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Jonung, Lars

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LUND UNIVERSITY

PO Box 117
221 00 Lund
+46 46-222 00 00

Lars Jonung:

The Proximate Determinants of the Swedish Money Stock 1871—1971

In a large number of countries a strong covariation between the money stock and economic activity as it is reflected in prices and production has been observed. This relationship has been interpreted by some observers to mean that changes in the money stock have been the primary cause of developments in the national income. Others have maintained that fluctuations in national income give rise to variations in the money stock.

Economists have studied the causal relationship between money and national income by means of different statistical techniques. These techniques have, however, so far proved to be incapable of clarifying precisely the nature of the relationship. In order to analyse the causal relationship, the determinants of the money stock have been examined in order to see how they are influenced by economic activity. The most outstanding example of the use of this approach is Phillip Cagan's study of the determinants of the American money stock (Cagan, 1965). His conclusion is, briefly, that in the long run the money stock is a central explanatory variable of developments in the nominal national income. In the short run, however, he finds no clear-cut relationship—money stock and economic activity appear to be mutually interdependent.¹

Furthermore, a study of the determinants of the

money stock is of importance for an analysis of the framing of monetary policy. A considerable number of researchers hold the view that the monetary authorities should concentrate on controlling the growth of the money stock. Since this variable is not directly under the control of the central bank, economic-policy decision makers must assess their actions on the basis of other variables which can be influenced more directly. In order to be able to determine how these variables are related to the supply of money, detailed knowledge of its determinants is thus required.

The following account aims at presenting the determinants of the Swedish money stock 1871—1971 using a framework which has proved fruitful in analyses of the American monetary background (Cagan 1965 and Friedman-Schwartz 1963). The main emphasis of the account is on a description of the longrun development of these factors. It should be pointed out that practically no attempts at empirical examination of the determinants of the Swedish money stock have been carried out previously. This may appear paradoxical bearing in mind the strong monetary tradition in early Swedish economic thought.

The determinants of the money stock

Most of the models of the supply of money assume that the volume of money in an economy is influenced by decisions made by the monetary authorities, by the banking system and by the public. In this breakdown of the economy into three decision-making sectors, the monetary authorities are, as a rule, synonymous with the central bank and the administrative branch which is responsible for the financing of the public sector. The banking system comprises the financial institutions whose debt instruments are included in the money stock, while the public includes all other economic units such as households, firms and government and municipal authorities. It may be discussed how the choices

¹ An investigation of the determinants of the money stock is of interest not merely to illustrate the causal relationship between money and national income, but also to examine whether changes in the money stock have different effects, depending on how they arise—i.e. has an expansion in the supply of money which is caused, for example, by an inflow of foreign reserves, the same effect on economic activity as a growth of the money stock which originates from an under-balanced budget?

Lars Jonung, civilekonom, is attached to the University of Lund, where he as a research assistant is working on a project concerning the Swedish money stock.

made within these three sectors influence the money stock on the basis of the following framework:

- (1) $M = S + D$
- (2) $B = S + R$
- (3) $r = R/D$
- (4) $s = S/M$

The money stock (M) is defined as the total of the public's holding of notes (S) and deposits in the banking system (D) and the monetary base (B) as the total of the public's holding of notes (S) and the banking sector's holding of reserves (R). These reserves consist of assets which can directly form the basis for an expansion of bank deposits. The relationship between the banking system's reserves (R) and the public's deposits with the banks (D) and between the public's holding of notes (S) and its holding of money (M) is defined as the reserve-deposit ratio (r) and the currency-money ratio (s), respectively, according to expressions (3) and (4).²

