statistic</th>
<th>Mean of Variable</th>
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</thead>
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- R-squared = .5411 (Adj. For Degrees of Freedom) = .5861
- Durbin-Watson Statistic (Adj. For 0 Gaps) = 2.1945
- Number of Observations = 57
- Mean of Dependent Variable is 100.017
- Sum of Squared Residuals = 454917.07
- Standard Error of the Regression = 301.634
- Estimate of Correlation Matrix of Estimated Coefficients

$$
\begin{bmatrix}
0.0000 & -1.572 & -6.593 & 0.0469 & 0.0223 & 0.0082 & 0.0736 \\
1.572 & 1.0000 & -1.869 & -0.0760 & -0.0146 & 0.0673 & 0.0644 \\
-6.593 & -1.869 & 1.0000 & 0.0316 & 0.0146 & -0.1767 & 0.0182 \\
0.0469 & 0.0760 & 0.0316 & 1.0000 & -0.0189 & 0.0051 & 0.0617 \\
0.0223 & -0.0146 & -0.0146 & -0.0189 & 1.0000 & 0.0412 & -0.1024 \\
0.0082 & 0.0673 & 0.0146 & 0.0051 & 0.0412 & 1.0000 & -0.0746 \\
0.0736 & -0.0223 & -0.1767 & 0.0051 & 0.0067 & -0.0746 & 1.0000 \\
\end{bmatrix}
$$

Actual 1977.10

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<th>Residual</th>
<th>Plot of Residuals (O)</th>
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### Table 6.29: Non-registered export related trade credit (TXK) - equation (xxi)

<table>
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<th>Standard Error of the Regression</th>
<th>Durbin-Watson Statistic (Adj. for 0 Gaps)</th>
<th>Number of Observations</th>
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- $\text{R}^2$ SQUARED = 0.3835 (ADJ. FOR DEGREES OF FREEDOM) = 0.3486
- Durbin-Watson Statistic (Adj. for 0 Gaps) = 2.3159
- Sum of Squared Residuals = 441.098407
- Standard Error of the Regression = 288.489

**Estimated Coefficient Matrix of Estimated Coefficients**

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<th>Mean of Dependent Variable</th>
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**Plot of Residuals**

- Mean of Dependent Variable is 159.449
Table 6.30. Total export related trade credit, $(TXK_t)$ equation (xxv)

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$R^2$-SQUARED = 0.4087 (ADJ. FOR DEGREES OF FREEDOM) = 0.3753
DURBIN-WATSON STATISTIC (ADJ. FOR 0 GAPS) = 2.1907
NUMBER OF OBSERVATIONS = 57
SUM OF SQUARED RESIDUALS = 4611174.07
STANDARD ERROR OF THE REGRESSION = 294.963

ESTIMATE OF CORRELATION MATRIX OF ESTIMATED COEFFICIENTS

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MEAN OF DEPENDENT VARIABLE IS 103.894

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PLOT OF RESIDUALS(O)
Figure 6.7: Automatic import credit (MKa) - equation (xii)

\[ \text{Actual AMKA} \]

\[ \text{Fitted AMKA} \]

\[ s = 123.4 \quad DW = 1.86 \quad R^2 = 0.938 \quad R = 0.950 \]
Figure 6.8: Automatic export credit ($X_{K_a}$) — equation (xiii)

$$AX_{KA} = -1.20 \times K_{A1} + 2.13 \times AMEXL$$

$N=73$  $DW=1.19$  $R=0.840$  $R^2=0.870$

- **ACTUAL $AX_{KA}$**
- **FITTED $AX_{KA}$**

- $-1.20 \times K_{A1}$

- $+ 2.13 \times AMEXL$

**STANDARDIZED RESIDUALS**
Figure 6.9. Changes in payments habits related to import credit, (MK_d) - equation (xiv).
Figure 6.10. Changes in payment habits related to export credit, \( \Delta X K_{L} \) - equation (xx).

\[
\Delta X K_{L} = +16.50 - 1.24 X K_{L(-1)} - 0.698 AMEXL + 107.4 AMBLOPE
\]

\[ t = 0.00 \] \[ \text{D.W.} = 1.22 \] \[ R = 0.04 \] \[ R = 0.91 \]

N = 73

ACTUAL \( \Delta X K_{L} \)

FITTED \( \Delta X K_{L} \)

-1.24 \( X K_{L(-1)} \)

-0.698 AMEXL

+107.4 AMBLOPE

STANDARDIZED RESIDUALS
CHAPTER 7: THE DETERMINATION OF THE FORWARD PREMIUM

7.1. Introduction

When the future price is unknown but contracts involving future transactions exist, agents run a risk. This risk is removed when a forward price is fixed. Therefore, a forward market is best interpreted as a facility wherein agents having future commitments of delivering, respectively, receiving some particular goods, meet and agree upon a price which shall rule in the future. Establishing such markets means increasing the general welfare by reducing the risk agents undertake. Unfortunately, it is not only those who want to reduce this risk that benefit; gamblers also will have a better opportunity to satisfy their passion.

The better the forward market is organized, the better it fulfills its job. Forward markets for foreign exchange, in general, function very well. This depends, of course, on the legal and institutional regulations which are at work.

In the following theoretical part of this chapter, we will discuss the price theory of the forward market for foreign exchange. Afterwards, when applying the theory to the Danish case, it is to be appraised to what extent the perfect competition model can be used as the foundation for an empirical study of a relatively restricted market.

7.2. A Theoretical Model of the Market for Forward Exchange

The best starting point for the analysis of the forward market is to regard it as just a financial market where claims with different characteristics are traded. Two properties are of
special importance: 1) The currency on which the contract is settled, and 2) The length of the contract.

When the price of the forward contract is fixed, one can calculate the implicit rate of depreciation/appreciation of the actual currency. Therefore, the forward rate gives an indication of how the spot rate is expected to develop in the future and therefore gives useful information concerning the expectations. As we shall see, the forward rate will, in addition, mirror the difference between the Danish and the foreign rates of interest on financial claims with equal maturity periods. Merely for the sake of simplicity, 1 month contracts are chosen.

The functioning of the forward market depends on the behavior of different types of participants. For that reason, we have to separate between agents using the forward market as an institution to cover the risk of changes in the exchange rate related to normal current account activities, and, on the other hand, agents wanting to earn money by dealing in the forward market, either through arbitrage or speculation.

7.2.1. Pure Traders

The first type of agents we will label traders, although being aware that an importer or exporter can act as well as an arbitrageur or speculator. But the essence of the action of a pure trader is always to close an open position — never to take a risk. All future trade contracts are assumed to be immediately covered in the forward market. Therefore, the relevant conversion factor, when trade contracts are denominated in a foreign currency and payment is deferred, is the forward exchange rate. It is not exclusively the spot rate that influences export and import activities, but also the forward rate as soon as a credit element is involved.
This process of covering the exchange rate risk coming from the transactions of the current account determines "the real part" of the volume of forward transactions\(^1\), \(^2\). If there is imbalance, e.g. a deficit at the current account, then a tendency towards excess demand for forward exchange will appear.

One has to differentiate between exchange rate regimes when analyzing the volume of forward transactions. In a regime with freely floating exchange rates, there is a strong incentive to use the forward market simply as a cheap and efficient way of getting insurance. When the exchange rates are fixed or can only fluctuate within rather narrow limits, the traders do not have the same need for covering all open positions. In a monetary union there will be no need at all, if a currency unification already has taken place, otherwise the typical case will be that the traders may suffer from monetary distrust in certain currencies, and then use the forward market. The expectations concerning the future spot rate are often skewed distributed. For instance, considering a small country within the EMS, one would expect that all dollar and Pound contracts were covered, broadly speaking, whereas only D-mark liabilities should be covered -- and perhaps limited to the hot periods, depending on the behavior of the authorities. This, to some extent, asymmetrical behavior may be caused by risk aversion and can cause the net supply function to be downward sloping.

\(^1\) Instead, one could argue that it is the trade credit (liabilities and assets) which is the underlying cause for actions in the forward market. This is very much the same thing; besides, it points out that changes in the terms of trade credit will affect the demand and supply in the forward market.

\(^2\) Cohen, 1969, p. 59 mentions hedging as a separate action of covering changes in the value of long term financial assets and liabilities derived from exchange rate fluctuations. I have some difficulty in recognizing the advantage of this distinction as far as the basic transaction is to close an open position. In addition, the forward market is normally rather thin in the long end, which makes long term forward cover rather expensive. (Cf. below about the different nature of the inherent risk of respectively short and long term (foreign) claims.)
In summary, it would appear as though the volume of forward contracts undertaken by — what we have called — traders, is determined by:

1) the current account plus non-portfolio capital account,
2) the terms of trade credit,
3) the forward rate itself. If the elasticity conditions are fulfilled, then there will be an increasing relationship between a higher forward rate and the supply of forward currency by the traders,
4) the forward premium. An increasing premium means that it is becoming more expensive to cover liabilities and more advantageous to cover foreign assets — for given future spot rate. Both lead to a rising net supply curve.
5) the exchange rate regime.

7.2.2. Speculation

Speculators will be regarded as acting only in the forward market. Buying a forward contract with the purpose of selling the currency at the spot market when the contract expires does not occupy any funds. The speculator's hope is that the future spot rate will be higher than the actual forward rate.

Speculation in the spot market can be divided into two distinct activities, namely, 1) concerning the decision to undertake an open position, and 2) eventually to combine the former with an action of arbitrage, if the latter is profitable.

1 There will, of course, always be a number of amateur speculation which take place in the spot market, either because the persons do not have access to the arbitrage market or because they are undertaking an illegal action. (Cf. above concerning the anonymity of Central Bank notes).
For instance, a person in London buys dollars spot because he thinks the future spot rate will be higher; in this case his action is only rational — if he can obtain a higher return in the New York money market (or Treasury Bill) than in London, adjusted for the price of forward cover. Otherwise, he would simply keep his funds in London and buy dollars forward.

Thus, the driving force of the speculators is the expected future spot rate compared with the forward rate. For a given expectation, the demand for forward currency will decrease and the supply increase with a rising forward exchange rate.

When the contracts expire they must be carried out one way or another. Depending on whom the other party actually is, the amount of currency will show up in the spot market because the speculators do not want and often do not have funds to keep the currency. If it is another speculator — with opposite expectations — who holds the inverse contract, they simply have to find out who was correct concerning the exchange rate and clear the difference. But, if it is a trader, the amount of currency has to pass through the spot market to fulfill the contract. The same would be the case with arbitrageurs who want to repatriate their funds. This amounts to the fact that the net supply (demand) of speculators will show up in the spot market later on when the contracts expire. So, a part of the future net demand (supply) of spot currency is determined by the speculators today:

\[
0^S_{30} = 0^T_{30} + 0^A_{30}
\]

\[
0^{i^S}_{30} - 30 - 0^{i^S}_{30}
\]

1 In an heroic attempt to avoid confusion in the nomenclature, it is decided that speculation and trade are treated as net supply of spot and forward exchange, whereas arbitrage is regarded as demand for exchange. This will facilitate the geometrical exposition.
The only important determinant for the speculative supply is the expected future spot rate. Speculators are gamblers; they can be regarded as risk lovers, and if risk plays any significant role, it probably will be with a positive sign (i.e., for a given expected return, one chooses the riskiest currency).

