WELFARE IMPLICATIONS OF INFLATION ON TURKISH ECONOMY

A Master's Thesis

by
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WELFARE IMPLICATIONS OF INFLATION ON TURKISH ECONOMY

Graduate School of Economics and Social Sciences
of
Bilkent University

by

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In Partial Fulfillment of the Requirements For the Degree of
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in

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ANKARA

June 2011

I certify that I have read this thesis and have found that it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Arts in Economics.

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ABSTRACT

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Inflation is an obstacle in the decision-making processes of agents in an economy. In order to make better decisions under periods of inflation, agents need to spend extra effort, and this creates a loss in welfare. This study aims to measure the welfare gain from disinflation in Turkey during the period 2001-2010. The methodology of Cagan (1956) has been used to estimate the relation between M1 money demand and inflation rate, and the welfare gain estimations are calculated using the methodology proposed in Bailey (1956). After the welfare gain calculation, this study examines the economic indicators from the banking and real sectors in Turkey and compares the findings to the observations from the economy. This study concludes that the indicators of welfare gain in Turkish economy are in the same direction as, yet weaker than, the result of the estimation.

Keywords: Inflation; Welfare cost of inflation; Welfare analysis; Stationarity; Cointegration

ÖZET

TÜRKİYE EKONOMİSİNDE ENFLASYONUN REFAH ÜZERİNDEKİ ETKİSİ

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Enflasyon, bir ekonomideki şahısların karar verme mekanizmalarında zorluk teşkil eder. Yüksek enflasyon dönemlerinde, enflasyonun yarattığı belirsizlikten kaçınmak için şahıslar zaman ile çaba sarfederler ve bu çaba, refah kaybı yaratır. Bu çalışma, 2001-2010 yılları arasındaki dezenflasyon neticesinde Türkiye ekonomisinde ortaya çıkan refah kazanımını hesaplamayı amaçlar. Bu hesaplamanın bir parçası olarak, para talebi ve enflasyon oranları arasındaki ilişkiyi tahmin etnek için Cagan'ın (1956) metodu kullanılmış; refah kazanımı ise Bailey'in (1956) önerdiği yöntem ile hesaplanmıltır. Refah kazanımı hesaplamasının ardından bu çalışma, Türkiye'deki bankacılık ve reel sektörlerindeki göstergelerin değişimlerini inceleyerek, bu göstergelerdeki sonuçları refah kazanım hesaplamaları ile karşılaştırmasını sunar. Bu karşılaştıma sonucunda, Türkiye ekonomisindeki göstergelerin sunduğu değişimin, refah kazanım hesaplamaları sonuçları ile benzer yönde, fakat miktar olarak beklenenden daha az olduğu sonucuna ulaşılır.

Anahtar Kelimeler: Enflasyon; Enflasyonun refah bedeli; Refah analizi; Durağanlık; Eşbütünleşme

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CHAPTER 1

INTRODUCTION

This study investigates welfare implications of disinflation in Turkey. Anticipated or unanticipated, inflation hinders agents to make healthy economic decisions, and also causes important long run implications, as well as impacts in the short run. In order to avoid this negative impact of inflation, agents in an economy spend time and effort. The sum of these expenses is regarded as welfare costs. Although earlier studies have examined this issue in some advanced economies[1], Turkey remains as an untapped case.

Between the years 1987 and 2010, Turkish Economy experienced a yearly average of 46% inflation. Following the banking crises in 2001 and changes in central banking legislation, Central Bank of the Republic of Turkey (CBRT) became more independent and prioritized its aim of price stability. With this, CBRT adopted first implicit, then (in 2006) explicit inflation targeting. As Neyaptı (2009) has shown empirically, inflation targeting is an effective way of improving inflation performance around the world, and CBRT, among other conjunctural features, benefitted from this practice significantly. Observing the continuous fall in the inflation levels of the last decade, which brought the annual inflation rate

[1] See Serletis and Yavari (2004) for Canada, Ireland (2010) for U.S for recent examples.

down from 53.54% (average of 2001) to 8.58% (average of 2010) one realizes that, economically, a positive impact should be observed.

This gives us an opportunity to carry out a study to find out how welfare is affected from disinflation in Turkey. As we will examine in detail in Chapter 5, one can observe the impacts of disinflation on Turkish economy in the banking sector, the real sector and the indices that reveal income distribution. In the banking sector, the period between 2001 and 2010 indicates an increase in the share of credits to bank assets. In the real sector, companies have access to higher amounts of bank credit. Also, income distribution indices show that poverty has declined, and income is distributed so that the middle income group got larger after disinflation.

Our study endeavors to find out the changes in welfare as a result of bringing inflation down in the Turkish economy in the past decade. Since welfare is an abstract concept, we employ the method proposed by Bailey (1956), which entails the measurement of the area under inverse money demand curve. Our study will be the first one to employ this methodology to examine the welfare gains/losses in Turkish case. The literature also offers theoretical studies that analyze the welfare implications of inflation. Fernandez (1999) examines Chilean economy and Mogliani et. al. (2010) build a compensating variations model for Argentina.

Our study is composed as follows: Chapter 2 offers a review of the literature on the relationship between welfare and inflation. Chapter 3 includes a detailed analysis of the methodology and explains the data used in this study. In Chapter 4 the results of our study are discussed. Chapter 5 includes an analysis of

the Turkish Economy in the light of the results obtained in Chapter 4, and Chapter 6 gives the concluding remarks.

CHAPTER 2

BACKGROUND

In the first part of this chapter, we overview the impacts of inflation on an economy in Section 2.1, and in Section 2.2, we review the literature that examines the relation between inflation and its welfare costs. In Section 2.3 we propose a short summary of the studies that carried out money demand estimation for the Turkish economy.

2.1 Inflation and Welfare

Inflationary financing of budget deficits, although quite detrimental for the reputation of a central bank, is not rare in practice (Barro and Gordon, 1983). When central banks issue money to finance budget deficits, it usually causes the money stock to be less valuable and the result is inflation. This would mean that the same amount of money will buy fewer goods than before.

As money loses its value, agents in the economy will be prone to keep less money in their pockets. This means, especially in an economy where money performs the role the medium of exchange to a large extent, that transactions are less, or costlier. Mankiw (2003) categorizes these costs of anticipated inflation

under two main categories. The first one is the cost that agents will face when they want to keep the value of their monetary holdings constant. Unlike the case where there is no inflation, it takes effort to keep the purchasing power of a certain amount of money constant. This cost is called the “shoeleather cost”.

The second type of cost of anticipated inflation, according to Mankiw, arises from adjusting to new price levels. When price levels change, the prices in an economy need to be adapted. So, the agents need to incur some cost for the adjustment. This second type of cost of anticipated inflation is called the menu cost.

The cost of anticipated inflation, as mentioned above is crucial, but the costs of unanticipated inflation are much more severe. Unexpected inflation causes the real terms of contracts change suddenly; not all nominal prices can be adjusted accurately as price levels change (Fischer and Summers, 1989). Unanticipated inflation surprises agents in an economy, as they cannot change the contracts they made in the past, and also, they are uncertain of how to adjust the nominal prices in such a way that real prices should stay the same. Under the uncertainty of unexpected inflation, investment becomes riskier. Higher risk leads to higher interest rate, so investors have less incentive to invest. Similarly, keeping time deposits with longer maturities becomes riskier for depositors, so average maturity of bank deposits falls, causing banks to experience a mismatch between the maturities of their lending and borrowing. In case of unexpected inflation, banks are also likely to lose since the real value of the credit they lend decreases. While borrowers benefit, banks are discouraged to give credit, so they search for other ways of making profit. Government bonds with high interest rate provide an alternative to obtaining funds and hence, banks start to lend less, and keep more

government bonds in their assets. This leads to lower private investment, as in the case of the crowding-out effect.

In addition, unexpected inflation has redistributive effects. When unanticipated inflation reduces the purchasing power of money, salaries, that are predetermined for the length of the employment contracts, fall. Hence, repeated shocks of unanticipated inflation cause income distribution to be distorted. On the other hand, inflation leads nominal interest rates to rise and money to earn more money, whereas the real economy suffers. These high returns also discourage capital owners from investment. While the fund owners benefit, those who do not have sufficient funds to carry out investment cannot have access to capital as interest rates increase. Sustained inflation hence causes capital owners to gain, while agents whose earnings are fixed by contracts lose their real purchasing power over time and cannot borrow easily. As a result, redistribution of income leads some agent to benefit while some agents lose.

In addition, budget deficits rise due to increases in interest payments and declining domestic savings, in turn, lead current account imbalances to rise. Both of these constitute important sources of economic and political instability,

2.2. Calculation of the Welfare Cost of Inflation

In this section, we will review the literature that covers ways of analyzing welfare costs of inflation. First, we will mention the welfare cost estimation methods, and secondly, we will review the money demand estimations developed.

One way of calculating the welfare cost of inflation is to set up a model that incorporates the behaviors of agents in an economy, facing high inflation levels.