The above definitions can be combined into an identity (5),

$$(5) M = \frac{1}{s + r - s \cdot r} B$$

in which the money stock is related to three factors: the monetary base, the currency-money ratio and the reserve-deposit ratio. From this identity it can be seen that an expansion in the monetary base leads to a growth of the money stock, while an increase in one of the ratios, on the other hand, leads to a contraction in the money stock, *ceteris paribus*. An increase in the banking system's

reserve-deposit ratio, or in the public's currency-money ratio means that the reserves which may form the basis for an expansion in the money stock are reduced, either by being tied up in the form of larger holdings of reserves with the banks, or in the form of a larger holding of notes by the public. Since the framework assumes fractional reserve banking, a decline in the volume of reserves will result in a more than proportional reduction in the money stock, if s and r are constant. A reduction in the reserve-deposit ratio or the currency-money ratio, on the other hand, will give rise to an expansion in the money stock. The identity (5) is sometimes simplified by the ratio between the money stock (M) and the monetary base (B) being denoted as the base money multiplier (m), i.e.

$$(6) M = m \cdot B$$

the currency-money ratio and the reserve-deposit ratio are incorporated in one variable.

The three variables: the monetary base, the reserve-deposit ratio and the currency-money ratio have been denoted as the proximate determinants of the money stock in the American monetary literature, i.e. as the determinants in the sense that changes in the nominal money stock can be attributed to changes in one of these three variables and that their development is, in turn, dependent on other variables which must be taken into account in order to get an idea of what has determined developments in the money stock. By relating the nominal money stock to the three determinants of the expression (5), a framework which has proved fruitful for a closer study of the variables influencing the money stock is obtained. This analysis is thus based on a kind of two-stage procedure. In the first stage an attempt is made to obtain a picture of the development of the monetary base, the currency-money ratio and the reserve-deposit ratio. The second stage then comprises a description of the factors which have been decisive for changes in these three variables.

² It is assumed here that the banking system is based on fractional reserve banking, i.e. the cash reserve holdings of the banking system are less than the public's deposits and consequently the reserve ratio has a numerical value of less than 1. It should be pointed out that, according to the construction of the model, the currency-money ratio cannot exceed the value 1.

This description, which takes into account factors such as interest charges, the public's demand for money, different institutional factors such as the existence of reserve ratio requirements, of exchange controls, and of fixed or flexible exchange rates, is facilitated by an attempt to relate the changes in the three proximate determinants to decisions made by the monetary authorities, the banking system and the public. Generally, it has been assumed that the monetary base is under the control of the central bank, i.e., the monetary authorities are able to effect this variable by various monetary measures. Empirical studies will have to determine to what extent the central bank actually has been able to control the development of the monetary base within a given institutional framework. It is also assumed that the banking system chooses the desired reserve ratio, the choice being influenced, among other things, by the yield on bank advances as well as by the discount rate and other costs of borrowing from the monetary authorities. Taken as a whole, the banks have, thus, no possibility of determining themselves the absolute volume, either of reserves or deposits, but only the desired ratio between these two. Finally, it is assumed that the public chooses the size of the noteholding it wishes to have in relation to its total holding of money. This choice is influenced by factors such as the yield on bank deposits, the public's belief in the solvency of the banking system, the use of notes in relation to cheques for cash payments, the taxation system, and the rate of inflation. It can thus be assumed that the central bank, the banking system and the public influence the nominal money stock by each one having its main influence on one of the three proximate determinants of the money stock as described above. It will then be an empirical problem to examine to what extent this assumption corresponds with experience. There are good grounds for expecting interdependence between the three determinants, which makes the analysis more difficult. A sudden

Chart 1. The share of the monetary base held by Riksbank notes, 1871—1971

Percent



increase in the monetary base caused by the action of a central bank can, for example, make the banking system inclined to allow the reserve ratio to rise instead of attempting to expand advances if, for example, the banks expect that the increase in their reserves is of a temporary character. The existence of interdependence between the three determinants in identity (5) has, however, not proved to be a serious obstacle to empirical investigations using the above framework.

