MONEY MULTIPLIER AND MONETARY CONTROL

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I. INTRODUCTION

In the 1970s, the world-wide acceleration of inflation was the most important problem for which practical remedies must be immediately offered. The central banks of the most major industrial countries had adopted monetary targeting strategies against the global inflationary trend. After the breakdown of fixed-rate system of Bretton-Woods, a necessary scope for an autonomous monetary policy had been created. Provided that there is a long run relationship between the money stock and the prices, the monetary targeting is considered as the best strategy through which a central bank choose the money stock as nominal anchor to provide price stability. In order for the money stock to be targeted intermediately, on the other hand, the central bank should be able to control the money stock. This necessitates, in turn, the followings: First, the monetary authority must choose a monetary aggregate which incorporates all the instruments it uses to implement the monetary policy. Second, the relationship between the monetary aggregate and the money supply; i.e., the money multiplier must be stable and predictable. Provided that, the monetary base (H) is under the control of the monetary authority, the determination of the reasons behind the changes in the money multiplier becomes important in the implementation of monetary policy. Given that H is under the control of the Central Bank, it could only achieve its primary objective of providing the price stability by controlling the money multiplier as much as possible.

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Therefore, the assessment of the money multiplier in the context of monetary control is given the primary importance in this paper.

Thus, the objective of this paper is to discuss the significance of the money multiplier and the monetary aggregate in terms of monetary control and to determine the reasons behind their variation. This study is organized as follows: First the importance of the money multiplier in terms of monetary policy is analyzed. Following the calculation of the money multipliers (k_1 and k_2), and their parameters, the components of Central Bank Money (CBM), which has been used as monetary aggregate since 1989 in Turkey, and their relative contributions to a change in CBM are analyzed. Finally, the absolute and relative contributions of its components to a change in money supply, M2 are investigated.

II. MONEY MULTIPLIER

An important principal lesson for monetary policy can be drawn from the experience of the 1970s and 1980s. It is the focusing of monetary policy on nominal quantity variables. Monetarists claim that the monetary authority can control the quantity of its liabilities to residents. By using this control in turn, it can peg a nominal quantity such as exchange rate, the price level, the nominal level of national income, the quantity of money and even the rate of growth of these nominal quantities.

The success of the monetary authority in that control mechanism requires two things. First, in order to regulate the liquidity in the economy the monetary authority must choose a monetary aggregate which consists of all instruments the monetary authority uses to enforce its policy. Second, there must be a stable relationship between the chosen aggregate and the money supply. Evidence from

the past periods suggests that there is a high degree of association between the monetary base (H) and the money supply and it is the most important determinant of the money supply. The monetary authority can control the larger portion of the changes in the money supply by controlling the size of changes in H. There are some other factors, on the other hand, such as changes in the composition of deposits between demand and time deposits, changes in the composition of money between currency and deposits and the commercial banks' behaviour in holding excess reserves which are all said to be outside the control of the monetary authority. All these factors are included in the money multiplier. Therefore, the predictability of the money multiplier and the degree of control of the monetary authority over H gain importance in determining the money supply. The relationship among the money supply, the money multiplier and H can be written as follows:

$$M = k \times H$$

For the special case of Turkey, the determinants of H are: Net Foreign Assets (NFA); Net Domestic Claims on Government (NDCG) which is obtained by deducting the Public Deposits with Central Bank from Domestic Claims on Government (DCG); Devaluation Account (DA); Claims on Commercial Banks (CCB) and Net Other Items (NOI) (Table 1 and Table 2). Because CBM has been used as the monetary aggregate since 1989 in Turkey, in this paper the average and relative contributions of its components to a change in CBM are calculated (Table 3). The difference between H and CBM is that, public deposits are not included in H; i.e., domestic credits to the public sector are taken as net in calculating. We can formulate them as follows:

$$CBM = NFA + DCG + DA + CCB + NOI$$

$$H = NFA + NDCG + DA + CCB + NOI$$

The determinants of the money multiplier (Table 4) can be seen from the formula used to calculate k_1, which is the money multiplier for the narrow definition of the money supply, and k_2, which is the money multiplier for the broad definition of money.

$$k_1 = M1/H = (C + MEV - MEV_g - TD_{tt} + MEV_{mb})/(C + RR + ER)$$

$$k_1 = (1 + c^* - g^* - t'^* + mb^*)/(c^* + r^* + e^*)$$

where,

M1 = narrow definition of the money supply.

