

TURKEY'S EXPERIENCE WITH DISINFLATION: Where did all the welfare gains go?

Abstract

This paper adopts the framework proposed in Bailey (1956) to measure the welfare gains from disinflation in Turkey in the last decade. The estimates of welfare gains during the 2000s are observed to exceed the real output gains during the period. This is likely to be due to prevailing allocative inefficiencies in the economy, pointing at the need for further structural and institutional reforms for the benefits of price stability to be utilized towards achieving sustainable development.

Key Terms: *Turkish Inflation; Disinflation; Welfare Costs of Inflation*

JEL Codes: E31; E41; I31

1 Introduction

Inflation leads to welfare losses, commonly known as the shoe-leather and menu costs, the former of which arises due to time and effort spent to keep the money's worth and the latter arises as a cost of administering frequent price changes. When inflation is not well-predicted and highly volatile, a feature that is usually observed in cases of high inflation, it also leads to welfare costs incurred through income redistribution: borrowers gain and lenders lose from unanticipated inflation. In addition, those who are locked in long-term nominal contracts also cannot insulate themselves from the loss of purchasing power, leading to further distributional inefficiencies. Uncertainty in real returns to caused by unpredictable and high inflation rates leads to low investment activity and hence low growth rates, which hampers sustainable development. Furthermore, economic agents in inflationary economies, anticipating a reduction in the real value of money, have incentive to defer payments, which in turn aggravates inefficiencies in tax collection, increases non-performing loans and national imbalances.¹

Turkey experienced three decades of high (averaging 50 percent per annum) and highly volatile inflation since 1970s (see Figure 1).² Notwithstanding the economic inefficiencies generated by high inflation rates, Turkey continued to grow, though at lower than desirable rates for a developing country, and exhibiting great volatility.³ Following the banking crisis in 2001, that resulted from eventual surfacing of the accumulated fiscal and financial imbalances, a comprehensive stabilization program was adopted (see Celasun, 2002, for a thorough discussion of this period).⁴ The program entailed several formal institutional reforms including revisions in the central bank, banking and bankruptcy laws. The assignment of greater degree of independence to the Turkish Central Bank was reinforced by the adoption of inflation targeting regime, which initially started in an *implicit* format and moved to *explicit* targeting regime in 2006. It is fair to say that these reforms were successful, at least by an account of the

¹ Fischer (1981) discusses the real costs of inflation in detail.

² The average for the high inflation years (over the two decades of the 1980s and 1990s) is 64 percent and was generally accelerating throughout that period.

³ Cetinkaya and Yavuz (2002) report a negative sacrifice ratio for Turkey between 1987 and 2001.

⁴ The Central Bank of the Turkish Republic, "Strengthening the Turkish Economy", <http://www.tcmb.gov.tr/yeni/eng/>.

inflation rate that declined to less than 10 percent in the second half of the 2000s. While the aim of this paper is not to provide a thorough assessment of the reform performance during the 2000s, it draws attention to the potential implications of the rapid disinflation experience in Turkey and contrasts them with the post-reform period macroeconomic performance that was reinforced by the political will of the incumbent party that constituted majority in the parliament. The single party government that characterized the 2000s both facilitated the government's decision making process and benefited, in turn, from the reforms that was followed by a period of notably favorable economic circumstances.

It has been widely argued in the literature that stabilizing chronic high inflation is particularly difficult due to inertia whose eradication requires institutional reforms geared to alter inflationary expectations (see, for example, Reinhart and Vegh, 1994, Calvo and Vegh, 1999, and Barnea and Liviathan 2008). Various stabilization episodes recorded in the world indeed demonstrate that drastic institutional measures often played the chief role in achieving disinflation (see, for example, Montiel, 1989 and Cukierman, 2008 for overview). Global improvements in the institutional environment via the recognition of best-practices (besides, possibly, the growing share of the cheap Chinese exports in the world trade) have indeed led to a world-wide reduction in the inflation rates during the 2000s.⁵ Significant institutional measures often followed major economic and financial crises, as was also exemplified by the 2001 crisis in the Turkish economy.

