Credibility models of Central Bank independence and the case of Turkey

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Abstract

In this paper, we argue that the standard models of central banking, which lie at the heart of the theory of monetary policy, omit important features of the modern world. We focus upon two absences: an international dimension that properly reflects "globalisation" of finance; and endogeneity of the money supply. We summarise the existing paradigm of the theory of monetary policy, followed by a discussion of its limitations in a world marked by global financial markets, and then consider the relevance of the theories of endogenous money supply. Finally, we find empirical evidence supporting the structuralist version of money supply endogeneity for Turkey.

1. Introduction

The theory of monetary policy has, since the 1980s, developed within a thoroughly modern paradigm, but in a historical perspective it is at the latest stage of an old debate. There are a number of candidates for its starting point. For some, today's literature may be seen as the full maturity of the Chicago case for a monetary rule, whose terms were set out in 1936 by Henry Simons. Within a longer perspective, it may be seen as another staging post on the long road monetary theory has travelled since the birth of economics, a road defined originally by the early nineteenth century debates between the currency and banking schools. Today, the case for rules or discretion ("authority") employs the modern concepts of rational expectations, credibility, commitment, and time (in)consistency. But is it an appropriate framework? Has the modernity of theory been gained at the expense of losing touch with the actually existing modern world?
In this paper we argue that the standard models of central banking, which lie at the heart of the theory of monetary policy, do, indeed, omit important features of the modern world. We focus upon two absences: an international dimension that properly reflects ‘globalisation’ of finance; and endogeneity of the money supply. Although the models’ simplicity is a virtue, enabling them to generate powerful results, their framework of purely national (rather than global) markets and a vertical money supply curve severely limits their applicability. The models’ standard concept of credibility illustrates those points. The models assume that credence refers to the perceptions of employers and workers and their impact on the labour market: but central bankers actually pay attention - arguably much greater attention - to their credibility in the eyes of international financial markets. And while credibility is defined in terms of the central bank’s actions on policy instruments, assuming that policy is immediately translated into changes in money supply, in actual economies the credibility of those instruments themselves is equally relevant: do rational agents believe the money supply is wholly determined by central bank policy instruments?

In the following section we summarize the existing paradigm. In Section 3 we discuss its limitations in a world marked by global financial markets, and in Section 4 we consider the relevance of theories of endogenous money supply. Section 5 presents empirical evidence, which supports the structuralist version of money supply endogeneity for Turkey. Section 6 concludes.

2. The existing paradigm

The existing paradigm of the theory of monetary policy has the central bank’s credibility at its center. The central result, in a world of rational expectations and no information asymmetries, is that discretionary monetary policy has an inflationary bias. That bias can only be eliminated, with a consequent gain in social welfare, if the central bank is pre-committed to strictly tying monetary expansion to a rule. The inflationary bias of discretionary policy exists because central bank announcements are not credible. Here lack of credibility is identical with dynamic inconsistency. If the central bank announces a zero inflation policy, then the public, with perfect information including information about the bank’s objective function, rationally expects the bank to adopt a different, surprise policy to expand employment once inflation expectations have been formed, and therefore determines its actions on those fully informed expectations. Dynamic inconsistency means that the bank’s announced policy is not credible. Extensions to the model, permitting asymmetric information, uncertainty in
the minds of the public, and sophisticated strategies in the central bank/public game lead to related results, but rather than credibility being simply present or absent, it is a function of reputation, influenced by central bank actions and a variety of institutional arrangements. The rationale for worldwide moves toward central bank independence, for the appointment of central bank governors with 'conservative' reputations, and for contractual or constitutional rules regulating relations between government and central bank is located in models of credibility-increasing institutional arrangements.

Who is the public in this model, and what types of actions by the public are in play? The agents around which the model revolves are workers and employers and their critical actions occur in negotiating wages in the labour market. Specifically, they negotiate the nominal wages that will obtain over a period in an attempt to attain an optimum real wage over that period; thus, their negotiations reflect expected inflation over the period and, hence, the credibility of central bank policy announcements. Central bank credibility, therefore, is credibility in the eyes of labour market actors. If the bank lacks credibility, nominal wage settlements will rise faster than otherwise and, given technology and the degree of monopoly, that rate of wage inflation will be reflected in a higher rate of price inflation.

The model’s focus on credibility in the labour market can also be seen in their assumption about the central bank’s objective or loss function. Its two variables are inflation and unemployment, and both are determined in the labour market. With given inflation expectations in the labour market, a short-run Phillips curve would exist apparently offering a trade-off between inflation and unemployment. If the Central Bank announces a policy (for example, of ‘zero inflation’) it would not be credible to workers and employers because they know that dynamic inconsistency exists. That is, if the expectation of zero inflation were held, the bank would then seek to maximise its objective function (minimise loss) by raising inflation and reducing unemployment below its ‘natural rate’ to attain a point on that short-run Phillips curve where it is tangent to an indifference curve of the objective function. Knowing that, nominal wage negotiations in fact generate a higher inflation rate. Thus, the driving force for the inflationary bias of discretionary monetary policy is lack of central bank credibility in the eyes of labour market actors.