H = monetary base

MEV = Total deposits (includes official, excludes interbank deposits and deposits at the Central Bank)

MEV_{mb} = Deposits at the Central Bank (state enterprises + other sectors)

MEV_g = Official deposits (sight + term)

TD_{tt} = Saving deposits (sight + term)

RR = Total required reserves.

ER = Excess reserves (includes bank liquidity requirements due to unavailability of data)

O = Other H items (includes fund accounts, non-bank deposits and open market operations (OMO) liabilities)

$c^* = C/MEV$; $mb^* = MEVmb/MEV$; $t'^* = TDtt/MEV$

$e^* = ER/MEV$; $g^* = MEVg/MEV$; $r^* = RR/MEV$; $o^* = O/MEV$

$$k_2 = (C/MEV + MEV/MEV - MEV_g/MEV + MEV_{mb}/MEV)$$
$$/(C/MEV + R/MEV + ER/MEV)$$
$$k_2 = (1 + c^* - g^* + mb^*)/(c^* + r^* + e^*)$$

These formulas for k_1 and k_2 (Keyder: 1991) are used in calculating money multipliers for M1 and M2 because the division of required reserves between sight and time deposits is not available over the period 1983-1988.

The determinants of the money multipliers are r^*, c^*, e^*, t'^*, mb^*, g^*. r^* (reserve requirement ratio) is under the control of the Central Bank (CB). An increase in r^* will decrease both k_1 and k_2. r^* has been one of the most effective policy tools of the CB to regulate money supply. r^* is also known as policy variable in determining money multipliers.

The other factors, c^*, e^*, t'^*, mb^*, g^* are called as behavioral parameters. Even if policy variable were held constant, the money multipliers could change in response to changes in behavioral parameters. An increase in the t'^* which is determined by the public will lower k_1 but will increase k_2.

e^*, on the other hand, is determined by banks. Banks hold excess reserves (ER) over and above their required reserves. e^* tend to vary directly with deposit variability (variations in t'^*), variations in the level of deposits and the rediscount rate. Since banks are profit maximizing institutions, the reasons for their holding non-interest earning ER need to be explored. Banks can borrow from each other or from the CB. However, it may be cheaper to hold some ER. If the discount rate is above the market interest rate; i.e., a "penalty rate" then it seems to be the better strategy for banks to hold ER. The opportunity cost of holding ER, is the market interest rate. The cost of

borrowing reserves, on the other hand, is the discount rate. As the difference between discount rate and the market interest rate rises, ER get larger and larger. This shows the sensitivity of money multipliers to the interest rate. Given that H and discount rate are both under the control of the CB, an increase in the market interest rate will decrease excess reserves and this, in turn, will raise the money multipliers.

Suppose the composition of the deposits changes in such a way that the public decides to have more time deposits for every TL of demand deposits. It is generally true that reserve requirement ratio on demand deposits is greater than that of the time deposits. As a result, ER will increase and k_1 and k_2 will decrease. Since a common r^* for both demand and time deposits is used in this study, the effect of the change in the composition of the deposits between demand and time deposits is ruled out.

c^*, is another behavioral parameter which determines money multipliers. An increase in c^*, raises both numerator and denominator of k_1 and k_2. Since the numerator is always larger than the denominator, the proportionate increase of the numerator is smaller than that of the denominator. As a consequence, a rise in c^*, will cause k_1 and k_2 to fall. The value of c^*, is closely related to technological factors such as the introduction of universal credit cards and ATM cards which reduce the need for currency. Even though c^* has seasonal features, it does not change very much over time.

Although o^* does not appear in the k_1 and k_2 formulas, it affects them like e^* and it must be placed to the denominator of these formulas when they are calculated.

Following these explanations about the parameters it could be claimed that, the predictability of the money multiplier requires a stable relationship between behavioral parameters and their explanatory variables. Demand functions for those parameters must be stable over time. In addition to that, monetary aggregate and money multiplier must be independent from each other; i.e., a change in the monetary aggregate must not affect the money multiplier.