This paper presents an original attempt to quantify the size of the welfare gain from disinflation in Turkey during the 2000s. Increased demand for liquidity, associated with falling inflation rates, facilitates transactions and enables longer term contracts, which include investment. Using a Cagan (1956) type money demand function (besides other specifications), I estimate the welfare gains arising from the increase in money holding.⁶

⁵ While Bade and Parkin (1988), Alesina (1988), Grilli et al. (1991) Cukierman et al (1992 and 2002), Eijfenger (1993 and 1995), de Haan (2000 and 2008), Cukierman (2006), Arnone et al. (2007), among others, have all shown that central bank independence has played a big role in reducing inflation, Neyapti (2009) argues that IT has been the most prominent institutional factor that is associated with low inflation rates in the decade of 2000s.

⁶ This method of estimating the welfare costs of inflation has been common, as can be also seen in the works of Fischer (1981) and of Ireland (2009) for the U.S. economy; of Serletis and Yavari (2004) for Canada and the U.S.; and of Gupta and Uwilingiye (2008) for South Africa. Also using the same

While quantifying the welfare gains is a difficult task, this study paves the way for further research by presenting striking empirical evidence.

In view of the costs of inflation discussed above, it is expected that disinflation improves welfare by contributing to growth as well sustainable development. Increased preference for liquidity also implies that wider groups of agents participate in economic transactions than before. One manifestation of this is the access to credit by small and medium enterprises, which in turn is expected to have positive distributional and developmental consequences. Moreover, expectations of low inflation reduce the incentives for deferred tax payments and debt-service, hence improve macroeconomic balances and efficiency.

The evidence on the gains from Turkish disinflation during the 2000s is somewhat inconsistent with the above predictions, however. The Turkish economy grew only dimly more *per annum* during the disinflationary period of the 2002-2009 as compared to the former three decades (4.59 as opposed to 4.46)⁷. Regarding income distribution, the GINI coefficient has showed only a slight improvement (43 for 1987-2001 versus 40 as of 2008). Slight improvements can also be cited with regards to the ratios in GDP of total (not private) domestic investment and foreign direct investment and domestic credit growth, the latter of which could stand as an indicator of financial sector development. On the other hand, current account balance (even prior to the great recession), external debt, labor force participation (of female in particular) and gross savings to GDP have all worsened during the 2000s as compared to the earlier decade (in averages). Furthermore, inflation showed a rising trend after 2007, hitting double digits at times, in annual terms.

The analysis in this paper reveals that the potential welfare gains from disinflation in Turkey has been much higher than the real output gain, which stands at 54 percent

framework, Lucas (2000) reports small welfare gains in the US from reducing inflation from 10 percent to zero.

⁷According to Altug et al. (2011), the periods of 1988:3-1989:2; 1990:4-1991:2; 1994:1-1995:1; 1998:3-1999:4; and 2000:4-2001:4 all mark the recessionary periods prior to the 2001 reforms (2001 recession itself is defined as the period of 2000:4-2001:4 and is included in the former period, to the benefit of the alternative hypothesis), whereas 2008:4- is the recessionary period in the aftermath of the reforms. Because of the crisis episodes in both the periods prior and after reforms, comparison of the average figures for the two periods is deemed to be fair.

cumulative increase in real GDP, according to one estimate, or accounts for a significant part of it according to an alternative estimate. These observations lead to the question: “where have the welfare gains from disinflation in Turkey gone?”. While this study presents the evidence to justify this question formally, it aims to provoke further studies that seek answers to it. Identifying the inefficiencies in the distribution of the welfare gains would in turn help improve policy design to facilitate sustainable growth.⁸

The rest of the paper is organized as follows: Section 2.1 presents the estimation of money demand in Turkey for the period between 1987 and 2010 and the measurement of the welfare gains from disinflation in the period following 2001. Section 2.2 discusses the economic nature of the welfare gains from inflation. Section 3 concludes.

2 Measuring the Welfare Gains from Disinflation in Turkey

This section first presents the underlying model to estimate the welfare gains from disinflation in Turkey, and then reports the data and estimations (Section 2.1). I then elaborate on the possible manifestations of these welfare gains in the Turkish economy during the decade of the 2000s (Section 2.2).