7.2.3. Arbitrageurs

By connecting the spot and forward markets, the arbitrageurs are, in many ways, the most important group in this context. Their transactions in the forward market have an immediate counterpart in the spot market. The dependent variable is the differential between the domestic short term rate of interest and the foreign one. If there are no transaction and information costs or political risks, and the spot and forward rates are equal, then it is profitable to place available short term funds in that country which has the highest rate of interest. Under perfect conditions the properties of a covered foreign investment are similar to a domestic one because the uncertainty of the exchange rate is removed. The difference will be related to the so-called "country risk", that the actual country in one way or another will freeze the foreign capital and prevent it from being withdrawn.

In fact, it is not only the interest rate differential itself that determines the financial centre which attracts available funds, but this differential corrected for the cost of covering in the forward market.

1 One ought to say that there exist different types of arbitrage. Besides the interest-arbitrage, there is spot-arbitrage, which secures that the spot rates are the same at all exchange markets at the same time. In addition one could mention good-arbitrage that the same kind of goods has the same price - besides transportation cost and duties - all over the world.

2 Aliber, 1973, deals with this aspect
If there is perfect arbitrage, this equation will always equal zero. When it is positive there is a profit to be gained from moving funds abroad, and in contrast a country can attract foreign funds by making the equation negative. In summary, the main characteristics of arbitrage are:

1. occupy funds
2. influence the spot and forward markets as well as the domestic credit market
3. do not imply any exchange rate risk, but a "political" one.

7.3. A Geometrical Exposition of the Spot and Forward Markets

For the sake of simplicity, we shall look at the forward market for 30 day contracts only and leave the aspect of the time structure of the forward premium out. Thus, we will draw a picture of the spot and one month forward markets for foreign exchange, assuming that the rate of interest, the future spot rate expectation, the current account payment patterns, and the actions of the exchange rate authority are constant.

Basically, both markets should be regarded as showing demand and supply relations for stocks, where any changes can be interpreted as flows which will in the case of the spot market be recorded in the balance of payments. Following the previous section, we will consider four kinds of activity: a) trading (and non-portfolio capital transactions), b) arbitrage, c) speculation, and d) public intervention (assumed to be zero in the beginning).

The multiplication depends on the length of the contract that is under consideration.
The current account can be divided between spot payments $0T_0$ and payment one month in the future $0T_{30}$. The latter is assumed to be entirely covered in the forward market. For a country with a current account deficit, there will normally also be an excess demand for foreign exchange. These excess demand curves are assumed to be relatively inelastic w.r.t. the exchange rate in the short run and are, therefore, drawn rather vertically (cf. $0T_0$ in the spot market and $0T_{30}$ in the forward market).

1 When the net supply is negative it is conceptionally equal to a positive demand

2 In the previous chapter, we discussed this relationship between the exchange rate and the current account and the possibility of a J-curve effect in the short run.
Arbitrage or covered short term capital flows are dependent on the interest differential and the forward premium (cf. equation (1)). Thus, in the ideal case where interest rate equality is supposed to hold, any changes in the spot rate will also change the forward excess demand of the arbitrageurs. This is the important link which connects the two markets and explains why the spot and forward rates normally fluctuate closely together.

Figure 7.2.

Demand for spot \( q_A^0 \) and forward \( q_A^{30} \) exchange from arbitrage. \( q_A^0 = -q_A^{30} \). \( o^{s30} \) is supply of forward exchange from speculation.

When the foreign interest is higher than the domestic, forward exchange will be at a discount, but does not determine the absolute level of the exchange rates. As arbitrage occupies funds there will, from a portfolio point of view, of course, be limits to the share of the wealth which will be kept abroad for a given interest differential. For instance, increased alternative earnings, political risk, covariance will give the horizontal curves a certain twist (cf. \( q_A^0 \) and \( q_A^{30} \) in figure 7.2.). In conclusion, it should be stressed that the two curves have approximately the same shape; any amount
demanded in the spot market will simultaneously be demanded with an opposite sign in the forward market and vice versa⁴.

re_c) The speculators' demand for forward exchange is the crucial factor for determination of the level of the forward rate. When the forward rate is equal to the mean of the expected future spot rate, the excess supply is zero (cf. $O_{S30}$ in figure 7.2). For a higher forward rate there will be an excess supply of forward exchange. Since nobody can feel safe and the future rate is uncertain, the excess supply will probably -- for given expectations -- be a monotonously increasing function. Above a certain limit the speculators are willing to deliver whatever amount of foreign exchange is demanded and vice versa. In periods of excessive speculation, the forward rate can, in the short run, be more vivid than the spot rate because arbitrage cannot adjust as quickly as expectations can change, even though the "leads and lags" effect by the traders will contribute to a higher speed of adjustment in the spot market.

re_d) Official intervention in both markets can take the form of willingness to demand or supply foreign exchange at given rates. This will make the excess demand curves horizontal around the levels of intervention, whereas swap-intervention will keep up a certain forward premium (discount) in an attempt to affect the size of the arbitrage.

---

¹ Two things should probably be explained more fully. First, the demand for forward exchange derived from arbitrage is, in fact, a supply curve mirrored in the vertical axis. Secondly, this supply has approximately the same shape as the demand curve for spot exchange; but, as stressed in the text, it is only the relative price between spot and forward exchange that matters for the arbitrageurs. Thus, one curve can, for reasons of simplicity, be drawn horizontally in its full length. The other curve will be given the slope which indicates that a bigger and bigger discount on forward exchange is needed to attract more and more arbitrage funds. Therefore, the domestic currency must be expected to appreciate; otherwise, speculators would not supply the forward exchange. One additional point concerning transaction costs: these will make the $A_{S30}$-curve discontinuous where it crosses the second axis.
7.3.1. The Interaction between the Spot and Forward Markets

Figure 7.3.

Demand equals supply, under the condition that \( \bar{A}_0 = -\bar{A}_{30} \)

We will now see how the spot and forward rates of exchange are determined simultaneously at a certain point in time and, later on, see how the exchange rate formation is interrelated with time. The above stated assumption will be maintained, unless otherwise mentioned.

At a given point in time, the excess supply of foreign currency in the spot market is determined by the actual (and in this case exogenous) current account situation \( oT_0 \) and the past speculative contracts that expire at this particular time \( oS_0 = -30S_0 \). Thus, only one degree of freedom remains, namely, the amount of arbitrage which must equalize the excess supply, assuming that the spot market clears every day. At the same point in time, there is an excess supply of forward exchange given by the behavior of the traders \( oT_{30} \) and the speculators \( oS_{30} \). Here,

---

1 This section is inspired by McCormick, 1977 (see also appendix for an elaboration of McCormick's analysis.
also, the arbitrage is supposed to make equal supply and demand. Thus, the forward premium is determined by a simultaneous adjustment in both markets, which makes the excess supply in these markets equal to zero -- given the rate of interest differential.

30 days later the amount of speculation contracts \( (S_{30} = S_{30} - S_{30}) \) from a month ago will now show up in the spot market:

**Time zero**

**Spot market:**

\[
S_0 + T_0 - A_0 = 0
\]

\( \) where \( A_0 = A_{30} \)

**Forward market:**

\[
S_{30} + T_{30} - A_{30} = 0
\]

**30 days later**

**Spot market:**

\[
S_{30} + T_{30} - A_{30} = 0, \text{ where } S_{30} = -S_{30}
\]

**Forward market:**

\[
S_{60} + T_{60} - A_{60} = 0 \text{ and } A_{30} = -A_{60}
\]

If there is a deficit at the basic balance (current account and long term capital flows), then the stock demand for spot exchange will increase every period. To countervail this, the foreign arbitrageurs have to invest a larger and larger amount in e.g. domestic treasury bills (or money market). This will only happen in the case of an increased covered interest differential. In the forward market the speculators are then persuaded to take up the bigger demand for forward currency by an increased expected gain, i.e., increased differential between the actual forward rate and the expected future spot rate.

Thus, in the case of a persistent deficit at the basic balance, the spot and forward rates will slide upwards in such a way that the discrepancy between the rates will narrow down. (This result builds on given interest differentials and expected future spot rate, cf. figure 7.4.)
7.3.2. Intervention

Instead of letting the coverage of the accumulating basic balance deficit rely on the interaction of the arbitrageurs and speculators the government could step in and provide the markets with the needed foreign exchange. In the spot market it could sell out of reserves to establish, in a more secure manner, the preferred exchange rate. Concurrent with the intervention in the spot market there will be an equivalent fall in the demand for forward currency from the arbitrageurs, and speculators, supposedly, will not take up so extreme a position. In this case, the forward rate will be determined, more or less exclusively, by the interest differential.

Inversely, the government could have intervened in the forward market. This is advantageous in cases where the actual amount of foreign reserves is limited or the ruling spot rate is regarded
as satisfactory from a longer term point of view. For instance, a speculative attack against the domestic currency can be handled this way. Without any intervention the forward rate will immediately go up, but the spot rate will rise as well, thus giving confirmation to the speculators that they were correct in expecting a higher rate of exchange. To avoid this development of self-complying expectations, the government can intervene and supply forward exchange to the old rate, thus pushing the excess supply curve back again. But, what happens 30 days later?

a) Without government intervention. If the expectations are unchanged at the higher level, the spot rate will have risen so that the speculators think they were right. This implies that the speculators can, more or less, force the forward and spot rates wherever their expectation may lead, which is a nuisance.

b) With government intervention. A certain amount of forward contracts have been supplied by the government, so the forward and spot rates are unchanged at time zero. If the government now simply hands over the amount of foreign exchange from the reserves to the speculators, an excess supply of spot exchange will be created which will depress the spot rate until the arbitrageurs step in. Depending upon the steepness of the demand curve of the arbitrageurs, they will take over the role of the government in regard to a more or less unchanged spot rate. Then the speculators must realize they were wrong. So the government has only to support the forward market in one period; the arbitrageurs will do the rest.

In periods with severe speculation, it is sometimes a problem to provide the speculators from the exchange reserves, and the government, therefore, has to demand foreign exchange in the spot market. This can raise the spot rate, and the speculators' expectations would seem to be fulfilled. In this case, the spot exchange should be demanded simultaneously with the speculators'
supply, and for this purpose, the swap arrangements between the central banks are very useful. But the discouragement of the speculators is not as pronounced as in the first case.