III. AVERAGE AND RELATIVE CONTRIBUTIONS OF THE CENTRAL BANK MONEY COMPONENTS TO A CHANGE IN IT

Average contribution figures in Table 3 are calculated by the following formula:

$$(\Delta CBM/CBM_{-1}) = (\Delta NFA/CMB_{-1}) + (\Delta DCG/CMB_{-1})$$

$$+(\Delta CCB/CBM_{-1}) + (\Delta DA/CBM_{-1}) + (\Delta NOI/CBM_{-1})$$

Dividing each "average" contribution figure by the percentage change in CBM; i.e., (CBM/CBM_{-1}) and multiplying by 100 we can reach the relative contribution figures in Table 3.

As far as the growth rate of CBM is concerned, the only slight increase in CBM was seen in 1990 at which the Central Bank of the Republic of Turkey announced its first monetary program. In 1990, CBM grew by 28.6 %. The positive effects of the monetary program unfortunately could not be long lasting due to the Gulf Crisis started on August 1990. Moreover, there was a general elections in 1991, which resulted in prominence increase in public expenditures and, in turn, significant increase in CBM following 1990. While CBM increased by 84.6 % in 1991, the growth rate of CBM reached its highest level in 1992, increasing by 99.7 %. Afterwards, there was an important slow down in the growth rate of CBM which were 45.8 %

and 50.8 % in 1993 and 1994, respectively. This results from the public expenditures reduction measures taken by the stabilization program on 5th April 1994 which aimed at re-establishing stability in the economy

If we look at the relative contribution figures in Table 3, we will be able to see which component contributes more to the growth of CBM. This could also be seen in Graph 1. The negative sign of NFA for the years 1986-88 means that foreign liabilities of the CB were much greater than its foreign assets. However, for the period 1988-1989 NFA of CB; i.e., the foreign exchange reserves of the CB increased by US $5 billion. The relative contribution of NFA reached 38.5 % in 1988-89. Although it reduced to 17,8 % in 1989-90 period, it was again positive. As a result of the Gulf Crisis which began in August 1990, the foreign exchange reserves of the CB started to decrease very rapidly. The relative contribution of NFA to the change in CBM in turn became negative (-12.4 %) in 1990-91. Since reserve position of the CB has improved thereafter, its relative contribution increased to 0.9 % in 1991-92. As a result of the interest rate reduction policy pursued by the Treasury since May 1993, in spite of the increased public deficits, the domestic debt markets loosed their attractiveness and the excess liquidity moved towards foreign exchange. As a matter of fact, an explicit dolarisation process began. Moreover, the current account deficit which increased to US $6.4 billion in 1993, fostered the devaluation expectations. Commercial banks whose foreign exchange open positions were great at this time also demanded foreign exchange to close down their open positions very quickly. Thus Turkish Lira (TL) was devalued by 13.6 % against the US dollar on 26 January 1994. Due to the instability of financial markets, there was a great capital outflow. Therefore in 1994 CB

reserves decreased significantly associated with the negative growth of NFA of the CB by 156.2 %.

The relative contribution of DA to the change in CBM was very high for the first two periods. This was due to the fact that the foreign exchange debt of the CB, which is a way of financing the balance sheet of the CB, increased continuously. DA is an account which automatically changes depending on the foreign exchange position of the CB and depending on cross exchange rates. Therefore, in 1986-87 and 1987-88 the relative contributions of the DA were 181.0 % and 136.0 % respectively. It decreased to 60.3 % in 1988-89 due to the decrease in the foreign exchange debt of the CB. 1991 is a year which contains a lot of uncertainties because of Gulf Crisis and domestic political problems. If uncertainties increase in an economy, the demand for foreign exchange and the pressures on exchange rates rise. Therefore, for the first three months period of 1991, CB reserves decreased by US $2.3 billion. In addition to that, the cross exchange rates changed in such a way that the CB earned revenue. Consequently, the relative contribution of DA decreased to 29.9 % in 1990-91 first and then to 5.3 % in 1991-92. It became negative for the first time in 1992-93. The relative contribution of DA showed an abrupt increase in 1993-94 due to the significant devaluation of TL against foreign exchange stemming from the financial crisis started at the end of 1993.

