

AN INFLATION MODEL FOR THE TURKISH ECONOMY
1950-1990

A Thesis

Submitted to the Department of Economics
and the Institute of Economics and Social Sciences
in Partial Fulfillment of the Requirements
for the Degree of

MASTER OF ARTS IN ECONOMICS

submitted by:
UFUK DEMİRCİOĞLU

June, 1992

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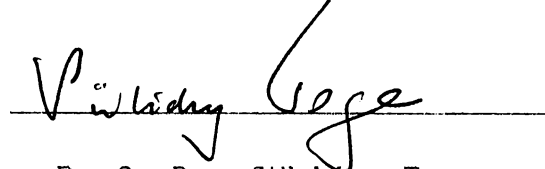
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Prof. Dr. Sübidey Togan

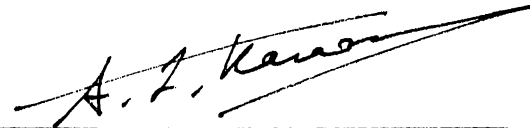
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ABSTRACT

AN INFLATION MODEL FOR THE TURKISH ECONOMY

1950 - 1990

submitted by:

UFUK DEMIROGLU

MASTER OF ARTS IN ECONOMICS

Supervisor: Subidey Togan

June 1992, 50 pages

This study investigates the inflationary aspects of Turkish Economy in the period 1950-1990 and presents a model to investigate quantitatively Turkish inflation experience in those years. The expectations are assumed to be formed adaptively and the levels of economic activity and prices are taken to be determined by the equilibrium of demand arising from the money market and a supply schedule which assumes that production respond positively to unexpected price increases. The model constructed in that line is tested. In addition to these, import prices are also incorporated in the supply function because of the import dependence in the manufacturing sector of Turkey. Price expectations and import price changes are found to be significant in determining the price level, whereas the money growth is insignificant as its affect is captured by the expectations variable. The interest rate is also insignificant, but this is mainly due to that it was restricted before 1980, and a stability test on this variable show that interest rate is in fact influential after 1980 and insignificant before that year.

OZET

1950-1990 ARASI TÜRKİYE EKONOMİSİ İÇİN BİR ENFLASYON MODELİ

TESLİM EDEN:

UFUK DEMİROĞLU

EKONOMİ YÜKSEK LİSANS TEZİ

Tez Danışmanı: Sübidey Togan

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Bu çalışma 1950-1990 dönemi Türk ekonomisinin enflasyona yol açan özelliklerini incelemekte ve bu yıllardaki enflasyon deneyimini sayısal olarak incelemek için bir model geliştirmektedir. Beklentilerin adaptif biçimde oluşturulduğu kabul edilmiş, toplam üretim ve fiyat seviyelerinin ise para piyasalarında belirlenen talep ve üreticilerin beklenmedik fiyat artışlarına üretimi arttırarak cevap verdiği bir arz şeklinin dengesi sonucu belirlendiği biçiminde düşünülmüştür. Bunlara ek olarak Türkiye'nin imalat sektörlerindeki ithalat bağımlılığını da göz önüne almak amacıyla ithalat fiyatları da arz fonksiyonuna argüman olarak katılmıştır. Bu yönde oluşturulan model denenmiştir. Beklentiler ve ithalat fiyat seviyesi fiyatları belirlemede etkindir, ancak parasal genişleme (beklenti teriminin etkisini alması nedeniyle) anlamlı bir değişken olarak ortaya çıkmamaktadır. Faiz oranlarının da 1980 yılına kadarki faizi serbest bırakmayan politikalar nedeniyle katsayısı anlamlı çıkmamış, ancak yapılan kararlılık testi sonucunda bu değişkenin 1980'den önce etkisiz olmakla birlikte bu tarihten sonra anlamlı olduğu anlaşılmıştır.

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I would like to thank to Dr. Sonmez Atesoglu who initiated my work on the topic of inflation and Prof. Dr. Subidey Togan for his help in this study. I also wish to thank to all faculty members who had contributed by their suggestions, and in particular to Dr. Umit Erol and Dr. Erinc Yeldan for their supervision and corrections.

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1. INTRODUCTION :

Inflation in Turkey has been a major concern for many years, usually the most displeasent issue for the wage earners, and a prevalent topic both in daily speech and in political discussions. It has been on the agenda of Turkey during most of the years since mid fifties. Yet, inflation is a controversial topic, on which debates still continue on its reasons, harms and remedies for it. Apart from the debates among the economists in this field, another source of confusion is the misconceptions about inflation blurring people's minds. The mechanisms relating the money supply and other cost-push effects to inflation of prices are various, complicated and not very well agreed upon. An other aspect of inflation phenomenon is the impossibility of isolating the reasons of inflation and discussing them in the framework of a simple idealized economy, because of the structural issues involved. Inflation in developed countries and inflation in less developed countries are almost two distinct topics.

This thesis starts by an account of some fundamental theories on inflation, all aiming to fill the gaps or remove the deficiencies of each other, and then continues with a discussion of some structural issues concerning Turkey. Then in the third section a model for inflation in Turkey is

presented. The import price dependence and sensitivity of the demand for real balances to inflation expectations are two structural items incorporated in this model. The thesis ends with a discussion of the results.

2. THEORIES OF INFLATION :

QUANTITY THEORY OF MONEY:

It is a very old idea that inflation is caused by excess supply of money. The belief that only monetary terms are needed is culminated in the 'Quantity Theory of Money', which has its roots in the works of David Hume, Adam Smith and Ricardo, and later Fisher at Yale and Marshall at Cambridge¹. In its naive form, the theory is based on the following equation:

$$M v = p T$$

where M is the nominal stock of money; v is the velocity of circulation, T is the number of transactions per unit time and p is the average price of transactions. This equation is an identity, and the main assumptions of Quantity approach is not assuming correctness of this equation, but rather some other assumptions regarding the nature of the variables appearing in the equation. It has been thought that T and v are parameters determined by non-monetary issues such as technology and habits, and they are not only assumed to be independent of money, but also slowly changing over time. Further, quick adjustment to equilibrium is also assumed. Another version of

¹ Jackman, Mulvey and Trevithick (1982), pp. 10-13

the above equation is the Cambridge equation of the demand for money:

$$M_d = k p y$$

where M_d is the demand for nominal money balances, y is real output and p , this time, is the average price of output. This equation can be transformed to the 'velocity of money' form:

$$M v = p y$$

where this time v is the velocity of the circulation of money.

In the quantity theory, the real aspects in the economy such as preferences, available technology and resources, determine the relative prices and the amount of production (or allocation) of commodities; and the level of prices is determined by the money supply.

There is a difficulty at this stage, the prices are determined by real factors, so how are the increases in the quantity of money reflected into prices? This difficulty is resolved by Patinkin (1965) in his *Money, Interest and Prices*. Excessive money which is supplied by the government exogenously leads to higher demand, because it must be held by somebody who would want to make additional purchases with at least part of his extra holding of money balances. This new demand pushes prices upward. The process continues until the prices sufficiently increase to reverse the situation in the face of

real money holdings to the the initial level, but this level is the one at which the prices increase exactly proportionally to the amount of money.