The empirical picture

The choice of empirical equivalents to the variables making up identity (5), which describes the proximate determinants of the money stock, is not clear-cut. In this account the sum of the public's holding of Riksbank notes and deposits with the commercial banks will be chosen as the definition of the money stock in the years 1871—1971 (Jonung, 1973). In general, the monetary base comprises the claims of the banking sector and the public on the monetary authorities which can be directly utilized for increasing the money stock. In this description the Swedish monetary base is defined as the aggregate of the following three

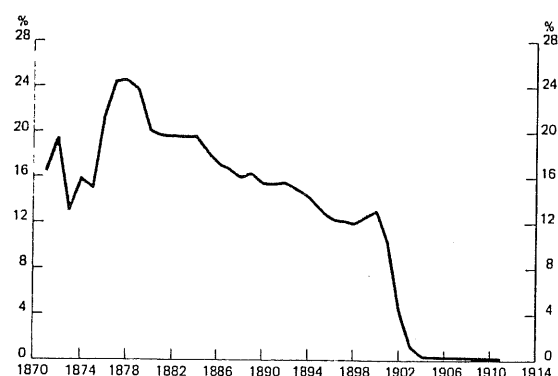
components: the public's and commercial banking system's holding of Riksbank notes, the commercial banks' short-term deposits with the Riksbank and with the National Debt Office, as well as the commercial banks' holdings of silver and gold.³

Of these three components the volume of notes in circulation has dominated the composition of the monetary base, as will be seen from Chart 1, which indicates the relative share of the volume of base money represented by the note circulation. According to this chart the share of Riksbank notes increased strongly from 1871 up to the turn of the century. This development was caused, among other things, by the fact that the note-issuing commercial banks, which held gold as cash reserve for their issue of notes, based their operations to a growing extent on deposits attracted from the public. Other private banks, whose demand for cash reserves was almost entirely in the form of Riksbank notes, expanded their operations during this period to roughly the

³ A number of alternative definitions of the concept "the monetary base" have been proposed. It may be of interest to include the commercial banks' holdings of short-term claims on foreigners. Since Sweden has, as a rule, maintained fixed exchange rates, the commercial banks have, with a great degree of certainty, expected to have their foreign assets exchanged for Swedish base money at a given rate. There is thus an argument for including these assets in the monetary base. In addition, there are grounds for taking into account postal giro deposits. Postal giro balances represent a short-term claim on a government institution which the public and the banking sector hold. In several European countries the administration of the postal giro forms part of the government budget process. This is also the case to some extent in Sweden. It must be pointed out, however, that the definition of the monetary base which has been chosen here is the only one that can be constructed on the basis of existing banking statistics for the entire period 1871—1971.

Chart 2. The commercial banks' holdings of gold and silver in relation to the volume of base money, 1871—1971

Percent

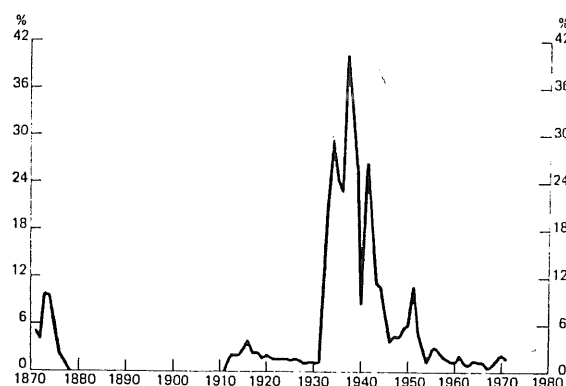


same extent as the note-issuing commercial banks. Owing to these factors the demand for Riksbank notes in relation to holdings of gold rose.

When the Riksbank obtained a monopoly of note issuing at the turn of the century, private bank notes were removed from circulation. Compare

Chart 3. The commercial banks' holdings of short-term deposits with the Riksbank and the National Debt Office, 1871—1971