The relative contribution of DCG and CCB decreased for 1986-89 periods and the relative contribution of CCB became almost 0 % in 1988-89. Because DA, which is a loss and must be financed somehow, formed the 40 % of the CB balance sheet for the mentioned years. Therefore, the CB could not raise the credits to the government and commercial banks because it had to devote much of

its sources to the finance of DA. In 1989-90, in which the monetary program was announced, the relative contribution of DCG became negative and that of CCB increased significantly. However, CB had to increase its credits to the government in 1990-91 due to Gulf Crisis. As a consequence, the relative contribution of DCG increased to 87.2 % in 1990-91. In 1991-92 it reached 90.5 %. Furthermore, continuously increasing government deficits were financed by the CB sources, because the government could not borrow domestically as a result of its interest rate reduction policy mentioned before. Thus, the relative contribution of DCG increased very rapidly and it reached first 113.9 % in 1992-93 and then increased to 162.5 % in 1993-94 which was its highest level. The relative contribution of CCB became negative again in 1993-94, after having increased to 23.4 % in 1992-93.

IV. THE CONTRIBUTIONS OF THE DETERMINANTS TO THE CHANGE IN M2.

In Table 4, the calculations of c^*, t^*, e^* r^* and o^* are given. Their pattern of changes could be seen in Graph 2. Table 5 is more important showing the components which are responsible for the changes in the money multiplier, k_2 and in turn, to a certain extent, for the changes in money supply, M2. In calculating the relative contributions of the money multiplier's parameters to a change in M2, the following formulas are used.

Average contributions of:

1) $H = + (d\ln H) / dt$

2) $c^* = + (1/1+c^*+ mb^*) (dc^*/dt) - (M2/H(1/1+c^*+ mb^*) (dc^*/dt)$

3) $r^* = - (M2/H(1/1+c^*+mb^*) (dr^*/dt)$

4) $mb^* = + (1/1+c^*+ mb^*) (dmb^*/dt)$

5) $e^* = - (M2/H (1/1+c^*+ mb^*) (de^*/dt)$

6) $o^* = - (M2/H (1/1+c^*+mb^*) (do^*/dt)$

Relative contributions (%) = (Average contributions (%) / % change in M2) x 100

The major contribution to a change in M2 comes from H. This means that if the CB controls H, it controls by far the larger portion of the changes in the stock of money. In addition to that, the monetary authority can control the variability of the money multiplier coming from the changes in r^*. If the CB increases the reserve requirement ratio, r^*, the relative contribution of r^* to a change in M2 becomes negative. In the case of its decrease its contribution becomes positive.

The relative contribution of c^* to a change in M2 was negative except in 1990-91 and 1993-94. The general upward trend in c^* is the reason behind the negative contribution of cash ratio to the expansion in M2. The relative contribution of e^* can be interpreted by the same way as r^*. An increase in e^* cause the relative contribution of e^* to the expansion of M2 to be negative and vice versa.

It must be taken into consideration that the relative contribution of o^* to the expansion in M2 was quite high with -43.0 % in 1990-91 and with -35.4 % in 1991-92. o^* is the ratio of Other H items, which include OMO liabilities, to total deposit. For these years, the CB made a great amount of Open Market purchases in order to provide the economy with necessary liquidity. Therefore, o^* increased for these periods and its relative contribution to a change in M2 was negative. So we can deduce that through o^*, the CB can control some changes in the money multiplier and in turn in the money stock.

As opposed to 1990-91 and 1991-92, in 1992-93 and in 1993-94, the relative contribution of o* to the change in M2 turned to be positive and was realized as 21.4 % and 22.6 %, respectively.

The changes in these policy variables and behavioral parameters determines the patterns of change of the money multipliers k_1 and k_2. We can see the trends of k_1 and k_2 from Graph 3. The stability and the size of the money multiplier are very important as far as the monetary control is concerned. A too small and too high money multiplier makes the monetary authorities' job more difficult. If the money multiplier is too small, a large increase in the monetary base would be required in order to achieve a desired level of money stock. If it is too large, on the other hand, the effect of a small change in H on the money stock will be too high. It is deduced from Graph 3 that k_1 is more stable than k_2. Although both k_1 and k_2 increased in 1994, the rise of k_2 is much severe. This is due to the fact that t'*, which is the ratio of time deposits to total deposits, and which is incorporated in k_2 increased sharply in 1994.