Since that basic model became established, the theory of central banking has developed within a political economy framework. In it, a key additional player is the elected political authority ('government'), for, as Waller and Walsh (1996) put it, such models address “the continual tensions between the Federal Reserve and the US Congress as well as the ... worldwide moves toward redesigning central banking institutions”. Fratianni, von Hagen, and
Waller (1997), for example, examine a variety of institutional arrangements as outcomes of the desire to solve a political principal-agent problem. The public (principal) finds that the central bank (agent) operates suboptimally because its ties to the government, whose objectives are re-election, affect its credibility. The effects of a variety of institutional arrangements are examined, with independence or performance contracts having the best effect. Similarly, Waller and Walsh (1996) examine optimal institutional arrangements in the form of the length of term of the central banker's appointment and the principle of appointing a conservative central banker, showing that long term lengths may be too costly if society's preferences permanently shift. However, the political economy models of optimal institutional design, with inflation and unemployment in the objective or social welfare function, are also driven by labour market reactions, and credibility perceived in the labour market.

Cukierman (1995) develops a political economy framework as a positive theory oriented toward explaining the existence of inflationary monetary policy and goes beyond a simple inflation-unemployment objective function. Recognising that actual central banks both historically and today have a number of roles, his model includes revenue-raising for the state (seigniorage), stabilisation of the banking system and financial markets, and balance of payments objectives, as well as domestic macroeconomic responsibilities (inflation-unemployment) among them. Thus, monetary expansion and inflation might arise either from the standard inflationary bias and credibility problems, or from attempts to optimise the state's revenue from seigniorage, or from short term interest rate smoothing in pursuit of financial stabilisation, or for balance of payments reasons. As we suggest in the following section, that perspective increases the model's applicability to existing central banks, but misses important aspects.

A more thoroughgoing attempt to go beyond the labour market orientation of central bank models, is Epstein's construction of a model (Epstein, 1994) in which the structural characteristics of the labour market are integrated with other structural features of the economy to explain the determinants of monetary policy. In that case the underlying research programme is, unusually, a puzzle over the absence of expansionary monetary policy (Epstein 1993). In his 1994 model, which is seminal within the structural economics paradigm, Epstein demonstrates how the interaction between four structural features can determine monetary policy: in addition to the structure of the labour market they are the relation between the central bank and the state, the connection between the industrial and financial sectors, and the economy's position in the world economy.
3. Limitations of the existing paradigm

The basic model of central banking, which revolves around monetary policy's credibility in the labour market has an unduly restrictive focus. In reality, whatever the relevance of monetary policy for labour market outcomes, monetary policy is conditioned by central bank credibility in other markets. In particular, money market rates, bond yields, equity returns, and foreign exchange rates are highly sensitive to the credibility of the central bank. Consequently, the design of central banking arrangements, such as independence, or the installation of a 'conservative' central banker, is driven to a large extent by the need to win credibility in financial and foreign exchange markets. Similarly, the actions of central banks are frequently designed to strengthen the bank's reputation in those markets. Arguably, credibility and reputation in those markets has been the dominant force in modern central banking. But the basic model, with its restricted concept of credibility, is unable to engage with that reality, and the political economy models such as Cukierman's and Epstein's, which do introduce the central bank's concern for financial markets, do not include a developed concept of central bank credibility in those markets.

Any attempt to introduce into our models the central bank's relationship to financial and foreign exchange markets immediately exposes another limitation of the existing models, for they define central banks in terms of their national boundaries while in reality financial markets are increasingly global. That discrepancy is a serious problem for the applicability of central banking models, and requires some consideration at this stage.

The difference between a model defined in terms of national boundaries and a globalized world is not the same as the distinction between a closed and an open economy.

Models such as Cukierman's, which includes a 'balance of payments motive' for monetary policy, and Epstein's are both open economy models, but they remain 'national economy' models. Open economy models treat international finance as flows between nation states; residents of the country or another country move their own or their principals' funds between financial markets located in the country and financial markets elsewhere. And those choices of residents are reflected in balance of payments accounts.

The notion that financial markets are globalized is rather different. It implies that financial markets have no national identity, and the flows between them are similarly without citizenship. The interest rates on a particular country's paper, or the country's exchange rate, may be determined in offshore markets located anywhere in the world and, according to the concept of
globalization, the physical location of those markets in a particular country does not detract from their global character; the eurodollar markets in London in the 1970s, for example, were quite independent from conditions in the UK economy, having a global role that was an early form of today's globalization. Similarly, in a globalized economy, important financial flows as well as financial markets lack national identities. They consist of global funds, such as hedge funds, rather than portfolios easily identified with residents of particular countries.

It would be wrong to claim that the world economy is fully characterized by globalization and the concept itself is open to criticism, but it describes a rising trend along which financial markets and flows are arguably more advanced than others. To that extent models of central banking would be strengthened if, instead of being constructed in terms of national boundaries, they were able to recognize central banks' roles in those markets.

Having had a key role in the creation of more global markets — especially through liberalization of foreign exchange and financial markets and the shift from extensive control over bank assets to capital adequacy controls — a driving force behind central bank design and monetary policy is the high priority to be given to credibility in respect of those markets.

Placing matters in that context highlights a further weakness in the existing models of central bank design. All consider purely domestic devices for increasing the credibility of monetary policy, but in reality the world of global markets both requires and delivers new forms of international devices to bolster credibility. Weak central banks have their policy credibility in global markets strengthened by publicly subordinating it to a program agreed with the International Monetary Fund, or by linking their currency to a strong central bank's through a variety of currency board-type arrangements. And even well-established central banks may seek to strengthen their policy's credibility in global markets by adhering to an exchange rate bloc or currency union.