Another channel the prices respond to increases in money supply thorough is interest rate as described by Alfred Marshall (1923). When there is an increase in the money supply, interest rate goes down due to excessive supply of credit in the credit market. Such a decline in the rate of interest will stimulate desired investment, which is another form of demand. The capacity of the economy is thought to be fixed, and there is no way the excess demand or investment can be met other than by an increase in prices. The prices go up until the excess of supply of credit is removed and interest rate returns back to its equilibrium level.

KEYNESIAN APPROACH:

Keynes (1936) *General Theory of Employment, Interest and Money*, which had enormous impact in Economics, laid down the foundations of the neoclassical theory in which deviations from full employment were regarded as transitory lapses from an otherwise stable equilibrium. This theory was very successful in explanation and policy prescription in the case of depressed economies. The income-expenditure approach was determining

the level of economic activity. Though the General Theory was successful in explaining the under-employment equilibrium, the developments after the Second World War brought suspicion to its generality². The explanation brought by Keynes and his followers to the problem of depression of 1920s and 1930s was the notion of deficient demand. The post war years in which full employment was achieved were now facing the problem of inflation, and General Theory was under the threat of becoming the theory of under-employment economies.

To explain this inflation phenomenon, the notion of excessive demand is advanced. As similar to the quantity approach, whenever there is a demand exceeding the full employment capacity of the economy, this demand is responded by an increase in prices until the excess demand is removed. But a difference is that, it is not clear in the Keynesian approach, whether the price will converge automatically to some new higher level or the inflation process will continue indefinitely³

In his book with the heading of *How to Pay for the War*, Keynes implicitly defines a model in which the prices are pushed up by the behavior of wage earners⁴. In this model,

² David Laidler and Michael Parkin (1975)

³ Jackman, Mulvey and Trevithick 1982, p. 19

⁴ *ibid.*, pp. 19-22

wage earners and producers are not content with what falls to their share from the national output after the government's rather big share needed to finance the war is deducted. In such a case where government's sudden excess demand arises, prices increase and meanwhile, some producers make windfall profits. But these then have to pay a lot of tax, so instead, they use this extra income to finance an increase in money wages of the workers who start to complain because of the increased prices. This is the channel in which wages increase. But then wage earners can claim more from the national output, and thus the total demand again exceeds the capacity and prices increase again, forming a wage-price spiral. The profiteers make faster adjustment to prices, whereas workers can bargain only at certain periods. Wage earners, during negotiations, may achieve the level they desire to reach, but the output they claim creates an excess demand, which in turn increases the prices again. This is a description of continuous inflation.

An improvement on this is Hansen's two-gap model⁵. In this model, both the labor and commodity markets can be jointly in disequilibrium for all the time. The real wages determine the demand for goods and if there is an excess demand, commodity prices increase. The real wages also determine the production decision of the producers and thus the

⁵ Bent Hansen, 1951

labor demand, and if there is an excess demand for labor, the wage price increases. It may be that these two markets (of labor and of commodities) may be both in continuous disequilibrium and both prices increase indefinitely.

In Keynesian framework, another criticism to the well-known proposition of the quantity theory as "the increase in money supply creates a proportional increase in the prices" is that the economy may be in an under-employment position, and the increase in the money supply for this reason alone may increase the level of output rather than increasing the price level.

Still another issue is the interest elasticity of demand for money. Holding cash is a trade off between the loss and the comfort due to holding money (and the trade off between the risk and gain due to holding return yielding assets, on the firms' side⁶). The interest rate, the variable affecting this decision, is critical in determining the velocity of circulation.

FRIEDMAN'S REVITALIZATION EFFORTS:

⁶ Tobin, J., "Liquidity preference towards Risk"

Friedman (1970) developed a model of inflation in order to review and compare the quantity theory and the Keynesian approach and further, to develop a third way to explain inflation⁷. This model contains six equations and seven unknowns, where the seventh equation that will determine the system, according to Friedman, is specified in different ways under each alternative approach. In quantity theory, real output assumed to be a constant (i.e., an exogenous variable) and then relative prices and interest rate turn out to be determined in the real sector of the economy, where money supply only affects the overall level of prices. In Keynesian approach, according to Friedman's interpretation, price level is assumed to be an exogenous variable and thus real income is affected by changes in the money supply. Finally Friedman suggests alternatively a third way, where interest rate is determined by the expectations of inflation. This scheme leads to the result that:

$$\text{nominal output} = \text{money supply} \times \text{velocity}(R)$$

where velocity is a function of the current level of interest rate, R . Thus Friedman provides a theory of the nominal output in relation to inflation, rather than the real output. When this theory is blended with Okun's Law (which states a negative relation between unemployment and real output growth) and the Philips Curve, the resulting solution is that both the rate of

⁷ Frisch, H., 1963, pp. 102-152

unemployment and the real output growth rate are determined by the unexpected component of the money supply (the difference between the money supply and the expectation about it in the previous period.) For example, a positive unexpected money supply (an under-estimation) decreases unemployment and increases growth. The difficulty in transforming this idea into a systematic policy is the impossibility of permanent creation of unexpected money supply, because the public then would notice the pattern in government's behavior and it would become impossible to surprise the public any more.

PHILIPS CURVE :

The famous trade-off between unemployment and inflation is first brought into picture by Philips (1958) by a statistical test of the relation of the level of unemployment and the rate of change of money wages in UK. He obtained the famous graphic relationship which is known as the Philips Curve. Philips curve originally presented as a relationship between wage inflation and unemployment, and later transformed by Samuelson and Solow to its present version. This curve tells that policy makers face a "menu of choice between different degrees of unemployment and price stability"⁸. The original exposition did not have a theoretical justification either and

⁸ Samuelson and Solow (1960)

a theoretical basis is provided with a variety of following works.

In the 1960s, Philips Curve started to lose its popularity. In the late 1960s and 1970s, the general trend in the world was persisting and accelerating inflation, and the Philips Curve was turning out to have not so much explanatory power. This brought the need for a reconsideration of the relationship of employment to inflation. An argument in this line is that inflation is more sensitive to the cost-push of trade unions rather than the market forces which both leads to higher employment and drives the prices up. Another explanation is that wage claims takes account of not only the the excess demand but also expected inflation. This leads to expectations augmented Philips Curve. In its modified version, the position of the Philips Curve depends on the level of expectations about the future inflation rate, it shifts upward as inflation expectations are higher. Different expected rates of inflation correspond to different Philips Curves. Here, inflation is thought as decomposable into two elements: an anticipated and an unanticipated component. Only the latter influences employment. If the inflation rate is anticipated perfectly, then the unanticipated component will be zero; such a case is sometimes thought as a steady state in which the equilibrium is determined by the real variables of

real variables of the economic system⁹. The corresponding unemployment level is called as the *natural rate of unemployment*.

