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TURKEY'S GREAT INFLATION

Maxwell J. FRY*

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I. INTRODUCTION

Turkey's great inflation started its explosive stage during 1977-1979. The annual inflation rate measured by the wholesale price index accelerated from 18 per cent in the first quarter of 1977 to 119 per cent in the first quarter of 1980. As measured by the continuously compounded rate of change in the GNP deflator (the index actually used in the model) inflation rose from 22 per cent in 1977 to 71 per cent in 1980. Concomitant with this price explosion was an equally alarming decline in the rate of economic growth. Real GNP grew by over 7 per cent a year between 1974 and 1976. The growth rate fell to 3 per cent in 1978 and was negative in both 1979 and 1980. Given the behaviour of prices the falling growth rate can hardly be attributed to deficient demand. Rather as explained in detail below Turkey's great inflation caused a great credit squeeze (as well as an acute balance of payments crisis). Output growth was constrained in part from the supply side by the lack of finance.

Turkey experienced a similar episode of accelerating inflation and declining growth between 1955 and 1960. The pattern of events in the 1970s seems to have followed inexorably the script of the 1950s. During the period 1977-1979 I was teaching at Boğaziçi University. A strong feeling of *deja vu* prompted me to try to understand some of the economic forces that caused these two economic catastrophes.

*Professor, University of California, Irvine, USA.

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While living in Istanbul I began work on a small-scale macroeconomic model designed to explain inflation and short-run growth [Fry and Farhi (1979); Fry (1980b)]. This paper presents a reestimate of that model and dynamic simulations for the 1977–1983 period.

The novelty of the model is that it incorporates the deposit rate of interest as a determinant of both inflation **and** growth. Policy simulations presented in Fry and Farhi (1979: 329–339) suggest that had money supply growth been brought down rapidly to reduce inflation in 1978, Turkey could have suffered a recession from then until 1984. On the other hand a substantial increase in deposit rates of interest **followed** by monetary deceleration a year later could have avoided a recession completely by relieving the credit squeeze and bringing down inflation simultaneously. Monetary contraction alone merely accentuates the credit squeeze in the short run.

In the event inflation as measured by the GNP deflator peaked at a continuously compounded rate of 71.2 per cent in 1980 as shown in Table 1. The rate of growth in real GNP was negative in both 1979 and 1980 but rose to a continuously compounded rate of 4.1 per cent in 1981. In this year the nominal 12-month time deposit rate of interest was increased dramatically to 50 per cent raising the real deposit rate by almost 20 percentage points to its highest level in 10 years. In 1982 monetary expansion slowed and the real deposit rate became positive for the first time since 1970 (Table 1).

Simulations of the reestimated model track closely what actually happened to inflation and growth over the period 1977–1983. In this paper I also show what might have happened had deposit rates not been raised. Specifically, the simulations suggest that economic growth would have remained negative for the entire period 1978–1983 had the deposit rate been held at its 1977 level.

Turkey's interest-rate experiments initiated in 1981 provide strong support for the efficacy of using institutional interest rates as a benign policy instrument for stabilisation purposes under conditions of financial repression.

2. INSTITUTIONAL INTEREST-RATE SETTING

Until 1981 the government fixed ceilings for virtually all nominal institutional interest rates in Turkey. These ceilings were binding

throughout the postwar period. The ceiling on the 12-month time deposit rate typifies the inflexibility of the system. Between 1951 and 1961 the deposit rate was 5 per cent compounded annually (Table 1). It was raised to 6.5 per cent in 1961, to 9 per cent in 1970, and to 12 per cent in 1978. Loan rate ceilings were also adjusted only in those years.

On the other hand the inflation rate varied considerably over this period (Table 1). Clearly the real 12-month deposit rate of interest calculated as the continuously compounded nominal deposit rate minus the continuously compounded expected rate of inflation fluctuated widely and changed roughly in the opposite direction to the inflation rate (Table 1).

There has been widespread evasion of the loan rate ceilings. The easiest way of evading these ceilings has been for the banks to require borrowers to hold compensating balances, despite the illegality of this practice. However, over half the total assets of Turkey's banking system are held by state-owned special law banks. These banks have less incentive and opportunity to evade the loan rate ceilings than do the private commercial banks.

Although large depositors have received rates above the deposit rate ceilings, commercial banks have strong incentive to collude in observing deposit rate ceilings. Expenditure on nonprice competition –advertising and branch expansion– has been enormous. Hence bank cost ratios in Turkey compare most unfavourably with those in Western Europe and North America. It seems reasonable therefore to conclude that deposit rate ceilings have been fairly effective and that banks have colluded to avoid deposit rate competition.

The marginal utility to depositors of bank expenditure on nonprice competition is undoubtedly well below that of expenditure on interest payment because demand for money falls when the real deposit rate of interest declines. In other words nonprice competition is not a perfect substitute for price competition. Hence deposit rate ceilings widen the spread between effective deposit and loan rates of interest. This in turn reduces money demand and may also reduce both saving and investment (Fry, 1979a).