4. The theory of endogenous money supply: Its relevance for monetary policy

In addition to the weaknesses already identified in central banking models' concept of credibility, a rather different problem exists. Instead of problems concerning the markets affected by the credibility of the bank's intentions (whether they are labour markets, other 'national' markets, or global markets) we now draw attention to credibility concerning the central bank's ability to
implement its policy. The theory of endogenous money supply attempts to capture the idea that the central bank has no control over money supply. However there are several alternative models of money supply endogeneity. In this section we review the arguments and advance a structuralist version. In the following section we outline empirical evidence relating to endogeneity in one case study of the Turkish economy.

A basic notion underlying money supply endogeneity is that the demand for money creates its own supply. Banks create credit money whenever they extend loans. They hold cash reserves to maintain the convertibility of credit money into liquid form. This is how bank or credit money retains its moneyness and general acceptability as a means of payment. Since money is accepted as the means for settlement of debt it can never be in “excess supply”. An increase in the supply of money will always be demanded. Fiat and credit money is created whenever central bank or commercial banks purchase assets and issue their own monetary liabilities in exchange. Supply and demand relationships for credit money are interdependent.

Supply of credit money responds to changes in the demand for bank credit. The supply of credit money is governed by the amount of credit granted by banking institutions. Modern commercial banks are price-setters and quantity-takers in both their retail deposit and loan markets. It follows that the total quantity of money is both credit-driven and demand-determined.

Commercial banks extend credit with a margin upon the central bank rate of interest and they are price- and quantity-takers. Banks lend first, look for reserves later. Central banks (CBs) are ready to provide reserves at the existing rate. Loans make deposits and deposits make reserves. If the central bank does not fully accommodate increases in the demand for money, then shifts in velocity will trigger movements in interest rates. As a result, shifts in the velocity function itself will be induced by financial innovations.

But that basic notion should not disguise the existence of two schools of thought on endogenous money.

The first argues that whenever economic units desire to increase their money balance they will always be able to do so at some price. The price is set by the CB as the ultimate supplier of fiat money. Hence CB behavior, with its emphasis on targeting and administering the level of short term interest rates rather than quantitatively targeting money stock aggregate, is not a special case but a logical necessity arising from the nature of money and finance in all modern credit money economies. Within this paradigm, the CB chooses to peg the interest rate, therefore the money supply curve is horizontal at that rate and the supply of money is endogenous or demand-determined. The CB could exercise its control through open market operations (OMO) by setting short
term rates over federal fund rates for banks' private market and reserve borrowing. Once the CB sets the discount rate, other rates will follow suit. The most notable defender of this position is Basil Moore who, in his book *Horizontalists and Verticalists* (1988), uses the horizontal money supply curve to distinguish between the endogenous and exogenous concepts of money supply determination. Amongst the leading proponents of the horizontalist view are Kaldor (1982), Kaldor and Trevithick (1981), and Weintraub (1978).

However, the horizontalist view is challenged by writers like Rousseas (1986), Pollin (1991), Palley (1991), and Arestis and Howells (1996), on theoretical and empirical grounds; they propose other concepts of endogeneity. Pollin (1988), following Holmes' “banks extend credit, creating deposits in the process, and look for reserves later” (1969, p.73), argues that the process of “looking for reserves later” is problematic in the horizontalist view, which he calls accommodative money supply endogeneity.

According to Pollin, CB efforts to control the growth of non-borrowed reserves through open market sales introduce quantity constraints on reserve availability, thus discount window borrowing is not a close substitute for open market operations. Therefore, when CBs choose to restrict the growth of non-borrowed reserves, commercial banks generate reserves within the financial structure itself through innovative liability management practices such as borrowing in the federal funds, Eurodollar and CD markets.

Let us place those various arguments in the context of a wider discussion of the respective roles of CBs and commercial banks in capitalist economies.

One of the dominant characteristics of the modern world of economics is the existence of credit money, which is related to modern production and speculation. CBs operate within this inherently unstable system under conditions of uncertainty. In this world firms, to cope with uncertainty, are able to invent various means of financing such as hedge, speculative and Ponzi. Firms also enter into contracts with each other and financial institutions. If the system evolves towards a crisis, these contracts are upheld preventing a systemic breakdown. Stability expectations require contract-enforcing institutions, and, in addition, the CB intervenes through its lender of last resort powers to abort the development of economic crisis by providing necessary liquidity to prevent collapse.

According to the accommodative view of endogenous money supply, the CB in its role as ultimate liquidity provider plays a crucial role of controlling the quantity and price of net inflow of funds into the wholesale markets. Depending on the extent to which it supplies funds to the wholesale markets relative to the wholesale markets' net demand for funds, the CB is able to raise or lower general short term wholesale interest rates. By far the bulk of the
CB’s OMOs involve continuously injecting into or withdrawing funds from the wholesale markets defensively in response to changes in net inflow and outflows of funds so as to maintain the depth and liquidity of the financial markets. CBs do not have it in their power not to accommodate; that is, to constrain the supply of credit money quantitatively. All CBs can do is to set the price and terms at which they supply fiat money on demand to the financial system.