Philips Curve is a short run relationship. In the long run, this trade off depicted by the Philips Curve does not exist any more. Higher rates of inflation lead in the long run to higher inflation expectations, so that the Philips Curve continuously shifts upward, ruling out any long run trade-off between unemployment and inflation. Friedman (1977) points to three stages of the Philips Curve. The first is the initial relation between inflation and unemployment at a given level of expectation, the usual expectations augmented Philips Curve. The second stage is the long run Philips Curve when the expectations are adjusted so that inflation is fully anticipated, in this case the Philips Curve is vertical crossing the unemployment axis at the *natural* rate. The third stage is, for the longer run, a positively sloped Philips Curve, i.e. inflation is conjectured as creating further unemployment in the long run. This is due to the inefficiencies created by inflation in the economy and the resulting reduction in the output growth.

⁹ Milton Friedman(1968)

STRUCTURAL APPROACHES :

Structural Theories were first brought to attention as attempts to explain the long run trend in western economies of rising prices. The idea of linking the long run tendency toward inflation to structural factors dates back to Streeten (1962) and Baumol (1967), where inflation is thought as a result of the differences in the productivity growth in the different sectors of the economy. The productivity in the industrial sector grow at a faster rate than productivity in the service sector, but wages in both sectors move parallel, and the wage rate growing due to the productivity in industrial sector creates wage cost pressure in the service sector which leads to price inflation in the economy in general¹⁰. This incompatibility is a structural issue.

The failure of monetary remedies even in the long run, has led to the development of structural theories for less developed countries, particularly in the Latin America. In the framework of structural analysis, inflation is a result of bottlenecks, deficiencies, failures, or other structural issues specific to that economy.

¹⁰ Aksoy (1982)

The quantity theory and other non-structural approaches leave only a minor area of manipulation for the governments, while the needs of underdeveloped countries imply much wider duties and functions, such as rapid development of transportation, mass communications and education services. Moreover, the governments responsibilities in social and distributional issues are much heavier than the corresponding duties in developed countries. These factors enforce the governments to make fiscal expenditures usually in excess of the receipts, and such requirements make the problem of fiscal deficits inevitable. These deficits are usually monetized in less developed countries¹¹.

In the less developed countries which have high portions of their populations highly dependent on food prices, the variations in the agricultural output and the price fluctuations resulting thereof have severe repercussions in the whole economy which affects the whole society and income distribution.

Another matter is the rapid growth in the population and the accelerating need for food products. This progressive increase in the demand in the agricultural sector worsens the aspect stated above.

¹¹ OAZIOGIU (1986)

This adversity is further amplified through the political instabilities, institutional disorders, irrational government interventions, corrupted public administrations, etc.

3. INFLATIONARY ASPECTS OF TURKISH ECONOMY:

TURKISH INFLATION EXPERIENCE:

Turkey has been suffering from high rates of inflation since the 1950s. The table on the right gives the inflation rates in Turkey in that period. The particular episodes of inflation are the inflation of late 1950s and early 1970s. After 1978, hyperinflationary years of Turkey starts and this problem continues to appear in the agenda since then.

FISCAL BURDENS :

The governments have been giving budget deficits since 1951, and these deficits have the tendency of becoming larger in the more recent years, particularly after second half of 1980s as can be seen

Table-1.
Turkish Inflation, 1951-1990

Year	Inflation rate
1951	6.4
1952	0.7
1953	2.5
1954	10.3
1955	7.8
1956	16.8
1957	18.4
1958	15.1
1959	20.0
1960	5.0
1961	3.0
1962	5.8
1963	4.1
1964	1.3
1965	8.1
1966	4.9
1967	7.5
1968	3.2
1969	7.0
1970	6.5
1971	15.8
1972	18
1973	20.5
1974	29.8
1975	10.2
1976	15.6
1977	24.1
1978	52.6
1979	54.0
1980	107.3
1981	36.8
1982	27.0
1983	30.5
1984	50.4
1985	43.2
1986	29.6
1987	32.0
1988	68.3
1989	69.6
1990	53.1

from table-2 which presents the fiscal deficits as the share of the GNP. A similar development had occurred in the second half of 1970s, which were the years of severely accelerating inflation, and it ended by the coup of 1980.

There are some particular factors which compel the budgets to give deficits in Turkey.

Agricultural Subsidies:

In Turkey, still a large portion of the population is engaged in agriculture, although the share of agriculture in GNP is a modest figure. In 1988 50.6% of the total civilian employees were in the agriculture sector¹², whereas the share of agriculture in GNP was about 20% in the same year. The

Table-2
Fiscal Deficits

Year	Deficit/GNP (%)
1950	0.5
1951	-0.5
1952	0.1
1953	0.1
1954	1.1
1955	0.8
1956	0.8
1957	0.7
1958	0.4
1959	0.8
1960	0.8
1961	0.9
1962	0.2
1963	0.0
1964	0.9
1965	1.2
1966	0.8
1967	0.0
1968	0.6
1969	1.5
1970	0.0
1971	2.9
1972	0.0
1973	0.9
1974	1.0
1975	0.3
1976	0.6
1977	5.0
1978	1.9
1979	3.0
1980	3.6
1981	1.5
1982	1.6
1983	2.3
1984	6.1
1985	0.1
1986	3.1
1987	5.1
1988	3.7
1989	4.4
1990	3.9

¹² OECD Economic Surveys, Turkey, 1990-91

source: Pakdemirli(1991)
p. 163,164

financial support made to this sector is a necessity of the social state. The tools used for this purpose are the floor prices which are set by the government to be applied in government's purchases in this sector. It can be argued that such subsidies are obligatory in social terms, and even beneficial in economic terms as a support to an important sector, but the concern here is the inflationary effects such policies are causing.

The marginal propensity to consume among people working in that sector are high and the funds that are transferred to agricultural sector are mostly directed to consumption. The purchasing power transferred to this sector then directly creates excessive demand and thus enforces inflation. The intervention of government in the agricultural sector drives the prices of the products of this sector and this is another factor pushing the costs upward in other sectors which take their inputs from agriculture.

The governments also provide incentives in a wide variety of other industries in Turkey. All such services by the government are expenditures that have to be financed in one way or another.

Public Personnel:

Turkish Republic employs considerable number of public personnel, both in the administrative offices and in public enterprises. The share of the public sector, in spite of all the political commitments for privatization, has still been growing.

The statist industrialization which started in 1930s initially had the purpose of stimulating the economic development and substituting the private sector which at the time by no means was sufficiently developed to keep the things going. However, public sector still continues its existence at an increased rate even in those sectors which private entrepreneurship has developed the potential to undertake business. Public sector operates in many sectors through Public Economic Enterprises. These institutions are open to political pressures and the political concerns usually have higher priority than economic efficiency. For example, managers obtain their posts through political appointment in a public enterprise, rather than their competency in the field. In time of elections, the pricing policies in the public sector are also under control of non-economic concerns and these in turn bring severe pressures on government finance. Public Enterprises in Turkey do not make the back payments for

the credits they receive from central bank and the government.

HIGH BORROWING RATES IN THE RECENT YEARS:

The banking sector profit rates which are above the world averages have been a burden in the production sector of the Turkish Economy. In the 1980s, the high interest rates on credits is a cost creating element in the manufacturing sector and leads to cost-push inflation.