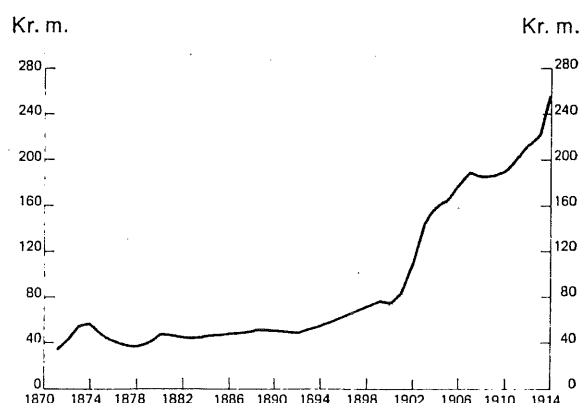
Percent



the strong upturn in Chart 1 at the beginning of the 1900's. The private note-issuing banks decided to sell their holdings of gold since it no longer fulfilled any reserve requirements. After 1903 the commercial banks' holdings of gold formed a negligible item. This change is also reflected in Chart 2, which shows the relative share of the monetary base represented by the commercial banks' holdings of gold and silver in 1871—1911. The share of gold exhibits a falling trend throughout the end of the 19th century. (The silver component of the monetary base, which was otherwise small, is primarily of interest during the years 1871—1872, when Sweden was on a silver standard). In Chart 2 the rise until 1878 is associated, among other things, with the establishment of the gold standard in Sweden, when the commercial banks gradually increased their holdings of gold in the middle of the 1870's. No notable circulation of gold coins outside the commercial banks took place during the years covered by Chart 2. The gold standard was never established in Sweden in the sense that the public used or hoarded gold coins. According to reports, there was a unanimous indication that the public's holdings of cash was dominated by Riksbank notes and private bank notes. The public's holdings of gold and silver coins is thus not included in the monetary base as calculated here. Each estimate of this holding, moreover, contains a large measure of uncertainty.

The commercial banks' holdings of short-term deposits with the Riksbank and with the National Debt Office in relation to the total volume of base money is illustrated in Chart 3. During the years 1871—1877 a small number of note-issuing banks maintained such reserves with the Riksbank to meet legal reserve requirements. As these banks received a new charter, which did not count sight deposits with the Riksbank as reserves, this item diminished in size. From 1878 until 1911 the commercial banks' short-term deposits with the Riks-

Chart 4. The monetary base, 1871—1914



bank are not shown as a separate item in the banking statistics. For various reasons it is impossible to estimate these deposits. The Riksbank was, among other things, unwilling to permit short-term deposits from the Commercial banks because this form of deposits tended to exhibit large fluctuations which could strain the reserve position of the Riksbank. It is probable that certain commercial banks then arranged for deposits under the guise of private individuals. Against this background it appears to be reasonable to completely disregard the commercial banks' possible balances with the Riksbank during the years 1878—1911.

Chart 5. The monetary base 1915—1971

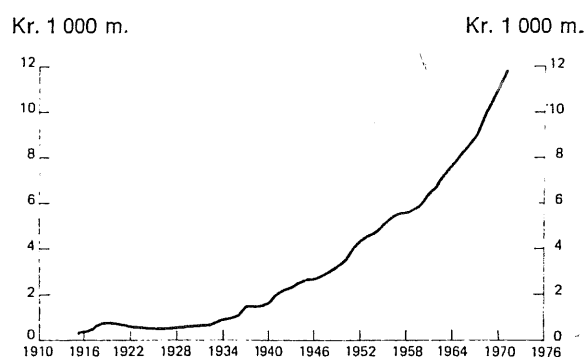
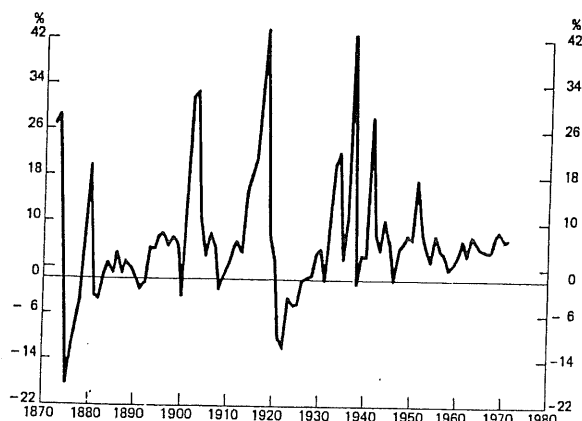