In contrast to the accommodative view that CBs can essentially determine their behavior especially for short term interest rates, structuralists believe that CB efforts to restrict the growth of non-borrowed reserves will impose significant quantity constraints on total reserves. They do not accept the view that discount window borrowing is a close substitute for non-borrowed reserves. Furthermore, CBs do not necessarily pursue a policy of fully accommodative posture through OMO, but instead, do, at times, tighten liquidity leading banks to practice liability management to provide reserves. Rousseas (1986) argues that, as endogenous as the money supply may be, it does not mean that accommodation to the “needs of trade” takes place smoothly or equitably or even fully, or that it is without cost in terms of distortions in the flow of credit. Controlling the paths of the flow of credit through the economy remains a problem.

Looking at commercial banks’ role in the process, despite its analysis of the credit expansion process through the base multiplier process, the mainstream theory of exogenous money supply argues that deposits make loans.

In this view banks act like portfolio managers. They are price-takers and quantity-setters in wholesale and retail markets. Banks can increase or decrease their asset and deposit balances in response to their reserve position. In this tradition banks are treated as utility maximizers. Their expected profits reflect some degree of risk aversion. Changes in the high-powered base which is assumed to be under CB control, ultimately govern the rate of change in the volume of bank intermediation. The volume of bank intermediation is determined by the volume of bank earning assets. Accordingly, in the determination of the money stock, reserve movements are exogenous. Whenever the CB performs OMO, commercial banks respond by buying or selling assets to eliminate reserve excesses or deficiencies. Banks at their own initiative increase or decrease their total earning asset portfolios.

CBs, through OMO purchases of securities, are able to inject high-powered base, which consequently increases deposits of selling units. Banks, as a result, are faced with excess reserves with which they make new loans or security purchases. This process of deposit expansion and excess reserve creation
continues in other banks until the banking system reaches a position of portfolio balance where excess reserves have been eliminated.

There are some shortfalls of this paradigm. Let us view banks from a different perspective by dividing their assets (output) and liabilities (input) into two categories: retail (assets, deposits) and wholesale (assets, deposits). A closer version to reality is that, banks in their retail deposit and loan markets are viewed as price-setters and quantity-takers. In the wholesale input and output markets banks are price-takers and quantity-setters.

Likewise we can also distinguish commercial bank assets as marketable and non-marketable assets. Marketable assets are those assets which metamorphose into liquid form more rapidly and are traded on the wholesale markets. These are banks' defensive assets. Commercial banks hold short-term Treasury Bills, government or corporate securities and convertible deposits (CDs) in order to respond to changes in reserve excesses and deficiencies. Non-marketable assets are bank loans and advances. The main difference between the non-marketable loans and marketable assets is that, non-marketable assets are created on the initiative of bank borrowers.

A bank's defensive assets must exceed its required reserves. This defensive margin determines banks' ability to meet reserve or cash requirement should they be confronted with excessive withdrawals of deposits. In this situation banks can draw deposits with other banks, refuse to renew overnight loans of federal funds to other banks, sell CDs, present maturing Treasury Bills instead of cash, borrow on the eligible securities, bills or other term deposits, sometimes with an agreement to repurchase them. Total bank balance assets and liabilities are linked through the banks' balance sheet identity.

The two approaches diverge at this point on two fundamentally different directions. The first disagreement is on the loan/deposit/reserve connections. Although conforming with the causality of this nexus, structuralists argue that, there could be no proportionality in the relative movements of loans and reserves as accommodationists suggest, because of modern banking practices i.e., liability management. According to structuralists, liability management can attract funds out of demand deposit accounts into CDs, Federal Funds markets, Eurodollars within the short-term money market. The reserve requirements on these instruments will be lower than on demand deposits. As a result, even when the CB is controlling the absolute level of reserves, a given level of reserves will support more liability-managed type of deposits and demand deposits will support more loans to business. This could be linked to the increasing trend of globalization, as described in the earlier sections of this paper which opens new avenues for commercial banks to evade CB control in
absolute terms. This renders the control of the money supply and the implementation of monetary policy even more difficult for the CB.

The second disagreement relates to interest rate behavior. Structuralists criticize the accommodationist view of interest rate behavior at two levels. The first level relates to the accommodationist view of close substitutability between borrowed and non-borrowed reserves. Structuralists argue that discount window borrowing is not a close substitute for OMOs. They agree that administrative restrictions could be effective and exert significant quantity constraints on reserve availability when CBs choose to restrict growth of non-borrowed reserves. But, then additional reserves will come from the financial structure itself through innovative liability management practices. Also, CBs act under the constraint of, for example, inflationary dangers and imperfect information. As a result, CBs could exercise some restrictions on OMOs and these restrictions will induce banks to seek alternative ways to raise reserves.

Therefore, borrowed and non-borrowed reserves cannot be perfect substitutes. This problem leads to the second level of the structuralist critique of interest rate behavior. The use of liability management will put upward pressure on interest rates by imposing higher costs to the banks which will be passed on to the borrowers. This upward interest rate pressure would lead to financial innovations and thus provide a new institutional environment where liability management rates return to sustainable levels.

Under these circumstances, even if the CB continues to constrain reserve growth, rates on managed liabilities need not continue to rise. According to the structuralist view then, interest rate determination is not a one-way process initiated and controlled by the CB; It is an interactive process where the CB retains its influence but market forces also play their role. This process is even more apparent within the framework of liberalized global financial markets.

5. The empirical evidence

In this section we report some empirical results concerning the relationships involved in endogenous determination of the money supply, using Turkey as a case study.