V. CONCLUSION

In this paper, we aimed at revealing the importance of the control of both the monetary aggregate and the money multiplier in achieving the targeted level of money supply. This, in turn, will enable the CB to provide price stability. In the special case of Turkey, H is found to be the major contributor to the change in M2, except for the 1993-94 period in which a financial crisis has been experienced. In 1993-94, the relative contribution of H to the change in M2 was very low. Therefore, the sum of the relative contributions of H and the parameters which should be close to 100 % as much as possible, was add up to 78.7 %. This was because of the fact that, M2

increased by 123.2 % in 1993-94 period which was exceptionally very high as compared to the previous years. The reason behind the significant increase in M2, was the severe increase in TL time deposits following the measures taken by the stabilization program on 5th April 1994 for the purpose of restoring credibility with TL and in turn re-establishing stability in the financial markets. As a consequence, only for this year we suggest that it had better to replace M2 with M1 whose growth rate was 78.8 % in 1993-94.

In Turkey, CBM has been used as the monetary aggregate since 1989 and therefore we calculated the CBM components' contributions to the change in it. However, H differs from CBM only in that H does not include public deposits whose share in CBM is not very important. Therefore, the findings related to the CBM could also be used to analyse H. We could deduce from the findings in Table 3 that most of the changes in CBM originate from the variations in domestic claims on government, DCG. It could easily be seen that the relative contribution of DCG to the change in CBM increased especially during the election periods, which in turn directly leads to a rise in CBM. In fact, well-developed financial markets are the most secured way of financing the government deficits not causing to more inflation. Because financial markets in Turkey is not developed enough, there remains two alternatives for the finance of the government deficits. The first alternative is to resort to the CB sources and oblige it to print money. This is the easiest way of financing but detrimental to the objective of price stability. This way of financing, limits significantly the CB in its monetary policy implementation. Therefore, the fiscal imbalance in Turkey is the most important obstacle for the CB to implement its monetary policy autonomously. Because the CB's control over H is not independent of

government deficits, structural measurements should be taken immediately in order to improve fiscal balance in Turkey. DA, on the other hand, for the 1987-90 period first and then for the 1993-94 became the second most important factor narrowing the mobility of the CB in terms of monetary control.

As far as the money multiplier, k_2 is concerned, the CB could control fully the changes in r^*. Moreover o^*, which includes OMO liabilities, is under its control to a certain extent. It could even be claimed that the CB can determine the changes in the behavioral parameters because they are responsive to the interest rate changes in the markets. Furthermore, behavioral parameters' contributions to the change in M2 are not very important except for the periods of uncertainties like 1993-94. Thus, the CB could even control the changes in the money multiplier, especially through controlling the changes in r^* and o^* and through controlling the changes in behavioral parameters to a certain extent. As a consequence, provided that the fiscal balance is to be achieved in Turkey, we suggest that the CB could control the money supply by applying proper policies taking into accounts the factors analyzed in this study.

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TABLE 1

CALCULATION OF CBM BY "USES" AND "SOURCES" APPROACH*

(Bill. TL)

	1986	1987	1988	1989	1990	1991	1992	1993	1994
Calculation of CBM by "Uses" Approach									
1. RESERVE MONEY (A+B+C+D+E)	4000	5504	10143	17035	23871	37244	61195	101721	185738
A. Banknotes Issued	1908	2955	4485	8365	14074	21288	36838	63104	120212
B. Required Reserves	1470	1578	3748	6047	7323	11227	19064	30341	57510
C. Free Deposits	203	445	1023	1721	1564	2934	4056	5707	6152
D. Fund Accounts	183	213	380	444	358	1488	693	1491	657
E. Deps of non-Bank Sector	236	313	507	448	552	307	544	1078	1207
2. MONETARY BASE (1+F)	4038	5994	11349	17365	22944	42828	82974	123556	186876
F. Liabilities from OMOs	38	490	1206	330	-927	5584	21779	21835	1138
3. CENTRAL BANK MONEY (2+G)**	4298	6431	11851	18528	23837	43993	87837	128113	193140
G. Public Deposits	260	437	502	1163	893	1165	4863	4557	6264
Calculation of CBM by "Sources"Approach									
4. TL. TRANSACTIONS (A+B)	4770	7736	9752	9834	8996	25624	66751	125751	190499
A. Domestic Cash Credits	4624	7524	10039	10892	10644	28199	72044	127344	226488
AA. Credits to Public Sector	3887	5607	7020	7860	5324	22904	62602	108482	214161
AB. Credits to Banking Sector	737	1917	3019	3032	5320	5295	9442	18862	12327
B. Other Items (net)	146	212	-287	-1058	-1648	-2575	-5293	-1593	-35989
5. FX TRANSACTIONS (3-4)	-472	-1305	2099	8694	14841	18369	21086	2362	2641
A. NFA***	-4286	-6769	-6605	-2713	-549	396	14411	16993	-21383
AA. Foreign Assets	3301	4778	11429	17948	25583	38736	75758	128126	368701
AB. Foreign Liabilities	7587	11547	18034	20661	26132	38340	61347	111133	390084
B. FX liabilities to residents (-)	2136	4345	8476	9799	11018	14456	28060	46555	109781
C. Devaluation Account	5949	9809	17181	21206	26408	32429	34735	31924	133805