7.3.3. Leads and Lags

The importers and exporters can, of course, also take a speculative position. These speculative transactions consist of leaving some positions open. For instance, an importer can choose to pay for the goods in advance if he is expecting the foreign currency to appreciate. On the contrary, an exporter will try to postpone the withdrawal of the foreign revenue as long as possible. These actions will increase the excess demand for foreign currency in the spot market.

During the actual period when the payment pattern changes, there will be an upward pressure on the exchange rate in both markets. This can be prevented by government intervention in either the spot or forward market. Forward market intervention is similar to the above analysis in that it can, because of the considerable size of foreign trade, involve quite a large amount of forward contracts to redress the spot and forward rates.

Spot market intervention has, in addition to its effect on rates, an effect on liquidity in that it reduces primary liquidity by an equal amount. If it is a once and for all change in the payment pattern, then the government has only to intervene in one period, and when the speculative stream turns around, there can even be reasons for a reversed intervention.

Thus, the main difference between spot and forward intervention seems to be the derived effect on primary liquidity and the rate of interest. This will create repercussions in the forward market because the forward premium no longer matches the increased interest differential. There will then be a tendency towards arbitrage capital inflow and a modification of the
original fall in the forward rate\textsuperscript{1}.

This points to a direct change in the short term rate of interest as a possible way of supporting the exchange market intervention or even, in extreme cases, replacement. Therefore, the three kinds of government intervention should be regarded as complementary instruments\textsuperscript{2}.

Two ultimate problems should be touched upon. One is how expectations about the future spot rate may be determined, including the factors that affect this process. The choice between different expectation formation models is mainly empirical. It is difficult from purely theoretical reflections to set up the expectation model. But still, expectations are so volatile that even if the previous process of expectation formation can be explained satisfactorily, its validity for the future has to be proved. At this point, the other problem arises: namely, the influence of the changes in the exchange rate regimes. In a flexible exchange rate system, one would expect changes to be less abrupt and more frequent than in a fixed rate regime. In the latter case, there can be reasons to incorporate a variable counting for the probability of any change in the rate \( \text{rate} \) within a reasonable time horizon\textsuperscript{3}.

### 7.4. Summary of the Theoretical Model

This section should be summarized with regard to the empirical explanation of the forward premium and the rules for intervention.

\textsuperscript{1} In relation to the actual discussion of the EMS the benefits of a system with fixed forward exchange rates instead of spot rates has been much underestimated, cf. Jespersen, 1978b.

\textsuperscript{2} The Monetary Approach, here represented by Dornbusch, 1977, pp. 270-271, explains the effect of the different policy instruments as exclusively working through changes in the demand for money.

\textsuperscript{3} Cf. Kouri, 1976, p. 38 and below section 7.5.2.
1) The following catchwords can be useful in relation to the empirical investigation.

**Trade:** The payment pattern and the amount of deferred payment that is covered, which is a function of the expected future spot rate and the cost of forward cover.

**Arbitrage:** This is basically a portfolio choice, where the yield and risk are the determining variables. Thus: The rate of interest differential, the stock of short term capital, the speed of adjustment from changes in the forward premium to the domestic rate of interest, and the availability of funds.

**Speculation:** The expected future spot rate which is affected by relative prices, relative rates of interest, relative income and wealth, and a number of uncertain factors (a.o., the actions of the monetary authority).

**Intervention:** The size of the actual spot and forward intervention.

In each case one must discover what the legal and institutional constraints are and to what extent they can prevent transactors from dealing in the exchange market. In general, the perfection of the markets will be of great significance to the applicability of the theoretical model.

2) **Rules for intervention:** If there is a perfect functioning forward market and no capital control on short term capital flows, the above analysis points in the direction of:

a) Intervention in the forward market should be done with the main purpose of controlling the spot rate.

b) Intervention in the spot market for controlling liquidity.

c) Intervention in the security market for controlling the rate of interest.
These rules are mutually consistent as far as the forward rate is left redundant, and they should be used simultaneously\(^1\).

The usefulness of the above rules requires, in addition, that the monetary authority always knows in advance what spot rate it is willing to defend. Otherwise, it can prove extremely damaging and expensive if the monetary authority gives up in the middle of the storm. Parities should always be changed in calm periods when the consequences are less encouraging for speculators.

7.5. **The Application of the Theoretical Model for an Empirical Analysis of the Forward Market for Foreign Exchange**

7.5.1. **Demand and Supply Functions.**

Due to our previous discussion, it is now possible to set up a model which can be tested empirically.

The demand for forward exchange derives from the activities of the arbitrageurs, who try to take advantage of any discrepancy between the interest rate differential and the forward premium:

\[
\text{IMM-IEUR} = \text{FORW}
\]

\(0A^d_{90} = a (\text{IEUR}, \text{IMM}, \text{FORW})\)

The supply is derived partly from the traders desire to avoid the exchange risk and partly speculation and, finally, intervention from the central bank. At this stage of the analysis,

\(1\) These conclusions seem to be in accordance with the results which N. Blomgren-Hansen, 1976, derived from a more rigorous analysis of the same problem, and, 1978, derived from an empirical model.
the treatment of private banks is rather uncertain, but let us regard them mainly as arbitrageurs (cf. the institutional and legal restrictions levied on the banks' activities discussed in Chapter 3).

"Traders":

\[ O^{S}_{90} = \beta (\text{FORW, (IMP - EX)} \times (\text{risk, costs, ceiling on advances, etc.}) \text{ eventually the stock of short term capital}) \]

This is a net supply function, where an increased deficit at the trade balance (IMP - EX) will reduce the supply of forward exchange. When the forward premium rises - for the given expected future spot rate - the supply will increase. Similarly, firms with foreign debts can feel themselves tempted to cover their obligations in periods with pronounced exchange rate uncertainty.

Speculators:

\[ O^{S}_{90} = \gamma (E(s) - f) \]

\( s \) - spot rate, \( E(s) \) - expected 's'

\( f \) - forward rate

The expected future spot rate is a difficult variable to handle empirically because it is, like all other expectational variables, unobservable.

7.5.2. Exchange rate expectations

In literature this rate is often treated in relation to the concept of the equilibrium exchange rate. If perfect foresight or rational expectations are assumed, the two rates are linked together and often identical. In other cases the expectations will, to some extent, be influenced by the assumed longer
run development. Thus, it seems reasonable to begin with a
discussion of the "equilibrium" rate.

We take the definition of the equilibrium exchange rate strictly
from the literature: the rate that is obtained from a general equi­
librium model. To avoid misunderstanding, it should be stressed
that the solution of such a model can only, if at all, be reached
in the long run as a consequence of the slow adjustment on the
real good markets.

Two categories of disturbances affect the equilibrium solution:
1) Purely nominal changes, and 2) Real changes.

Re 1) If only the nominal values change and there is no money
illusion (understood as perfect flexible prices also at the
labor market) in the economy, the exchange rate will change
proportionally to the relative price levels (domestic and
external). In this case, the purchasing power parity will give
a satisfactory theoretical background for the determination of
the development in the equilibrium rate.

Re 2) Real changes (e.g. terms of trade, productivity, consumers'
preferences, and wealth) will affect all the equilibrium values.
In the long run such changes are very likely to happen.

As a preliminary conclusion, one can state that the "equilibrium
rate" is not an unequivocal concept, but conditioned by the
exogenous, as well as the endogenous, variables and the speed
of adjustment. So, it can hardly be satisfactory to base the
calculation of the expected exchange rate upon this concept alone.

The question is: What then? One can fall back on the more
traditional approaches of "behavioral theory", where expecta—
tion formation is postulated on a reasonable but ad hoc basis.
Adaptive expectations are a very conventional behavioral assump—
tion where the past is extrapolated into the future. This is
often done with an eye to the empirical results.
A somewhat safer approach, although also of ad hoc character, is the "quasi-rational expectations" (Beenstock, 1976, pp. 6-7), where known information is adapted:

\[
E(s) = \sum_{h=0}^{H} w_h \cdot RXP_{t-h} + \sum_{j=0}^{J} u_j \cdot TOT_{t-j} + \sum_{i=0}^{I} v_i \cdot VRF_{t-i}
\]

- **RXP** - Relative rates of inflation
- **TOT** - Terms of trade
- **VRF** - International reserves.

Equation (1) is derived from the assumption of flexible exchange rates. In the Danish case, it is the DM/Dkr relation which is of main interest. This exchange rate is, in principle, fixed, but has been devalued several times - each time with a rather small percentage. The main concern of the agents dealing in the foreign exchange market is, therefore, to estimate the time and the size of changes in the DM-rate. Some obvious foundations for this activity are the development in: the amount of international reserves (VRF) related to the current account deficit, terms of trade (TOT), and the relative rates of inflation between Denmark and Germany (RXP). The above relation can be extended to include some variables which measure how acute the need for exchange rate adjustment seems to be.

When the expected DM-rate is established, the expected exchange rate between the Dkr and floating currencies is determined by the development of these currencies toward the DM. Thus, the expected dollar rate is influenced by the DM/Dkr and the $/DM rates. This creates some difficulty because it is less straightforward for the economic agents to establish expectations concerning the development of the DM towards other floating currencies.
One additional risk should be mentioned, namely, that the Snake ceases to exist\(^1\). This event would probably require a sudden and considerable adjustment of the exchange rates in connection with an increased uncertainty about the future exchange rate policy.

In general the amount of international reserves can be regarded as an important magnitude showing the potential, in addition to international swap-arrangements, of the defence of the actual exchange rate. The development of the current account measures the need of an exchange rate adjustment. It is probably more important to examine the direction in which the deficit is moving because of the assumed, rather slow adjustment of real flows\(^2\). An idea of the magnitude of the exchange rate adjustment can be derived from a comparison of the Danish and German rates of inflation or, even better, how their real effective exchange rates develop\(^3\).

A few words should also be said regarding the risk variable (referring to chapter 2.1 for the distinction between risk and uncertainty). In the literature the risk is traditionally measured by the variance of the distribution of the return.

---

1 After the July 1978 summit in Bremen, this event seems to be less likely to happen. Time, Gentlemen, is running, so it is now - January 1979 - even less likely after the formal agreement on the EMS at the December, 1978 summit in Brussels, although Denmark probably still has the opportunity to leave the EMS.

2 It could also be argued that the rate of unemployment should be given some weight in this "need-for-adjustment" index.

3 There is a fast growing literature concerning the question of short run over/under shooting of the exchange rate (Dornbusch, Basevi & DeGrauwe, Niehans i.a.). This aspect is much too refined for an empirical use of the expected rate of exchange and is only dealt with in the theoretical part, cf. Chap. 2.4.
But in time series analysis this is not of much use because we need a number showing the risk in each period. One possibility is to postulate that the squared difference between the actual and the expected rate of exchange gives an indication of the pressure for (risk of) an exchange rate adjustment. Using the semi-rational approach, this procedure is not helpful as long as no exact figures for the expected rate can be obtained.

Alternatively, one could say that the size of the international reserves and the direction of the change of the current account give an indication of the state of confidence which, in this case, can be identified with the risk factor.