5.1. The Turkish case: Background knowledge

Radical reversal to Turkey's financial system was introduced at the beginning of 1980. This was part of a larger attempt to reform a tightly government-controlled economy into a world-integrated market-oriented one.
The effects of the new policy strategy were immediately apparent. The fight against inflation was given top priority but as inflation assumed a chronic character, monetary policy proved increasingly less effective. Initially, accompanied by a tight monetary policy, the rate of inflation with the GNP deflator declined from just above 100% in 1980 to 28% in 1983. In the pursuing period the rate of inflation fluctuated at higher levels.

From 1985 onwards, monetary policy was designed to control bank reserves. Annual monetary targets were developed to estimate the reserve path that could provide the growth rate of the money stock. These programs were specified by taking into account the real growth and inflation targets of the government. In 1986, the reserve requirements for commercial banks were lowered from 18% to 15%, and the ratio of commercial banks' foreign currency holdings that must be transferred to the CB was reduced from 20% to 15%, as was the reserve ratio on foreign currency deposits. The Turkish Lira was devalued by 5% against the US dollar in March 1986.

In 1986, the CB started a system for interbank lending. Interest rates for deposits were lowered. In the beginning of 1987, a decree regulating the operation of chartered accountants was published so that banks would be audited by officially approved auditors.

In 1987, the CB started Open Market Operations (OMO) where the CB traded government securities. OMO were used as a tool by the CB to control the liquidity of the banking system in the short term. The securities acceptable for OMO transactions were: Treasury bonds, registered bonds and commercial...
paper issued by joint stock companies, CDs issued by banks, revenue-sharing certificates and other bonds issued by government agencies.

Monetary policy was loosened towards the end of 1987. For the first time in 1986, the CB began to set monetary targets and M2 was the target variable. Monetary programs continued to be implemented in 1987 and in 1988. The targets were exceeded by substantial margins so that the CB did not prepare a program for 1989. In 1989, an official gold market was opened. A new government decree (Decree 32, Protection of the Value of Turkish Lira) was published. Under this new regime, foreign exchange transactions were further liberalized. In 1990, this decree was amended introducing further removal of restrictions on foreign exchange transactions (OECD, 1993, 1995, 1996).

In the beginning of 1990, the CB announced its monetary program for the year. The target variable was the TL liabilities of the CB (Önder, Türel and et al. 1993). The medium term target for 1990 indicated a structural change in the CB's balance sheet from a low liquid nature into a liquid one. In 1991, again the CB did not prepare a program; it claimed that a monetary program would be meaningless without fiscal discipline and a fiscal program. The target of the CB's 1992 program was to keep stability in the foreign currency market. In order to attain its target, the CB used OMO. During the 1992-1993 period, the increase in public debt was financed through CB monetization of debt.

In May 1992, a wide-ranging reform of the capital market law was implemented. In addition to banks, non-bank financial institutions were allowed to establish venture capital funds, pension funds, real estate and mutual funds. Banks' minimum capital requirement was increased from 5 billion TL to 20 billion TL. The new regime legalized and regulated repurchase transactions that have been used extensively by commercial banks. The new system also allowed securitization of bank claims, which has become very attractive to banks as it provides them and their clients with cheaper funds by avoiding required reserve holdings with the CB.

Between the 1990-1992 period, the CB's goal was to restore control of its own balance sheet. The target instruments were CB money, total domestic assets and total domestic liabilities. In the presence of lax fiscal policy, this has resulted in high real interest rates and an appreciating real exchange rate. Consequently, interest costs of the public debt increased. In 1993, the CB did not announce its monetary policy. The CB focused its attention on keeping orderly balances in the foreign exchange conditions. The inability of the CB in controlling its balance sheet resulted in an increase in broad money; M2 declined to 51% and M2Y declined from 75% in 1991 to 45% at the end of 1993.
The CB constantly tackles the problem of a high Public Sector Borrowing Requirement (PSBR). By the first quarter of 1994, the Treasury had drawn all its quota of CB advances and was effectively cut off from borrowing on domestic or foreign markets. Against this background, the devaluation of the TL reached 232% within a 12-month period. The run on the TL resulted in a financial crisis. In order to restore market stability the authorities introduced 100% guarantees for individual bank deposits. The CB extended its control of the system by extending reserve and liquidity requirements to asset-backed securities as well as deposits and non-deposit liabilities. Holdings of TL were encouraged by applying lower reserve requirements on TL deposits than foreign currency deposits. After the 1994 stabilization program, the PSBR halved in relation to GDP, but inflation remained high. The stabilization program of 1994 included measures to strengthen the autonomy of the CB in implementing the monetary policy. Short-term advances to the Treasury by the

### Table 1

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<td>1/1/95</td>
<td>885.07</td>
<td>48.43</td>
<td>55.50</td>
<td>0.44</td>
<td>-2.66</td>
<td>54.22</td>
</tr>
<tr>
<td>6/1/95</td>
<td>-72.54</td>
<td>22.53</td>
<td>36.87</td>
<td>0.61</td>
<td>43.07</td>
<td>-4.04</td>
</tr>
<tr>
<td>1/1/96</td>
<td>86.99</td>
<td>35.65</td>
<td>43.18</td>
<td>0.43</td>
<td>53.43</td>
<td>17.40</td>
</tr>
<tr>
<td>6/1/96</td>
<td>215.72</td>
<td>67.83</td>
<td>66.33</td>
<td>0.81</td>
<td>189.02</td>
<td>36.85</td>
</tr>
<tr>
<td>1/1/97</td>
<td>-124.79</td>
<td>26.99</td>
<td>28.74</td>
<td>0.43</td>
<td>-10.50</td>
<td>-80.50</td>
</tr>
<tr>
<td>6/1/97</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Source: IFS.*
CB tightened. The reforms also provided lender of last resort status to the CB enabling it to extend credits for up to one year to insolvent banks. Prior to this, the CB could only extend what were in effect bridging credits of not more than four months duration. In 1995, the CB followed tight monetary policy and accordingly no credit could be extended to the banking sector through the discount window.