Chart 6. Rate of growth of the monetary base, 1871—1971

Annual percentage change

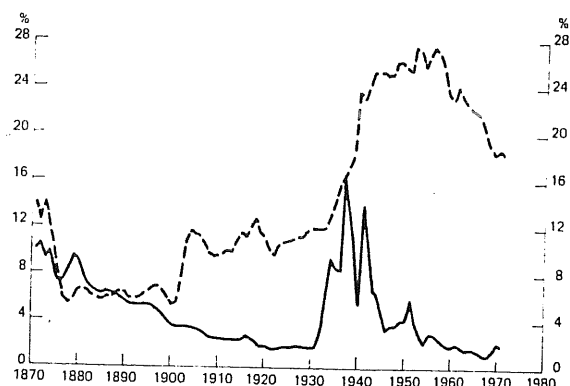


When the Riksbank organized a clearing between the commercial banks at the end of the 19th century, the commercial banks were permitted to maintain a certain volume of deposits on a giro account with the Riksbank to be used for the clearing. This volume, which first occurs in the

Chart 7. The currency-money ratio and the reserve-deposit ratio, 1871—1971

Percent

----- Currency-money ratio
—— Reserve-deposit ratio



statistics in 1912, remained a relatively constant share of the monetary base until the first years of the 1930's when a very noticeable upturn occurred in the demand deposits of the commercial banks. These balances stayed at a relatively high level until peace was concluded in 1945. This development is explained, among other things, by the relatively low level of interest rates, which made it attractive for the banking system to keep large reserves, and by the unstable foreign currency situation which led to a repatriation of Swedish funds from abroad. The post-war period showed something of a return to the level that had existed during the years before the 1930's. The upturns and downturns at the beginning of the 1950's are caused by the cash reserve requirements which were introduced for a brief period for restrictive purposes. The reserves which the commercial banks were obliged to maintain with the Riksbank are included in the monetary base for these years in Chart 3.

From 1958 the National Debt Office accepted short-term deposits from the commercial banks. These funds which, unlike the sight deposits with the Riksbank were interest-bearing, represent for the banking system a close substitute for the holding of sight deposits with the Riksbank and for cash balances in the form of notes. Therefore, it is probably reasonable to include these balances in the monetary base, especially as the National Debt Office can be regarded as a monetary authority which cooperates intimately with the Riksbank in the framing of monetary policy.

The total volume of base money, as it has been defined above, grew from Kr. 33 m. in 1871 to Kr. 11 000 m. a hundred years later. The size of the monetary base which is shown for the years 1871—1914 and for the years 1915—1971 in Charts 4 and 5, respectively, exhibits a stable secular increase. The rate of growth of the monetary base,

which is given in Chart 6, has, on the other hand, been subject to considerable fluctuations. These reflect various events in Swedish monetary history—such as the growth in 1902—1903, when the Riksbank established its monopoly of note-issuing, the expansion during the First World War as a result of large government budget deficits and surpluses in the balance of payments as well as the contraction in 1921—1923 when the authorities, by pursuing a strongly deflationary policy, attempted to return to the gold standard at the pre-war parity. The relatively high rate of growth during the post-war period reflects, among other things, the significant expansion in the national debt during these years—which has resulted in large purchases by the Riksbank of Government bonds.