The government took a first hesitant step towards introducing a more flexible interest rate policy in May 1979 when the 12-month deposit rate was raised from 12 to 20 per cent. However the effect

TABLE 1 Money, Interest, Inflation and Growth Rates, 1950-1983

Year	GNP Growth Rate	Inflation Rate	Money Growth Rate	Velocity of Circulation	Nominal Deposit Rate	Real Deposit Rate
1950	8.9	—2.1	5.8	5.8	6.5	7.7
1951	12.1	6.3	17.6	5.8	5.9	3.5
1952	11.3	2.7	17.7	5.6	5.0	2.1
1953	10.7	4.7	19.4	5.4	5.0	1.2
1954	—3.0	5.0	17.1	4.6	5.0	1.1
1955	7.6	10.7	16.2	4.7	5.0	—0.7
1956	3.1	11.2	23.4	4.3	5.0	—2.5
1957	7.5	20.9	24.4	4.5	5.0	—6.7
1958	4.4	13.3	14.8	4.6	5.0	—7.0
1959	4.0	18.1	10.8	5.2	5.0	—9.1
1960	3.4	3.3	11.8	4.9	5.0	—6.2
1961	2.0	4.0	8.9	4.8	5.8	—4.1
1962	6.0	9.1	9.3	5.1	6.5	—3.7
1963	9.2	5.6	10.9	5.3	6.5	—2.5
1964	4.0	2.5	13.5	4.9	6.5	—0.1
1965	3.1	4.2	16.6	4.5	6.5	0.9
1966	11.3	6.2	20.2	4.3	6.5	1.1
1967	4.1	6.3	18.1	4.0	6.5	0.7
1968	6.5	3.8	15.0	3.8	6.5	1.2
1969	5.3	5.2	15.1	3.7	6.5	1.4
1970	5.6	11.2	17.2	3.7	7.3	0.3
1971	9.7	16.8	22.3	3.8	9.0	—1.2
1972	7.2	15.2	24.0	3.8	9.0	—2.7
1973	5.2	20.0	24.1	3.8	9.0	—5.1
1974	7.1	25.0	23.9	4.1	9.0	—8.6
1975	7.7	15.0	23.8	4.1	9.0	—8.2
1976	7.4	15.7	22.9	4.1	9.0	—8.5
1977	3.9	21.8	25.3	4.1	9.0	—10.3
1978	3.0	36.1	30.2	4.5	11.3	—13.6
1979	—0.4	53.7	40.1	5.1	17.3	—17.0
1980	—1.1	71.2	49.7	6.3	26.5	—20.2
1981	4.1	35.0	57.9	5.2	49.2	—0.3
1982	4.4	24.2	51.2	4.1	50.0	4.1
1983	3.1	22.9	27.2	4.1	42.7	1.1

Source: State Institute of Statistics, **Monthly Economic Indicators**, February 1984, pp. 33-34, Türkiye Cumhuriyet Merkez Bankası, **Üç Aylık İstatistik Özetleri**, March 1984, p. 8; Türkiye Cumhuriyet Merkez Bankası, **Yıllık Rapor** 1982, pp. 115, 126; **International Financial Statistics**, June 1984, computer tape; Maxwell J. Fry and Miriam Rodrik Farhi, **Money and Banking in Turkey** (İstanbul: Boğaziçi University Press, 1979), pp. 376-385.

Note: All rates of change expect the nominal deposit rate of interest are continuously compounded.

of this substantial increase in the nominal deposit rate on the real deposit rate was more than wiped out by an increase in the inflation rate from 36 per cent in 1978 to 54 per cent in 1979.

Some observers believe that the government took a more confident stride towards interest rate flexibility in 1980. As part of the

stabilisation programme implemented under a standby agreement with the International Monetary Fund, the Turkish government deregulated interest rates on time deposits in July 1980. The 12-month time deposit rate rose immediately to 35 per cent, a rate determined through cartel agreement by the large commercial banks (Kopits, 1984: 4). That a cartel would step in if the government stepped out of the business of setting institutional rates of interest was quite predictable (Fry, 1980b: 543). The July 1980 deposit rate increase was still insufficient to counteract the acceleration in inflation to 71 per cent in that year. Table 1 shows the steady decline in the real deposit rate of interest until 1981.

Under some competitive pressure from increasingly attractive yields on government bonds, the bank cartel raised the 12-month deposit rate in two steps to 50 per cent by February 1981. This before-tax rate was equivalent to an after-tax rate of 37.5 per cent given the 25 per cent witholding tax. Apparently the cartel agreement was broken frequently and rates in excess of 50 per cent were quite common (Kopits, 1984: 4). Despite an acceleration in the rate of monetary growth from 50 per cent in 1980 to 58 per cent in 1981 the inflation rate was halved from 71 to 35 per cent. At the same time the rate of economic growth increased from −1.1 per cent in 1980 to 4.4 per cent in 1981 (Table 1). Both the reduction in inflation and the acceleration in economic growth can be attributed to the 20 percentage point increase in the real deposit rate of interest between 1980 and 1981 as argued below. The consequent increase in money demand illustrated by the rapid reduction in velocity of circulation from 6.3 to 5.2 (Table 1) reduced inflation and at the same time relieved the credit squeeze that had previously stifled economic growth.

Deregulation lasted only until January 1983 when the government again modified the interest-rate setting system. The nine largest banks were then bound by the interest rate structure negotiated between the government and the bank cartel, while the other banks were allowed to offer a premium of 2.5 percentage points above these rates (Kopits, 1984: 4–5). With the decline in inflation the nominal 12-month time deposit rate was reduced to 45 per cent in January 1983 (the witholding tax was lowered from 25 to 20 per cent then) and to 40 per cent in July of the same year. As a result, the real deposit rate fell somewhat in 1983 and inflation hardly changed despite a decline in monetary growth from 51 per cent in 1982 to 27 per cent in 1983.