![Figure 2: Public and Private Sector Credit](image)

5.2. Empirical Tests

We report on three sets of tests based on Pollin’s (1991) work. In all three tests we use monthly data from the Central Bank of the Republic of Turkey’s (CBRT) statistical publications and from International Financial Statistics (IFS). The data covers the period starting 4.1.1987 and ending 1.2.1997. Sub-periods are chosen to coincide with events that changed Turkey’s financial environment in the process of its liberalization program. Monthly data are used to calculate yearly averages.

1. The proportionality of relative movements of loans and reserves were tested after establishing controls for changes in required reserves and lag structure for loans and reserves. We expect to see stationarity over time. If the CB could fully accommodate loan demand, the L/R ratio should be relatively stable where L is the total loans of the commercial banks and R is the total reserves. If the CB could not accommodate and the L/R ratio is rising, this would imply some restrictiveness and importance of financial innovations which
increases lending capacity. For the purpose of this paper means and variances are group means and variances. In order to examine the increase in the mean of L/R, a further test is conducted following the identity:

$$\log \left( \frac{L}{R} \right) = \log \left( \frac{L}{D} \right) + \log \left( \frac{D}{ML} \right) + \log \left( \frac{ML}{R} \right)$$  (1)

where D is total deposits (sight and time deposits) of the commercial banks, ML is managed liabilities and L and R are as defined above. Following Ersel (1990) and Iskenderoglu (1991), ML is derived from a simplified version of the CBRT balance sheet and is the sum of CDs, Treasury Bills held, and claims on other institutions by the private banks.

The log differential of variables are used with 1 month lags.

$$\frac{\Delta \log X/Y}{\Delta t} = \text{Rate of Change}$$  (2)

Table (2) below presents evidence on the test for L/R in Turkey between 1987-1997. The full period is divided into three sub-periods in order to observe any differences. The findings indicate that increased use of liability management instruments in Turkey replaces traditional deposits in relative importance.

<table>
<thead>
<tr>
<th></th>
<th>Full Period</th>
<th>1st period</th>
<th>2nd period</th>
<th>3rd period</th>
</tr>
</thead>
<tbody>
<tr>
<td>L/R:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>7.90</td>
<td>6.00</td>
<td>7.87</td>
<td>10.67</td>
</tr>
<tr>
<td>Variance</td>
<td>0.71</td>
<td>1.49</td>
<td>0.55</td>
<td>0.92</td>
</tr>
<tr>
<td>Lt-1/Rt:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mean</td>
<td>8.33</td>
<td>6.24</td>
<td>8.25</td>
<td>11.43</td>
</tr>
<tr>
<td>Variance</td>
<td>0.86</td>
<td>1.64</td>
<td>0.57</td>
<td>0.11</td>
</tr>
</tbody>
</table>

Source: Calculated from IFS.

The results obtained from equation 1 are presented in Table 3 below.
Table 3
Selected Ratios for the Turkish Commercial Banking Sector
(Annual % Rates Of Growth)

<table>
<thead>
<tr>
<th></th>
<th>Full Period 1987-2.1.1997</th>
<th>1st period 4.1.87-4.1.91</th>
<th>2nd period 5.1.91-3.1.94</th>
<th>3rd period 4.1.94-2.1.97</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loans/Reserves</td>
<td>7.73</td>
<td>4.67</td>
<td>8.46</td>
<td>10.67</td>
</tr>
<tr>
<td>Loans/Deposits</td>
<td>0.48</td>
<td>0.26</td>
<td>0.54</td>
<td>0.03</td>
</tr>
<tr>
<td>Deposits/Man.Liab.</td>
<td>0.75</td>
<td>0.67</td>
<td>5.49</td>
<td>-4.01</td>
</tr>
<tr>
<td>Man.Liab./Reserve</td>
<td>6.50</td>
<td>3.74</td>
<td>2.43</td>
<td>14.68</td>
</tr>
</tbody>
</table>

Source: IPS.

From the table we can specify the varying proportions of different types of deposits created with lending activity. D/ML indicates the proportion of traditional deposits to managed liabilities. We also observe that from period 1 to period 2, the ratio of D/ML dramatically increased together with L/R and decreased between 1994-1997. The largest change during the 3rd sub-period is the increase in the ML/R ratio. This could be explained in terms of CB intervention when a run on the Turkish Lira (TL) resulted in a financial crisis in 1994. The CB exerted its control by extending reserve and liquidity requirements to asset-backed securities as well deposits and non-deposit liabilities in foreign currency.

In order to restore market stability the authorities introduced 100% guarantees for individual bank deposits. The 1994 stabilization program included measures to strengthen CB autonomy in implementing monetary policy. Short term advances to the Treasury by the CB were tightened. The program also provided lender of last resort status to the CB enabling it to extend credits for up to one year to insolvent banks. Previously CB could extend credits for four months.