A concreate specification:

\[
(2) \quad E(s) = f(s, \sum_{j=0}^{J} w_j \cdot \frac{\text{wages (DK)*}}{\text{wages (G)}} - t-j, \sum_{i=0}^{I} \frac{\text{current deficit}}{\text{GDP}} - t-i...)
\]

\[
(3) \quad \text{Risk}(s) = g((E(s)-s)^2, \frac{\text{VRF}}{\text{curr.def}}, \Delta \text{current account})
\]

Finally, the central bank can intervene in the market and supply the amount of forward currency which it finds convenient, taking into consideration the political aims. Unfortunately, figures showing the amount of forward intervention by the monetary authorities were not published until 1975, except from semi-annual indications of the magnitudes stated in the annual report.

Given the assumption of equilibrium in the market for forward exchange, the following relationship can be established:

* It is a lengthy discussion as to how relative rates of inflation can be measured in the best way, cf. Chapter 2.4.3.
7.6. The Danish Case

In Chapter 3 the specific regulations concerning forward exchange activity are listed. Here it is only necessary to mention that except for private banks, pure arbitrage and speculation by private firms and households are not allowed. In fact, forward transactions need a current account transaction or a specific financial commitment to create permission for dealing in forward exchange. Private banks are unrestricted in their forward activities as such, but if they want to match their forward position with an opposite spot transaction, they are limited by the 15% rule concerning their net foreign assets in relation to their own capital.

Taking these restrictions into consideration, the crucial question for this empirical investigation becomes: Is there enough room for forward transaction within ordinary trading activity to make the forward market work as though it performed to the theoretical model set up above?

\[ (4) \quad 0A_{90} = 0T_{90} + 0S_{90} + 0G_{90} \]
\[ 0A_{90} = (IEUR, IMM, FORW) \]
\[ 0T_{90} = (IMP, EX, RISK, FORW) \]
\[ 0S_{90} = (E(s), FORW) \]
\[ 0G_{90} = \bar{G} \]

\[ (5) \quad \text{FORW} = f(\text{IMM, IEUR, EX, IMP, RISK, E(s), } \bar{G}) \]

\[ ^{1} \text{The signs above the variables indicate the a priori expectation concerning the partial derivative.} \]
Before going into the details of the regression analysis, two more immediate observations should be mentioned. In Figure 7.5, it is shown that the aggregate position of the private non-financial sector has been, throughout the entire period under consideration - 1970.3 -- 1976.4, an excess demand for forward exchange, which the banks have counterbalanced. The second observation is that the forward premium has, except for a few months in 1975, been positive and, in addition, the interest rate parity has practically never been fulfilled, but, rather, has always been an advantage for foreign investment which favors Danish banks, cf. Figure 7.6.

Figure 7.5 - Non-financial sector's stock and flow demand for forward exchange.

Figure 7.6 - The forward premium and the interest rate difference.

Figure 7.7 - Some important interest rates.

7.7. **Empirical Findings**

7.7.1. **A Quarterly Study**

In the following section I shall report on some results extracted from a relatively large number of regressions.

Even though the simultaneous structure is recognized in the theoretical section, only the simple OLS-regression technique is employed. The market is assumed to be in equilibrium which, perhaps, is not extremely unrealistic for the forward market, but the assumption is not tested.
THE STOCK DEMAND OF THE NON-FINANCIAL SECTOR (MTEX)
The gross flow demand of the non-financial sector (MBFWF)
Alternative rates of interest, such as the lending rate of private banks, the discount rate, etc., were tried, but with much lesser success. It is striking that the coefficients are of different magnitudes, which is also a result reported by several other studies. One immediate interpretation is that changes in the price of domestic money have an equivalent impact on the forward premium because private banks use liquidity when they act as arbitrageurs and, therefore, have to look at the opportunity cost. They are, to some extent, prevented from borrowing abroad, and the eurodollar rate plays a correspondingly smaller role for the forward premium.

It is a weakness in the analysis that the domestic rate of interest is represented by the day-to-day money market rate, but the data for 3 month interbank loans are not reliable in this relation because of the thinness of the market.

---

1 E.g. N. Blomgren-Hansen: FORW = 1.01 IMM -.59IEUR ....... on a semi-annual basis. 'Samspillet mellem pengeinstitutternes likviditets-, fonds og rentepolitik,' Danmarks Nationalbank 1977, p. 20.
When more variables are introduced, the elasticity of the interest rate variables decreases, which is to be expected. The extra variables are not extremely significant hence the magnitude of the coefficients has to be considered with caution.

In any case, we see that an increase in exports reduces the forward premium; the seasonally adjusted data give a somewhat better result as compared to the non-adjusted data. We find exactly the same pattern for imports, in addition to a smaller elasticity. On the other hand, it is important to mention the fact that firms have increased their forward activity during the period under consideration, but, even in 1975, it was only an amount equal to one third of the total import of goods and one tenth of export of goods that went through the forward market. These numbers indicate that importers and exporters normally refrain from covering their open position in the forward market. This, of course, can be explained by the ability of some firms to match their foreign assets and liabilities.

As a final point, the effect of the supply of forward exchange from the private banks and the central bank has been tested. From a theoretical point of view one would expect that an increase in supply of forward exchange from these sources would reduce the premium. The results, however, indicate that the banks are leaning against the wind in the sense that they involve themselves in the forward market only when the disequilibrium -- and the tendency toward higher premium -- is pronounced. This result, therefore, cannot be used to forecast the forward premium -- if anything, it indicates the reaction function of the banks. On the other hand, the coefficients of the other variables should be more reliable, and we see that when XTEX is included, the elasticities are smaller than otherwise. But data for XTEX are in themselves a low quality for the pre-1975 period.

---

1 The relative magnitude of import and export derived forward activity makes the relative size of the coefficients of imports and exports rather doubtful.
There is an alternative explanation of this positive coefficient: The amount of forward exchange, private banks are willing to sell is determined by the demand. This is true whenever banks pass the 15 per cent limit, which is typically the case in speculative periods. What we have detected, therefore, is in fact an upwardly sloping demand curve for forward exchange arising from traders who are ready to close their open positions in the hot periods, at nearly whatever cost. Depending on the competition among banks and the interventional policy by the central bank, the imbalance at the forward market will give opportunities for excess profits. The immediate interpretation is that for each extra billion of forward exchange which the banks have to supply, the forward rate is increased by approximately \( \frac{1}{2} \) percentage point (equation (5)).

7.7.2. Monthly study

On a monthly basis the assumption of market equilibrium is less acceptable, but the reduced form approach is still used, thus making the comparison with the quarterly equations easier.

\[
\begin{align*}
MFORW &= 0.74 \text{ MIMM} - 0.37 \text{ MIEUR} + 0.33 \\
\text{t-values} &= (14.4) \quad (3.9) \quad (0.44) \\
R^2 &= 0.73 \quad s = 1.81 \quad n = 78 \quad (1971.2-1977.7) \quad DW = 1.47
\end{align*}
\]

We observe a lower elasticity for both variables compared to equation (4), but still the domestic rate of interest has about the double effect. The standard deviation is higher, thus indicating that the interest rate parity hypothesis is even less fulfilled on a monthly than a quarterly basis.
(7) \[ \text{MFOW} = 0.66 \text{MIMM} - 0.30 \text{MEUR} - 0.0016 \text{MEX} + 0.00097 \text{MIMP} + 0.00046 \text{MXTE} \]
\[ \text{t-values} = (12.4) (3.2) (2.7) (2.3) (2.7) \]
\[ R = 0.77 \quad s = 1.70 \quad n = 81 \quad (1971.2-1977.9) \quad DW = 1.47 \]

(8) \[ \text{MFOW} = 0.57 \text{MIMM} - 0.24 \text{MEUR} - 0.87 \text{MEXX} + 0.72 \text{MIMPX} + 0.00035 \text{MXJEX} \]
\[ \text{t-values} = (7.6) (2.7) (2.9) (3.2) (2.4) \]
\[ R = 0.78 \quad s = 1.67 \quad n = 81 \quad (1971.2-1977.9) \quad DW = 1.42 \]

\[ \text{MEXX} = \text{MEX} \cdot (\text{UDNYT} - 66)^2 \cdot 10^{-5} \]

\[ \text{MIMPX} = \text{MIMP} \cdot (\text{UDNYT} - 66)^2 \cdot 10^{-5} \]

\text{UDNYT} = \text{The percentage of the granted loans by private banks which is actually utilized.}

7.7.3. \textit{The Significance of the Exchange Rate}

Further experiments have shown that the exchange rate does have some importance for the development of the forward premium. In equations (9) and (10) the forward premium has been estimated with the D-Mark/$ (EDMUSL) and the Dkr/D-Mark (EDML) as explanatory variables. Both exchange rates follow a rather strange lag-pattern, and are drawn in Figure 7.8. They have been detected by the Almon lag technique.

The intention was to test whether there would be a different impact on changes in the Dkr/$ and the Dkr/DM exchange rates when taking into account the differences in the expectation patterns.

The results seem to indicate that such a difference does exist, but the coefficients are determined by a rather large uncertainty, so no definite conclusions can be reached.
Figure 7.8.

Lag-Structures - Monthly figures

MIMPL

\[ \sum_{i=0}^{4} h_i = 1 \]

MEXL

\[ \sum_{j=0}^{5} h_j = 1 \]

Exchange rates

EDMUSL

DM/$

\[ \sum_{i=0}^{5} \omega_i = - \frac{3}{14} \]

EDM

Dkr/DM

\[ \sum_{j=0}^{5} \omega_j = + \frac{12}{42} \]
However, a depreciation of the Dkr towards the DM will create an immediate fall in the forward premium (cf. Figure 7.8); but if the depreciation is prolonged into the following months, the accumulated effect will be a rise in the premium. The total effect of a depreciation is a rise of approximately half the size in the forward premium.

The interpretation of the development of the expectations may be that what happens within the first month is regarded as transitory and is expected to be normalized quite soon; but any change which is sustained leads to an intensified belief in a possible change in the parity — a formal devaluation. One reservation must be added, namely, that if a devaluation of the expected size actually takes place, afterwards, the forward premium should be close to zero, and the new starting point for the formation of expectations is the new parity.

Surprisingly, the accumulated effect of a change in the DM/$ rate (as a proxy for the Dkr/$ rate) is the reverse — only with a magnitude of .10. When the DM depreciates (!) toward the $, the forward premium will fall, but even if the depreciation is sustained in the following months, the expectations seem only to be somewhat modified. On the whole, the forward premium will fall, showing inelastic expectations: Any change in the spot rate will be corrected to some extent in the future.

Despite the fact that the estimated expectation patterns only hold good for the historical period, it is of some importance that in the short run, i.e., within a month, expectations are inelastic. In the longer run, the expectations seem to depend, among other things, upon the exchange rate system. This analysis should, of course, be improved by incorporation of relative rates of inflation, etc., but until now it has not been possible to estimate a significant effect.