Inflation actually started to accelerate in the second half of 1983 (and throughout 1984). Since the bank cartel was unwilling to raise nominal deposit rates the government adopted yet another interest-rate setting system in December 1983. Under it the central bank has been authorised to review and set deposit rates at least every three months, taking into account fluctuations in the rate of inflation and other relevant economic developments. Under the new system the 12-month deposit rate was increased again to 45 per cent in mid-December 1983 and a three-month call deposit yielding 49 per cent was reinstated.

The withholding tax was reduced (from 20 per cent to 10 per cent) at this time, as was the financial transactions tax on nonpreferential loan rates of interest (from 15 to 3 per cent) (Kopits, 1984: 5). These two tax reforms together with the decline in the inflation rate substantially reduced the wedge between effective deposit and loan rates that had previously deterred financial intermediation (Fry and Farhi (1979: 366–373). In conjunction with rationalisation of reserve requirements and the introduction of deposit insurance in early 1983 the government appeared to have embarked upon a new course of financial development at long last. Under these conditions one might anticipate a further decline in velocity of circulation from its 1982–1983 level of 4.1 over the next few years.

3. INFLATION

Inflation in Turkey can be explained by a simple monetary model. The equilibrium condition in the money market can be expressed in per capita terms:

$$Md / N = Ms / N, \tag{1}$$

where Md is money demand, N is population and Ms is money supply. The money supply is defined broadly to include savings and time deposits as well as currency in circulation and demand / sight deposits (ie, M2). Equation (1) can be rewritten:

$$md.P = Ms / N, \tag{2}$$

where md is real per capita money demand (ie, Md / PN) and P is the price level as measured by the GNP implicit deflator. Equation (2) can be expressed in first difference logarithmic form:

$$\dot{m}d + \dot{P} = \dot{M}s - \dot{N}, \tag{3}$$

where the dots represent $\Delta \ln$. Finally equation (3) can be rearranged so that inflation is given as the difference between the rates of growth in per capita nominal money supply and per capita real money demand:

$$\dot{P} = (\dot{M}s - \dot{N}) - \dot{m}d. \quad (4)$$

Prices adjust relatively rapidly in Turkey because of the preponderance of auction markets. Hence it seems quite reasonable to expect the equilibrium condition to hold for the annual model used here.

To understand the inflationary process the determinants of nominal money supply and real money demand must themselves be analysed. The money supply mechanism takes different forms in different countries. This is how it appears to have worked in Turkey during the postwar period, at least until 1980.

Turkey's administered interest rate system ensures that there is always excess demand for institutional credit. This means that the nominal quantities of domestic credit have been determined solely by supply. Through rediscount and interest rate ceilings, required reserve and liquidity ratios, a selective credit policy and various informal pressures such as persuading commercial banks to take up unsold government bonds, the monetary authorities have had strong influence over the nominal quantity and distribution of domestic credit. Furthermore over most of the postwar period state owned special law banks held over 50 per cent of commercial bank assets. Hence the monetary authorities (ie, the government since the central bank has had no autonomy-highlighted by the government's sacking of a somewhat independently minded governor of the central bank in 1978) have essentially determined domestic credit expansion as well as its composition.

Accelerated monetary growth in the 1950s and 1970s originated in rapid and unanticipated increases in foreign exchange receipts. The sharp rise in the early 1950s was caused by the Korean War boom and a large increase in agricultural exports. The rise in the early 1970s was due to a substantial increase in remittances from Turkish workers in Europe (predominantly in Germany) as well as the commodity boom. Both were stimulated by the 1970 devaluation.

Initially the larger foreign exchange receipts raised net foreign assets. Rather than sterilising the effect of higher net foreign assets

on the money supply, the government responded by **expanding** domestic credit to finance a greater volume of imports of capital equipment and raw materials. Although this reduced rapidly the level of net foreign assets, it sustained the expansionary monetary impulse. The government then followed the real bills doctrine with respect to domestic credit expansion, accommodating with a lag demand pressures generated by the accelerating rise in nominal GNP.

Accelerating monetary growth produced inflation. This in turn enlarged the public sector deficit due to the lag in the collection of tax receipts, erosion of the tax base, and price freezes on products of the economic enterprises. The public sector deficit was financed by further increases in the money supply, so adding fuel to the inflationary fire.

This money supply process is modelled and estimated in Fry (1978c). Changes in the nominal money supply are explained best by changes in foreign exchange receipts and **lagged** changes in nominal GNP. Following Hemphill (1974) and Krueger (1974: 48–50), I assume that changes in foreign exchange receipts are exogenous to this model. Hence the system is recursive and changes in the nominal money supply can be treated **as if** they were exogenous without introducing simultaneous equation bias in the estimate of the inflation rate function.

The money supply model indicates that the money supply process in Turkey is unstable. Once inflation gets under way the feedback mechanism from inflation to monetary acceleration through the widening public sector deficit appears to be explosive. Whether or not Turkey's money supply system is unstable, however, both postwar inflations were certainly accompanied by increasing political instability. The 1950s inflation was brought to a halt after a massive devaluation, rescheduling of international debts, introduction of an austerity / stabilisation programme and the military coup of 1960. The 1970s inflation was contained after several devaluations, a series of debt reschedulings, the introduction of a stabilisation programme in conjunction with a standby agreement with the International Monetary Fund and a military takeover of government on 12 September 1980.