Table-3 provides a striking comparison of the profits in the industrial and banking sectors in the 1980s. This

Table-3
Industrial vs. Banking Profits

Year	Industrial*	Banking*
1980	100	100
1981	96.6	120.4
1982	95.9	93.8
1983	109.8	167.6
1984	153.5	293.2
1985	215.2	279.3
1986	175.6	476.8
1987	229.3	662.5
1988	202.5	708.3
1989	185.3	485.2
1990	-	611.7

Source: Cakmak and Yeldan
note: * = deflated by
consumer price index

comparison clearly shows the uneven growth in the banking sector profits. This enormous development of the share of

banking sector in the grand pie enforces the price growth in the production sector through increased credit costs.

TAX COLLECTION :

The major receipt of the government is tax collection, and efficient tax collection may decrease the public sector deficits. This is a particularly important topic for Turkey because of the high rate of tax evasion and inadequate levels of tax collecting efforts¹³. The legal stance towards tax evaders is also much softer compared to that in developed countries¹⁴. Özer (1984) gives an account of the softening in the tax laws in the 14 year period starting from 1970s. The tax system in Turkey is not equipped with adequate mechanisms needed to raise the proper revenues. This is sometimes seen as the number one deficiency of the government in its role in the Turkish Economy by which inflation maintains its existence.

SECTORAL DIFFERENCES:

Ataman Aksoy (1982) makes the following general analysis

¹³ The expenditure made to collect the tax per unit of tax income may be a measure of degree of efforts put on collecting tax. The figures are much lower in Turkey compared to other OECD countries.

¹⁴ For example, the tax reform in 1970s had great help in maintaining the success of the devaluation made at that time in keeping inflation at low levels. (Ilhan Özer, op.cit., p. 91)

on Turkish Economy. An excess demand, no matter why it occurs, is responded in general by increase in prices and output. This response, however, varies from sector to sector. Agricultural sector can not give the immediate output response to such demand pressures as the manufacturing sector does, and the increase in the demand for agricultural goods is responded wholly by price increases whereas in the industrial sector response is partially through higher prices. Thus increase in demand reverses the relative prices in favor of agriculture. Meanwhile the increased activity in the industrial sector increases the demand for labor and results in higher employment, but this in turn increases the demand for foodstuff further. On the other hand the increase in food prices is reflected to wages and in turn to industrial prices. Here, the Keynesian characterization of the producers' behavior is accepted: the prices are determined by cost plus constant profit markup and the output level is determined by the demand.

IMPORT DEPENDENCE :

Import price level is a very important cost-push factor in Turkey. The import substitution policies followed throughout the history of the Turkish Republic has created an industry which is highly dependent to imports in capital and intermediate goods, making the prices in production sector very

sensitive to changes in the import price level¹⁵. A devaluation aimed at removing the foreign exchange bottleneck suddenly increases the cost of capital and the intermediate goods, hence causes inflation.

EFFICIENCY OF REMEDIES:

Restricting the money supply does not prove to be a solution, it merely creates reductions in output instead of prices¹⁶. Restricting the money supply may even have a supply affect. In less developed countries, there are difficulties in finding credit which are needed as working capital¹⁷. The lack of alternative liquid assets creates credit bottlenecks which pushes the producers to resort either to producing less or resorting to more expansive credit alternatives. Thus the money supply restrictions not only have demand reducing effect, but also cause burden on the supply side.

Restrictive trade regimes form another gross markup for the production sector in Turkey. Due to the high dependency to imports in maintenance and operation, restrictive policy

¹⁵ Ziya Onis, 1990

¹⁶ Aksoy (1982)

¹⁷ *ibid.*

regimes leads to unused capacity and reduces the output and increases the prices. Thus in times of restrictive policy, prices increase at higher rates¹⁸.

SIGNIFICANCE OF AGRICULTURAL SECTOR:

Agricultural output has a fairly big share in the total output compared to developed countries. The industries based on agriculture (such as textile, food processing, etc.) are also very important in the Turkish Economy. This leaves Turkish economy open to uncertainties of agricultural output, which is sensitive to weather conditions. Thus, in the years in which agricultural output is low, the prices may be very high, creating a difficulty in the test of the models by making inflation sensitive to non-economic parameters.

FOREIGN EXCHANGE BOTTLENECKS:

Foreign exchange position has a very important place in Turkey's economic life. In early 1950s, Turkey had sufficient foreign exchange resources and even though there was a fairly significant growth in the money supply, this was paired with a growth in output rather than prices. As the foreign exchange

¹⁸ Ataman Aksoy (1982), pp. 71-103

bottlenecks were started to be seen by mid 1950s, inflation rates also increased together with comparable rates of money supply growth. Within the framework of the stabilization policies commenced in 1958, the money supply growth was reduced. Together with inflows of foreign aid which alleviated the foreign exchange problem, inflation rate decreased rapidly without reducing the output significantly.

Since 1950s, Turkey has been suffering varying degrees of

Table-4
Current Account Balance

Year	Current Acc. (Million \$s)
1975	-1880
1976	-2301
1977	3385
1978	-1418
1979	-1173
1980	-3210
1981	-2052
1982	-1166
1983	-1828
1984	-1407
1985	-1013
1986	-1528
1987	-982
1988	1503

Source:
State Institute Of Statistics
Yearbooks (1983: p. 425
1989: p. 415)

foreign exchange bottlenecks. For this reason, the period after 1950 is chosen as the period of interest. Table-4,

which shows the current account balance for the relatively recent period of 1975-1988, clearly indicates that Turkey in almost every year had given deficit in her foreign trade. The scarce reserves have been used for importing capital goods and raw material¹⁹. Aksoy (1984) gives the following separation of the period from 1950 to 1980:

Years of lesser foreign exchange problems:

1950-55, 1959-63, 1971-76

Years of major bottlenecks:

1956-58, 1964-70, 1977-79

Turkey has seen two episodes of significant increase in foreign exchange receipts: Korean War Boom in 1950s , and Workers' remittances in 1970s. The latter is stimulated further by the devaluations of that decade. These raised the net holdings of foreign assets. In both cases, the gvts , instead of sterilizing (i.e. decreasing the domestic component of the money supply to hold the total money supply fixed), printed money to buy these assets from the public in order to finance a grater volume of imports of capital equipment and raw materials. Meanwhile, government gave extensive permissions to capital importers.

¹⁹ Ataman Aksoy, op. cit., pp. 17-18

Thus there was an excess supply of credit which created inflation. Total tax collection did not catch up with the increase in prices, so there was an erosion in the tax base. Moreover, prices of the public enterprise products were frozen. These created deficit in the public sector, and this was financed by further increases in the money supply.

Inflation of 1950s was brought to a halt by a massive devaluation, rescheduling of international debts, introduction of a stabilization program and the military coup of 1960. Inflation of '70s was also accompanied by political instability. Following the years of the coup of 1980, inflation decelerated.

In the first half of 1960s, both money supply growth and inflation were at moderate levels, but in the second half, foreign exchange problems started to appear again. 1970s and particularly the second half, were years of inflation not only in Turkey, but in the world in general. The foreign exchange crisis which started in 1977 and continued until early 1980s was matched with record levels of inflation in Turkey.