* Balance Sheet of the CB is issued as of the last Friday of each month,
starting from January 1992 CB's Balance Sheet data has been as of the last work day of the month.

**Also, row no 4+5 =3

*** NFA excl. FX Liabilities to residents (-)

TABLE 2
CENTRAL BANK MONEY COMPONENTS AND THEIR ABSOLUTE ANNUAL CHANGES

(Bill TL)

	CENTRAL BANK MONEY AND ITS COMPONENTS					ABSOLUTE ANNUAL CHANGE IN ITS COMPONENTS						
	NFA*	+DA	+DCG	+CCB	+NOI	=CBM	ΔCBM	ΔNFA	ΔDA	ΔDCG	ΔCCB	_NOI
1986	-6422	5949	3887	737	146	4297						
1987	-11114	9809	5607	1917	212	6430	2133	-4692	3860	1720	1180	66
1988	-15081	17181	7020	3019	-287	11852	5422	-3967	7372	1413	1102	-499
1989	-12512	21206	7860	3032	-1058	18528	6676	2569	4025	840	13	-771
1990	-11567	26408	5324	5320	-1648	23837	5309	945	5202	-2536	2288	-590
1991	-14060	32429	22904	5295	-2575	43993	20156	-2493	6021	17580	-25	-926
1992	-13649	34735	62602	9442	-5293	87837	43844	411	2306	39698	4147	-2718
1993	-29562	31924	108482	18862	-1593	128113	40276	-15913	-2811	45880	9420	3700
1994	-131164	133805	214161	12327	-35989	193140	65027	-101602	101881	105679	-6535	-34396

Source : Calculated using data on Table 1

* NFA incl. FX Liabilities to residents (-) ie. Row 5A+5B (-) in Table 1.

TABLE 3
AVERAGE AND RELATIVE CONTRIBUTIONS OF ITS COMPONENTS TO THE CHANGE IN CBM (%)

	Average Contributions of its Components to the change in CBM (%)						Relative Contributions of its Components to the Change in CBM (%)					
		Average Contribution of						Relative Contribution of				
	% Δ in CBM	NFA*	DA	DCG	CCB	NOI	CBM	NFA	DA	DCG	CCB	NOI
1987	49.6	-109.2	89.8	40.0	27.5	1.5	100	-220.0	181.0	80.6	55.3	3.1
1988	84.3	-61.7	114.6	22.0	17.1	-7.8	100	-73.2	136.0	26.1	20.3	-9.2
1989	56.3	21.7	34.0	7.1	0.1	-6.5	100	38.5	60.3	12.6	0.2	-11.5
1990	28.6	5.1	28.1	-13.7	12.3	-3.2	100	17.8	98.0	-47.8	43.1	-11.1
1991	84.6	-10.5	25.3	73.7	-0.1	-3.9	100	-12.4	29.9	87.2	-0.1	-4.6
1992	99.7	0.9	5.2	90.2	9.4	-6.2	100	0.9	5.3	90.5	9.5	-6.2
1993	45.8	-18.1	-3.2	52.2	10.7	4.2	100	-39.5	-7.0	113.9	23.4	9.2
1994	50.8	-79.3	79.5	82.5	-5.1	-26.8	100	-156.2	156.7	162.5	-10.0	-52.9

Source : Estimated using data on Table 2. and Table 3. using the formulas given in the text

* Row totals may not add up to 100 because formula developed for continous series is being applied to discrete series; second reason is "rounding"

TABLE 4
MONEY MULTIPLIER ESTIMATION (1986-1994)

(Bill.TL)