---

1 Lybeck, 1975 also refers to the fact that extrapolative exchange rate expectations were found in the Swedish case concerning capital flows.

2 Recent experience in the DM/$ rate has perhaps shaken the expectation pattern. On the other hand, who can be certain that the rate is below 2.20 DM/$ in six months time?
7.7.4. **Ex post Forecasts**

As can be seen from the DW-coefficient of equation (9), in Table 7.1., there is some positive autocorrelation. In equation (10) the results of an estimation by means of the Cochrane-Orcutt iterative technique are reported. The autocorrelation coefficient $\rho$ is highly significant and takes the value of .76. It is often difficult to judge if this correction has improved the equation and is, to some extent, relying on the test-criteria. For instance, the smaller t-values are mainly caused by the estimation technique. In this case, it is better to look at changes in the coefficients. In this connection, the fall in the influence of the domestic rate of interest (MIMM) is discouraging; but my guess is that before a simultaneous estimation technique is employed, one should not trust the magnitude of this variable too much.

Another criterium for testing the quality of an equation is to make some ex post forecasts. For this purpose the two equations have been reestimated over the period (1971.8 - 1976.10), and the period (1976.11 - 1977.10) has been forecasted.
\[ MFORM = -11.7 + .53MIMM - .40MIEUR + .00066MXTEX - .0060 MEXL + .0027MIMPL + 10.9EDMUSL + 39 EDML \]

\[ t-value \ (1.9) \ (8.7) \ (4.3) \ (3.8) \ (5.0) \ (3.9) \ (1.9) \ (3.0) \]

\[ R^2 = .81 \ s = 1.59 \ DW = 1.38 \ n = 75 \ (1971.8-1977.10) \]

\[ MFORM = -20.8 + .24MIMM - .39MIEUR + .00057MXTEX - .0033MEXL + .0012MIMPL + 13.1EDMUSL + 53.8 EDML \]

\[ t-value \ (2.4) \ (4.6) \ (2.0) \ (2.4) \ (1.7) \ (1.0) \ (2.3) \ (3.2) \]

\[ R^2 = .86 \ s = 1.35 \ DW = 1.95 \ n = 74 \ (1971.9-1977.10) \]

MEXL - export of goods

MIMPL - imports of goods

EDMUSL - the D-mark/$

EDML - the Dkr/D-mark

All four variables are following a specific lag-pattern (drawn in Figure 7.1)
<table>
<thead>
<tr>
<th>Percentage-points</th>
<th>Ex post Forecasts of the Forward Premium</th>
<th>Actual Values</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Equation (9)</td>
<td>Equation (10)</td>
</tr>
<tr>
<td>1976.11</td>
<td>4.7</td>
<td>-2.3</td>
</tr>
<tr>
<td>.12</td>
<td>-0.1</td>
<td>-3.4</td>
</tr>
<tr>
<td>1977.01</td>
<td>1.8</td>
<td>0.9</td>
</tr>
<tr>
<td>.02</td>
<td>0.8</td>
<td>-0.4</td>
</tr>
<tr>
<td>.03</td>
<td>0.9</td>
<td>-0.7</td>
</tr>
<tr>
<td>.04</td>
<td>1.7</td>
<td>-0.6</td>
</tr>
<tr>
<td>.05</td>
<td>0.8</td>
<td>-0.9</td>
</tr>
<tr>
<td>.06</td>
<td>0.0</td>
<td>1.0</td>
</tr>
<tr>
<td>.07</td>
<td>0.8</td>
<td>2.8</td>
</tr>
<tr>
<td>.08</td>
<td>0.5</td>
<td>1.2</td>
</tr>
<tr>
<td>.09</td>
<td>-2.9</td>
<td>-3.8</td>
</tr>
<tr>
<td>.10</td>
<td>-2.1</td>
<td>-0.1</td>
</tr>
</tbody>
</table>

From Table 7.2, it can be seen that there does not seem to be any substantive difference in the quality of the ex post forecasts, so one cannot say that one equation is significantly better than another. On the other hand, the forecasting errors are surprisingly different and call for further investigation.

7.8. Concluding Remarks

Despite the number of reservations concerning the empirical results which have been stated throughout the text, I will attempt to summarize what has been learned about the factors affecting the forward rate of foreign exchange in the Danish case.
The rather tight Danish exchange regulations made it an open question, if the theoretical model set up in the first part of this chapter was useful in the Danish case. It was left for an empirical investigation to see whether the specified relation could be proved in regard to Danish data. Due to the results, it seems reasonable to conclude that, in fact, the forward premium was explained by the proposed variables.

As can be seen from Figure 7.5., the traders and speculators have had an excess demand for forward exchange during the entire period. This demand has been matched by banks who have exploited the profit opportunity in a non-competitive way. To some extent, pure arbitrage transactions seem to be missing. Banks can do arbitrage within the 15 per cent limit of their own capital, but whenever the banks, as such, have passed this mark, they have the opportunity to exploit a scarcity rent. In an attempt to prevent this profit margin from growing too high, the central bank has followed the rather liberal practice of giving dispensation from the limit when the upward pressure on the forward was pronounced, or, during certain periods, it has intervened directly in the forward market.

In addition to the arbitrage activity of the banks, it should be mentioned that to the extent that importers and exporters can choose between foreign and domestic financial facilities, they can act as arbitrageurs. The results indicate that the domestic rate of interest is a close alternative price and influences the forward rate to a full amount, whereas the foreign rate of interest has a much lower elasticity.

Trade credit also creates a rather wide margin for short term speculation. In this context, speculation should be understood as a deviation from the normal pattern of covering open positions. Thus, in tense periods importers will try to reduce their foreign liabilities or cover them in the forward market, whereas exporters want to increase their foreign assets without
covering forward. This behavior enhances the imbalance on the forward market in speculative periods. As in this situation, normal arbitrage is limited by the exchange regulations; the banks are in a favorable position.

In brief, the empirical findings can be summarized in the following four points:

1. **Interest arbitrage is far from perfect.** The coefficients of the domestic rate of interest and the eurodollar rate have a magnitude of .5 only. To some extent, this can be attributed to the regulations of capital and forward transactions between Denmark and other countries. Until recently, Danish residents were not allowed to make any external portfolio transactions and private banks were also restricted in regard to their foreign transactions.

2. **Importers and exporters do use the forward market.** For instance, if the export increases by 100 million Dkr in one month and is kept at this high level, the forward premium will decrease by .1 for six subsequent months, whereas the effect of an increase in the import is of approximately half the size.

3. **The exchange rate expectation does influence the forward premium.** Even though pure forward speculation is prohibited by the exchange regulation, there seems to be enough slack in the payments related to trade to create possibilities for speculation.

4. **The private banks have a bridging position in the forward market.** They supply more forward exchange when it is demanded, but in such a way that they can take advantage of a higher premium from the amplified disequilibrium. The discrepancy between the actual rates and the interest rate parity (that the foreign interest rate plus the forward premium should be equal to the domestic interest rate) is a measure of the profit related to the extra supply of forward exchange, and is positively correlated with the amount private banks do supply.
All things considered, the main implications of the theoretical model of the forward market have been detected by this empirical investigation, although one could have wished that the results were less equivocal.
Appendix 7.1:

A Comment on F. McCormick, "Forward Exchange"

In the enlightening exposition of the relation between spot and forward markets for foreign exchange in an intertemporal analysis there could perhaps be made one further improvement or clarification. McCormick stresses perfectly right the two ties that bind spot and forward markets together over time.

\[ 0A_0 + 0A_{30} = 0 \]

\[ 0A_0 \] - spot demand for arbitrage exchange

\[ 0A_{30} \] - forward supply of arbitrage exchange

the sum of spot and forward (30 days hence) excess demand for foreign exchange coming from arbitrage transactions is by definition zero. So the arbitrage curves are not a function of the absolute spot and forward rates but of the premium/discount on forward exchange (the relative rate).

\[ 0S_{30} = 30S_{30} \]

\[ 0S_{30} \] - speculative demand for forward exchange

\[ 30S_{30} \] - predetermined spot supply 30 days hence.

The excess demand for forward exchange with the purpose of speculation has to show up in the future spot market, hence this component of the future spot excess demand is predetermined.

So far everything works perfectly well, and we have established the long needed link between the forward market and the future spot market. But the entire story is not told before the distinction between stock and flow elements of the market equilibrium has been analyzed.

---

1 This link has of course been observed by other economists (see, a.o. Basevi, 1973 p. 113), but in a less obvious form.
Arbitrage is a stock concept, which can be seen from the fact that it will only show up in the balance of payments in the period, where it is established for the first time.

Trade is a flow concept, which is recorded in the balance of payments each period.

Speculation is a stock phenomenon which forms the counterpart of arbitrage as well as trade transactions in the forward market, but it does not show up in the balance of payments - not even when it is established, because speculation only takes place in the forward market.

What I want to point out in this context is, that a persistent trade (basic) balance deficit will require an ever increasing stock of arbitrage contracts, which shall finance the accumulating foreign debt. So, if the excess demand relation for arbitrage exchange is downward sloping to the right, the sum of the interest rate differential and the forward premium has to increase. Correspondingly the stock of speculative contracts will grow in the forward market to countervail the increased demand for forward exchange by arbitrageurs. This will require - for given expectations - an upward sliding forward rate which will draw the spot rate with it. But the expectations concerning the future spot rate will not stay unchanged, in a situation with persistent basic balance deficit. This will contribute to an even more pronounced rise in the forward rate.

Two conditions can make the development explosive. One, if the exchange markets react much quicker than the real goods markets, then a number of selfcomplying changes in the expectations will send the forward rate up in the sky. The other is the J-curve effect, where the basic balance deficit reacts perversely on changes in the spot rate.

There are many good reasons for assuming a downward sloping scape instead of a horizontal line, which would leave the forward premium unchanged. For instance, that the opportunity costs will rise concurrently with a bigger amount placed in short term assets, and that the gains from diversification will also - at least when a certain level is passed - diminish, limits to the availability of funds, political risks, etc.
The cumulative effect can be shown as follows:

**Spot market**

\[ 0^S_0 + 0^T_0 = 0^A_0 \]

30 days hence

\[ 30^S_{30} + 30^T_{30} = 30^A_{30} \]

60 days hence

\[ 60^S_{60} + 60^T_{60} = 60^A_{60} \]

\[ 0^A_0 + 0^T_{30} + 30^T_{30} + 30^T_{60} + 60^T_{60} = 60^A_{60} \]

**Forward market**

\[ 0^S_{30} + 0^T_{30} = 0^A_{30} = 0^A_0 \]

30 days hence

\[ 30^S_{60} + 30^T_{60} = 30^A_{60} \]

60 days hence

\[ 60^S_{90} + 60^T_{90} = 60^A_{90} \]

\[ 0^A_0 + 0^T_{30} + 30^T_{30} + 30^T_{60} + 60^T_{60} = 60^A_{60} \]

* T - trade (basic) balance

We see, that a basic balance deficit is accumulating, and if there is no government intervention the arbitrage has to grow period after period, and a snowball effect has been set in motion, (cf. Figure 7.4, above).
CHAPTER 8: CONCLUSIONS

8.1. Introduction

In this final chapter, I will concentrate on the policy conclusions which can be derived from the preceding chapters. It is, of course, impossible to make policy recommendations without having explicit aims for economic policy. Let us therefore take for granted that in regard to foreign relationships, the aim of the political authorities throughout the period has been to secure the financing of the current account and to maintain a sufficient amount of international reserves. Furthermore, this policy is assumed to be carried out in the least harmful manner towards other policy goals (full unemployment, price stability, more equal income distribution, etc.).

