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ECONOMETRIC STUDIES ON THE DEMAND FOR AND THE SUPPLY OF MONEY IN FINLAND: A SURVEY

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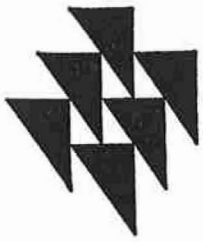

A b s t r a c t - R é s u m e

ECONOMETRIC STUDIES ON THE DEMAND FOR AND THE SUPPLY OF MONEY IN FINLAND: A SURVEY

The purpose of the paper is to summarize and evaluate the major findings of practically all the empirical studies on the demand for and the supply of money done in Finland up to the beginning of 1979. As regards the demand for money the issues to be addressed are: (i) the definition of money; (ii) scale elasticities; (iii) interest and inflation elasticities; (iv) the role of credit rationing; and (v) the speed of adjustment. As regards the supply of money two different approaches were distinguished: (i) the traditional money multiplier approach and (ii) the availability-of-credit approach.

ETUDES ECONOMETRIQUES SUR LA DEMANDE ET L'OFFRE DE MONNAIE EN FINLANDE: UNE VUE GENERALE

Let but de cet article est de résumer et d'évaluer les découvertes principales comprises dans presque toutes les études faites sur la demande et l'offre de monnaie en Finland jusqu'au début de l'année 1979. En ce qui concerne la demande de monnaie les sujets abordés sont (i) la définition de monnaie (ii) les élasticités des échelles (iii) les élasticités de l'intérêt et de l'inflation (iv) le role du rationnement du crédit et (v) la vitesse d'ajustement, En ce qui concerne l'offre de monnaie nous avons distingué deux traditions différentes: (i) l'approche traditionelle du multiplicateur de monnaie et (ii) l'approche de la disponibilité du credit.

ECONOMETRIC STUDIES ON THE DEMAND FOR AND THE SUPPLY OF MONEY IN FINLAND: A SURVEY

by

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1 - INTRODUCTION

Since the mid-1950's, the demand for money function has been one of the most intensively estimated relationships in empirical macroeconomics. Despite the continuing controversy about the role of money in the economy, there is now wide agreement about the general properties of the demand-for-money function: its arguments should include income or wealth as the constraint and one or more interest rates to stand for the opportunity cost of holding money.

There are far fewer econometric studies on the supply of money and the specification of the models varies considerably from country to country and even within a single country. One obvious reason for this is the fact that the money supply process is highly dependent on the institutional arrangements by which the base money is injected into the economy.

Even though in Finland monetary aggregates have never played a role of any note in the formulation of monetary policy, a number of econometric studies on the demand for money have appeared since the mid-1960s. In section 2 an attempt is made to summarize and evaluate the major findings of these studies. Section 3 is devoted to those few empirical studies which are directly related to the money supply process in Finland.

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2 - THE DEMAND FOR MONEY

2.1. Definition of Money

Monetary econometrics in Finland can be said to have started in 1959 with LARNA's study on the money supply, money flows and domestic product in Finland. This study was a reflection of the revival of interest in the quantity theory of money which had occured in the USA a few years earlier. Although Larna was aware of the importance of the demand-for-money function, he did not employ this as a point of departure for the development of empirical hypotheses. Instead he chose a rather empiricist approach explaining domestic product by means of the money supply and money flows. This study, however, remains a useful source of reference, in particular for its thorough discussion of the definition of money in Finland as well as for the carefully compiled data on the money supply, its components and money flows over the period 1910-1956.

As simple and by conventional statistical standards stable demand for money functions have been estimated for different monetary aggregates as well as for their individual components, there is no conclusive empirical evidence for regarding one aggregate or component as more appropriate than any other.