Real money demand is determined everywhere by one or more price (ie, interest rate) variables and a budget constraint. Here the

price variable chosen is the real deposit rate of interest, $D-\dot{P}^*$, where D is the nominal 12-month time deposit rate of interest continuously compounded and $\dot{P}^*$ is expected inflation. This implies that tangible assets used as inflation hedges rather than bonds are the dominant substitute asset for broad money. Holdings of nonmonetary financial assets by the nonbank sector were in fact very limited in Turkey throughout the regression period. The budget constraint is per capita real permanent GNP, y^*. The money demand function can be expressed in first difference semi-logarithmic form,

$$\dot{m}d = a_1\dot{y}^* + a_2(D-\dot{P}^*). \tag{5}$$

Equation (5) is substituted into equation (4).

The ordinary least squares (OLS) estimate of this inflation equation in Turkey for the regression period 1950–1977, as reported in Fry (1980b: 537), is (t values in brackets):

$$\dot{P} = 1.115(\dot{M}-\dot{N}) - 2.152(\dot{y}^*) - 1.418(D-\dot{P})^e, \tag{6}$$
$$(7.493) \quad (-3.501) \quad (-3.046)$$
$$\bar{R}^2 = 0.659 \quad DW = 1.92$$

Since the nominal deposit rate was virtually constant over the 1950–1977 period, the polynomial lag is imposed on $(D-\dot{P})$ in equation (6). The expected change in the real deposit rate of interest and per capita permanent income are estimated as far end-constrained third degree polynomial distributed lags with the following coefficients:

	t-1	t-2	t-3	t-4	t-5	t-6	t-7
$\dot{y}^*_{t-i}$	0.226	0.223	0.202	0.167	0.119	0.062	0.000
$\Delta(D-\dot{P})^e_{t-i}$	0.030	0.215	0.274	0.245	0.165	0.071	0.000

The new estimate for the extended period 1950–1983 covering the great inflation is

$$\dot{P} = 1.067(\dot{M}-\dot{N}) - 1.909(\dot{y}^*) - 1.526(D-\dot{P}^*). \tag{7}$$
$$(18.040) \quad (-5.289) \quad (-5.509)$$
$$\bar{R}^2 = 0.843 \quad DW = 1.36$$

The nominal deposit rate was changed frequently and with considerable publicity during the 1978–1983 period. Therefore the polynomial lag is imposed only on $\dot{P}$ in equation (7). This implies that the change in the nominal deposit rate (but not the change in the

inflation rate) is recognised without any lag. The distributed lag coefficients for equation (7) are:

	t	t-1	t-2	t-3	t-4	t-5	t-6	t-7
$\dot{P}^*$	0.520	0.297	0.140	0.043	0.000			
$\Delta\dot{P}^*$	0.300	0.194	0.136	0.112	0.102	0.092	0.064	0.000

The new estimate has considerably higher explanatory power than the old. As one might expect the lag structures indicate that responses to changes in income and inflation occurred faster during the 1978–1983 than the 1950–1977 period. However the coefficients in both reduced form equations are remarkably similar. The coefficients of the three variables in equations (6) and (7) all agree with **a priori** expectations. The coefficient of the rate of change in the nominal money suppy is not significantly different from one. The elasticity of money demand with respect to per capita real permanent income is about 2, a figure comparable with elasticities estimated directly in money demand studies using a broad definition of money. The coefficient of the change in the expected real deposit rate of interest of about −1.5 is also of the same order of magnitude as coefficients estimated for Turkey and other developing countries in money demand functions [eg. Abe **et al** (1975), Fry (1978d), Fry and Farhi (Ch 4)].

4. GROWTH

The short-run growth equation estimated here is a Fisherian Phillips curve with a credit availability effect added. The first determinant of the growth rate, g, is the ratio of the actual to the expected price level, P/P^*. This variable comes from extensions of the expectations-augmented Phillips curve in the late 1970s [eg. Fry (1978a and 1978b), Korteweg (1978), Laidler (1978)]. If actual price exceeds expected price, entrepreneurs interpret the difference to reflect a real increase in demand for their products. Their response is to raise the rate of capacity utilisation of the existing capital stock to increase output immediately and to invest more to increase that capacity. The higher is P/P^* the better the investment outlook appears and the greater is the growth rate. Expected price P^* equals $\exp(\dot{P}^*)P_{t-1}$. The expected inflation rate, $\dot{P}^*$, is calculated here using the weights for the expected change in inflation, $\Delta\dot{P}^*$ in equations (6) and (7).

Expected inflation also affects short-run growth through the expected real deposit rate of interest (D-$\dot{P}^*$). Under Turkey's disequilibrium interest rate and exchange control systems, real money demand determines to a large extent the real supply of domestic credit because domestic credit is the primary asset backing the monetary liabilities of the banking system.

The traditional link between credit and output is through demand- the increase in credit created by monetary expansion is accompanied by an increase in demand which stimulates real output. Since 1973, however, a number of economists [eg, Buffie (1984), Fry (1980a), Kapur (1976), Keller (1980), Mathieson (1980), Taylor (1983), and van Wijnbergen (1982 and 1983)] have focused on the link between credit and real output through the supply side. This Wicksellian view holds that the availability of working capital determines, **ceteris paribus**, the volume of production that can be financed. In particular, as Keller (1980: 455) argues, ".....production **expansion** may depend, entirely or in part, on credit availability and / or the cost of credit." Evidently this supply link between credit availability and real economic growth springs from the ratio of credit to output, or from the real rather than the nominal volume of credit.

Faster expansion of money and nominal credit raises the inflation rate. If the nominal deposit rate is fixed, the ensuing increase in expected inflation reduces the real deposit rate of interest- and this in turn reduces real money demand or decreases the ratio of money to nominal GNP. The ratio of domestic credit to nominal GNP DC / Y also falls. In this way, an acceleration in nominal domestic credit and hence in the money supply reduces credit availability in real terms.