In addition, the external relationship has been strongly influenced by Danish participation in fixed exchange rates arrangements. The smooth functioning of that system relies on the existence of satisfactory currency reserves such as to prevent sudden changes in the external payments, which would make it impossible to sustain the fixed exchange rate. In the Danish case -- with a persistent current account deficit -- this proved an ever present sword of Damocles which made the size of the currency reserves a very important aim -- not merely a means of preserving the exchange rate. Only once during the considered period did the official reserves seem to have been exhausted, namely in May, 1969, but that crisis proved, in fact, less dangerous than it appeared because it was mainly Danish private banks which had emptied the reserves. Later, when the Snake was established, the participating central banks received unlimited short term drawing rights from one another, a factor which eased the acute need for extra reserves in the middle of a speculative currency crisis. The newly agreed European Monetary System contains the same credit arrangement, but settlements shall be made within 45 days after the end of the month of intervention. Any further prolongation of an amount exceeding the member country's quota may be politically conditioned.
The main question to be answered is therefore: What kind of policy instruments must be used and with what success? One can divide the instruments into six categories:

1) Monetary policy
2) Fiscal policy
3) Public external borrowing
4) Capital control
5) Forward market intervention
6) Exchange rate policy

Finally a somewhat wider perspective is taken. Here it is emphasized that the way we have treated the capital flows is very partial and a much broader frame of reference would have been desirable. The capital flows have implications for the development on the financial market and in a longer perspective as well for the real sectors. Therefore, what is needed for a satisfactory analysis is a full scale econometric simulation model, where the interplay of all sectors is recognized without using the strait-jacket of the concept of equilibrium.

8.2. Monetary Policy.

The period since the 1969 currency crisis has been characterized in Denmark by a monetary policy concentration on the keeping of the external balance.\(^1\) It was judged desirable that private capital import should amount to a considerable part of the needed external borrowing. This opinion resulted more from a political than a "real" economic point of view, i.e. that it would damage the credibility of the Danish state if all foreign debt was public. Moreover, due to exchange regulations, private banks were prevented from making any substantial contribution to the financing of the current account. Accordingly, private firms had to undertake capital import. In that context, monetary policy played a crucial role by inducing firms to borrow abroad and encouraging foreigners to buy Danish financial assets.

For a given financial demand, this inducement can take form as either an increased cost of domestic borrowing or as credit rationing. The former may influence the total composition of assets and liabilities within the net wealth, whereas the latter normally acts on the growth of liabilities. Thus, one would expect different effects, depending on whether one is looking at the introductory period or the prolonged period after initiation. The consequence of persistent inflation is a quick and continuous activation of credit ceilings.

Contrary to this, the effect of changes in relative interest rates has a tendency to wear itself out for two reasons. Firstly, because a certain interest rate differential gives rise to a certain portfolio composition, and when that is established, no further capital import will take place. In addition, there is some empirical evidence that an increased domestic level of the interest rate has a damaging effect on the current account by raising the cost level. This leads to a longer run deteriorating influence, that continuously will increase the foreign debt.

Furthermore, it is well known that high real interest rates diminish the level of real investment. In Denmark the tax structure aggravates this tendency because high interest rates do not, to the same extent, reduce the purchasing power of households because they can deduct the borrowing costs from their income. When, as in many cases, the marginal personal income tax rate is between .5 - .7, consumers do not feel the full impact of higher interest rates. Of course, firms have an equal right of deduction, but their marginal rate is only .37, and they have to compete with foreign firms, whose borrowing costs may be smaller. Therefore, when credit is rationed, consumers are in a more favourable posi-

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1 This depends on the exact specification of the model. In chapter 6 we use an additive specification which makes the statement correct. When a multiplicative specification is employed, the interest rate differential determines a fraction of the wealth, in which case net capital import will take place when the wealth decreases.

tion with regard to paying the high cost of borrowing. If such a situation concerning credit rationing as well as high real interest rates goes on for a number of years, it cannot help but strongly influence the investment pattern, and, accordingly, the future production structure.

8.2.1. The Choice between Credit Rationing vs. Interest Rate Policy

In this respect, I consider the most important decision the monetary authorities can reach is either 1) to choose quantitative restrictions and then keep down the borrowing cost, or 2) to fix a (realistic) interest rate level\(^1\) and then leave the quantitative adjustment to the market forces. To do both seems, to me, to pursue an unnecessarily restrictive monetary policy, particularly when taking into account the harmful effects on real investment.

In Denmark the interest rate of bank loans is linked to the Central Bank’s discount rate. If it is decided to let the credit ceiling be effective any interest rate below the equilibrium rate

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\(^1\) One previous experiment in the late sixties with this kind of policy was not successful, because the rate of interest was kept at such a low level that it had to be given up due to substantial speculative movements away from bond holdings.
rate will bring this about. On the other hand a interest rate above $\bar{r}$ will make the credit ceiling superfluously in this respect. The preferable choice between ceiling and interest rate must depend on the stability of the structural equations - given the aim is a certain capital import.

Referring back to section 2.4.9. where we set up an asset model for the financial sector, this model can be useful for the discussion of the choice of instrument. It is assumed that the structural demand and supply equations are known but subject to stochastic and unpredictable disturbances. Our policy objective is the amount of international reserves ($R^m$) in a system with fixed exchange rates, and the question is now whether credit rationing or interest rate policy gives the most secure steering of $R^m$. The answer to this question lies in the relative stability of the demand for money respectively the demand for foreign bonds, which is illustrated in figure 8.2.

Figure 8.2.

The financial sector.

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1 The question was originally raised to me by Peter Erling Nielsen and I have benefitted from further discussions on this topic with him.
In figure 8.2, we have two endogenous variables the international reserves 'R' and the domestic bond rate $r_d$. These variables are supposed to adjust in a manner that secure that the excess demand on the three market under consideration (money market, domestic bonds, and foreign bonds) is zero.\(^1\) The money market equilibrium line (LM) is drawn under the assumption that $\frac{\delta R}{\delta r_d}$ is bigger than $r - r_d$ which make the line downward sloping to the right.\(^2\) The equilibrium line for the market of foreign bonds BF is upward sloping, which indicates that a higher domestic bond rate reduces the excess demand for foreign bonds and hence the supply of int. reserves increases.

Within this snapshot picture of the financial sector we will make an analogous analysis to that of Poole, 1970 for the real sector: If the demand for foreign bonds is the most unstable relation the BF-line will oscillate the most and cause deviations in R from the desired level. In that case we see that a constant domestic credit expansion will make the rate of interest change and the amount of international reserves fluctuate less in response to external disturbances compared to a situation where the authorities fix the rate of interest, cf. that AB is smaller than CD.

When random disturbances impinge on the position of the LM curve the international reserves would fluctuate least if the rate of interest was kept unchanged. To fix the interest rate would mean that the authorities counterbalanced any shifts in the demand for money by changes in the domestic credit expansion leaving R unchanged.

\(^1\) This model is a very simplifying one, which can only be used for short run analyses of portfolio adjustment behaviour, and is of course object to the criticism brought forward in section 2.2.4. above.

\(^2\) The argument is not of substantial importance for the conclusions. If the derivatives are of equal size the LM curve will be vertical.
According to these results a situation where the demand for external bonds (loans) is appraised to be more unstable and unpredictable than the demand for money (and the demand for domestic bonds) it is preferable to use a quantitative instrument e.g. a ceiling on bank credit.

8.2.2. Empirical Evidence of Monetary Import

The present empirical study concerning the main determinants of private capital import gives some indication as to which of the two monetary policies has proved effective in the 1970's. Looking at that part of capital flows which was by and large free from control, we find a much stronger effect of changes in bank lending than of changes in the relative interest rates. The total net import of capital reacted by approximately one quarter of the change in bank advances (cf. equ. (i), p.184).¹ Then, of course, it is of crucial importance to show that the bank advances have changed for reasons other than capital flows themselves. This is done by testing the correlation between actual changes in bank advances and permitted changes according to the credit ceiling. Here, we find a coefficient of .97 which shows a high correspondence between the two variables. If we had witnessed a lower correlation, it would have indicated that credit rationing had not been as effective, probably due to market clearing rates or even higher rates.

Against this background, it is not surprising that the influence of interest rates has not proved very strong. The only interest variable which provided a (nearly) significant contribution to the development of the capital import was a change in the euro-dollar rate. In addition, the effect was diminutive (app. 75 mill. kr. per percentage point) and the variable is exogenous to the Danish monetary authorities.

¹ In equ. (ii), p.184 we find an even more pronounced effect. As it is difficult to choose between the two equations, it is better not to exaggerate the result. On the other hand in the monthly study the sum of the coefficient for the import and export related credit is .4, indicating that app. 40% of the bank loans substitute foreign borrowing.
Looking at the monthly study of the trade credit, the result is less disappointing from a policy maker's point of view. Here it is the domestic bank rate which is shown to affect the stock of import credit by app. 100 mill.kr. per percentage point. Anyhow, this order of magnitude is so small that the bank rate can hardly be said to play an important role in relation to the financing of the balance of payments deficit.

When the forward premium is considered, we find the same pattern: that only in the monthly study can any significant relationship be established. This effect is also weak: a rise in the forward premium of one percentage point only holds back 50 mill.kr. of the capital import. In order to determine the entire impact of a change in the forward rate, the magnitude of the coefficient has to be appraised in light of the equations stated in chapter 7. There we found that the domestic interbank rate had a coefficient of -.5, which means that the two forces work against one another and reduce the aggregate effect.

Although the above results cannot be regarded as conclusive, it seems to me that the quantitative instrument in casu credit ceiling is a more effective instrument that changes in interest rates. This conclusion runs counter to that achieved by N.Blomgren-Hansen, who (cf. chapter 4) emphasizes the opposite weighing, but has estimated only one equation for the net capital import on semiannual figures. In addition the interpretation of the content of the equation may be challenged, because his quantitative variable is the short term borrowing requirements of the private sector, which in fact, is measured as the sum of the bank loans and the net foreign debt (cf. page 143). It can be doubted whether the ex post observations of the bank loans (restricted by the credit ceiling) and the foreign debt (which is also the dependent variable) are the right measures of the short term borrowing requirements.