The individual components which have comprised the various aggregates are: C = currency in the hands of the public; D = demand deposits of the public; U = unused overdraft facilities; TS = savings accounts; TT = term deposits; TI = indexed deposits. The official definition of the money supply as published in the Bank of Finland Monthly Bulletin and International Financial Statistics is M1 = C + D. The official definition for 'quasi money' includes all time deposits (T = TS + TT - TI) of the public at all banking institutions. As savings banks, cooperative banks and the Post Office Bank provide exactly the same assortment of deposits (including demand deposits)

and pay the same interest on them as the commercial banks, there is no reason to distinguish between deposits at different banking institutions.

Though M2 = M1 + T is a relatively well defined aggregate corresponding to the broad aggregate used in many other countries a case can be made for the redefinition of the narrow aggregate. In many other countries demand deposits are widely used also by households as transaction balances, whereas in Finland they are almost entirely held by firms. On the other hand, savings accounts are highly liquid and used extensively as a means of payments. Most wages and salaries are paid into them, and even cheques can be drawn on some forms of them. Therefore an aggregate including C, D and TS would be a closer counterpart to the narrowly defined aggregate used in other countries than the official M1 = C + D. This aggregate has been used only in one study, RANTALA (1976).

The inclusion of unused overdraft facilities in the definition of money was strongly advocated by LARNA (1959, p. 31-34). Of all the studies only KANNIAINEN (1976, 1979) has included this component in his definition of the money balances held by firms.

In most studies the demand for money function has been estimated in real terms, i.e. the dependent money stock variable as well as the scale variable have been deflated by the price level. The exceptions are LEPONIEMI (1966, 1967), PUNTILA (1969), BANK OF FINLAND (1972) and POHJOLA (1974). In only one study have money balances been deflated by population (SUVANTO, 1976).

Most equations have been specified in a log-linear form the major exceptions being the studies related to the Quarterly Model of the Bank of Finland (BANK OF FINLAND, 1972; POHJOLA, 1974; RANTALA, 1976). LEPONIEMI (1967) compared log-linear and linear additive specifications and the results clearly showed the superiority of the log-linear specification.

2.2. Scale Elasticities

As far as scale elasticities are concerned the results of the four early studies of the 1960's show strikingly uniform results despite the considerable variation in specifications, somewhat different time periods and even different scale variables. For M1 and its components, C and D, the long-run income elasticity estimates lay between 0.7 and 0.8, and for M2 and T this elasticity was around 1.2. (PUNTILA, 1965, 1969; LEPONIEMI, 1966, 1967). It is interesting that long-run scale elasticities of the same order of magnitude have been found in later studies. Thus it seems that a relatively reliable range can be assessed for the income elasticity of the demand for narrow money and for its components at least as far as the postwar period until the beginning of the 1970's is concerned. The elasticity estimates are generally below unity implying the economies of scale in holding transactions balances. Some doubts, however, are raised by the results of the most recent study (KANNIAINEN, 1979) which shows that the income elasticity estimate may depend on whether the equation is estimated in levels or in differences and on the assumptions made about the residual term.

The majority of studies have found the income elasticity of the demand for broad money and its major component, time deposits, to be slightly above unity, the exceptions being RANTALA (1976) and SUVANTO (1976). Rantala used real M1 + TS as the dependent variable and the real disposable income as the constraint and obtained a long-run income elasticity of 0.85. Suvanto tested the permanent income hypothesis with annual data for both the interwar period, 1920-1939, and the postwar period, 1948-1970. The demand for nominal money was assumed to be homogeneous with respect to both the price level and population. The permanent income elasticity of the demand for M2 was around 1.6 both in the interwar and the postwar period. The high income elasticity may be partly explained by the permanent income concept used and partly by

the fact that the share of the government sector was excluded form the income concept. The results clearly supported the permanent income hypothesis in the case of M2 whereas in the case of M1 the measured income was an appropriate constraint.