FINANCIAL REPRESSION:

Before 1980s Turkish Economy was a financially repressed economy, without an equity or a foreign exchange market.

Interest rates were fixed by the government below their equilibrium level. Governments were exerting pressures to banks to buy unsold bonds, and through required reserve and liquidity ratios, and thus having influence on the quantity and distribution of domestic credit.

Turkey's disequilibrium interest rate policy caused continued excess demand for credit. According to Fry (1980 and 1986), under-equilibrium interest rates had adverse effects on the economy. If higher interest rates were allowed, there would be more incentive to save in the banks, and meanwhile, the credit which would therefore be abundant would lower the real cost to investors by accommodating liquidity preference and increasing operational efficiency.

Fry also argues improvement prospects in the balance of payments when interest rate is liberalized. When interest rate is allowed to be higher, balance of payments get better. Fry gives foreign country examples, where after increasing interest rate, foreign exchange reserves increased substantially. One reason is the reduction in capital flight which prevails when interest rate is repressed.

A reform package is put into affect on January 24, 1980, in conjunction with IMF, in order to pass to a more open,

outward regime. The reforms basically consisted of monetary contraction, exchange rate devaluation, competitive interest rates, liberalization of foreign trade and adopting export led growth policies instead of import substitution. The military regime, which took power soon after this package is launched, created a suitable environment for the implementation of these policies.

REAL WAGES:

The real wages could not keep up with inflation. Particularly after the military coup of 1980, the strong union movements of 1970s were abolished and real wages declined significantly. This can be thought in the framework of Keynes' explanations of inflation, which relate it to output claims of political groups. The output claim of wage earners are suppressed by political power preventing a wage-price spiral. Still, however, the inflation rates could not have been suppressed. The wage bill therefore is not a powerful factor in the explanation of inflation of recent years in Turkey.

In the following, table-5 is presented which shows how the real wages evolved since 1955. The real wage rate which steadily improved beginning from 1960 until the end of 1970s,

Table-5
Average Daily Real Wages

Year	Wage/Day	Deflator	Real Wage
1955	7.18	34.5	20.8
1956	8.22	40.3	20.4
1957	9.19	47.7	19.5
1958	10.86	54.9	19.8
1959	13.25	65.9	20.1
1960	14.44	69.2	20.9
1961	15.59	71.3	21.9
1962	16.48	75.4	21.8
1963	17.91	78.5	22.8
1964	19.50	79.5	24.5
1965	21.61	85.9	25.1
1966	23.53	90.1	26.1
1967	25.84	96.9	26.7
1968	28.22	100	28.2
1969	32.13	107	30.0
1970	35.32	114	31.0
1971	39.32	132	29.8
1972	43.88	156	28.1
1973	54.41	188	28.9
1974	68.26	244	28.0
1975	85.55	269	31.8
1976	115.30	311	37.1
1977	146.53	386	38.0
1978	207.93	589	35.3
1979	294.31	966	30.5
1980	426.96	2003	21.3
1981	543.84	2740	19.8
1982	691.03	3480	19.8
1983	944	4540	20.7
1984	1307	6826	19.1
1985	-	9777	-
1986	-	12668	-
1987	-	16726	-
1988	8025	28151	28.5

Sources:

Wages from Yearbooks of SIS
Deflator from Pakdemirli(1991)

fell sharply in 1980 back to its level in 1950s. Wages depreciated even slightly more in the following years, but after a period where the data is missing, there is a partial improvement in the 1988.

4. THE MODEL:

BASIC EQUATIONS:

The model used in this thesis takes two equations as its basis. The first of those is the money demand equation

$$M / P = k Y^{\alpha_1} R^{-\alpha_2} (p_+^e)^{-\alpha_3} \quad (1)$$

where Y is the real output, R is the nominal interest rate, P is the price level and p_+^e is the expectation of inflation about the future period in the current period²⁰. M_1 is chosen as the definition of money. There exists two kinds of alternatives to holding M_1 : saving in a monetary way, for example in a time deposit account, or buying non-monetary assets such as durable goods or gold. The interest rate is the opportunity cost of holding money with respect to the time deposits alternative. p_+^e represents the opportunity cost of investment in monetary assets instead of buying durable goods or gold. The demand for real balances decreases as the interest rate rises or the

²⁰ The notation used is as follows:

the letter α is used for parameters expected to be positive

the letter β is used for parameters for which there is no prior expectations

the letter γ is used for parameters the value of which is expected to be some certain number.

The work of Nur Keyder (1974) "Money and Gold Demand in Turkey" examines the period 1962-1976. Her finding is that money demand in this period is positively related to real output and negatively related to p_+^e and R, as expected. Gold had been a major alternative to holding money until quite recent years and the lower the relative gold price, it was expected that the gold would be a better alternative and switch the attention from money onto itself. But Keyder's results tell that situation is to the contrary, the price of gold is not a good explanator of the money demand. The money equation here, in that line, takes R and p_+^e as its only alternative cost variables. As usual, the demand for money increases as output rises.

This model further assumes equilibrium in the money market, that is, the supply of money equals the demand for it. According to Ataman Aksoy's estimates (1982, p.14), the impact of changes in money supply on prices is fast and significant. Also Fry (1976) claims that prices adjust quickly to clear the money market because of the 'preponderance' of auction markets in Turkey.

The second equation is:

$$y = \beta_1 + \alpha_4(p - p^e) - \alpha_5 d(2)$$

where y, p and d are rate of yearly growth of real output,

where m and r are the rate of yearly growth of the nominal money supply and the interest rate, respectively. The above equation takes the following form after rearranging:

$$p = \gamma m - \alpha_1 y + \alpha_2 r + \alpha_3 \ln \left(\frac{p^e}{p^e} \right) \dots \gamma = 1 \quad (1')$$

Inserting equation 2 into equation 1' and rearranging yields:

$$p_{14} = \beta_2 + \frac{\gamma}{(1 + \alpha_1 \alpha_4)} m + \frac{\alpha_1 \alpha_3}{(1 + \alpha_1 \alpha_4)} d + \frac{\alpha_1 \alpha_4}{(1 + \alpha_1 \alpha_4)} p^e + \frac{\alpha_2}{(1 + \alpha_1 \alpha_4)} r + \frac{\alpha_3}{(1 + \alpha_1 \alpha_4)} \ln \left(\frac{p^e}{p^e} \right) \quad (3)$$

Here, as α 's are positive and γ is supposed to be equal to one, coefficient of m is positive and less than one. Further, we expect the coefficient for the import price index also to be less than one and positive.

DATA:

This equation is tested using the yearly data covering the period 1950-1990. The variables used are as follows:

p = change in the logarithm of price level

m = M1 definition of money

d = change in the log of import prices (in T.L.) minus p

There were however difficulties related to this variable, because of the import restrictions.

p^e = Public is assumed to be forming expectations of inflation adaptively. Only the first lag of inflation is significant in the explanation of current inflation:

$$p^e = 4.98 + 0.79 p_{-1}$$

(1.90) (7.31)

R^2 adjusted = 0.59 DW = 2.11

Appendix A contains a list of the variables used in the test of the model together with explanations.