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1 N.Blomgren-Hansen, 1977. He investigated the period 1970-74, but even an extension of the period up to 1977 does not modify his conclusion.
In the traditional literature monetary policy is recommended for correction of external imbalance whereas fiscal policy has a more direct effect on effective demand and hence on internal imbalance. In this connection it is important to point at that fiscal policy besides the effect on the trade balance (current account) also has an impact on the net wealth of the private sector.

We have found a direct effect of .25 from a fall in the net financial wealth of the private sector to the capital inflow. This implies that a surplus in the public sector account towards the private sector will lead to an increased int. reserves equal to one fourth of the surplus. The other three fourths are financed through further net indebtedness towards the public sector. Unfortunately, there has not been enough experimentation to show what the difference between money and bond financing of the increased indebtedness will be. The latter point is of crucial importance in judging the validity of the "monetary approach".

In any event, one may conclude from the above that fiscal policy does not only work through the current account, but some improvement in the capital account can also be expected from a more austere policy. But for a satisfactory appraisal we need a simultaneous analysis of how changes in taxes and public expenses influence the saving behaviour of the private sector.

8.4. Public External Borrowing

The weighing between public and private capital flows is primarily political and, secondarily, technical.

The political decision must rely on the degree of trust in the perfect functioning of the financial markets, in addition to the confidence in being able to manage capital flows through monetary and fiscal policies.
The technical decision is related more to the ability to forecast the future need for foreign exchange. If this cannot safely be done, there is not much room, in any case, for a political choice except for public capital import.

As can be seen from figure 3.1 a negative correlation exists between public and private capital import. The most likely explanation is that public borrowing is planned to fill the gap between the deficit on the current account and the private capital import. In practice, this is partly arranged by stand-by loans which have only to be drawn within some rather broad time limits.

The other possible explanation is that the public borrowing squeezes the private borrowing because they are competing over the same limited means of international finance. This might be the case in periods with a shortage of loanable funds; then, international banks may put a quota on the amount they want to lend to a single country.¹

Compared to private capital import, public borrowing has some advantages. Firstly, it is one of the instruments by which policy makers can affect international reserves directly. Secondly, the currency reserve can be filled without disturbing the domestic financial markets, and thirdly it is normally on relatively long term.

During the analysed period, public loans has accounted for approximately 1/3 of the foreign debt. This is not to say that the public gross capital import amounts to 1/3 of the total capital import. On the average, public loans imply smaller yearly installments than the equivalent private debt and make refinancing less a problem.

8.5. Restrictions on External Capital Flows

Using a strict system of foreign exchange control, the authorities may probably dry up the capital account altogether, which means that disruptive capital flows, as well as socially benefi-

¹That has been the experience of 1974.
cial flows, would be impeded. In a situation where a deficit on the basic balance exists, it is insufficient to stop capital export; in this case a positive capital import is needed. The control system can, of course, be worked out as a one-way street, but, on the other hand, this will run counter to international agreements (e.g. the Rome Treaty, OECD-arrangements, etc.) and may not prove extremely successful.

Accordingly, it seems more reasonable to set up control measures adjusted to reduce the magnitude of speculative movements. Especially within a regime of fixed exchange rates, speculative capital movements are a nuisance which may force the authorities to act in a headstrong manner. As we have seen in chapter 6, even in relation to trade credit, the speculative element was of a considerable size, a situation probably unstoppable by means of capital control. Here, the authorities have the choice of either abandoning any kind of trade credit which runs contrary to the idea of no hindrances to the real flows or hoping that the speculative waves which can be created by leads and lags in the foreign market are not larger and longer than can be withstood by the currency reserves.

One more complication should be carefully discussed before the capital control is abandoned: namely, as long as the number of objectives for the economic policy is unchanged, dropping one instrument makes the achievement of the objectives more difficult.

To give high priority to private capital import assumes that capital controls are relaxed and hence the monetary policy must be more directly committed to the keeping of the external balance. Therefore, the abandonment of the capital control can be a double-edged remedy for the monetary policy in the sense that more consideration will be devoted to the development of the balance of payments but, on the other hand, increased integration gives less margin for an autonomous monetary policy.
This study has revealed that in the Danish case capital control seemed to influence the capital flows in a significant manner. This result was obtained by the negative conclusion that only items which are mainly unrestricted elements of the capital account can be explained satisfactorily by a free market model. In chapter 4 we saw that capital export -- except for trade related credits -- was left unexplained in our econometric investigation, whereas the short term capital import could be given empirical evidence, which is supported by the fact that finance loans were liberalized from 1968 onwards.

As discussed above, the relaxation of capital controls makes the country more vulnerable to speculation. In the empirical findings, we have seen that even within the Danish regulations, the speculative flows can be of considerable size. The more the country opens up for free trade in financial claims, the more often an acute currency crisis can arise.

8.6. Intervention in the Market for Forward Exchange

Until now, we have drawn the policy conclusion exclusively from the assumption that the exchange rate regime is one of fixed but adjustable rates. This is what can be expected for Denmark as a participant in the EMS. On the other hand, this does not prevent floating exchange rates towards a number of important currencies (such as the $ and the £) in the future.

In the present empirical study, we only touched upon this distinction in the section where we discussed the determination of the forward premium. One result was that expectations towards currencies with a fixed and flexible rate, respectively, were somewhat different. Towards the D-mark, we found rather elastic expectations in the sense that exchange rate depreciation raised the forward premium as a sign of expected further depreciation in the future -- until a formal devaluation occurs. On the contrary, when the exchange rate towards the $ depreciated, a future appreciation was expected. Neither of the estimated coefficients
was particularly significant. In any event, I think the result points to the important factor that expectations are formed in different ways, depending on the exchange rate system.

This implies that the tendency towards a European Monetary Union will concurrently change the expectation patterns. Accordingly, the stability of the behavioural equations established on historical figures will probably appear rather low in the future.

In relation to the forward market, the question has been raised as to whether intervention in this market eventually can ease some of the pressure from the spot market. This depends on the elasticity of the arbitrage demand for forward currencies and the simultaneous supply of spot currency. If the elasticity is relatively high, only a small change in the domestic interest rate will produce a change in the forward premium, which is sufficient to stabilize the spot rate. Especially in cases where the interest elasticity of uncovered capital flows is low, forward intervention seems to provide a quite useful instrument. This, of course, assume that arbitrage transactions are not restricted by capital control; on the other hand, pure speculation in the forward market could still advantageously be kept out of the market.¹

8.7. The Choice of Exchange Rate Policy

8.7.1. Flexible Exchange Rates

From our theoretical discussion (section 2.4), we know that the necessity of a currency reserve is abolished when the exchange rate is allowed to float freely. Therefore, one should expect the political authorities to gain an extra degree of freedom by giving up fixed rates. For a number of reasons, two important ones of which I shall emphasize, this is not the case.

¹ Administratively, this could be accomplished by a requirement that no forward transaction could be undertaken without a real (non-speculative) future spot obligation to fulfill.
Firstly, flexible exchange rates create uncertainty, which is a nuisance for firms involved in international trade, and in an attempt to reduce the haphazard development of these rates, the authorities seem, in fact, to have kept large currency reserves (corrected for inflation) under the actual system (and in the Danish they have even been increased considerably).

Secondly, the exchange rate is not merely a factor involving the conversion of prices denominated in one currency into another currency. It has real repercussions which, of course, are the main concern of the exchange rate policy. Within the neoclassic flow model, one of the conclusions was that free floating rates could insulate the domestic economy from outside shocks. This conclusion has been perforated by the dynamic analysis which shows that an open economy is open no matter what exchange rate policy it adopts.

A portfolio readjustment will affect the exchange rate which, after a while, influencesim- and export of goods and services. The latter effect depends on the degree of the money illusion within the analysed economy. If domestic prices and wages are indexed according to the exchange rate, the real flow distortions may be negligible, but wealth effects still exist which will prevent the neutrality of exchange rate changes. Concerning the money illusion, it seems that recent experience in Great Britain and Italy concerning flexible exchange rates has revealed much lower money illusions than previous experiments would have given cause to expect.1

8.7.2. Double Exchange Rates

A currency regime between fixed and flexible exchange rates exists: namely, the dual exchange rate. In this system, current account transactions (and presumably trade credit related to

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1 In any event, considerable improvements in the current accounts of both countries have taken place within the last year.
them) take place at the official (fixed) rate whereas the capital account transactions have to find their own equilibrium exchange rate. In the pure case, the domestic economy seems to be insulated against real disturbances derived from capital flows. The damaging effect of speculative attacks seems particularly to be avoided, which implies that capital control as such can be removed. But still, an administrative body is needed to decide which transactions can be carried out at the official rate. The separation of the two markets is not always easy and a number of countries have given up dual exchange rates for that reason (Italy, France).

8.7.3. Fixed Exchange Rates

For a small, open economy, a free floating exchange rate is much too hazardous when taking into account the real distortions. Therefore, to prevent unwanted exchange rate movements, one kind of fixed exchange rate system, eventually combined with capital control, is preferable. The possible forms of fixed exchange rate policies will be touched on briefly.

One can point to the EMS approach as one concrete shape of a fixed rate system. But, in this context, it is indispensable to contemplate how the exchange rate will be changed. Hence, it is surprising that the EMS has been set up without any formal procedure as to how the intervention boundaries are to be reconsidered. Insofar as the rates of growth and inflation are somewhat different for each member country, it is naive - and perhaps threatening for the survival of the system - to expect the official exchange rates to remain constant for periods longer than the time being. If the exchange rate is not allowed to take the adjustment of the difference in the inflation rates some other variables have to - which very likely could be the number of unemployed. Thus, the discussion of forming a semi-automatical procedure of exchange rate adjustments within the EMS should be ini-

1 Among others, see Dornbusch, 1976a, for a competent analysis.
tiated.\textsuperscript{1} From the point of view of minimizing the uncertainty, it would be preferable to have an automatic and symmetrical adjustment procedure, perhaps combined with rather frequent, but small, changes. This would make speculation less profitable without major disruption of real flows.

In conclusion of the discussion of the least disruptive exchange rate system with regard to the real part of the economy it seems as though a system that relates the value of the currency to a basket of the most important trading partners' currencies (a so-called 'fixed effective exchange rate') would be desirable. But not even in this case it is sufficient to define a fixed effective exchange rate, because the discrepancy between the domestic inflation rate and the weighted inflation rate of the trading partners will cause a persistent need for adjustment. Therefore, the considered country should define a \textit{real effective exchange rate} which is secured through market intervention. This would of course entail minor daily fluctuations in the nominal exchange rates, but in a longer perspective the variance of the exchange rates as well as the distortion of the real sector will be smaller than in a case where the country experiences less but larger changes in the nominal exchange rates.


In sum, one can say that the capital flows are of crucial importance when a fixed exchange rate system is considered. Fortunately a number of policy instruments are available although the effectiveness of some of the instruments has been challenged.