2.3. Interest and Inflation Elasticities

Finland is one of those countries lacking well developed money and capital markets. As a consequence there are no obvious candidates to serve as a measure for the opportunity cost of holding money, except perhaps the rate of return on real assets. However, if one chooses to define money narrowly then the rate of return on 'near moneys', i.e. time deposits of various types, should be an appropriate candidate (cf. FEIGE and PEARCE, 1977). This has been attempted in a number of studies, with seemingly positive results in general.

In interpreting these findings it should be borne in mind that deposit rates have been fixed adiministratively since the early 1930's. Changes in them have been infrequent and generally very small. For example, the interest rate on ordinary savings accounts remained constant over the ten year period 1959-1968. However, the greatest problem in the interpretation of the interest elasticity estimates is created from the fact that all studies using the time deposit rate in the demand-for-money equation have defined it as a weighted average of interest rates on all kinds of time deposits, including the inflation compensations paid on indexed deposits. As a consequence the estimated interest elasticities reflect many kinds of behaviour such as shifts in the liquid assets portfolio induced by the introduction of new savings instruments (indexed deposits and term deposits with longer maturities), transfers of funds from other types of deposits into indexed deposits and other real assets in periods of rising inflationary expectations, and finally the substitution proper between M1 and time deposits due to an exogenous change

in the time deposit rate. It may well be that the first two effects dominate the last one. That this may have indeed been the case is supported by the fact that the time deposit rate has frequently received a negative coefficient also in the equations explaining the demand for time deposits and M2.

LEPONIEMI (1967) used the government bond rate in explaining the demand for nominal D + T. Since the bond rate was calculated as a weighted average of nominal rates (at the time of issue) and also included the compensations paid on indexed bonds, the same ambiquity of interpretation also arises in this case.

In his study on the demand for money (D + U) by firms, KANNIAINEN (1976, 1979) used a foreign interest rate as an explanatory variable. The coefficients, though with a correct sign, were generally insignificant.

TEIGEN (1971) estimated the demand for money in Norway using dummy variables representing the introduction of new savings instruments to stand for the opportunity cost of holding money. The hypothesis was that the introduction of new instruments which are less liquid but offer a higher return is equivalent to an increase in the opportunity cost of holding money. Teigen's own results lent strong support for this hypothesis.

SUVANTO (1973) carried out similar experiments with the Finnish data and found that of a number of dummies employed only those representing the introduction and the abolishment of indexed deposits were significant. Later KANNIAINEN (1976, 1979) used the same indexation dummies in his equations for the demand for money by firms.

Once again the true meaning of the coefficients of the indexation dummies is ambiquous. Probably they only give indirect evidence about the effect of inflationary expectations on the demand for money rather than on the substitutability of assets as hypothesized by Teigen. Justification for this conclusion is provided by a casual glance at the historical evidence. When indexed deposits were first introduced in 1957, inflationary expectations

were rising, and when the banks finished taking deposits which provided 100 per cent compensation, it was because the public had lost interest in them. Similarly, when indexed deposits with 100 per cent compensation were reintroduced, it was again a time of rising inflationary expectations. Indexed deposits together with the most other forms of indexation were abolished in 1968 when it was generally felt that the comprehensive system of indexation then in existence posed a threat to the stability of the economy.

After these comments it is worth seeing what kind of direct evidence on the sensitivity of the demand for money with respect to the rate of inflation or inflationary expectations is available.

Most studies which have addressed this issue explicitly have obtained significantly negative coefficients for the rate of inflation in the demand-for-money functions, the notable exception being KANNIAINEN (1976, 1979). Again, the estimates for the long-run inflation elasticity are strikingly similar in different studies despite the marked diversity in specifications. The long-run inflation elasticities vary between -0.01 and -0.06 for the narrow definition of money and its components, and between -0.06 and -0.10 for the broader definition of money and time deposits.

KANNIAINEN (1978) is an interesting study, because it compared two different specifications for the partial adjustment process, one in terms of real balances and the other in terms of nominal balances (cf. GOLDFELD, 1976, p. 691). His results provided some evidence for the proposition that if the adjustment of nominal balances is a correct specification but the estimation is carried out with a (misspecified) model assuming the adjustment of real balances then the estimates for the inflation elasticity will be biased upwards.