TEST RESULTS:

The result of the OLS regression is as follows (the numbers in parentheses are t-statistics):

$$p = -7.83 + 0.105m + 0.143d + 1.14p^e + 5.67r + 27.4 \ln \left(\frac{p_+^e}{p^e} \right)$$

(-3.3)(0.78)(2.29)(8.93)(1.33)(7.61)

R^2 adjusted = 0.86 DW = 2.35 32 DF

Price expectations turn out to have a significant effect on the price level. Expectations are influential through two channels. One is, the change in the expectations (the term $\ln(p_+^e / p^e)$) result in a change in the demand for real balances, and affects the level of aggregate demand and then levels of output and prices. The second is on the supply side,

higher the expectations of inflation are, producers are willing correspondingly to produce at higher prices, i.e., the supply schedule is 'shifted upwards'. The coefficients regarding these affects are both positive.

The coefficients for money growth and interest rate are insignificant. The insignificance of the interest rate can be attributed to the financial repression of the years up to 1980s, when the interest rates were not allowed to move freely. The insignificance of the coefficient estimate for the money growth, on the other hand, is due to the price expectation variable which captures the affect of growth in money. This is partly due to the fact that money supply decision of the government naturally depends on the level of inflation, the factor cited here to be the one which determines the level of expectations. Yet, note that the coefficient estimate is positive and less than one, as it was supposed to be according to equation (3).

The real import price index is also significant. It must be noted that the variable used in the regression as the import price inflation is constructed by first calculating the 'real' import price index which is a number in terms of Turkish Lira deflated through division with the domestic price index and then calculating the rate of change in that real index. Thus

the significance of this variable is not due to the natural reflection of the domestic inflation into import prices as a result of the exchange rate depreciation.

The model gives a good explanation of the inflation for the period under consideration, which is a period of unpredicted and substantial changes in the political and economic life of Turkey. The adjusted R-square value is 0.86. The performance of the model can be better seen in the figure on page 46 which is a graph of the time paths of the actual inflation and the values predicted by the model. Besides the close trace of the actual inflation by the predicted one, model's prediction successfully catches the direction of change at the turning points of the actual inflation. This is an important criterion used for judging the predictive performance.

Appendix A and B contain the data and the Shazam program used to test this model.

5. CONCLUSION :

In this thesis , after a survey of theories of inflation, the history of inflation experience in Turkey is investigated and finally a model is presented to explain inflation in Turkey for the last four decades. The model provides a good fit to the path of inflation, and also catches the turning points, including the great inflation of 1980. The most influential factor turn out to be the expectations, which works through two separate channels; the demand for money decreases as the expected level of inflation rises, which increases the demand in the commodity and service markets and thus increases the price level on one hand, and on the other hand, higher inflation expectations lead to bidding of higher prices by the firms for their products. Inflation expectations are significantly effective through both channels.

The short run effect of the growth in the money supply to the level of inflation is insignificant. The reason of this, however, is that the coefficient does not on its own reflect the total effect of money growth, as part of its effect is captured by the expectations variable. The results of the regressions when expectations variable is deleted give significant coefficient for the money growth variable,

although it gives a poor fit on the whole. Yet, that money growth is not significant is not all that surprising. In the framework of macro rational expectations hypothesis, this can be explained as follows: The affect of the growth in money supply can be differentiated into the affects of the anticipated and unanticipated components. // Anticipated money lead to price increase directly through its influence on the inflation expectations. Thus this affect is captured by the expectations term. The unanticipated part is not influent on the price level as much and lead to inflation indirectly and not proportionately. The coefficient of the money growth variable reflects the affect of this part.

The results show that inflation of domestic prices in Turkey is significantly affected from the " import price inflation. The import price index variable used in the test of the model is deflated by the domestic inflation, and thus it directly reflects the change in the relative prices of imported goods with respect to the domestic goods. The coefficient of this variable is still significant, a result which is supported by the structural fact of import dependence of manufacturing sector in the Turkish Economy.

REFERENCES :

- Aksoy, M. Ataman, 1982, Structural Aspects of Turkish Inflation, 1950-1979, World Bank Staff Working Papers
- Cakmak, Erol H., A. Erinc Yeldan, 1992, "The Role of Agriculture in the Structural Adjustment Experience of Turkey", Bilkent University Discussion Papers
- Cubukcu, Tuğrul, 1983. **Enflasyon Teorisi ve Türkiye'de Enfasyon**, Ankara: H.U.I.I.B.F. Yayınları
- Frisch, Helmut, 1983, Theories of Inflation, Cambridge University Press
- Friedman, M., 1968, "The Role of Monetary Policy", *American Economic Review*, 58, 1-17
- Friedman, M., 1970, "A Theoretical Framework for Monetary Analysis", *Journal of Political Economy*, 78, 193-238
- Fry, Maxwell J., 1986, "Turkey's Great Inflation", *METU Studies in Development*, 13, 95-116
- Fry, Maxwell J., 1978, "Alternative Stabilization Strategies from a Model of Short Run Price and Output Fluctuations in Turkey", *METU Studies in Development*, no.18, 21-34
- Fry, Maxwell J., 1980, "Money, Interest, Inflation and Growth in Turkey", *Journal of Monetary Economics*, 6, 535-545
- Gazioğlu, Ş., 1986, "Government Deficits, Consumption and Inflation in Turkey", *METU Studies in Development*, 13, 117-134
- Jackman, Richard, Charles Mulvey, James Trevithick, 1981, *The Economics of Inflation*, Camelot Press
- Keyder, Nur, 1977, "Türkiye'de Para Talebi ve Altın Talebi, 1962-1976", *ODTU Gelişim Dergisi*, 1977, Summer, 43-68

Keynes, J.M., 1936, *The General Theory of Employment, Interest and Money*, London, McMillan

Keynes, J.M., 1940, *How to Pay for the War*, London McMillan.