The examples for these types of models include endogenous growth models (as in Fernandez, 1999), Real Business Cycle models (Cooley and Hansen, 1989) and compensating variation models (Mogliani et. al., 2010). Özbilgin (2010) models small open economy for the purpose of understanding the relation between currency substitution and welfare gains of disinflation, and then calibrates this model for Turkish economy.

Another method, which goes back to the 1956 paper of Bailey is measuring the welfare cost of inflation by calculating the area under the inverse money demand function. The relation between inflation and welfare has been widely discussed since Bailey argued that inflation causes an opportunity cost of holding money, so welfare loss is what is observed when there is inflation and people hold cash less than optimal amounts. However, the money demand function to be used should be statistically capable of capturing the changes in money demand. Since welfare loss is related to the cost of holding money that loses value due to inflation, nominal interest rate is used as the opportunity cost of holding non-interest-bearing money in money demand functions used in these field of research. Lucas (2000), in his seminal paper, aims to find out the welfare cost of inflation depending on the arguments of Bailey (1956), Meltzer (1963) and Friedman (1969). Lucas (2000) uses the money demand function of Bailey (1956), along with Cagan (1956), to estimate the welfare cost of inflation in the U.S.

Lucas concludes for U.S. data that covers 1900-1994 that the Cagan's model of money demand function is superior to the semi-log money demand function of Meltzer for the U.S. Lucas' method of calculating the welfare cost of inflation, using the inverse of Cagan's money demand function has been applied by Fischer (1981) for the U.S.; by Serletis and Yavari (2004) for Canada and U.S.;

by Gupta (2007) for South Africa; by Gupta (2008) for Zimbabwe and by Ireland (2009) for U.S.

In this study, we apply Bailey's model to Turkish data, to measure the welfare cost of inflation. To do this, one should examine the suitability of the the data at hand for the Cagan money demand specifications.

2.3. Money Demand Estimations for Turkey

2.3.1. Cagan Money Demand Estimation

To explain Turkish money demand, Metin and Muslu (1999) has tested the applicability of Cagan money demand function on Turkish data using M1, M2 and reserve money; and nominal interest rate, which covers the period from 1986 to 1995. Metin and Muslu conclude that Cagan money demand model can be used to model money demand for the given period. Saraç (2010) extended the period under examination to 1981-2003 to reach a similar conclusion on the applicability of the Cagan money demand on Turkish data. In their study on seignorage revenue estimation, Özdemir and Turner (2004) also make use of Cagan's money demand function, emphasizing that, despite the merits of money demand functions that are designed considering the special conditions in an economy, Cagan's money demand function provides "a simple, well-established theoretical relationship, which is sufficiently general to encompass a range of alternatives" (p.2).

2.3.2. Other Money Demand Estimations

In addition to the Cagan model of money demand, the following models to estimate Turkish money demand have been established.

In order to estimate M2 money demand, Mutluer and Barlas (2002) includes income, interest rate on demand deposits and government bond rates as well in the money demand function, and their study includes data from 1987 to 2001. Mutluer and Barlas indicate that the power of inflation rate is significant in estimating money demand, and has "substantial impact on Turkish broad money demand". This study also provides an error correction model for short run estimations.

Altıntaş (2008) includes exchange rate in his model along with nominal interest rate and real income, and does not include inflation rate, depending on the high correlation between inflation rate and nominal interest rate. His study shows that nominal interest rate has considerable impact on estimation of M2 money demand.

Saatçioğlu and Korap (2005) also include exchange rate and national outcome in the demand function, but unlike Altıntaş, they include quarterly rate of inflation in their model. In this study that covers the period 1987 to 2004, Saatçioğlu and Korap (2005) reach the conclusion that "the main determinant of [their] money demand model is estimated as inflation expectations" (p.1).

Civcir (2003), examining M2 money demand by including the inflation rate, as Saatçioğlu and Korap (2005) does, and in addition, in order to understand the degree of exchange rate substitution, also integrates Eurodollar interest rates in his model. His work also differs from the other attempts to understand money demand in that, "portfolio theory" is used instead of transaction motive in order to

understand motives for money demand. Civcir finds the impact of inflation to be smaller in the short-run in comparison to its long-run impact.

Kogar (1995) estimates M1 and M2 using a model that includes real income and exchange rate along with inflation rate, and reaches the conclusion that inflation rate is significant in money demand estimation..

CHAPTER 3

METHODOLOGY AND DATA

This study aims to calculate the welfare increase due to the fall of inflation in Turkey. We follow the method proposed by Bailey (1956). Section 3.1 describes the methodology used in our study, and Section 3.2 gives information about the data used.

3.1 Methodology

The method of calculating the area under the inverse money demand function involves obtaining the relation between real money demand and nominal interest rates.

The inverse money demand function, or as Bailey (1956) refers to it, "liquidity preference function", gives the relation between nominal interest rate and demand for real balances. This relation depends on the rationale that as the cost of holding money is higher; demand for real balances will be smaller. However, this assumption is more suitable for countries where inflation rate is lower. In countries that experience high inflation, as Bailey (1956) mentions, inflation rate can replace nominal interest rate, assuming that real output and real

interest rate are fixed. In our study, we also used rate of inflation as the cost of holding money.

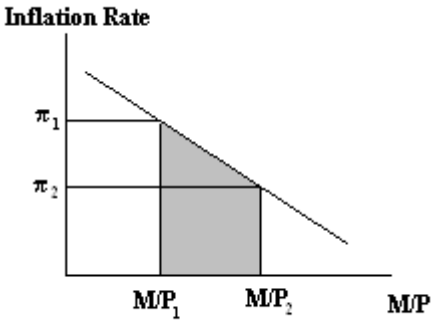

Figure 1: The Area Under the Inverse Money Demand Curve

The first step to calculate the welfare gains that occur after the fall of inflation is to estimate a money demand function that relates inflation rate to real money balances. Real money demand can be written as a function of income and interest rates.

$$m/p = f(y, r) \quad (1)$$

However, since Cagan (1956) carries out welfare analysis on economies with hyperinflation, in this model, real money demand is estimated as a function of inflation rate only. The main reason for this feature is that, in case of hyperinflation, impact of inflation rate swamps the impact of income and interest rates.

$$m/p = f(\pi) \quad (2)$$

Following Cagan's (1956) money demand estimates for countries with high inflation, we relate real money balance and the rate of inflation in the following way:

$$(\ln m - \ln p)_t = \alpha_t + b\pi_t^e + \varepsilon_t \quad (3)$$

where (lnm-lnp) is the natural logarithm of real balances, π^e is the expected rate of inflation and ε is the error term. Cagan (1956) also formulates the expected inflation, depending on adaptive expectations assumption. Adaptive expectations allow agents in the economy to see how their expectations turned out to be at the end of a given period, and adapt their expectations so that the discrepancies between their expectations are more similar to the actual data (Mizen, 2000, p.212). By assigning each past value of inflation a weight, agents can decrease the expectational errors; however, adaptive expectations method solely depends on past occurrences, and changes that are unexpected cannot be corrected. McCallum (1989) mentions this drawback of adaptive expectations approach and warns against systematic expectational errors, which are "errors that are systematically related to the information available to individuals at the time at which their expectations are formed" (p.143).

In order to overcome this shortcoming of the backward-looking adaptive expectations model, a forward looking model is proposed in 1970's, which brought a new perspective to economic models, including the Cagan model (McCallum, p.148). Under rational expectations assumptions, agents are assumed to use "all available and relevant information … to make the best possible guess of the future value of a particular economic variable", which, in our case, is the inflation rate (Mizen, p 214). Under the rational expectations assumption, the expected change in the price level, that is, expected inflation rate should look like the following:

$$\Delta p^{e}_{t+1} = E(\Delta p_{t+1} \mid \Omega_t) \quad (4)$$

where Ω_t signifies all the information available to the agents at time t. Incorporating this into the Cagan model of real money demand, we obtain the following equation:

$$(lnm - lnp)_t = \alpha_t + b\, E_t\, \Delta p_{t+1} + \varepsilon_t \quad (5)$$

As McCallum mentions, as long as all the information available to agents is specified, we will not be able to fully define the above equation (p. 149). Hence, for sake of simplicity, we will take the inflation expectation for the next period simply to be the realized inflation rate of the last period in our study. We assume that agents in the economy see the last period's inflation rate, and expect the same rate for the current period. So, our estimation model becomes

$$(lnm - lnp)_t = \alpha_t + b\pi_{t-1} + \varepsilon_t \quad (6)$$

For a measure of inflation rate, we use both monthly and annual CPI inflation rates. In addition, our study also attempts to relate real balances to nominal interest rates and real income. We will use the natural logarithms of annual inflation rates, as well as the real balances and income, in order to keep the variables on the right hand side and the left hand side of the equation in similar scales[2].

However, a relation between inflation and real balances might not always yield a reliable result. There is the risk of obtaining a spurious relation when the explanatory power is levied on the error term rather than the variables (i.e. when the error term is not stationary), hence one should first analyze the series to check for a unit root, in order to see the degree how the series is integrated within itself. Then, cointegration tests should be carried out in order to make sure that the relation that the money demand function yields is not spurious.