2.1 Modeling the Welfare Gains from Disinflation

Bailey (1956) employs a Cagan-type money demand function to model real money demand as a function of the expected inflation rate. Cagan (1956) formulation pertains to economies where real income is relatively stable and nominal interest rate changes can be proxied by inflation expectations:

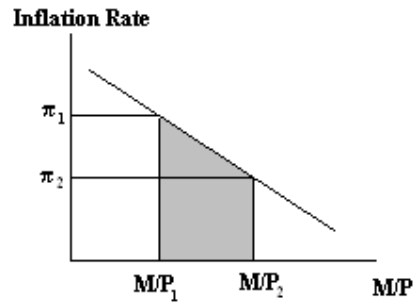
$$m_t = (M_t - p_t) = \alpha + b\pi_t^e + \varepsilon_t \quad (1)$$

where M stands for the log of M1 definition of money stock, p is the consumer price index (CPI, 1987=100) and π_t^e stands for inflationary expectations. α is a constant and ε_t is the error term. This formula follows the conventional specification for the demand for

⁸ In a theoretical study, Ozbilgin (2009) demonstrates that welfare gains from disinflation increase with currency substitution.

real money balances: $m_t = f(y_t; i_t)^9$, where the nominal interest rate (i) is determined via Fisher equation: $i=R+\pi_t^e$, and the real interest rate (R) is assumed to be roughly constant, as is real income (y). Bailey (1956) argues that as inflation rises, people's real money holdings decline, leading transactions costs to rise and transactions to decrease; hence the money demand function shows liquidity preference. As the inflation tax imposed on people is captured by the government as seignorage revenues, the welfare losses associated with a rise in the inflation rate (say, from π_2 to π_1 in Figure 1) can be shown as the shaded area under the inverse demand curve in Figure 1.¹⁰

Figure 1 : Welfare loss from inflation



In a time-series study of the period between 1986:1 and 1995:3, Metin and Muslu (1999) provides evidence that Cagan's model can be used to explain the inflationary and monetary behavior in the Turkish economy. Using rational expectations approach, today's information to form π_t^e is assumed to be contained in the past period's inflation rate, because under chronic inflation adaptive expectations can be rational. In addition to its convenience, this specification is also shown to be consistent with the Turkish data. The current paper therefore adopts this framework as a benchmark to analyze the gains from disinflation in Turkey since 1987. In what follows, Section 2.1.1 describes the data and estimation issues; Section 2.1.2 looks into the measurement of welfare changes resulting from changes in inflation.

⁹ This specification involves transactions motive to hold money (proxied by the income level) and the opportunity cost of holding money: as inflationary expectations rise, demand for money decreases as and interest-earning assets are preferred.

¹⁰ Bailey (1956) argues that for the shaded area to be considered to measure the welfare loss, there are three conditions: i) inflation is expected by everyone (as is the case in episodes of chronic inflation); ii) contracts take into account the expected inflation such that distributional effects can be ignored; and iii) there are no money-substitutes such as bank deposits. Bailey's approach to calculating welfare costs has also been employed by Lucas (2000) to calculate the welfare gains from disinflation for a low inflation economy, the US.

2.1.1 Data and Estimation

Our data set to estimate money demand in Turkey covers the period from 1987:Q1 to 2010:Q4, and is obtained from the data delivery system of the Central Bank of the Republic of Turkey (CBRT). Table 2 provides abbreviations for the series used in the benchmark regression model, where $lnm1$ is the log of M1 and, alternatively, $lnm2$ and $lnm2Y$ stand for the logs of M2 and M2Y¹¹, respectively, divided by consumer price index (CPI); $CPIinf$ is the (log of the) percentage change in the quarterly CPI series. As discussed above, the estimation uses its one period lag as a measure of rational expectation of the CPI inflation; the letter D stands for first differences. The M2 and M2Y measures of money stock are employed as an alternative to M1, because, due to the short-term nature of deposit contracts during the high inflationary episode under study, time deposits in Turkey could easily be converted into liquidity. Depreciation in TL over the period also motivated the hot money inflows. As Figure A3 in the Appendix shows, M2Y has increased faster than M2 till 2001 owing to the increase in foreign exchange deposits that was mainly hot money.