2.4. The Role of Credit Rationing

As emphasized by BINGHAM and KUKKONEN (1980) the availability of credit, and hence credit rationing, is the most important issue in the formulation of monetary policy in Finland. If the demand for money has any significance in characterizing the behaviour of the public in Finland then the sensitivity of the demand for money with respect to the degree of credit rationing, or the 'tightness' of the money market, should be an important subject for empirical research.

In his study on the demand for money (D + U) by firms KANNIAINEN (1976, 1979) used a proxy for credit rationing as an additional explanatory variable together with real income, current inflation, indexation dummies and the lagged money stock. The coefficients for the credit rationing proxy were negative and generally highly significant.

Apart from the problem of the definition of the credit rationing proxy, another problem is posed by the interpretation of these results. Kanniainen assumed that the degree of credit rationing does not directly affect the desired real balances. Instead he formulated a flexible adjustment mechanism allowing the degree of credit rationing to affect both the adjustment cost and the cost of being out of equilibrium. In particular, he postulated that the cost of adjustment increases relative to the out-of-equilibrium cost during the periods of increasing 'tightness'. Formally his model would imply the dependence of all short-run elasticities as well as of the constant term on the degree of credit rationing. For example, short-run income elasticity should decrease together with increasing 'tightness', which has important implications as regards the relative efficiency of monetary and fiscal policies.

In the empirical application, however, Kanniainen made a convenient linearization which made only the constant term dependent on the degree of credit rationing, i.e. the proxy for credit rationing appeared as an additional

additive term in the final equation. This specification is indistinguishable from the specification in which the 'tightness' directly affects the desired real balances towards which the actual balances gradually adjust according to the conventional partial adjustment formula (cf. WONG, 1977).

2.5. The Speed of Adjustment

The most commonly estimated demand for money equation, at least in studies using quarterly data, is that which incorporates the partial adjustment mechanism in the form of a lagged dependent variable. The coefficient of this variable subtracted from unity is interpreted to represent the speed of adjustment. Thus it is an important parameter of the model. In Finland LEPONIEMI (1966, 1967) was the first to use this conventional specification (even though he did not give it the partial adjustment interpretation). The estimates for the speed of adjustment which can be calculated from Leponiemi's results are very close to those found in later studies (SUVANTO, 1973; KANNIAINEN, 1976, 1978 , 1979). i.e. 0.3-0.4 for the components of narrow money and 0.1-0.2 for time deposits (quarterly data). As far as narrow money is concerned, these figures are comparable to estimates obtained in other countries.

In many respects RANTALA (1976) is the most interesting study on substitution relationships between different assets (savings accounts, term deposits, government bonds and equities). In the theoretical part it claims to be an explicit application of portfolio theory. In the empirical part, however, estimation is done in terms of flows, i.e. changes in real financial assets are explained by the level of real disposable income, the levels of interest rates and the rate of inflation. This is rationalized by the assumption that the adjustment is infinitely slow in Finland because of the lack of well developed secondary markets for securities. If this were actually

the case then all short-run coefficients should be zero; in fact they are not. Therefore this specification requires a theoretical justification other than portfolio theory with exteremely slow adjustment.[1]

In fact Rantala also estimated his equations in the partial adjustment form, i.e. with the lagged money stock among the explanatory variables. The estimated speed of adjustment of time deposits was indeed close to zero. Two features of Rantala's model may explain this result. First, he specified his equations in a linear additive form while LEPONIEMI (1967) had shown that a log-linear specification is superior to the linear one. Secondly, he used measured real disposable income as the constraint while SUVANTO (1976) had shown that permanent income (wealth) was clearly superior in the case of broad money.