[2] Please refer to the Table 15 in the Appendix for further variable descriptions and their sources.

After establishing a relation between inflation and real balances, we proceed to examine the area under the inverse money demand function. However, in order to get a better fit of our estimations to the actual data, we divide the period under examination, that is, 1987 and 2010 into periods in accordance with the breaking points in Turkish economy. We take the first period to cover January 1987 to April 1994, the time of a major economical crisis when Turkish Lira was devaluated in face of US Dollar. The second period covers from May 1994 to February 2001, when another crisis affected the economy. The third and the last period starts from March 2001 and ends at December 2010.

3.2 Data

In this study, we use monthly data from the period January 1987 to December 2010. For calculation of the real money balances, we use monthly M1 data from Central Bank of the Republic of Turkey (CBRT). In order to obtain real money balances, we need a price index. Monthly Consumer Price Index with 1987 as the base year is obtained from TurkStat. Gross Domestic Product (GDP) is taken from CBRT; this series is hold quarterly, and through the conversion system of CBRT, we use GDP in monthly periodicity. After 1998, CBRT calculates real GDP in 1998 prices and the real GDP series that has 1987 as the base year ends at 2007, so we calculated the real GDP series from 2008 to 2010 using the post-1998 series and converted it to a 1987 base year version, so that the real GDP series is completely in 1987 prices. Annual nominal interest rate of bank deposits with a maturity of 12 months is also taken from CBRT. Our study uses two types of inflation rates: monthly and annual. Monthly interest rate is calculated as the

percentage change of the CPI with respect to the value of the last month. Annual inflation rate, as the annual change in the price levels with respect to the same period of the last year, is obtained from TurkStat. Series of M1, GDP and monthly inflation rate show seasonality. In order to deseasonalize the data, we use the Census X-12 method. We used Eviews as the econometrics software in order to analyze series and carry out estimations.

Figures 2, 3 and 4 below provide the change of real M1 money demand, real GDP, nominal interest rates and annual CPI inflation. An annual summary of the data used in this study can be found on Table A1 at the Appendix to this paper.

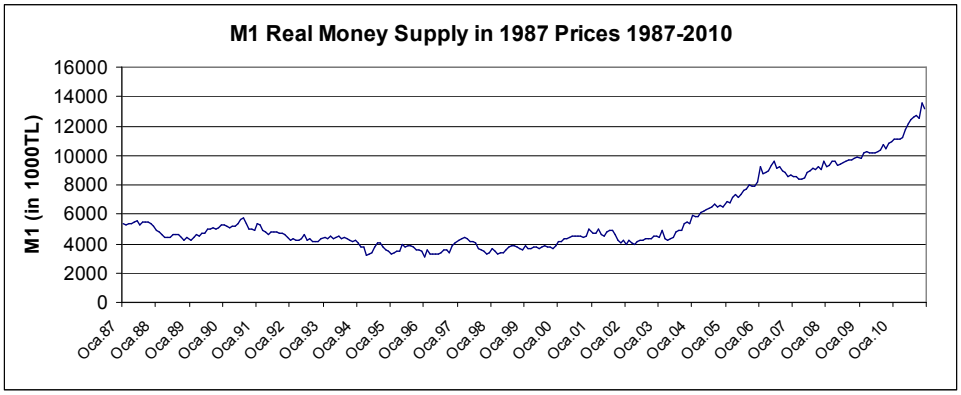

Figure 2: M1 Real Money Supply, 1987-2010

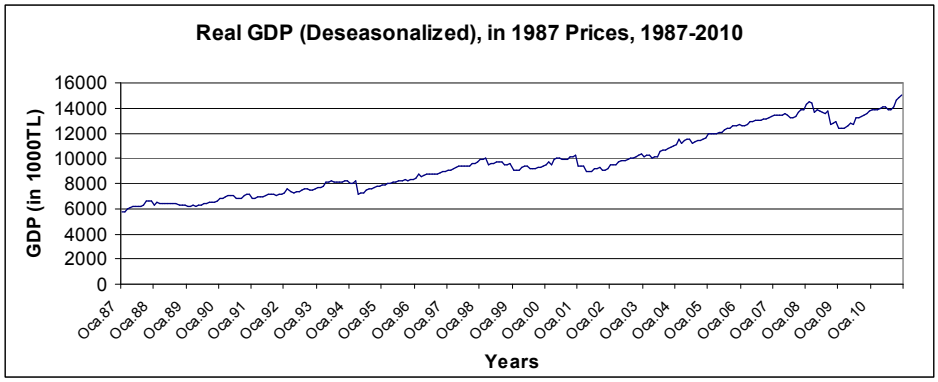

Figure 3: Real GDP

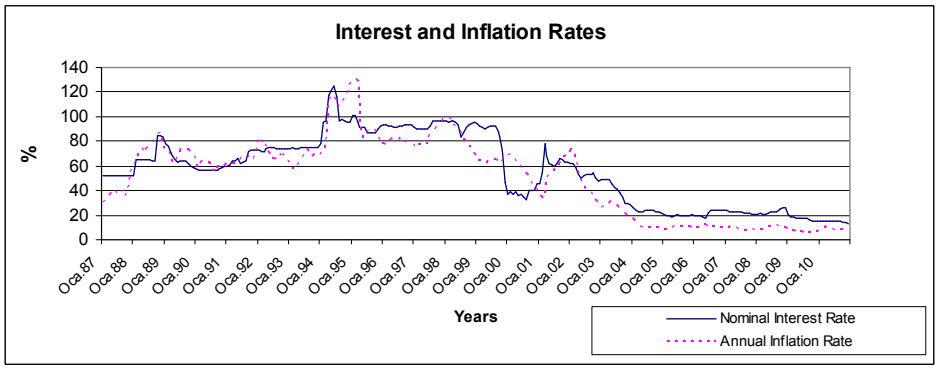

Figure 4: Nominal Interest Rates and Annual CPI Inflation Rate

CHAPTER 4

EMPIRICAL FINDINGS

In our study to find a measure for the welfare implications of falling inflation rate, after choosing the data series to be used, we will first estimate a relation between the inflation rate and real balances, and then, we will use this estimation to calculate the area under the inverse money demand function. However, before we start to estimate the relation, we should make sure that Turkish data is suitable for Cagan's specifications, as we mentioned in Chapter 3. Section 4.1 of our study first carries out the necessary tests to check the suitability of Turkish data to the model we aim to use, and after obtaining positive results, Section 4.2 establishes the relation between real money balances and the inflation rate. This estimation is followed by calculating the area under the inverse money demand function in Section 4.3, where an evaluation of the results obtained as well.

4.1 Verification of the Suitability of Turkish Data to Cagan Model Specifications

Table 1: The Abbreviations for Data Series Used in Our Study

lnm1-lnp	Natural logarithm of real money balances
d_lnm1-lnp	First difference of lnm1-lnp
lnr	Natural logarithm of nominal interest rates
d(lnr)	First difference of lnr
lny	Natural logarithm of real GDP
d(lny)	First difference of lny
lnacpiinf_1	Natural logarithm of the annual inflation rate of the last period
d(lnacpiinf_1)	First difference of lnacpiinf_1
mcpiinf_1	Level of monthly inflation rate of the last period
d(mcpiinf_1)	First difference of mcpiinf_1

The first step we take to examine the data is to check the stationarity of the series at hand. Augmented Dickey-Fuller and Phillps-Perron tests help us see if the series to be used in the estimation process are stationary or non-stationary.

Table 2: Augmented Dickey-Fuller and Philips-Perron Unit Root Test Results

	ADF		**PP**	
	with Intercept	**with Trend and Intercept**	**with Intercept**	**withTrend and Intercept**
lnm1_lnp	0.68	-1.22	0.80	-1.07
d_lnm1_lnp	-17.97	-18.30	-17.95	-18.45
lnr	-0.17	-2.05	-0.06	-1.95
d(lnr)	-12.41	-12.52	-12.44	-12.50
lny	0.48	-1.84	-0.06	-2.86
d(lny)	-7.63	-7.69	-17.52	-17.51
lnacpiinf_1	0.56	-1.86	-0.39	-2.56
d(lnacpiinf_1)	-6.31	-6.72	-11.14	-11.45
mcpiinf_1	-2.60	-9.31	-7.22	-9.66
d(mcpiinf_1)	-10.68	-10.69	-57.16	-100.21
Critical Value	*-2.87*	*-3.43*	*-2.87*	*-3.43*

At 5% level, Augmented Dickey-Fuller test statistics indicate that all the series are non-stationary. Phillips-Perron test statistics indicate that mcpiinf_1, which is the series of monthly inflation rate does seem to be stationary, yet since it contradicts with ADF results, we take monthly inflation rate series to be non-stationary as well.

However, the first-differenced series do not seem to exhibit such non-stationarity. ADF and PP tests both indicate that, although these series are non-stationary when they are used as levels, they are stationary as first-differenced series, that is, they are difference stationary. Hence, unit root test statistics indicate that our series are integrated of order 1, or simply, I(1).