As inflation accelerates, and as real deposit rates, real money demand and real credit supply all decline, the government may find that the gap between conventional tax receipts and public expenditure widens [eg, Aghevli and Khan (1977 and 1978), Dutton (1971), Ness (1972), Uluatam (1973)]. This gap is financed by heavier reliance on seigniorage and the inflation tax. The government extracts greater seigniorage by increasing the proportion of domestic credit allocated to the public sector, and thus reduces the ratio of private sector credit to total domestic credit DCp / DC. It levies an inflation tax by creating more money than the public wishes to hold at the current price

level. This produces a double squeeze on credit available for private sector working capital. In other words DC_p / Y falls due to the decline in both DC / Y and DC_p / DC when inflation accelerates in countries implementing selective credit policies through rigidly fixed nominal interest rate systems [Fry (1979a, 1981, 1982a and 1982b), Kapur (1976), Mathieson (1979)]. In Turkey for example velocity of circulation rose by 70 per cent and the ratio of public sector domestic credit to the money supply increased from 20 to 229 per cent as the expected real deposit rate of interest fell from 0.3 per cent in 1970 to −20.2 per cent in 1980.

Turkey's private sector was starved of credit as the real supply of domestic credit declined and government extracted a higher seigniorage from the money supply. Funds to finance working capital dried up and the credit squeeze reduced the rate of capacity utilisation of the existing fixed capital stock [Fry (1979a)]. The growth rate declined. Hence $(D\text{-}\dot{P}^*)$ has a positive effect on g.

In the longer run g is determined by, among other factors, the volume and productivity of investment, both of which are affected positively by $(D\text{-}\dot{P}^*)$ in Turkey (Fry, 1979a) and in several Asian developing countries [Fry (1980a, 1981 and 1984)]. However here it is assumed that investment raises productive capacity –so moving the transformation frontier outwards– smoothly over time. For industrial countries, the time trend of real GNP may provide a reasonable proxy for normal supply-the noncyclical component of supply determined solely by productive capacity. For most developing countries however it is also necessary to take into account fluctuations in both agricultural output and the level of imports (Fry 1980b: 539).

Year-to-year changes in the level of agricultural output are determined largely by variations in weather conditions. Therefore they represent exogenous shifts in the production possibility curve. Short-run fluctuations in the level of imports may also shift the production possibility curve if imports act as a factor constraint. They are also exogenous or noncyclical phenomena in developing countries such as Turkey that maintain disequilibrium foreign trade regimes subject to tight government control. Here imports are determined by foreign exchange receipts, a variable determined completely outside the present model.

Trend growth in real GNP in Turkey differed significantly before and after the period 1962–1976 (Fry, 1971: 322). Therefore trends in real GNP, agricultural output and real imports were calculated separately for 1948–1961, 1962–1976 and 1977–1983. Normal supply is defined as trend real GNP plus the differences between the actual and trend real agricultural output and real imports.

Normal growth, g^t, exerts a positive effect on g. However above-average growth in agricultural output and / or imports will depress growth in other sectors of the economy as a result of an additional credit effect. Credit requirements of Turkey's agricultural price support programme, which are of course positively related to growth in agricultural output, as well as foreign credit demands (related positively to the level of imports), have had priority over credit demands of other sectors. Hence the other sectors suffer a credit squeeze in real terms when more of the fixed real supply of domestic credit is allocated to agriculture and imports.

All this implies that the effect of g^t on g is positive but that the coefficient of g^t will be somewhat less than one, despite the fact that on average g equals g^t. Above-average growth in agricultural output and / or imports imposes a credit squeeze on the other sectors which reduces their rates of capacity utilisation and so produces below-average growth there.

The final determinant of g in this model is the lagged difference between g and g^t, ie, $g_{t-1} - g^t_{t-1}$, defined as x_{t-1}. This variable has a negative impact on g. **Ceteris paribus** there is a tendency to return to normal growth. If actual growth exceeded normal growth in the previous year, it is more difficult for g to exceed normal growth again in the current year. It will need additional positive stimuli from P / P^* and / or $(D\text{-}P^*)$ to achieve the same difference between g and g^t in the second of two consecutive years. The converse also applies **mutatis mutandis** for sustained below-trend growth.

The original estimate (Fry, 1980b: 540) of the growth equation in Turkey for the period 1950–1977 is

$$g = \underset{(9.701)}{0.834}(g^t) + \underset{(1.946)}{0.012}(P / P^*) + \underset{(2.338)}{0.127}(D\text{-}P)^* - \underset{(-1.134)}{0.189}(x_{t-1}). \quad (8)$$

$$\bar{R}^2 = 0.828 \qquad DW = 1.93$$

The new estimate for the extended period 1950–1983 is

$$g = \underset{(9.137)}{0.759(g_{-1})} + \underset{(3.045)}{0.018(P/P^*)} + \underset{(2.701)}{0.137(D\text{-}\dot{P}^*)} + \underset{(1.220)}{0.178(x_{t-1})}, \qquad (9)$$

$$\bar{R}^2 = 0.812 \qquad DW = 2.11$$

The variable x_{t-1} was included in the first instance to preclude any possibility of explosive instability in the dynamic simulations of the model that are reported in Fry and Farhi (1979, Ch 10). In fact however an almost identical result is obtained when x_{t-1} is omitted. The original estimate for the period 1950–1977 is

$$g = \underset{(10.742)}{0.869(g_{-1})} + \underset{(1.670)}{0.010(P/P^*)} + \underset{(2.149)}{0.115(D\text{-}\dot{P})^*}, \qquad (10)$$

$$\bar{R}^2 = 0.827 \qquad DW = 2.16$$

The new estimate for 1950–1983 is

$$g = \underset{(9.656)}{0.784(g_{-1})} + \underset{(2.859)}{0.017(P/P^*)} + \underset{(2.698)}{0.138(D\text{-}\dot{P}^*)}, \qquad (11)$$

$$\bar{R}^2 = 0.803 \qquad DW = 2.34$$

The coefficients of the old and new estimates are again extremely similar to one another.