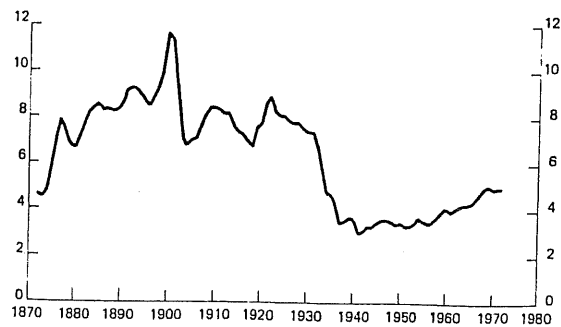
When the empirical definition of the money stock and the monetary base are chosen, the empirical equivalents of the currency-money ratio and reserve-deposit ratio are also obtained. The currency-money ratio thus includes in the numerator the public's holdings of Riksbank notes and in the denominator the total money stock. The reserve-deposit ratio shows the relationship between the commercial banks' holdings of base money in relation to the public's deposits with the commercial banking system. These variables, which are shown in Chart 7, exhibit a number of major fluctuations. The upturn in the currency-money ratio at the beginning of the 1900's is linked with the elimination of private bank notes during the years 1902—1904. (If one includes private bank notes in the numerator of a redefined currency-money ratio, despite the fact that these notes do not constitute base money, a fall in this type of currency-money ratio will be obtained on the other hand, i.e., Riksbank notes were not an entirely perfect substitute for private bank notes since the loss of private bank notes was not wholly replaced by an equally large volume of Riksbank notes.) In the middle of the 1930's a large expansion took place in the currency-money

ratio, which to a large extent was caused by the low return that the banks offered their customers—the holding of money in the form of cash became a more attractive alternative to bank deposits. The marked expansion in 1939 is explained by the concern and uncertainty which existed at the outbreak of war. The continued rise during the war was related, among other things, to the threat of a wealth tax on bank deposits, to the increased mobility of the population owing to mobilization as well as to the occurrence of black-market transactions. All these factors increased the demand for notes in relation to bank deposits.

Following the war a drop in the currency-money ratio is to be expected. No such reduction occurred, however. Instead, the ratio continued to grow until the middle of the 1950's. A number of phenomena responsible for this trend may be indicated: a relatively low return on commercial bank deposits owing to the policy of low rates of interest, the upturn in retail trade after the war, the pattern of payments within industry and commerce. A discussion of the decline in the currency-money ratio after 1957 must in the first place take into account two factors: the rise in the level of nominal rates of interest from this period and the increasing use of cheques and the postal giro system for the payment of goods and services.

Apart from developments during the 1930's and 1940's, the reserve-deposit ratio presents a relatively stable secular pattern. The trend downturn from the 1870's to the 1930's is due, among other things, to the reduced share of the banking system's total liabilities represented by notes; as a result, a relative decline occurred in the banks' demand for base money as reserves, since the structure of deposits took on a more of a time deposit character. When the Riksbank's monopoly of note-issuing was established, the commercial banks received, as compensation

Chart 8. The base money multiplier, 1871—1971



for the loss of their note issue, the opportunity of borrowing on a more regular basis from the Riksbank by means of rediscounting. This right caused a decline in the commercial banks' desired reserve-deposit ratio, *ceteris paribus*.

The strong growth and subsequent decline in the reserve-deposit ratio between 1932 and 1945 has a principal explanation in the level of interest-rates during those years: the banks' returns on expanding their deposits in relation to holding base money as cash reserves were relatively low. Not until the end of the war the reserve-deposit ratio did return to a position corresponding to what may be considered as normal. During the post-war period this ratio has tended to fall and at the end of the 1960's it stood at about 2 %. The public's and the banking sector's reaction pattern can be summarized in the base money multiplier (m), which indicates the relationship between the money stock and the monetary base. In elementary textbooks this multiplier is sometimes assumed to be constant—an increase in the monetary base leading to a growth of the money stock, which corresponds to an expansion in the monetary base multiplied by the value of the multiplier. As a result of this assumption, there is a tendency to neglect the influence exerted by the banking system and the public on the money supply. As will be seen from

Chart 8, the value of the multiplier has, actually, fluctuated between 3 and 12 during the period 1871 to 1971. These fluctuations may appear to be large, but compared with the development of the monetary base, it will be found that changes in the multiplier in the long run have accounted for a relatively small share of the growth of the money stock.