The second step in our analysis of data is to test for cointegration. For this step, we use the Johansen Cointegration Test function of Eviews econometric software. This function gives us the result for two hypothesis tests: a test for no cointegrating vector, and another test for at most one cointegrating vector. Johansen Cointegration Test gives two types of test statistsics, that is, Eigen Value and Trace test statistics.

Table 3: Johansen Cointegration Test Results and Critical Values for (1987-2010) Period

Variables		**Eigenvalue Test Statistics**		**Trace Test Statistics**	
LHS	RHS	Hypothesized No. of Cointegrating Equations			
		H0 (r=0)	H0 (r≤1)	H0 (r=0)	H0 (r≤1)
lnm1-lnp	**mcpiinf_1**	60.30	2.27	62.57	2.27
	lnacpiinf_1	17.27	0.67	17.93	0.67
	lnr	13.10	0.84	13.95	0.84
Critical Value (at 5%)		*15.89*	*9.16*	*20.26*	*9.16*

Table 4: Results of the Johansen Cointegration Test Results

lnm1_lnp	mcpiinf_1	Cointegration
	lnacpiinf_1	No Cointegration
	lnr	No Cointegration

According to the Trace test statistics, the null hypothesis of no cointegrating vector is rejected only for the series of lnm1-lnp, that is, the natural logarithm of the real money balance, and mcpiinf_1, the monthly inflation rate. On the other hand, null hypothesis of no cointegrating vector cannot be rejected for lnm1-lnp with lnacpiinf_1, the annual inflation rate series. Similarly, the null hypothesis of no cointegration cannot be rejected for lnr, the natural logarithm of annual nominal

interest rate series. Trace test statistics also indicate that the null hypothesis of at most one cointegrating vector cannot be rejected for none of the groups. Hence, Trace test statistics show that only mcpiinf_1, the monthly inflation rate series and lnm1-lnp, the real money balances are cointegrated.

Eigenvalue test statistics indicate that the null hypothesis of no cointegrating vector cannot be rejected for lnm1-lnp and lnr. On the other hand, the null hypothesis of no cointegrating vector can be rejected for lnm1-lnp with mcpiinf_1 and lnacpiinf_1 series. The null hypothesis of at most one cointegrating vector cannot be rejected for any of these series. Together with the results for the null hypothesis for no cointegrating vector, Eigenvalue test statistics indicate that lnm1-lnp series show cointegration with mcpiinf_1 and lnacpiinf_1.

The Johansen Cointegration Test yields one cointegration vector for lnm1-lnp and mcpiinf_1, according to both Trace and the Eigenvalue test statistics. However, only Eigenvalue test statistics indicate the existence of a cointegrating vector. For the next parts of our study, we shall use mcpiinf_1, the monthly inflation rate series as the main measure of inflation rate. However, we will also provide the estimation results when lnacpiinf_1 or lnr are used instead of mcpiinf_1, just to complete the picture.

Although some money demand estimation calculations that we covered in Chapter 2 include income in the equation, we do not do this. The reason for not including real income in the estimation process is due to the high degree of correlation our data indicates between series of the natural logarithm of real income and monthly CPI inflation. We noticed 70.03% correlation between these series, so, in order to avoid multicollinearity, we do not include real income in our study. However, for comparison, one can find an estimation of a model that uses

both lny and mcpiinf_1 to estimate lnm1-lnp in Table A6 of the Appendix to this paper.

4.2 Estimating the Relation Between Real Balances and Inflation

In this part, we will produce lnm1-lnp, or real money balance estimations, using mcpiinf_1, the monthly inflation rate series, which we have found to be cointegrated with lnm1-lnp. The results of this estimation will then be used to calculate the area under the inverse money demand function. Along with this calculation, we also provide the estimation results when lnacpiinf_1 or lnr are used instead of mcpiinf_1.

The estimation that we will use in the calculation of the welfare implication of the change in inflation level will relate the natural logarithm of real money balances (lnm1-lnp) and the expectation of the monthly inflation rate, where we use the rate of the last month (mcpiinf_1). As mentioned earlier, we want to have a closer fit of the data to the model, so we include dummies that will change the coefficient of mcpiinf_1 and constants each period. Hence, the model we will use to estimate the relation should look like Equation (3):

$$\text{lnm1-lnp} = c + \beta_1 \text{mcpiinf\_1} + \beta_2 \text{mcpiinf\_1*d2} + \beta_3 \text{mcpiinf\_1*d3} + \text{d2} + \text{d3} \qquad (3)$$

In Table A6 at the Appendix to our study, we also provide studies to find the estimation equation when the natural logarithms of the annual inflation rate or nominal interest rate are used, as well as the case where both monthly inflation rate and real income together are used.

In order to examine the changes in the relation between inflation rate and real money balances in the last two periods, that is, between 1994 and 2001 and between 2001 and 2010, we choose to insert dummies such that d2 will account for the second period, and d3 for the third.

Table 5: Output for Estimation of lnm1-lnp by mcpiinf_1

Variable		Coefficient	t-statistics	Adjusted R2
mcpiinf_1	Constant	8.53	139 (+++)	0.71
	mcpiinf_1	-0.017	0.01	
	mcpiinf_1*d2	-0.002	-0.093	
	mcpiinf_1*d3	-0.12	-6.74 (+++)	
	d2	-0.20	-2.54 (++)	
	d3	0.54	8.23 (+++)	

Note: (+++): Significant at 0.01 level, (++): Significant at 0.05 level, (+): Significant at 0.1 level.

The results of the estimation indicate the expected negative relation between mcpiinf_1 and lnm1_lnp at each period. However, the coefficient of mcpiinf_1*d3 indicate a significantly stronger reaction of money demand to higher levels of inflation. This may also be interpreted as an increase in the price elasticity of money demand in period 3. In addition, t-statistics indicate that, using Cagan form of money demand estimation, one cannot obtain a significant money demand function for periods 1 and 2. It is only in the last period that we have a significant price elasticity of money demand.

When the annual equivalents of the monthly inflation rates are used to depict the inverse money demand functions, we get Figure 5.

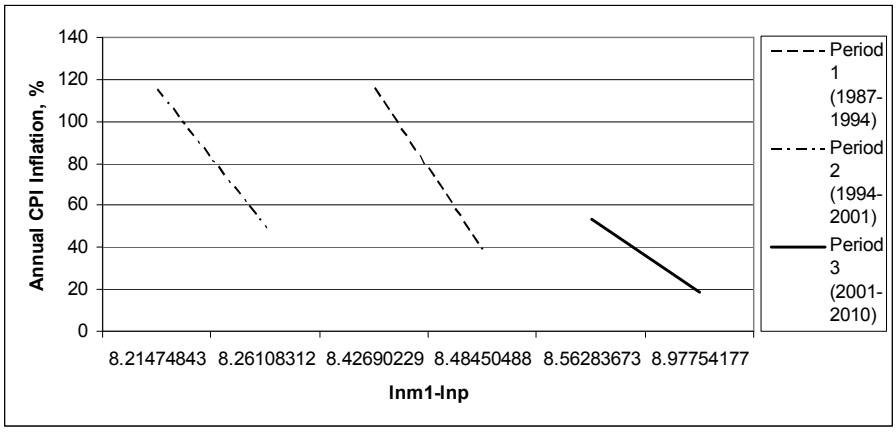

Figure 5: Inverse Demand Functions of Periods 1, 2 and 3

The results on Figure 5 also affirm the stronger sensitivity to cost of holding money in the third period, as the curve of period 3 is flatter than the other two, which means that a similar change in inflation rate will create a higher reaction in real money demand.

4.3 Calculating the Welfare Implication of Change in Inflation

In this part of the study, we calculate the area under the inverse money demand function and arrive at a meaningful solution that would help us measure the welfare change which results from having a lower inflation rate.

The aim of our study is to find a measure of welfare change, yet the area under the curve on itself does not give us a sense of the unit of the welfare change. It would be better to obtain this change in terms of real income. In order to evaluate the change in welfare in real income terms, let us divide the area under the curve to the difference that takes place in real GDP during the corresponding period. For instance, we calculate the area for period 2 (1994-2001) using the average of monthly inflation rates of 1994 and 2001, so we divide the area to the

difference of 1994 and 2001 annual averages of real income[3]. Since we used the real balances in their natural logarithms, we will use the difference of the natural logarithms of the real income between the beginnings of each period. Table 6 gives the outline of the calculations, and Table A3 in the Appendix gives a more detailed explanation of the calculation steps.

Table 6: Welfare Change Estimation

	Constant	Coefficient of mcpiinf_1	Area Under the Curve	Area/Real lny Difference
Period 1 (1987-1994)	8.53	-0.02	-0.26	-1.22
Period 2 (1994-2001)	8.33	-0.02	0.23	1.23
Period 3 (2001-2010)	9.07	-0.14	0.90	2.06

In this calculation, we calculated the average monthly inflation rate for the year each period begins and ends, and calculated the welfare gain (or loss, for the first period) that one expects to observe as a result of bringing inflation down in that period. Note that, since we use monthly inflation rate in our estimation, we calculated the average inflation rates in annual terms, and then de-compounded this rate to its monthly equivalent.