Equations (6) and (7) show that an acceleration in nominal money growth raises the inflation rate and so P/P^*. In turn an increase in P/P^* raises growth in real GNP as shown in equations (8)–(11). This is the standard short-run Phillips curve tradeoff. However when expected inflation rises so reducing P/P^* and $(D\text{-}\dot{P}^*)$ the growth rate declines. In long-run equilibrium P equals P^* because inflation is fully anticipated. Then only the negative impact of a lower real deposit rate $(D\text{-}\dot{P}^*)$ is felt. With D held constant (and below its market equilibrium level), the long-run Phillips curve produces a negative relationship between inflation and growth in a financially repressed economy like Turkey through the real credit supply mechanism, even before the effect of inflation on the saving rate and on the average efficiency of new investment is taken into account.

5. SIMULATIONS

Actual and predicted growth and inflation rates for the period 1950–1983 are shown in Table 2. Figures 1 and 2 show actual and

TABLE 2 Actual and Predicted Growth and Inflation Rates, 1950-1983

Date	Actual Growth Rate	Predicted Growth Rate	Actual Inflation Rate	Predicted Inflation Rate
1950	8.9	8.5	2.1	7.7
1951	12.1	13.1	6.3	10.2
1952	11.3	11.3	2.7	3.0
1953	10.7	6.9	1.7	3.1
1954	3.0	1.2	5.0	13.7
1955	7.6	7.7	10.7	12.7
1956	3.1	3.8	14.2	22.5
1957	2.5	5.4	20.9	23.5
1958	4.4	5.5	13.3	8.7
1959	4.0	6.2	18.1	8.5
1960	3.4	4.2	5.3	3.2
1961	2.0	3.3	4.0	3.3
1962	6.0	4.5	9.1	3.3
1963	9.2	7.8	5.6	1.5
1964	4.0	3.7	2.5	1.9
1965	3.1	5.0	4.2	9.9
1966	11.3	9.6	6.2	8.9
1967	4.1	5.4	6.3	10.4
1968	6.5	6.8	3.8	4.8
1969	5.3	5.9	5.2	7.0
1970	5.6	6.6	11.2	11.6
1971	9.7	9.5	16.8	13.5
1972	7.2	7.2	15.2	15.3
1973	5.2	4.1	20.0	19.3
1974	7.1	6.5	25.0	20.1
1975	7.7	7.4	15.0	13.3
1976	7.4	7.1	15.7	12.9
1977	3.9	4.1	21.8	21.0
1978	3.0	-2.0	36.1	31.2
1979	0.4	0.5	53.7	46.8
1980	1.1	1.5	71.2	59.8
1981	4.1	3.8	85.0	29.5
1982	4.4	4.8	24.2	43.3
1983	3.1	3.4	22.9	28.7

predicted growth and inflation rates for the more recent period 1977 1983. The predicted series are obtained simply by inserting the actual values of the righthand-side variables in equations (7) and (9). Figure 1 shows that the estimated growth rate series is a year early in its prediction of the 1979–1980 recession. However its prediction of zero growth on average over the three-year period 1978–1980 is quite accurate. The recovery starting in 1981 is tracked well.

The inflation equation tracks the actual inflation rate extremely well until 1979. Figure 2 shows that at this point it starts underpredicting the inflation rate until 1982 when it overpredicts. The reason for this is probably a change in the way people formed their expectations about inflation towards the end of the 1970s. By 1978 it was

becoming increasingly expensive to misforecast inflation. Hence it is reasonable to assume that the lagged adjustment of expected to actual inflation rates was shortened. This alone would explain equation (7)'s underprediction of inflation for 1979–1981 as well as its overprediction for 1982 and 1983. All-in-all however both equations perform reasonably well over the period 1977–1983 as a whole.

Another way of examining the explanatory power of this simple two-equation model is to conduct dynamic simulations for the period 1977–1983. Here only the actual rate of change in the per capita money stock, normal growth and the nominal deposit rate of interest are treated as exogenous variables. Per capita real permanent income, expected inflation, expected price and lagged growth are all calculated from the values of g and $\dot{P}$ estimated by equations (7) and (9). In this way forecast errors become built into the righthand-side variables in future time-period forecasts.