Laidler, David, Micheal Parkin, 1975, "Inflation: A Survey", *The Economic Journal*, 741-809

Marshall, A. 1923, *Money, Credit and Commerce*, London:McMillan

Onis, Ziya, 1990, "Exchange Rates, Inflation and Money Supply in Turkey", *Journal of Development Economics*, 32, 133-154

Özer, İlhan, 1984, **Türkiye'de 1970-1983 Dönemi Enflasyonu**, Ankara: Maliye ve Gümrük Bakanlığı Yayınları

Pakdemirli, Ekrem, 1991, **Ekonomimizin Sayısal Görünümü**, İstanbul:Milliyet Yayınları

Patinkin, D., 1965, *Money, Interest and Prices*, New York: Harper and Row

Philips, A.W., 1958, "The Relation Between Unemployment and the Rate of Change of Money Wages in the United Kingdom, 1861-1957", *Economica*, 25, 283-99

Tobin, J., 1958, "Liquidity Preference as Behavior Towards Risk", *Review of Economic Studies*, 26, 65-86

APPENDIX A

DATA

YEAR	PRICE	M1	GNP	R	USE	USP	REALD
1950	27.78	1.594	38.505	4	2.80	45.5	0
1951	27.82	2.018	43.446	3	2.80	50.2	9.68
1952	29.23	2.421	48.621	3	2.80	49.0	-7.36
1953	30.33	2.947	54.090	3	2.80	49.4	-2.88
1954	33.21	3.372	52.480	3	2.80	49.6	-8.66
1955	37.26	4.214	56.641	4.5	2.80	50.7	-9.31
1956	40.96	5.361	58.428	6	2.80	52.9	-5.22
1957	45.82	6.687	62.994	6	2.80	54.4	-8.41
1958	53.06	7.4211	65.844	6	2.80	54.6	-14.3
1959	65.99	8.6999	68.521	6	2.80	55.6	-20.0
1960	69.43	9.2566	70.868	9	4.73	55.6	47.34
1961	70.50	10.0255	72.258	7.5	9.04	55.3	62.7
1962	72.88	10.9644	76.754	7.5	9.04	55.3	-3.32
1963	78.66	12.1677	84.188	7.5	9.04	55.2	-7.81
1964	79.62	13.9999	87.619	7.5	9.08	55.5	-.229
1965	84.26	16.4344	90.367	7.5	9.08	56.2	-4.41
1966	89.02	19.7800	101.20	7.5	9.08	57.5	-3.21
1967	96.41	22.6822	105.46	7.5	9.08	58.3	-6.59
1968	100.00	25.9688	112.49	7.5	9.08	59.8	-1.41
1969	107.78	30.1277	118.59	7.5	9.08	61.8	10.34
1970	116.54	35.2688	125.42	9	10.92	64.1	5.81
1971	135.77	43.5877	138.18	9	15.14	66.5	.4024
1972	154.35	53.2533	148.47	9	14.30	68.7	10.66
1973	178.98	70.5288	156.45	8.75	14.28	73.4	20.79
1974	212.32	96.0455	168.01	9	14.06	89.7	48.89
1975	254.30	118.4700	181.38	9	14.56	100	2.66
1976	295.98	151.5055	195.75	9	16.17	106.4	-.526
1977	378.71	210.6422	203.35	9	18.09	113.8	8.92
1978	557.49	291.9999	209.18	10	24.63	122.1	10.97
1979	874.20	467.7000	208.34	10.8	35.21	137.9	21.24
1980	1884.78	738.5000	206.12	26	77.54	160.3	29.93
1981	2523.91	1019.33	214.67	31.5	142.2	177.5	-.694
1982	3076.90	1407.00	224.43	31.5	165.3	182.2	-5.37
1983	4042.74	2083.99	231.86	48.5	230.3	184.3	-6.26
1984	5999.42	2447.66	245.65	52	375.1	188.2	-2.78
1985	8696.16	3420.00	258.19	52	528.5	189	-3.48
1986	11706.78	5357.44	279.12	48	680.9	182.2	-8.13
1987	16254.86	8682.33	300.01	45	872.5	186.9	12.22
1988	28234.69	11311.55	310.91	54	1428	193.7	1.394
1989	46098.78	19560.11	316.00	54	2142	203.4	-3.59
1990	73896.34	31398.77	344.61	45	2660	210.9	-21.9

SOURCE: BLS

SOURCES of DATA :

PRICE: whole sale price index from Statistical Indicators 1990 , published by State Institute of Statistics.

MONEY: M1 , Various issues of Quarterly Bulletins of Central Bank of Turkey

GNP: in 1988 producer prices, from Statistical Indicators 1990 p.412-3

R: (INTEREST RATE) IFS yearbooks of 1980 and 1990

USE: Exchange rate for US dollar (from pp.290-1 of Statistical Indicators 1990

USP: US price index, from IFS yearbooks 1980 and 1990

REALD : rate of change in the real import price index (i.e. import price index deflated by GNP deflator)
(i) for the period 1967-1988 taken from World Tables 1991 prepared for the World Bank by the Johns Hopkins University, Johns Hopkins University Press: Baltimore ; and
(ii) in the rest of the table, USP*USE is used.

APPENDIX B

SOME VARIATIONS FOR THE MODEL

The insignificance of the money growth variable was an issue in the 4th section. To see how its influence on the level of inflation is captured by the expectations term, a regression without this term is ran and the result is:

$$p = -6.3 + 0.98 m + 0.09 d + 6.21 r + 11.2 \ln \left[\frac{p^e}{p^e} \right]$$

(-1.45) (5.63) (0.76) (0.79) (1.96)

$$R^2_{\text{adjusted}} = 0.52 \quad DW = 1.27 \quad 33 \text{ DF}$$

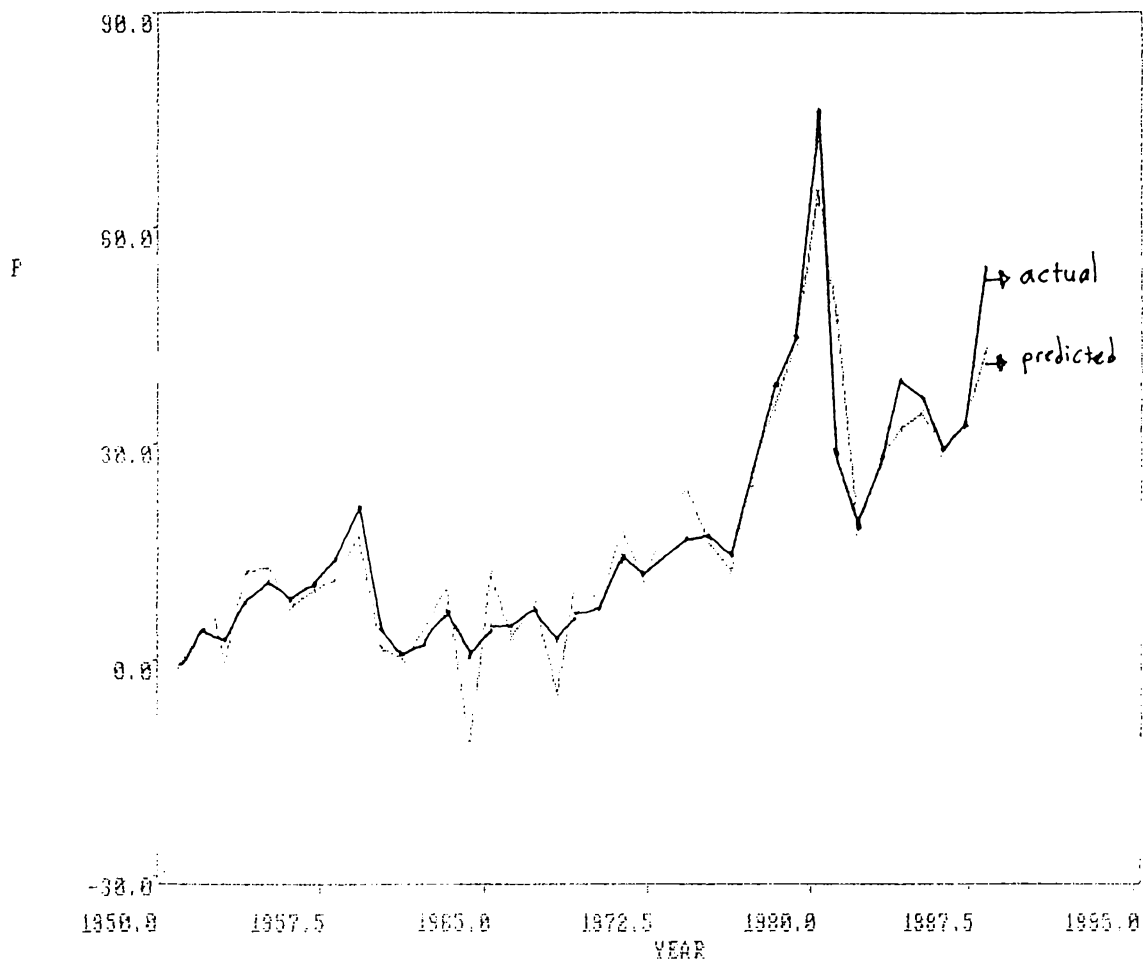
The coefficient estimate of the money growth variable is significant here, but the R^2 ratio is low compared to the original model. Here it can be seen ho money term became significant when expectations term is dropped.