The calculations indicate that, in the first period (1987-1994), the increase of annual inflation rate from 38.5% (average of 1987, the beginning year of period 1) to annual 104% (average of 1994, the end year of period 1) led to welfare loss in 1.2 times as much of the change in real income between 1987 and 1994. In the second period (1994-2001), our calculations yield a welfare gain, and the magnitude of the welfare gain is similar in magnitude to the welfare loss of the previous period. At the beginning of period 2, in 1994, the annual average inflation rate was 104%, and in 2001, the annual average rate of inflation was 53.45%. In the last period (2001-2010), the welfare gain that one expects to observe as a result

[3] In Table 15 at the Appendix, all of the steps for the calculation of the welfare change are provided

of bringing average annual inflation down from 53.45% (which is the average annual inflation of 2001, the beginning of period 3) to 8.58% (which is the average annual inflation of 2010) is around twice as much of the increase in real income. In the last period, real GDP has increased almost 50%, so the welfare increase should be near 100% of the GDP.

CHAPTER 5

WELFARE IMPLICATIONS OF DISINFLATION IN TURKEY: THE 2000'S

As proposed in the foregoing analysis, the welfare improvement of the size of the increase in real GDP is quite a strong result. Now, we have a sense of the magnitude of the welfare improvement we expect to see in Turkish Economy; however, the abstract concept of welfare still longs to be translated into changes that one can observe. This chapter delves into Turkish Economy to find the impacts of the impressive welfare gain one expects to see in light of the findings of the Chapter 4. In the first part, we examine the Turkish Banking Industry to see how lower levels of inflation led to changes that could be interpreted as contribution to welfare improvement. In the second part, we turn our focus to the real sector to look for improvements that result from lower rates of inflation. Finally, we compare the indicators for income distribution poverty over the first decade of the 21st century of Turkey.

5.1 Turkish Banking Sector and Welfare Changes

In this part we will examine the Turkish Banking Sector to see how lower inflation changed this sector. During periods of high inflation, lending credit to

customers becomes more risky for banks, as uncertainty increases. Uncertainty- and inflation- works for the benefit of the borrower and hurts the lender. Also, the maturity of bank deposits are expected to be shorter due to economic uncertainties, so maturity mismatch is felt stronger by banks. As a result, banks are less willing to give credits to customers. This causes banks to search easier ways to earn money, and they hold more government bonds in their assets, rather than giving credit. With lower levels of inflation, one expects to see a change in the balance sheet structures of banks: as government bonds become less attractive and lending credits become less risky, banks should hold less government bonds and give more credits. Examine Table A5 in the Appendix, which includes ratios from Turkish Banking Industry.

Over the course of the last decade, as annual inflation decreased from an average of 53% in 2001 to an average of 6% in 2010, we clearly see some changes in the above ratios. As one can follow on the figure below, share of credits in banks' assets is now almost twice as much as it was in 2001.

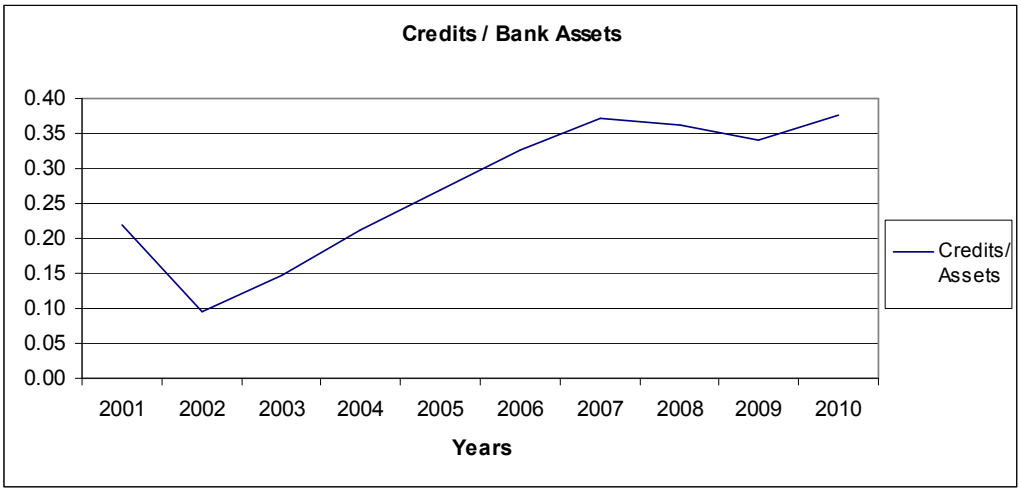

Figure 6: Ratio of Credits that Banks Lend to Bank Assets

Also one can see on Figure 7, from 2001 to 2008 (when the global credit crunch started to affect Turkey), the share of government bonds in total assets of banks decreased, while the share of credits increased.

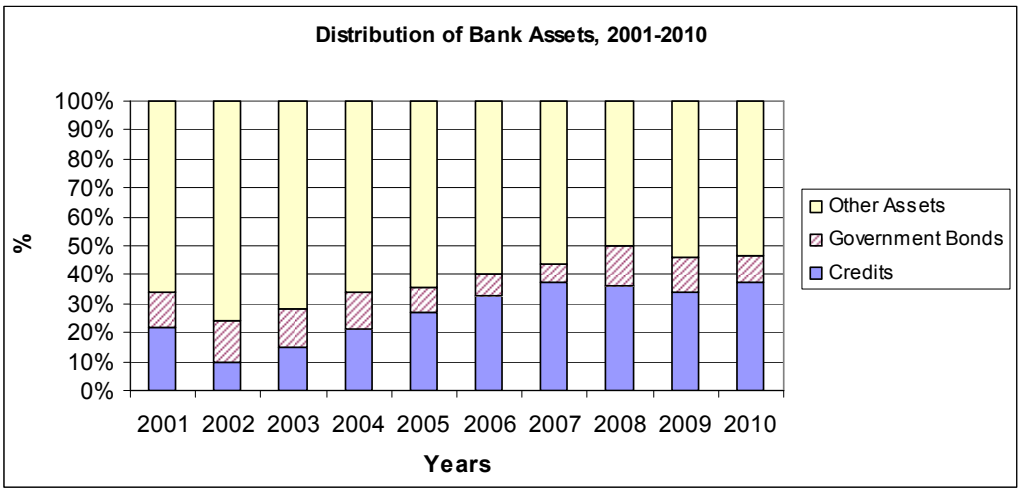

Figure 7: Distribution of Bank Assets

Apart from the distribution of banks' assets, the amount of banks' assets has also increased. The ratio of the total bank assets in Turkish Banking Sector to nominal GDP indicates that banks have increased their assets. This would further increase the credits to be lent in the future.

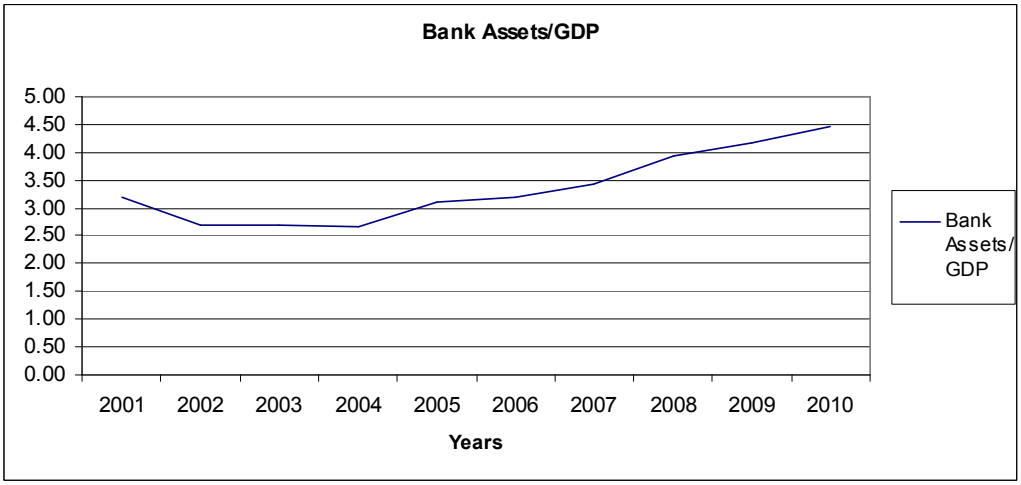

Figure 8: Ratio of Bank Assets to Nominal GDP

Now let us examine the distribution of bank deposits with respect to their maturities. We mentioned that, during periods of high inflation, bank customers hold their deposits for shorter periods due to uncertainty. So, as inflation falls, one expects to see more bank deposits in accounts with longer maturities. The figure below examines the distribution of nominal value of bank deposits over the last decade.