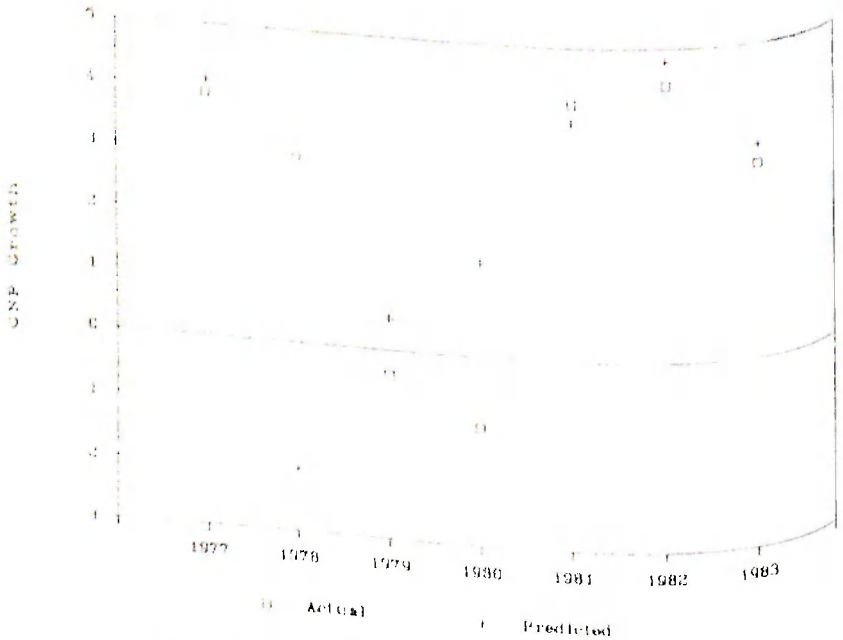

Figure 1 Actual and Predicted Growth Rates, 1977–1983

The monetary authorities had at their disposal two independent instruments of monetary policy to confront the inflationary surge

of the late 1970s-the rate of growth in the nominal money supply and the nominal deposit rate of interest. There is in practice an upper bound to the deposit rate at its competitive market equilibrium rate (Fry, 1980b: 542). The discussion here is based on the assumption that the nominal deposit rate lies below this upper bound.

The model presented and estimated in sections 3 and 4 shows that a higher deposit rate of interest reduces inflation and raises the growth rate at the same time. Therefore an optimal monetary policy must set the nominal deposit rate at its upper bound. An obvious answer would be to abolish all institutional interest rate ceilings. In practice, however, the optimal competitive deposit rate has to be forced upon Turkey's cartelised and oligopolistic banking system (Fry, 1972, Chs 3, 4 and 6) by fixing a **minimum** deposit rate and requiring banks to satisfy all deposit demand at this rate. This would be sufficient to produce the competitive result, provided loan demand were elastic at rates above the competitive loan rate of interest. The Turkish government recognised at least part of this case for financial liberalisation in the June 1980 standby agreement with the International Monetary Fund.

Two dynamic simulations of the model illustrate the effects of the interest-rate increases that occurred between 1979 and 1981 on inflation and growth. Simulation 1 in Table 3 and Figures 3 and 4 take as exogenous the actual rates of growth in the money supply, normal growth, and the nominal deposit rate of interest that applied over the period 1977–1983. Simulation 2 runs the model to see what would have happened had the 12-month deposit rate of interest been held at 9 per cent, its rate between 1970 and early 1978.

TABLE 3 Dynamic Simulations of the Model, 1977–1983

Date	Actual		Simulation 1		Simulation 2	
	Growth	Inflation	Growth	Inflation	Growth	Inflation
1977	3.9	21.8	4.4	19.4	4.4	19.4
1978	3.0	36.1	−1.6	36.2	−2.1	43.0
1979	−0.4	53.7	0.7	44.7	−0.9	61.7
1980	−1.1	71.2	2.4	48.7	−0.7	72.0
1981	4.1	35.0	4.9	28.0	−1.7	81.9
1982	4.4	24.2	4.1	63.7	−1.7	62.5
1983	3.1	22.9	2.8	23.3	−1.3	14.1