2. In the second set of tests that were carried out, we examined whether borrowed reserves (B) are a close substitute for non-borrowed reserves (NB). Table 4 presents the size of borrowed reserves (B) relative to total reserves (TR). B represents the sum of free deposits, CB’s claims on private banks and the sum of free reserves and required reserves (TR).
If borrowed reserves were viable substitutes for non-borrowed reserves, we would expect to see an increasing trend in the mean. Table 4 shows that in Turkey, B constitutes a significant proportion of total reserves but the B/R ratio follows a declining path. This indicates that the CB’s ability to determine the quantity on non-borrowed reserves through discount window lending, although still significant, is diminishing. From the 1st period until the 3rd, the B/R ratio decreases below the full period’s average. This may be due to two reasons. The first one relates to the liquidity requirement: Banks were required to keep 5% of their liabilities in the form of highly liquid assets as free deposits with the CB and as vault cash and 12% as government papers. Through gradual increases in 1991-1992, banks were required to keep 30% of their liabilities in the form of government bonds. The second reason is the tight monetary policy pursued in 1995 when no credit could be extended to the banking sector through the discount window (OECD, 1993, 1995, 1996).

Banks act as profit maximizers and they attempt through arbitrage to equate their marginal cost of funds across sources. As the differential of the CB fund rate over the discount rate increases, banks are induced to borrow from the CB. This will increase the borrowed reserves. If TR were constant, changes in NB would be negatively correlated with the changes in B.

Then the total of;
\[ \Delta NB + \Delta B = 0. \]

(3)

In order to evaluate this formally we have conducted two-variable regression on the following equation:
\[ B = \alpha + \beta (NB) \]

(4)

The calculation is done with the log values of variables. An intercept term is used at the degree of unity. B is taken as the dependent variable and NB as the independent variable. Monthly data is used for the full term and for the sub-periods. Ordinary Least Square results are given in Table 4. Borrowed Reserves / Total Reserves are calculated from the simplified CBRT balance sheet:

<table>
<thead>
<tr>
<th>B/R:</th>
<th>Full Period</th>
<th>1st Period</th>
<th>2nd Period</th>
<th>3rd Period</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mean</td>
<td>18</td>
<td>23</td>
<td>17</td>
<td>11</td>
</tr>
<tr>
<td>Variance</td>
<td>0.8</td>
<td>0.7</td>
<td>0.5</td>
<td>0.8</td>
</tr>
</tbody>
</table>

Source: (IFS, CBRT).
Table 5

Borrowed (B) and Non-Borrowed (NB) Reserve Substitutability

<table>
<thead>
<tr>
<th></th>
<th>α</th>
<th>β</th>
<th>DW</th>
<th>R²</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full Period</td>
<td>0.14</td>
<td>-2.23*</td>
<td>2.24</td>
<td>0.52</td>
</tr>
<tr>
<td>(4.1.97-2.7.97)</td>
<td>(6.5)</td>
<td>(-11.33)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1st Period</td>
<td>0.80</td>
<td>-1.22</td>
<td>* 2.40</td>
<td>0.29</td>
</tr>
<tr>
<td>(4.1.87-4.1.91)</td>
<td>(2.9)</td>
<td>(-4.44)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2nd Period</td>
<td>0.22</td>
<td>-4.32*</td>
<td>2.67</td>
<td>0.92</td>
</tr>
<tr>
<td>(5.1.91-3.1.94)</td>
<td>(11.79)</td>
<td>(-21.22)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3rd Period</td>
<td>0.16</td>
<td>-2.17*</td>
<td>2.19</td>
<td>0.54</td>
</tr>
<tr>
<td>(4.1.94-2.1.97)</td>
<td>(4.26)</td>
<td>(-6.49)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

(t) ratios in parenthesis.
* significant at 1% level.

Regression tests were performed for the full period and three sub-periods. In all cases, monthly data was used. From the table, we can observe that there is a stronger relationship between the variables during the 2nd period as opposed to the 1st and 3rd periods. The adjusted R² value shows that variation in the independent variable explains 92% of the variation in the independent variable B during the second period.

3. A third test is carried out, using monthly data, to determine the direction of interest rate causality. Four types of interest rates are taken as variables:

a. 3-month time deposit rates (Deposit)
b. Money market rate (MMar)
c. 3-months Treasury Bill Rate (TB3)
d. 6-months Treasury Bill Rate (TB6)

The rates are calculated by the CB are 3-month Treasury Bills and 6-month Treasury auction rates. A geometric lag/lead structure was used in specifying the independent variables. Lags were carried back and leads forward by four months. The Granger-Sims method of causality test may be done by using the following regressions:

\[ i_t^n = \sum \beta_i i_{t-n} + \sum \alpha_i t_{t-n} + \epsilon_t \]  \( (5) \)

for market rates and for CB controlled rates;
\[ i_{t+m}^m = \Sigma \beta_i i_{t+m}^m + \Sigma \alpha_i i_{t+n}^m + \varepsilon_i \]  

(6)

where \( i_{t+m}^m \) represent market rates and \( i_{t+1}^c \) the Central Bank controlled rates. As usual with these types of tests, we reversed the dependent and independent variables for each regression. The null hypothesis is “no causality”. We would then expect to see reversal of the results. Table 6 presents the results.