3 - THE SUPPLY OF MONEY

3.1. Traditional Approaches

The first econometric study on the supply of money in Finland was carried out by LEPONIEMI (1966). He formulated a traditional money multiplier models based on the notion of the 'potential money supply' which in turn was derived from the required reserve-deposit ratio. In the Finnish system, however, the formal 'cash reserve requirements' have a rather unconventional meaning which has relatively little to do with the actual liquidity management of the banks. In Finland the banks do not normally hold positive net reserves (different from formally required 'cash reserves') but instead adjust their liquidity borrowing from the central bank. This aspect was not taken into account in Leponiemi's first study.

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1) Some recent theoretical work suggests that the 'flow of funds approach' may be relevant after all, see AKERLOF (1978, 1979). See also an empirical study by POLLAN (1978).

In the later study LEPONIEMI (1967) altered his approach in this respect. He estimated a small monetary model including the demand for money (by components), the supply of credit (stock) by the banks, the equation for the central bank debt, and the consumption and investment functions constituting the real side of the model together with the national income identities. The links between the real and the monetary side were the supply of credit by banks affecting investment demand and the presence of currency and bank deposits in the consumption function. Even though the results were satisfactory by statistical standards their interpretation is not easy due to the insignificance or wrong signs of some central variables and the fact that the balance sheet constraints of the banking sector were not formally respected. A sympathetic interpretation could, however, be as follows. The optimal amount of central bank debt depends on the lending rate and the cost of the debt whereas the actual debt can change in the short run in response to the monetary effects of the balance of payments. Supply of credit adjusts slowly to the optimal level given the (expected) stock of deposits and the amount of central bank debt. On the basis of this interpretation one can calculate the speed of adjustment of bank loans for the period 1958-65. This parameter is about 0.4 (quarterly data), which is, interestingly enough, very close to the figures obtained by OKSANEN (1977) ten years later.

Following certain foreign examples, SÖDERLUND (1977) estimated the relative contributions of various proximate determinants of the money supply on the rate of growth of the stock of money in Finland in 1952-60 and 1961-72. He found that the monetary base had made a dominant contribution when an unadjusted base was used. Serious problems arose, however, when adjusted base concepts, such as the gross base minus the central bank dept of the banks and this difference minus the net foreign debt of the banks, were used. In the latter case the adjusted base received negative values for some years making the calculated contributions largely meaningless.

The conclusion is that, while the mechanical money supply equation may prove useful in characterizing certain structural aspects of the monetary growth in Finland in different periods, it is of little use for monetary policy purposes. Rather, one has to look behind the balance sheet identities and the definitional allocation parameters and study the behaviour of banks in more detail.

3.2. Availability of Credit

An early non-econometric study worth mentioning in this context is LASSILA (1966). He developed an explicit model to analyze the credit expansion process under the institutional cirumstances characteristic of Finland, where the commercial banks are in virtually permanent debt to the central bank and where lending and deposit rates are administratively fixed. The model was based on the 'availability-of-credit approach'. The banks rather passively accomodate the flow demand for loans, the sources of funds being the flow of new deposits, the balance of payments surplus and the increase in the central bank debt of the banks as a residual item. The passivity of banks follows from the 'normal profits' assumption and from the fixity of the interest rates.

The same basic philosophy is also adopted in the financial block of the quarterly econometric model of the Bank of Finland (BANK OF FINLAND, 1972). The basic link between the financial side and the real side of the economy is the 'availability of credit' or the 'degree of credit rationing', defined as the ratio of the central bank debt of the banks to the stock of the central bank debt.[2] This affects the investment demand which in turn affects the demand for new loans and hence feeds back to the 'degree of credit rationing'.

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2) In the later version the actual level of central bank debt has been replaced by the 'normal level' depending on the terms of the debt, see BINGHAM and KUKKONEN (1980).

3.3. Bank Liquidity and Lending

OKSANEN (1974, 1977) was critical of the 'normal profits' assumption as the characterization of the behaviour of the banks. Instead he postulated profit maximizing banks and from this assumption derived the optimal amount of central bank debt.