	1986	1987	1988	1989	1990	1991	1992	1993	1994
(1) D	3953.3	6417.2	7885.9	12717.8	20020.4	29344.1	47952.2	77442	128518.5
(2) C (Currency in circulation inc. coinage)	1301.8	2211.9	3425.7	6839.9	11377.6	17448.9	30388.9	51645.1	102328.4
(3) T	6918.1	9018.9	15882.6	27581.5	40171.6	70325.3	112395.1	153354.8	390501.1
(4) MEV = (1)+(3)	10871.4	15436.1	23768.5	40299.3	60192.0	99669.4	160347.3	230796.8	519019.6
(5) MEV_{mb}	27.6	17.0	12.6	25.0	27.5	18.8	183.9	307	177.1
(6) Other H^1 items	457	1016	2093	1222	-17	7379	23016	24404	3002
(7) ER^2	822	1224	2116	3363	4407	6986	10969.7	17882.1	25266.4
(8) RR	1470	1578	3748	6047	7323	11227	19064	30341	57510
(9) c* = 2/4	0.1197	0.1433	0.1441	0.1697	0.1890	0.1750	0.1895	0.2238	0.1971
(10) t'* = 3/4	0.6363	0.5842	0.6682	0.6844	0.6674	0.7055	0.7009	0.6644	0.7524
(11) e* = 7/4	0.0756	0.0793	0.0890	0.0834	0.0732	0.0700	0.0684	0.0775	0.0487
(12) r* = 8/4	0.1352	0.1022	0.1576	0.1500	0.1216	0.1126	0.1189	0.1315	0.1108
(13) o* = 6/4	0.0420	0.0658	0.0880	0.0303	-0.0003	0.0740	0.1435	0.1057	0.0058
(14) mb* = 5/4	0.0025	0.0011	0.0005	0.0006	0.0004	0.0002	0.0011	0.0013	0.0003
(15) k_1	1.30	1.43	0.99	1.12	1.36	1.09	0.94	1.04	1.23
(16) k_2	3.01	2.93	2.39	2.7	3.1	2.72	2.29	2.28	3.30

Source : Estimated using data in Table 1 and formulas given in the text.

1 Fund acc'ts + non-bank deposits + OMO liabilites

2 Vault cash + free deposits at the CB

TABLE 5
CONTRIBUTION OF ITS DETERMINANTS TO THE CHANGE IN M2 (1986-1994)

(Bill. TL)

			Average Contribution[2] (%)							Relative Contribution[3] (%)					
	M2	H[1]	(%) Δ in M2	H	c*	r*	e*	o*	mb*	H	c*	r*	e*	o*	mb*
			(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1986	12173.2	4051													
1987	17648.0	6020	45.0	48.6	-5.3	11.1	-1.2	-8.0	-0.2	108.1	-11.8	24.7	-2.8	-17.8	-0.4
1988	27194.2	11383	54.1	89.1	-0.2	-18.6	-3.3	-7.5	-0.1	164.7	-0.3	-34.4	-6.0	-13.8	-0.1
1989	47139.2	17472	73.3	53.5	-4.1	2.1	1.5	15.8	0.0	72.9	-5.5	2.8	2.1	21.5	0.0
1990	71569.6	23091	51.8	32.2	-3.8	9.0	3.2	9.7	0.0	62.0	-7.4	17.3	6.2	18.6	0.0
1991	117118.3	43041	63.6	86.4	3.5	3.3	1.1	-27.4	0.0	135.7	5.5	5.2	1.8	-43.0	0.0
1992	190736.2	83438	62.9	93.9	-2.9	-2.0	0.5	-22.2	0.1	149.3	-4.6	-3.2	0.8	-35.4	0.2
1993	282441.9	124272.2	48.1	48.9	-5.2	-3.4	-2.5	10.3	0.0	101.8	-10.9	-7.1	-5.1	21.4	0.0
1994	630348.0	188106.8	123.2	51.4	4.1	5.7	8.0	27.8	-0.1	41.7	3.4	4.7	6.5	22.6	-0.1

1 Coinage minted added to monetary base figure given in Table 1.

2 Calculated using the data given in Table 4 and formulas given in the text.

Relative contribution = (Average Contribution / % Δ in M2) x 100; the line numbers do not add up to 100% since formula derived for a continous series is applied onto discrete series.