The other insignificant variable is interest rate. This can be explained by the restraints on the interest rates which had been effective before 1980. In the following the results of a stability test for the interest rate is presented:

$$\begin{aligned}
 p = & -5.8 + 0.14m + 0.11d + 0.99p^e + 20.8 (r \times \text{dummy}) \\
 & (-2.4) (1.11) (1.85) (7.2) (2.25) \\
 & + 5.67 r + 27.4 \ln \left\{ \frac{p^e}{p^e} \right\} \\
 & (-0.2) (6.16)
 \end{aligned}$$

$$R^2 = 0.89 \qquad DW = 2.10 \qquad 31 DF$$

The variable dummy takes the value 1 for 1980 and onwards and takes the value 0 before 1980. The interest rate variable is insignificant, even has negative effect in the money demand in the earlier period preceding 1980, and after that year, the variable becomes significant. The other parameters have similar coefficients to those of the original test. The terms regarding the expectations are significant, while money growth is still insignificant although the coefficient is positive and less than one. The only outstanding difference is some loss of significance of the import price index.



APPENDIX C

PROGRAMS

Shazam Program Used in the Test of the Model

```
* data is from 1950 to 1990
sample 1 41
genr t=time(0)
* generate dummy, du=0 for t<1980 and du=1 o.w.:
genr du=time(-30)
genr du=dum(du)
*
* data will be read from the file DATA.
file 11 DATA
* read the variables and generate new ones
read(11) year price m1 gnp Rbig use usp reald
genr imppind=use*usp
* 100 * delta logarithms in place of rate of percent change
* generated variables will be:
* m, p, y, d, Rbig and rlow, and their lags
sample 2 41
genr p=price/lag(price)
genr p=log(p)*100
genr m=m1/lag(m1)
genr m=log(m)*100
genr y=gnp/lag(gnp)
genr y=log(y)*100
genr d=imppind/lag(imppind)
genr d= p + reald
genr rlow=Rbig-lag(Rbig)
* generate the lags
sample 3 41
genr pp=lag(p)
genr mm=lag(m)
genr yy=lag(y)
genr dd=lag(d)
genr rreald=lag(reald)
genr RRbig=lag(Rbig)
genr rnew = log(Rbig) - lag(log(Rbig))
genr rrlow=lag(rlow)
*
* THE MODEL
* 1st, the price expectation equation (pe is expected price)
ols p pp / rstat predict=pe
* note that pe is expectation at time=t-1 about p(t)
genr pechange= log(lag(pe,-1)) - log(pe)
* adjust sample for pechange
sample 3 40
```

```
* 2nd, the inflation equation
ols p m reald pe rnew pechange / rstat predict=pre
```


Shazam Program Used to test the Model
The Version Without the Price Expectation Variable

```

* data is from 1950 to 1990
sample 1 41
genr t=time(0)
* data will be read from the file DATA.
file 11 DATA
* read the variables and generate new ones
read(11) year price m1 gnp Rbig use usp reald
genr imppind=use*usp
* 100 * delta logarithms in place of rate of percent change
* generated variables will be:
*   m, p, y, d, Rbig and rlow, and their lags
sample 2 41
genr p=price/lag(price)
genr p=log(p)*100
genr m=m1/lag(m1)
genr m=log(m)*100
genr y=gnp/lag(gnp)
genr y=log(y)*100
genr d=imppind/lag(imppind)
genr d= p + reald
genr rlow=Rbig-lag(Rbig)
* generate the lags
sample 3 41
genr pp=lag(p)
genr mm=lag(m)
genr yy=lag(y)
genr dd=lag(d)
genr rreald=lag(reald)
genr RRbig=lag(Rbig)
genr rnew = log(Rbig) - lag(log(Rbig))
genr rrlow=lag(rlow)
*
* THE MODEL
* 1st, the price expectation equation   (pe is expected price)
ols  p   pp / rstat predict=pe
*   note that pe is expectation at time=t-1 about p(t)
genr pechange= log(lag(pe,-1)) - log(pe)
* adjust sample for pechange
sample 3 40
* 2nd, the inflation equation
ols  p   m reald rnew pechange / rstat

```

Shazam Program Used to Test the Model
The Version With Dummy Variable for 1980 and Afterwards

```

* data is from 1950 to 1990
sample 1 41
genr t=time(0)
* generate dummy, du=0 for t<1980 and du=1 o.w.:
genr du=time(-30)
genr du=dum(du)
*
* data will be read from the file DATA.
file 11 DATA
* read the variables and generate new ones
read(11) year price m1 gnp Rbig use usp reald
genr imppind=use*usp
* 100 * delta logarithms in place of rate of percent change
* generated variables will be:
* m, p, y, d, Rbig and rlow, and their lags
sample 2 41
genr p=price/lag(price)
genr p=log(p)*100
genr m=m1/lag(m1)
genr m=log(m)*100
genr y=gnp/lag(gnp)
genr y=log(y)*100
genr d=imppind/lag(imppind)
genr d= p + reald
genr rlow=Rbig-lag(Rbig)
* generate the lags
sample 3 41
genr pp=lag(p)
genr mm=lag(m)
genr yy=lag(y)
genr dd=lag(d)
genr rreald=lag(reald)
genr RRbig=lag(Rbig)
genr rnew = log(Rbig) - lag(log(Rbig))
genr rrlow=lag(rlow)
*
* THE MODEL
* 1st, the price expectation equation (pe is expected price)
ols p pp / rstat predict=pe
* note that pe is expectation at time=t-1 about p(t)
genr pechange= log(lag(pe,-1)) - log(pe)
* adjust sample for pechange
sample 3 40
* generate drnew
genr drnew = rnew * du
* 2nd, the inflation equation
ols p m reald pe drnew rnew pechange / rstat predict=pre

```