A profit maximizing bank will choose to borrow from the central bank as long as the marginal revenue of extending credit exceeds the marginal cost of borrowing. The marginal cost depends on the terms of borrowing and on the actual amount borrowed. In the Finnish system the marginal cost will eventually grow as the amount borrowed increases because an increasing penalty rate is charged on the total debt when it exceeds the quota assigned to each individual bank. The marginal revenue, on the other hand, depends on the fixed lending rate and on a number of structural factors which determine the size of the credit multiplier of an individual bank (market share, customer relationships etc.). In equilibrium the marginal cost is equal to the marginal revenue, which gives the optimal amount of central bank debt given the terms of borrowing, the lending rate and the structural factors.

Through a rather complicated procedure Oksanen succeeded in constructing data on optimal central bank borrowing for three banking groups (commercial banks, savings banks and cooperative banks).

The next empirical problem was to estimate the speed of adjustment of the central bank debt towards the optimal level assuming that the burden of adjustment falls completely on lending. For this a dynamic model, based on the analysis of MODIGLIANI, RASCHE and COOPER (1970), was formulated. The estimated speed of adjustment was between 0.2-0.3 (quarterly data) for commercial banks implying that approximately one fourth of the gap can be closed within a quarter of a year and about 70 per cent within a year. For savings and cooperative banks the estimated speed of adjustment was two to three times higher.

In an aggregative context this line of reasoning leads to a money supply process which is very similar to standard textbook analysis (cf. BRANSON, 1979, p. 271-276). Let us write the balance sheets of the central bank and the banks as follows:

$$\text{central bank} \quad RC + DC + BC^* = CP + (CB + BC^* - BC) \tag{1}$$

$$\text{banks} \quad RB + DB + (CB + BC^* - BC) = D + BC^* \tag{2}$$

where RC = net foreign assets of the central bank, DC = net claims on the domestic nonbank sector of the central bank, BC* = optimal amount of central bank debt of the banks, BC = actual amount of central bank debt, CP = currency in the hands of the public, CB = currency of the banks (working balances for daily transactions) and eventual cash reserve deposits at the central bank, RB = net foreign assets of the banks, DB = loans to the public, D = deposits of the public. Now define the money supply as M = CP + D, the currency-money ratio of the public as c = CP/M and the reserve-deposit ratio of the banks as h = CB/D. From these definitions the following money supply equation can be derived:

$$M^S = \frac{1}{1-(1-c)(1-h)} \; CAA - \frac{1}{1-(1-c)(1-h)} \; (BC^* - BC) \tag{3}$$

where CAA = RC + DC + BC* has the same meaning as unborrowed reserves and (BC* - BC) has the same meaning as net free reserves (cf. OKSANEN, 1974). By changing the claims on the domestic nonbank sector, the central bank affects BC (analogous to the effect of an open market operation on free reserves) and by changing the terms of borrowing, the central bank affects BC* (analogous to the effects of a change in the discount rate on free reserves). In both cases monetary impulses are transmitted through changes in (BC* - BC). Unless fully sterilized by changes in DC or BC*, the monetary effects of the balance of payments surplus or deficit are also transmitted through changes in BC and hence in (BC* - BC).

4 - FINAL REMARKS

This survey has covered practically all the empirical studies on the demand for and the supply of money done in Finland up to the beginning of 1979.

There are no apparent contradiction between the results of different studies on the demand for money despite considerable variation in specifications and estimation periods. It seems that later investigators have not always appreciated the findings of the earlier studies, which means, among other things, some loss in 'economies of scale' as regards the research on the demand for money.

Comparison between the results concerning the supply of money cannot be made without reference to a wider framework. The fact is that different studies, based on different approaches, lead to somewhat contradictory implications as regards the efficacy of monetary policy. Therefore further research is required.

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