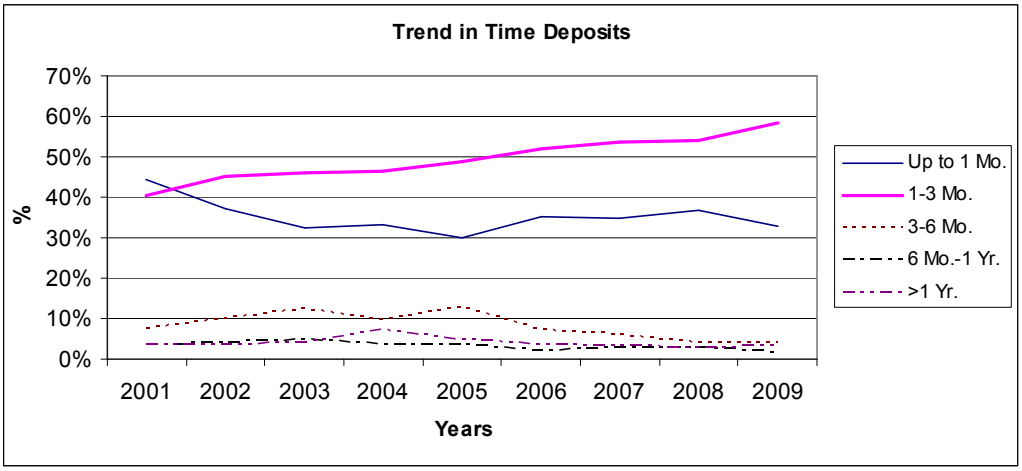

Figure 9: Trend of Time Deposits as a Ratio of Total Time Deposits

As one can see on Figure 9 as well as on Table 7, bank customers seem to have switched from time deposits of up to 1 month of maturity to those with longer maturities, i.e. up to 3 months. This is significant, yet there does not seem to be a change in the deposits with larger maturities. We should also examine how bank deposits with different maturities evolve with respect to GDP.

Table 7 shows the trend of bank time deposits to GDP ratio to see how time deposits with different maturities

Table 7: Trend of Time Deposits/GDP, in Different Maturities

Year	Up Until 1 Month	1-3 Months	3-6 Months	6 Months- 1 Year	1 Year or Longer	Total
2001	24.54%	22.39%	4.28%	2.02%	2.02%	55.24%
2002	15.43%	18.73%	4.19%	1.62%	1.53%	41.50%
2003	11.59%	16.48%	4.42%	1.72%	1.47%	35.68%
2004	12.13%	16.97%	3.47%	1.38%	2.67%	36.61%
2005	12.50%	20.45%	5.37%	1.50%	2.03%	41.86%
2006	15.90%	23.35%	3.15%	0.96%	1.59%	44.95%
2007	16.41%	25.17%	2.78%	1.25%	1.46%	47.06%
2008	20.01%	29.27%	2.07%	1.47%	1.45%	54.27%
2009	19.46%	34.91%	2.30%	1.06%	1.91%	59.64%

Source: Banks Association of Turkey Database

Figure 10, which illustrates the change of time deposits to GDP ratios reveal that, bank deposits of relatively shorter maturities have attracted larger capital over time, yet time deposits of longer maturities still fail to be attractive to bank customers. This may be a signal that bank customers still feel uncertainty, despite the fall of inflation level.

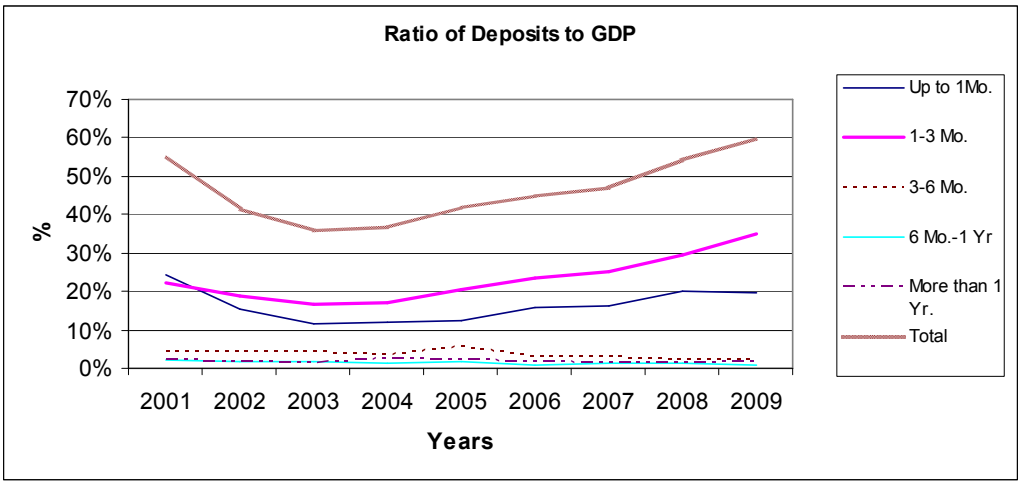

Figure 10: Trend of Time Deposits/GDP Ratio, with Respect to Their Maturities

5.2 Real Sector and Welfare Changes

In this part we turn our focus on the real sector and see how lower levels of inflation affected the production sector. As inflation falls, interest rates also fall,

and borrowing becomes more feasible for production companies, such as SMEs. Table 8 examines the bank credits lent to companies in production sector.

Table 8: Credits Lent to Production Sector, and the Share of Credits to Production Sector/GDP

Years	Bank Credits to Production Sector (in mill TL)	Share in Total Credits	Share in GDP
2001	10813.19	27.71%	6.18%
2002	14115.08	27.45%	5.13%
2003	19223.00	27.86%	5.37%
2004	26211.92	26.12%	6.12%
2005	37513.75	25.07%	7.71%
2006	47111.37	22.05%	8.20%
2007	57468.91	20.87%	9.02%
2008	76149.96	21.20%	10.57%
2009	72022.21	19.26%	10.02%

Source: Banks Association of Turkey Database

In nominal terms, the amount of credits lent to production companies, the companies that are involved in production of consumer goods according to the definition of the Banks Association of Turkey, did increase. Yet, one observes a decrease in the share of these credits in the total credits that banks have lent. To understand what this means, one could observe the share of production company credits in GDP. As the below figure shows, production companies access to a higher amount of credit. The decreasing shares of production credits in total credits lent could be a result of more diversified portfolio of clientele for banks.

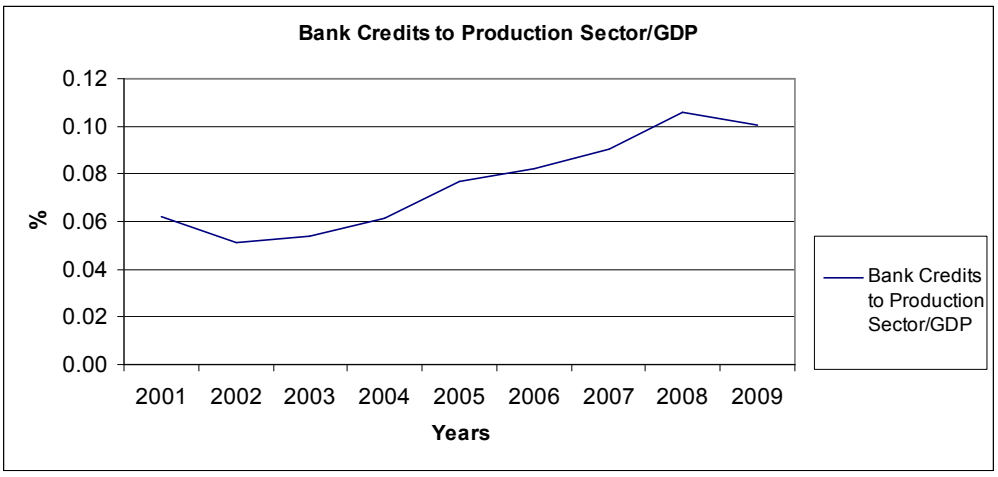

Figure 11: Ratio of Credits Banks Lent to Companies in Production Sector to GDP

Banks is not the only source of credit. SMEs also have access to credit from foreign development agencies, such as the European Investment Bank. These credits, which are distributed in Turkey by Halkbank, Vakıfbank and TSKB have become more feasible to SMEs as well. Table 9 gives the increase of investment per SME in real terms, and one can notice an increase.

Table 9: Change in Foreign-Sourced Credit per SME, 2001-2010.