Another problem results from the tendency of economic instruments to wear out. We have touched upon this in relation to interest rate policy, but credit ceilings cause a parallel situation to the extent that alternative channels for financial flows can evolve.

\textsuperscript{1} In this respect, the OPTICA reports could be helpful.
A more general reason for the weakening of the use of instruments is the degree to which they can be anticipated. This leads to a discussion of the importance of expectations in general and rational expectations in particular. If, for instance, we look at the effectiveness of a devaluation, it will be inversely proportional to the degree of anticipation.

The above discussion has been a one way consideration of how capital flows can be affected. But, of equal importance, is the question of how capital flows affect the usefulness of the instruments. In the extreme case, with fixed exchange rates and perfect substitution between domestic and foreign financial assets (the monetary union assumption), we have seen that monetary policy is completely impotent. The money supply is beyond the reach of the authorities. Important to the Danish case is the fact that concurrent with the integration of the European financial markets, the monetary policy will become more difficult to manage independently of the development in the other countries.

8.9. A Wider Perspective

The capital account cannot and should not be analysed as an insulated island in the overall economic ocean. Therefore, the implications of capital movements are much wider than those we have been occupied with in this study. Schematically one could say that we have dealt with markets that are supposed to adjust rather quickly in contrast to the real markets.

In figure 8.3 it is illustrated that in a short run analysis, here defined as a quarter of a year, the capital account is assumed to be affected by the conditions of the domestic financial sector and the real markets. These conditions are regarded as exogenous in relation to the capital flows. Considering the real markets, this seems not to be very unrealistic. On the other hand, with regard to the domestic financial sector there is a mutual interdependence (indicated by a dotted line). How important the influence of the capital movements are for the domestic
financial variables is the next future step of our analysis. Here we have only made one attempt to avoid simultaneity biases by shortening the period from a quarter of a year to one month.

When a longer run analysis is carried out it seems to us indispensable to set up a full scale model. In that case the real markets can no longer be treated as exogenous and unaffected by the financial conditions. This, of course, is extremely difficult in purely analytical models and we find ourselves caught by either confusing complexity or misleading simplification.
One of the simplifications may be the requirement of equilibrium. If equilibrium is assumed we can solve the model arithmetically and by this achieve analytical results. But leaving the state of equilibrium we need a simulation model to get results of the dynamic disequilibrium behaviour of the entire economy. In that context it is important to underline that a simulation model does not necessarily have properties different from a general equilibrium model except from some adjustment specifications.

Anyhow, a genuine disequilibrium simulation model opens for the possibility that 1) ex ante demand may be different from ex post demand, 2) observed demand data may differ from supply data, 3) the specification of the individual markets is not necessarily based on the assumption of equilibrium, 4) expectations is more than just one, by Almon technique determined, weighted expression of lagged values of the considered variable, and finally 5) the model need not have a long run equilibrium solution.

By setting up such an econometric model we shall be able to create a frame for forming a synthesis of the demand for realism represented by the disequilibrium analysis and the requirement of consistency which is best fulfilled in a general model with as few ceteris paribus clauses as possible.

In our opinion one future frontier in economic research is to be found by combining a strong analytical tool (i.e. the simulation model) with an economic theory which goes beyond the static maximization behaviour of economic agents and perfect functioning markets.
ANNEX 1: List of Variables and Data.

1.1. Quarterly Data.

All quantities are measured in mill. Dkr.
Interest rates are measured in per cent p.a.
Period 1968.1 - 1977.1

AUPOST - Balance of Payments (private sector)
BLOP - Bank Advances
BLOPS - Bank Advances seasonally adjusted
CST - Short term private Capital export
CURDEF - Current Account Deficit
EX - Exports of Goods (fob)
EXS - Exports of Goods seasonally adjusted
FORW - Premium on 3-months forward US $
IBDIF - Domestic Bond Rate - Eurodollar Rate
IBDIFW - IBDIF*PWEP/1000
IEUR - Eurodollar Rate on 3-months Deposits in London
IEURW - IEUR*PWEP/1000
IMEX - Trade Balance (Imports - Exports)
IMM - Money Market Rate on day/day loans
IMP - Imports of Goods (cif)
IMPS - Imports of Goods seasonally adjusted
KLT - Long term private Capital Imports
KP - Total private Capital Imports
KPCP - Net private Capital Imports (KP-CP)
KST - Short term private Capital Imports
Ko - Public Capital Import
PWEP - Net financial Wealth of private Sector
SPEC - Speculation dummy
S1 - Quarterly seasonal dummy
S2 - Quarterly seasonal dummy
S3 - Quarterly seasonal dummy
XTEX - Net Stock Demand for forward Exchange by Firms etc.
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1.2. **Balance Sheet Data.** (Quarterly)

**Assets** (Mill. Dkr.)

1. **The private sector:**

- PMB - Monetary Base held by the private sector
- PMBN - notes and coins
- PMBG - Post Giro accounts held by the private sector
- PDEN - Deposits by private banks at the Central Bank
- PLOG - loans granted to the government by the private sector
- PLOL - the local authorities by the private sector
- PBOG - government bonds held by the private sector at market prices
- PBOL - local authorities' bonds held by the private sector at market prices
- PVRF - International liquidity held by private banks

2. **The Central Bank:**

- NVR - International liquidity held by the Central Bank
- NLO - Loans granted by the Central Bank to private banks
- NBO - Bonds held by the Central Bank

3. **The government:**

- CLOP - loans granted by the government to the private sector
- GLON - the government's current account at the Central Bank
- GLOL - loans granted by the government to local authorities
- BGOP - private sector bonds held by governmental institutions (such as Hypotekbanken (the Mortgage Bank), Arbejdsmarkedets tillægsindsats (ATP) (the Labour Market's extra pension), Sociale Pensionsfonds (Social Pension Funds), Postkontoret (the Postal Transfer Bank) and building funds, etc.)
4. Local authorities:

LDEP - Deposits by local authorities at private banks
LBOP - Bonds held by local authorities at market prices

5. Foreign sector:

FLOP - Net loans granted by foreigners to the private sector
FLOG - - - - - - the government
FLOL - - - - - - local authorities
FBOP - Bonds held by foreigners at market prices

Liabilities (Mill. Dkr.)

1. Private sector:

LOP - loans obtained by the private sector
DEP - deposits at private banks by other sectors
BOP - net supply of bonds from the private sector

2. The Central Bank:

MBN - monetary base (notes and coins) held by the private sector
DEN - deposits by private banks at the Central Bank
LON - the government's current account at the Central Bank

3. The Government:

MBG - Post Giro accounts held by the private sector
LOG - loans obtained by the government
BOG - supply of government bonds at market prices

4. Local authorities:

LOL - loans obtained by the local authorities
BOL - supply of local authorities' bonds at market prices

5. Foreign sector:

VRF - international liquidity held by private and central
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1.3. Monthly Data.

All quantities are measured in mill. D.kr.
Interest rates are measured in per cent p.a.
Exchange rates are D.kr./unit of foreign currency
Period 1972.1 - 1977.1

EDM - D.kr./DM - exchange rate
EDML = -6/42 EDM + 5/42 EDM(-1) + 10/42 EDM(-2) + 9/42 EDM(-3)
       3/42 EDM(-4) - 9/42 EDM(-5)
EDMUS - DM/US$ - exchange rate
EDMUSL = -2/7 EDMUS + 3/14 EDMUS(-2) + 3/14 EDMUS(-3)
       -2/7 EDMUS(-5), cf. figure 7.8

JIMKA - Automatic Import Related Credit (model II)
IIMKB - Changes in Payments Habits Related to Import Credit (model II)
IIXKA - Automatic Export Related Credit (model II)
IIXKB - Changes in Payments Habits Related to Export Credit (model II)
IMKA - Automatic Import Related Credit (model I)
IMKB - Changes in Payments Habits Related to Export Credit (model I)
IXKA - Automatic Export Related Credit (model I)
IXKB - Changes in Payments Habits Related to Export Credit (model I)
MBFWF - Flow demand for forward Exchange by Firms etc.
MEEF - Trade weighted Exchange Rate (1970 = 100, revaluation is indicated by a raising number)
MEX - Export of Goods (fob)
MEXL = 1/6 (MEX + MEX(-1) + MEX(-2) + MEX(-3) + MEX(-4)
       + MEX(-5))
MFORW - Premium on 3-months forward US$
MIEUR - 3-months $ Deposit Interest Rate in London
MILO - Interest Rate of private Bank Loans
MIMM - Interest Rate of Money Market day/day Loans
MIMP - Imports of Goods (cif)
MIMPL = 2/9 (MIMP + MIMPL(-1) + MIMPL(-2)) + 1/6 (MIMPL(-3)
       + MIMPL(-4))
MKB = IIMKB
MSPEC - Speculation dummy
MUDNYT - The Ratio between actual Lending and the potential Lending of private Banks
MXTEX - Stock Demand for forward Exchange by Firms etc.
IMK - Total non-registered Import related Credit
IMKR - Total Import related Credit, IMK + IMKREG
IMKREG - Total registered Import related Credit
TXK - Total non-registered Export related Credit
TXKR - Total Export related Credit, TXK + TXKREG
TXKREG - Total registered Export related Credit
BIBLIOGRAPHY.

This bibliography contains all books, articles, and papers which I have referred to in the text. In addition I have listed a few basic volumes of literature that creates a broader background for the fields of economic theory that I have dealt with in the different chapters.


Blomgren-Hansen, N., 1977c: 'Samspillet mellem pengeinstitut­ternes likviditets-, fonds- og rentepolitik', (the Interplay between Liquidity, Portfolio and Interest Rate Policy of Banks), Danmarks Nationalbank, stenciled.


Danmarks Nationalbank: 'Beretning og Regnskab', (Annual Reports) and 'Kvartalsoversigt' (Quarterly Reviews), 1967-78, Havnegade 5, DK-1093 Copenhagen.


Danmarks Statistik: 'Arbogen' (Statistical Yearbook), 'Kvartalsoversigten' (Quarterly Review), 'Statistiske Efterretninger', Sejrøgade 11, DK-2100 Copenhagen Ø.


The Economist, 1975: 'All-Saints Manifesto, 1st of November.


Hansen, L. & E. Hoffmeyer, 1978: 'Danish Monetary Policy during the Last Decade', Kredit und Kapital, no. 2, (page references are to the stenciled version of the paper).


Hicks, J., 1935: A Suggestion for Simplifying the Theory of Money', chapt. 4 in Hicks, 1967.

Hicks, J., 1937: 'Mr. Keynes and the Classics', chapt. 7 in Hicks, 1967.


Hicks, J., 1965: 'Capital and Growth', Oxford University Press, 197


Nielsen, P. E., 1978: 'Reale- og monetære renteteorier siden Wicksell', (Real and Monetary Theories of the Interest Rate since Wicksell), University of Copenhagen: stenciled.