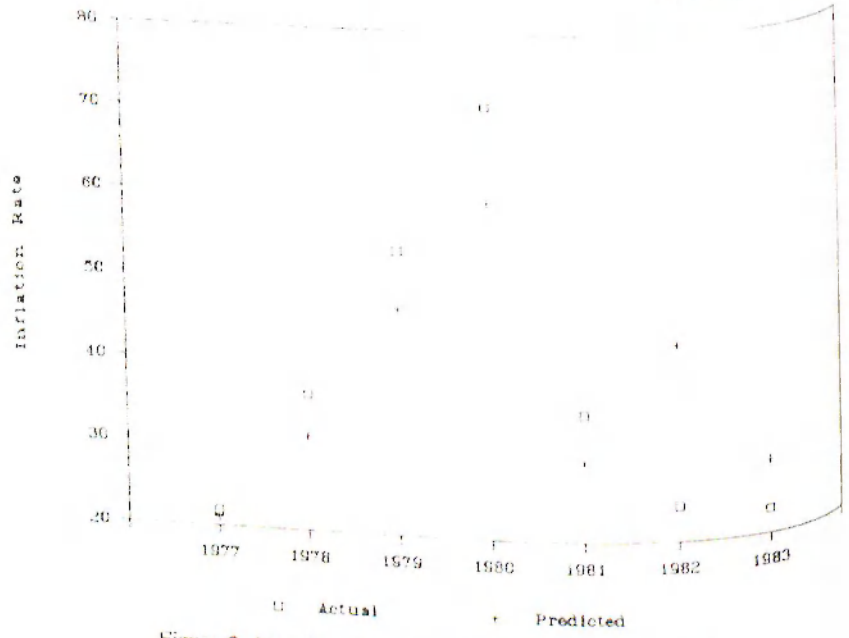

Figure 2 Actual and Predicted Inflation Rates, 1977–1983

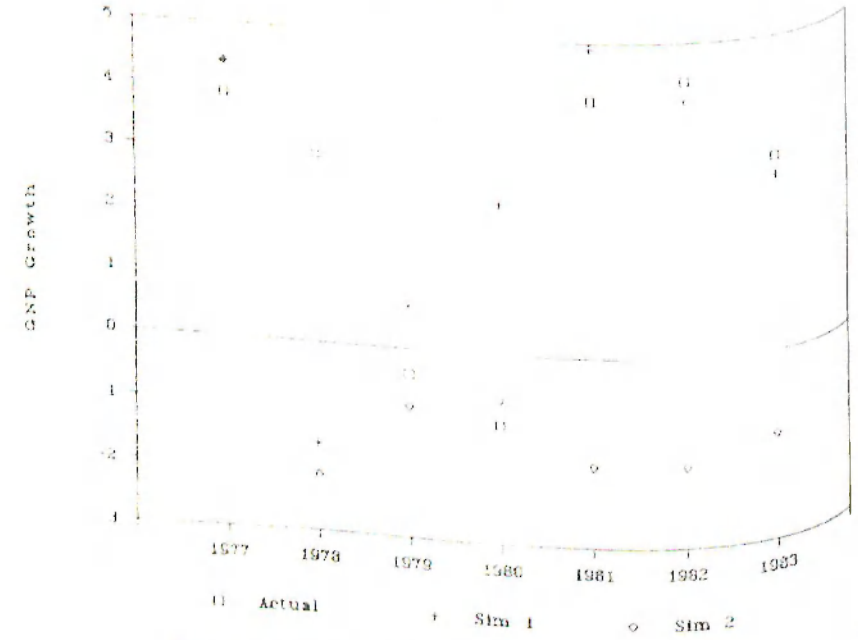

Figure 3 Actual and Simulated Growth Rates, 1977–1983

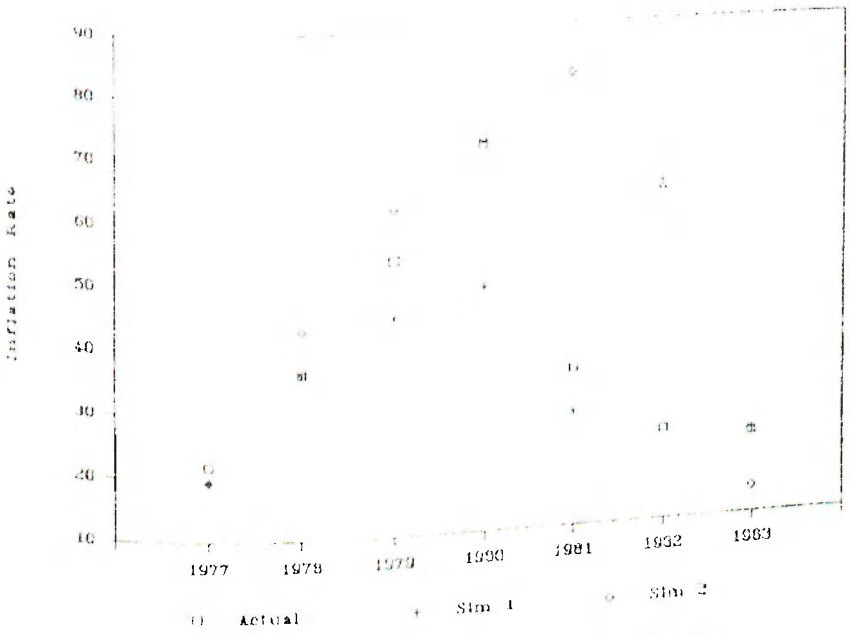

Figure 4 Actual and Simulated Inflation Rates, 1977-1983

Simulation 1 uses the actual deposit rate data and tracks actual inflation and growth reasonably well over the period 1977–1983. It predicts negative growth for 1978 instead of 1979 and 1980. However, the recovery to over 4 per cent growth in 1981 and 1982 together with the drop to 3 per cent in 1983 is predicted accurately. The rapid acceleration in inflation from 1977 to 1980 is predicted but the actual inflation rates are underpredicted until 1982. The simulation predicts the 1980 peak in inflation and the rapid fall in 1981. It overpredicts inflation in 1982 badly but predicts the 1983 rate almost perfectly.

Simulation 2 illustrates what might have happened had the deposit rate of interest been kept at 9 per cent. Inflation would have been much higher than it actually was between 1978 and 1982. This simulation forecasts an inflation peak in 1981 at 82 per cent and inflation rates of over 50 per cent for four years in succession, 1979–1982. Simulation 2 predicts much lower growth and forecasts declining real GNP for the six years 1978–1983.

The two simulations produce such different results solely because of the different deposit rate series used. They imply that it was the substantial increases in deposit rates that were responsible in large part for Turkey's relatively small recession and reasonably rapid recovery after the stabilisation programme was initiated in 1980. They also show just how much effect changes in the deposit rate can exert on both inflation and short-run growth.

6. CONCLUSION

This paper presents a reestimate of a simple, small scale monetary model of the Turkish economy. The model shows how two monetary policy variables -the rate of growth in the money supply and the deposit rate of interest- affect two target variables, inflation and short-run growth in real GNP. Two simulations for the 1977–1983 period illustrate that in monetary policy making active use of the deposit rate of interest is vastly superior to a policy relying solely on control over the nominal money supply under Turkey's disequilibrium interest rate system.

Concentration on these monetary policy instruments does not imply that fiscal, price, exchange rate and foreign trade policies are unimportant in Turkey. Indeed, fiscal policy has strong influence on the rate of growth in the money supply. The rapid recovery in exports would not have occurred without a radical reform of exchange rate policy. However consideration of the effectiveness of these macroeconomic policy instruments is beyond the scope of this paper.

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