	No. of SMEs that Received Credit	Investment (in 1000TL)	Investment per SME (in Nominal TL)	Investment per SME (in Real 1000TL)
2001	244	14985.87	61.42	61.42
2002	382	63725.06	166.82	128.80
2003	458	108416.46	236.72	154.53
2004	436	110423.38	253.26	152.14
2005	218	65554.41	300.71	162.05
2006	137	49310.27	359.93	185.86
2007	944	856508.64	907.32	432.27
2008	1361	1108600.85	814.55	352.59
2009	585	468872.88	801.49	325.68

Source: World Bank On-Line Database

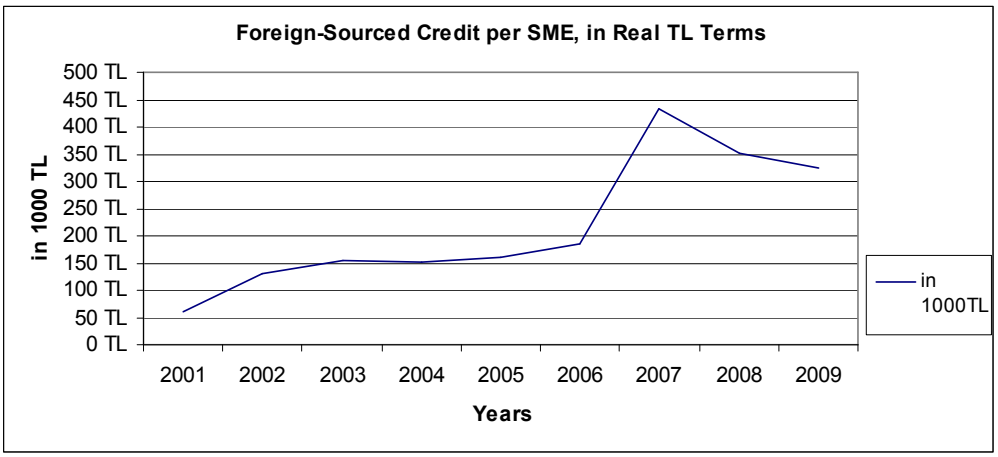

Figure 12: Change of Foreign-Sourced Credit per SME in 2001 Prices

5.3 Income Distribution and Welfare Changes

In this part of our study, we examine the income distribution over the period under examination. Since 1987 to 2008, as one can follow in Table 11, Gini coefficient has decreased. Decrease of Gini coefficient indicates that income is distributes more equally, which is a positive outcome. However, the decrease has not been constant. Between 1994 and 2005, there seems to be distortion in income equality according to this indicator. This could be attributed to inflation as a long-lasting impact. After 2005, Gini Coefficient is decreasing steadily, and as of 2008, Turkey has the lowest Gini Coefficient of the last two decades.

Table 10: Selected Indicators of Income Distribution

		Income share held by:			
Year	Gini Coefficient	Highest 10%	Lowest 10%	Highest 20%	Lowest 20%
1987	43.57	35.3	2.4	50	5.9
1994	41.53	32.3	2.3	47.7	5.8
2002	42.71	33.48	2.21	48.81	5.64
2005	43.23	33.19	1.91	48.81	5.18
2006	41.15	31.3	1.99	47.06	5.43
2008	39.74	30.25	2.11	45.83	5.65

Source: World Bank On-Line Database

The shares of income that the highest and the lowest earning population groups shows a positive signal for income distribution. From 1987 until 2008, the highest earning 10% and 20% groups of the population have been earning a smaller portion of the total income almost each year. On the other hand, the lowest earning 10% of the population in Turkey does not seem to be getting a larger share of the income. This is also the case for the lowest earning 20% of the population. As a matter of fact, the lowest earning 10% and 20% of the population earn a smaller share of total income than they used to earn in 1987. This change in distribution indicates that the distribution of income did not benefit the individuals at the bottom of the earning groups. Rather, mid-level earners have increased their share in income distribution.

The set of ratios provided on Table 11 are the ones that could be useful in analyzing the changes in income distribution concern the share of poverty in population. One of these ratios is the food poverty ratio, which gives the number of people in the society who earn less than the amount considered to be sufficient to support expenditures on food items. Complete poverty ratio also includes the ratio of people who may be above the food poverty level, but remain below the level of income to earn basic non-food items.

Table 11: Ratio of the Poor in Selected Poverty Categories

	Ratio of Poor Individuals			
Years	**Food Poverty**	**Complete Poverty (Food + Non-Food)**	**Below $2.15 Per Capita Per Day**	**Below $4.3 Per Capita Per Day**
2002	1.35	26.96	3.04	30.30
2003	1.29	28.12	2.39	23.75
2004	1.29	25.60	2.49	20.89
2005	0.87	20.50	1.55	16.36
2006	0.74	17.81	1.41	13.33
2007	0.48	17.79	0.52	8.41
2008	0.54	17.11	0.47	6.83
2009	0.48	18.08	0.22	4.35

Source: World Bank On-Line Database and TurkStat

Over the last decade, the ratio of people who can be considered to suffer from food poverty declined from 1.35% to 0.48%. Similarly, complete poverty has been decreasing as well. A similar trend can be observed in the share of people who live less than $2.15 or $4.3 as well. One can notice that poverty has been decreasing. The role of falling inflation on this phenomenon is closely related with the welfare gains that manifested itself in the various ways reported in the section.

CHAPTER 6

CONCLUSIONS

In our study, we aimed to measure for the welfare implications of inflation, using the methodology of Bailey (1956) and money demand estimation methods of Cagan (1956). We reached the conclusion that the welfare gain of Turkish economy from the decreasing inflation level in the last decade is as large as twice the size of increase in real income. One needs to be cautious to evaluate such a significant change, so we examined the descriptive results of fall in inflation. More specifically, we examined the banking and real sector ratios in Turkish economy to see the impact of the welfare gains, and we notice some development, even though the magnitude of development does not match the expectations. Our model does not show us what happens to the difference between the calculated welfare increase and the descriptive results we observe in the economy. However, it should be emphasized once again that the improvements we observed empirically do not compare to the extent of the welfare increase our model gave us.

Our study, to our knowledge, is the first attempt to formally measure the welfare gains of disinflation in Turkey. Further studies are needed to confirm these results and elaborate further on how these gains are distributed in the society and what happens to the welfare gain one expects to see but did not show on

descriptive results. Turkey is an exciting case for researchers who want to examine the welfare gains of lower inflation rates, due to the room for research in this area. We believe that future analyses will fill this gap.

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APPENDICES

Table A1: Data

	m	m_over_p	p	mcpiinf	y	r	acpiinf
Years	**M1 Money Supply, Nominal, in 1987 Prices, in 1000TL (Source: CBRT)**	**m1/cpi**	**cpi/100 (Base Year=1987)**	**Deseasonalized Monthly change in CPI**	**Real GDP, in 1987 Prices, in 1000TL Deseasonalized (Source: CBRT)**	**Nominal Monthly Interest Rate on 1-Year Deposits (Source: CBTR)**	**Annual Inflation Rate, Calculated on the Difference to the Same Month of the Last Year, Undeseasonalized (Source: TURKSTAT)**
1987	64,771	64,785	1.00	3.00	74,412	52.00	38.50
1988	93,979	54,326	1.74	4.83	76,333	68.66	74.70
1989	164,422	57,513	2.84	4.24	76,335	66.29	69.57
1990	284,565	62,758	4.55	4.10	83,723	57.28	60.37
1991	433,480	57,832	7.54	4.37	84,176	66.13	65.68
1992	658,385	51,378	12.83	4.48	89,325	73.65	71.09
1993	1,109,083	52,167	21.31	4.51	96,418	74.46	65.64
1994	1,938,769	44,275	43.96	6.93	91,698	102.64	103.93
1995	3,698,737	43,389	85.12	5.21	97,760	91.65	97.34
1996	6,446,544	41,842	152.71	4.95	104,763	92.79	80.31
1997	13,035,852	47,013	282.49	5.72	112,550	93.03	84.53
1998	22,640,115	43,521	518.68	4.59	116,263	93.31	86.66
1999	38,265,177	45,094	847.99	4.15	110,724	85.49	64.78
2000	69,870,849	53,226	1308.03	3.09	118,711	38.19	56.43
2001	110,547,263	55,290	2013.48	4.38	110,084	62.17	53.46
2002	148,650,114	50,850	2915.80	2.32	118,489	53.88	47.19
2003	209,890,224	57,342	3651.90	1.48	125,381	40.28	25.55
2004	304,832,128	75,634	4026.85	0.73	136,911	23.61	10.66
2005	401,452,376	89,877	4458.43	0.91	146,731	19.88	10.13
2006	508,751,929	108,229	4702.06	0.40	155,649	21.47	10.52
2007	543,924,990	106,298	5113.78	0.68	161,962	22.26	8.78
2008	648,827,017	114,832	5647.87	0.86	163,878	22.93	10.43
2009	745,649,965	124,193	6000.92	0.46	155,770	17.20	6.28
2010	947,654,747	145,363	6514.99	0.59	170,002	14.99	8.58

Table A2: Data Descriptions and Sources

Series	Specifications	Source
m	M1 Money Supply, Nominal, in 1000TL	CBRT
lnm1-lnp	ln(m1/cpi)	
p	Consumer Price Index, with 1987 average taken as 1.	TURKSTAT
mcpiinf	Monthly Inflation, calculated as the change in p with respect to the last month's value, deseasonalized.	
r	Nominal Monthly Interest Rate on 1-Year Deposits	CBTR
y	Real GDP, in 1987 Prices, in 1000TL, Deseasonalized. Values between 2008:1 and 2010:12 are derived from a new series of Real and Nominal GDP that are calculated in 1998 prices.	CBRT
acpiinf	Annual Inflation Rate, Calculated on the Difference to the Same Month of the Last Year, Undeseasonalized	TURKSTAT
Credits	The total of credits (of short and long maturity) that appear under "Credits" bracket of the Assets part of the balance sheet of the Turkish Banking Sector.	The Banks Association of Turkey
Bank Assets	"Assets" section of the balance sheets of the Turkish Banking Sector	The Banks Association of Turkey
Bank Deposits	The total of TL denominated bank deposits that appear in the "Liabilities" part of the balance sheets of the Turkish Banking Sector.	The Banks Association of Turkey
Government Bonds	Total of government bonds, treasury bills and public sector debt securities that are recorded as "Investment to Be Held to Maturity", under the "Assets" part of the balance sheets of the Turkish Banking Sector.	The Banks Association of Turkey
Investment	Private expenditure on machinery and construction that appears as the part of GDP, calculated with expenditures method.	CBRT
FDI	Direct investment in the recipient economy, under the "Financial Account" part of IMF IFS Report	IMF Statistics