Table 6
Causality Tests for Various Interest Rates

<table>
<thead>
<tr>
<th>Variables</th>
<th>Dependent</th>
<th>Independent</th>
<th>( \alpha )</th>
<th>( R^2 )</th>
<th>DW</th>
<th>( \Sigma \text{ lags} )</th>
<th>( \Sigma \text{ leads} )</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Deposit</td>
<td>MMar.</td>
<td>0.17</td>
<td>0.95</td>
<td>2.17</td>
<td>B ( \Rightarrow ) A</td>
<td>B ( \Rightarrow ) A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deposit</td>
<td>0.27</td>
<td>0.74</td>
<td>2.01</td>
<td>B ( \Rightarrow ) A</td>
<td>A ( \Rightarrow ) B</td>
<td></td>
</tr>
<tr>
<td>2. TB(6)</td>
<td>MMar.</td>
<td>21.90</td>
<td>0.83</td>
<td>1.81</td>
<td>B ( \Rightarrow ) A</td>
<td>A ( \Rightarrow ) B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TB(6)</td>
<td>1.86</td>
<td>0.10</td>
<td>2.32</td>
<td>None</td>
<td>None</td>
<td></td>
</tr>
<tr>
<td>3. TB(3)</td>
<td>MMar.</td>
<td>-0.99</td>
<td>0.91</td>
<td>1.70</td>
<td>A ( \Rightarrow ) B</td>
<td>B ( \Rightarrow ) A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TB(3)</td>
<td>1.02</td>
<td>0.58</td>
<td>1.98</td>
<td>A ( \Rightarrow ) B</td>
<td>B ( \Rightarrow ) A</td>
<td></td>
</tr>
<tr>
<td>4. TB(3)</td>
<td>TB(6)</td>
<td>-10.74</td>
<td>0.20</td>
<td>2.46</td>
<td>B ( \Rightarrow ) A</td>
<td>B ( \Rightarrow ) A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>TB(3)</td>
<td>-4.73</td>
<td>0.18</td>
<td>2.49</td>
<td>B ( \Rightarrow ) A</td>
<td>B ( \Rightarrow ) A</td>
<td></td>
</tr>
<tr>
<td>5. Deposits</td>
<td>TB(6)</td>
<td>1.66</td>
<td>0.89</td>
<td>1.73</td>
<td>B ( \Rightarrow ) A</td>
<td>B ( \Rightarrow ) A</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deposits</td>
<td>-17.66</td>
<td>0.93</td>
<td>2.43</td>
<td>B ( \Rightarrow ) A</td>
<td>B ( \Rightarrow ) A</td>
<td></td>
</tr>
<tr>
<td>6. Deposits</td>
<td>TB(3)</td>
<td>1.66</td>
<td>0.89</td>
<td>1.73</td>
<td>B ( \Rightarrow ) A</td>
<td>A ( \Rightarrow ) B</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deposits</td>
<td>-17.66</td>
<td>0.92</td>
<td>2.43</td>
<td>B ( \Rightarrow ) A</td>
<td>B ( \Rightarrow ) A</td>
<td></td>
</tr>
</tbody>
</table>
The regression data is downloaded from the IFS datastream. Regression results indicate that causality runs from market rates to deposit rates for the full period between 4.1.1986 - 5.1.1997. When we look at the relationship between market rates (MMar) and 6-months Treasury Bill rates (TB6), they interact. Nevertheless, detailed analysis indicate that there is a stronger causality running from 6-months treasury rates to markets rates. Data used for this regression covers the 1991-1994 period. Towards the end of this period the CB restarted its excessive use of OMOs to prevent a run on the Turkish Lira. When we consider short-term Treasury Bills and market rates they strongly interact, especially for the period between 4.1.1986 - 11.1.1993. Causality tests also indicate strong interaction between the short-term Treasury Bill rate and 6-month Treasury Bill rate, except when calculated with leads. Thus, causality runs from short-term rates to 6-month Treasury Rates in leads. This is evident for the 6.1.1992 - 11.1.1993 period. One reason for this could be that short-term claims on the CB have been increased as the PSBR increased during this period, as is the case. When we look at the causality between 3-month Treasury Bills and short-term bank deposit rates, it is evident that the lead structure of the regression specifies a strong causality from bank deposits to short-term Treasury Bills during 6.1.1991 - 11.1.1993. A possible interpretation of this is that banks, as profit maximizers, raised reserves from markets by using liability management instruments. During this period, the CB set ceilings on certain types of interest rates so that interest rate ceiling aversion played its toll. This could explain why causality runs from 6-month interest rates to deposit rates. In the longer term, the CB was able to insert interest rate levels in the longer run. When we look at the causality covering the period 4.1.1986 - 11.1.1993, this becomes evident.

6. Conclusion

The central problem here is that in standard models the central bank is assumed to be able to control the money supply and, thereby, to control inflation. But in modern economies, the rate of growth of the money supply is not directly under the control of central banks, but is determined, instead, by the interaction of central banks, commercial banks, and the non-bank private sector, with interactions mediated by financial markets. The complexity of those interactions account for the failure of experiments by the central banks, such as the Bank of England, when setting monetary growth targets; thus they make policy targets that are not credible.
Within monetary economics, the theory of an endogenous money supply attempts to capture the extreme, but apparently plausible, consequence of these complex determinants of the money supply. The idea is that the central bank has no control over the money supply. Theories of endogenous money supply are developed with advanced markets in mind. The results of our tests, which are based on data from Turkey, give support to the structuralist version of money supply endogeneity. Detailed research on the causes of these results also require further research into financial system structures in Turkey.

References


Özet

Merkez Bankası bağımızlığı kredibilite modelleri ve Türkiye için bir örnek çalışmaya