The contribution of the proximate determinants to the growth of the money stock

By expressing the identity (5) in terms of growth rates, the contribution of the three determinants to the growth of the money stock during different periods of Swedish monetary history can be computed. In this way a quantitative assessment can be made of how much the monetary base, the reserve-deposit ratio and the currency-money ratio have contributed to the growth of the money stock, and an idea can thereby be obtained of what factors are most important in a discussion of the long-run development of the Swedish money stock. The result of such an estimate is given in Table 1, which shows the average annual percentage growth of the money stock, the monetary base and its multiplier as well as the relative contributions by the latter two variables to changes in the money stock. The contributions made by the currency-money ratio and the reserve-deposit ratio, which in the secular perspective are small, have been incorporated here in the multiplier. Six periods have been chosen: the entire period 1871—1971, the pre-war period 1871—1913, the interwar period 1919—1938, the post-war period 1946—1971, and both world wars, 1914—1918 and 1939—1945. The striking impression made by Table 1 is the contribution of the monetary base to the growth of the money stock. The expansion in the volume of base money has accounted for the largest contribution to the changes in the money stock during all the periods except for the inter-war period

Table 1. The average growth rate of the money stock (M), the monetary base (B) and the multiplier (m)

Period	Percentage annual growth			Relative percentage contribution in relation to growth of (M) from	
	(M)	(B)	(m)	(B)	(m)
1871—1971	6.0	5.8	0.2	97	3
1871—1913	6.0	4.5	1.5	75	25
1919—1938	-0.4	3.6	-4.0	-900	1 000
1946—1971	7.2	5.8	1.3	81	19
1914—1918	21.5	24.8	-3.3	115	-15
1939—1945	8.2	9.4	-1.2	115	-15

Table 2. Distribution of the growth rates of the monetary base (B) and the multiplier (m), 1871—1971

Percent per year Annual percentage growth (absolute amounts)	of (B) number of times	of (m) number of times
0—2	14	25
2—4	15	23
4—6	24	21
6—8	18	14
>8	29	17
Total	100	100

when changes in the currency-money ratio and the reserve-deposit ratio, as these are reflected in the multiplier, have been responsible for the largest contribution. This can be seen, moreover, from Chart 7, where the currency-money ratio and the reserve-deposit ratio exhibit the largest fluctuations during the 1930's. The inter-war years

form an exception in the sense that the nominal money stock during these years underwent a contraction.

Both war periods exhibit identical patterns. The growth of the money stock and the monetary base lies above the trend values. In addition, the expansion of the monetary base is larger than that of the money stock. Differences in growth rates between these two war periods can, to a large degree, be explained by differences in the formation of monetary policy.

An examination of the cyclical pattern reveals that the multiplier, i.e., the public's and the banking system's reactions, must be allotted a more important role in the determination of the money stock than in the secular perspective. In the short run i.e., from year to year, fluctuations in the reserve-deposit ratio and the currency-money ratio have provided a larger contribution to the growth of the money stock than the monetary base on about 30 occasions during the period 1871—1971. One method of illustrating the contributions of the multiplier and the monetary base to the expansions of the money stock is to estimate the distribution of the growth rates of these two variables in absolute amounts. A calculation of this sort is shown in Table 2, which indicates that the monetary base accounts for a larger share of the contributions exceeding 4 % than the multiplier. However, the latter does provide considerable contributions, although these mostly related to lower rates of growth.

Summary

According to this description, the monetary base has been the proximate determinant which has dominated the long run growth of the Swedish money stock. This is, moreover, a result which corresponds with monetary experience in a number of other countries. In the cyclical

perspective, the contributions of the reserve-deposit ratio and the currency-money ratio are larger than in the long run. However, in the short run, too, the monetary base accounts for a considerable contribution to the fluctuations in the money stock. As a consequence of the above result, efforts should in the first place be concentrated on the behaviour of the Riksbank when investigating the factors which have accounted for the growth of the Swedish money stock, since the Riksbank has had the primary influence and control of the monetary base in the period 1871—1971.

Comments on the charts

All the charts and tables are based on end of month data except for a small number of aggregates during the first half of the 1870's for

which minor approximations have been made. A more detailed description of the data material is provided in a study of the Swedish money stock which is at present in preparation.

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