Table A3: Calculation of the Welfare Cost of Inflation

	Constant	Coefficient of mcpiinf_1	lnm1_lnp at the End of Period	lnm1_lnp at the Beginning of Period	Difference of lnm1_lnp in Period	Area Under the Curve	Diff. of real lny in Period	Area/Real lny Difference
Period 1 (1987-1994)	8.531	-0.017	8.426	8.484	-0.057	-0.255	0.208	-1.222
Period 2 (1994-2001)	8.328	-0.018	8.261	8.214	0.046	0.225	0.183	1.231
Period 3 (2001-2010)	9.074	-0.140	8.977	8.562	0.414	0.896	0.434	2.063

Table A4: Yearly Averages for the Years When Periods Begin and/or End

Year	Yearly Averages of Real lny	Yearly Averages of Annual CPI Inflation	Monthly Equivalent of Yearly Averages of Annual CPI Inflation
1987	8.73	38.50	2.75
1994	8.94	103.93	6.11
2001	9.12	53.45	3.63
2010	9.55	8.58	0.68

Table A5: Changes of Selected Ratios in the Balance Sheet Structure in Turkish Banking Sector, 2001-2010

Years	Credits to Bank Assets	Credits to GDP	Bank Deposits to Bank Assets	Bank Deposits to GDP	Government Bonds to Bank Assets	Government Bonds to GDP	Bank Assets to GDP	Investment /GDP	FDI to GDP
2001	0.22	0.70	0.69	2.20	0.12	0.28	3.19	0.16	0.023
2002	0.10	0.26	0.67	1.80	0.15	0.39	2.69	0.19	0.007
2003	0.15	0.39	0.64	1.72	0.13	0.36	2.68	0.22	0.009
2004	0.21	0.57	0.64	1.72	0.13	0.34	2.67	0.23	0.007
2005	0.27	0.84	0.64	1.99	0.09	0.27	3.11	0.25	0.063
2006	0.33	1.04	0.65	2.06	0.08	0.25	3.19	0.26	0.066
2007	0.37	1.27	0.64	2.18	0.06	0.21	3.43	0.25	0.034
2008	0.36	1.42	0.64	2.52	0.14	0.54	3.92	0.23	0.028
2009	0.34	1.42	0.64	2.66	0.12	0.50	4.18	0.21	0.010
2010	0.38	1.68	0.64	2.87	0.09	0.41	4.47	0.22	0.015

Source: Banks Association of Turkey Database

Table A6: Distribution of Time Deposits with Respect to Maturities, in millions

Year	Up Until 1 Month	1-3 Months	3-6 Months	6 Months- 1 Year	1 Year or Longer
2001	42,898	39,137	7,477	3,531	3,531
2002	42,426	51,513	11,509	4,453	4,208
2003	41,526	59,059	15,838	6,157	5,270
2004	51,970	72,721	14,879	5,897	11,425
2005	60,808	99,438	26,140	7,312	9,880
2006	91,380	134,190	18,084	5,504	9,161
2007	104,521	160,335	17,688	7,940	9,283
2008	144,184	210,939	14,900	10,600	10,444
2009	139,823	250,784	16,526	7,581	13,743

Source: Banks Association of Turkey Database

Table A7: Regression Results of Other Money Demand Models [4]

I.

$lnm1\text{-}lnp = c + \beta_1 lnacpiinf\_1 + \beta_2 lnacpiinf\_1*d2 + \beta_3 lnacpiinf\_1*d3 + d2 + d3$

Dependent Variable: LNM1_LNP
Method: Least Squares
Date: 06/01/11 Time: 09:57
Sample: 1987M01 2010M12
Included observations: 288

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	9.469613	0.216176	43.80515	0.0000
LNACPIINF_1	-0.245587	0.052439	-4.683286	0.0000
LNACPIINF_1*D2	-0.000936	0.078227	-0.011959	0.9905
LNACPIINF_1*D3	-0.190955	0.054636	-3.495044	0.0006
D2	-0.150910	0.334368	-0.451329	0.6521
D3	0.590645	0.220293	2.681176	0.0078

R-squared	0.894483	Mean dependent var	8.576399
Adjusted R-squared	0.892612	S.D. dependent var	0.371396
S.E. of regression	0.121707	Akaike info criterion	-1.353788
Sum squared resid	4.177149	Schwarz criterion	-1.277476
Log likelihood	200.9454	F-statistic	478.1103
Durbin-Watson stat	0.159832	Prob(F-statistic)	0.000000

[4] Natural logarithm of annual inflation rate (lnacpiinf_1) or of nominal interest rate (lnr) are used as a measure of cost of holding money, instead of the monthly inflation rate.

II.

$lnm1\text{-}lnp = c + \beta_1 lnacpiinf\_1 + \beta_2 lnacpiinf\_1*d2 + \beta_3 lnacpiinf\_1*d3 + d2 + d3$

Dependent Variable: LNM1_LNP
Method: Least Squares
Date: 06/01/11 Time: 10:36
Sample: 1987M01 2010M12
Included observations: 288

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	10.96589	0.317311	34.55876	0.0000
LNR	-0.599204	0.075798	-7.905280	0.0000
LNR*D2	0.385332	0.083233	4.629554	0.0000
LNR*D3	-0.096245	0.078590	-1.224643	0.2217
D2	-1.789970	0.351591	-5.091049	0.0000
D3	0.206240	0.324649	0.635273	0.5258

R-squared	0.920638	Mean dependent var	8.576399
Adjusted R-squared	0.919230	S.D. dependent var	0.371396
S.E. of regression	0.105551	Akaike info criterion	-1.638636
Sum squared resid	3.141752	Schwarz criterion	-1.562324
Log likelihood	241.9636	F-statistic	654.2637
Durbin-Watson stat	0.221958	Prob(F-statistic)	0.000000

III.

$$lnm1\text{-}lnp = c + \beta_1 mcpiinf\_1 + \beta_2 mcpiinf\_1*d2 + \beta_3 mcpiinf\_1*d3 + d2 + d3 \quad (3)$$

Dependent Variable: LNM1_LNP
Method: Least Squares
Date: 06/01/11 Time: 09:58
Sample: 1987M01 2010M12
Included observations: 288

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	8.531582	0.061379	138.9976	0.0000
MCPIINF_1	-0.017109	0.013560	-1.261738	0.2081
MCPIINF_1*D2	-0.001536	0.016450	-0.093347	0.9257
MCPIINF_1*D3	-0.123722	0.018368	-6.735891	0.0000
D2	-0.202756	0.079797	-2.540902	0.0116
D3	0.542936	0.065968	8.230320	0.0000

R-squared	0.713395	Mean dependent var	8.576399
Adjusted R-squared	0.708313	S.D. dependent var	0.371396
S.E. of regression	0.200584	Akaike info criterion	-0.354555
Sum squared resid	11.34596	Schwarz criterion	-0.278244
Log likelihood	57.05596	F-statistic	140.3863
Durbin-Watson stat	0.322654	Prob(F-statistic)	0.000000

IV.

$lnm1\text{-}lnp = c + \beta_1 mcpiinf\_1 + \beta_2 mcpiinf\_1*d2 + \beta_3 mcpiinf\_1*d3 + \beta_4 lny + \beta_5 lny*d2 + \beta_6 lny*d3 + d2 + d3$

Dependent Variable: LNM1_LNP
Method: Least Squares
Date: 06/04/11 Time: 01:33
Sample: 1987M01 2010M12
Included observations: 288

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	13.47896	1.000694	13.46961	0.0000
MCPIINF_1	-0.009505	0.006751	-1.407997	0.1602
LNY	-0.563142	0.113855	-4.946137	0.0000
MCPIINF_1*D2	-0.002870	0.008435	-0.340290	0.7339
MCPIINF_1*D3	0.030236	0.010536	2.869685	0.0044
LNY*D2	0.930578	0.175446	5.304081	0.0000
LNY*D3	3.052381	0.141187	21.61943	0.0000
D2	-8.524911	1.582753	-5.386128	0.0000
D3	-27.97833	1.275428	-21.93642	0.0000

R-squared	0.933361	Mean dependent var	8.576399
Adjusted R-squared	0.931450	S.D. dependent var	0.371396
S.E. of regression	0.097239	Akaike info criterion	-1.792533
Sum squared resid	2.638076	Schwarz criterion	-1.678066
Log likelihood	267.1248	F-statistic	488.4648
Durbin-Watson stat	0.273693	Prob(F-statistic)	0.000000