The initial step to estimate Equation (1) using these data is to inspect the time series properties of the variables used in the estimation to make sure that there is a stable long-term relationship between them. To do this, all the series are first de-seasonalized using the *Tramo-Seats* method in the E-views program. After confirming the existence of unit roots in the de-seasonalized series via conventional Augmented-Dickey-Fuller (ADF) and Phillips-Perron (PP) tests reported in Table 2, Table 3 reports the cointegration test results.

Table 1: Variables used in the estimation (quarterly, deseasonalized series)

Abbreviation	Variable descriptions
$lnm1$	Natural logarithm of real money balance (M1/P)
$lnm2(Y)$	Natural logarithm of real money balance (M2(Y)/P)
$D(lnm1)$	First difference of $lnm1$
$D(lnm2(Y))$	First difference of $lnm2(Y)$
$CPIinf$	Natural logarithm of CPI inflation rate
$D(CPIinf)$	First difference of $cpiinf$

¹¹ M2Y is the sum of M1 and time deposits, including foreign currency deposits.

Table 2: Augmented Dickey-Fuller (ADF) and Philips-Perron (PP) Unit Root Test Results

	ADF		PP	
	with Intercept	with trend and Intercept	with Intercept	with trend and Intercept
<i>lnm1</i>	0.85	-1.53	0.85	-1.53
<i>lnm2</i>	1.37	-2.12	1.37	-2.12
<i>lnm2Y</i>	0.71	-3.78	0.36	-3.08
<i>CPlinf</i>	0.09	-4.01	-1.95	-4.01
<i>D(lnm1)</i>	-8.05		-8.05	
<i>D(lnm2)</i>	-8.49		-8.49	
<i>D(lnm2Y)</i>	-8.9		-8.44	
<i>D(CPlinf)</i>	-8.23		-14.82	
Critical Value (at 5%)	-2.89	-3.45	-2.89	-3.45

(Note: The Null Hypothesis states that the series has a unit root)

According to the test results reported in Table 2, M1 and M2 money stock series (in real and logarithmic terms) are non-stationary. Both *CPlinf* and *lnm2y* fail the ADF test but pass the PP test when trend and intercept are employed; however, both pass either tests when only the intercept is employed and hence can be taken as non-stationary.¹² The table also shows that the first differences of all the variables are stationary. Hence, the unit-root tests indicate that all the series considered are integrated of order 1, or I(1).

Next, I report two types of Johansen test statistics for cointegration in Table 3. Based on the Eigen value and Trace tests, while the null hypothesis of “no cointegration” is rejected, the null of “at most one cointegrating vector” cannot be rejected for *lnm1* and *mCPlinf-1*. In view of these results, OLS estimation of *lnm1* using *CPlinf* in levels is deemed appropriate. For the case of the M2 and M2Y money stocks (denoted by *lnm2*

Table 3: Johansen Cointegration Test Results and (Osterwald-Lenum) Critical Values

Variables		Eigenvalue Test		Trace Test	
LHS	RHS	Hypothesized Number of Cointegrating Equations (r)			
		H ₀ (r=0)	H ₀ (r≤1)	H ₀ (r=0)	H ₀ (r≤1)
<i>lnm1</i>	<i>CPlinf</i>	21.44	0.41	21.85	0.41
<i>lnm2</i>	<i>CPlinf</i>	11.22	2.22	13.96	2.22
<i>lnm2Y</i>	<i>CPlinf</i>	8.82	0.59	9.41	0.59
Critical Value (at 5%)		14.07	3.76	15.41	14.07

¹² *CPlinf* also passes the ADF test, however, when neither trend or intercept terms are used, which also support its non-stationarity.

and $lnm2Y$, respectively), however, no co-integrating relationship with $CPlinf$ is observed, which leads one to focus on estimations of $lnm1$.

To estimate the money demand function for Turkey, one should note two recent crises: the 1994 currency crisis that was followed by a severe devaluation, and the 2001 banking crisis that was followed by large scale macroeconomic reforms. Hence, in what follows these events are controlled for either using dummies for the years, denoted by $d94$ and $d2001$ or for the two periods following them, denoted by $d2$ and $d3$.¹³ In addition, one should allow for the possibility that the three episodes since 1987, separated by these crises, may exhibit different trends in money holding behavior. Hence, Equation (2) presents the general regression model for estimating Equation (1).

$$lnm1_t = f(d2; d3; d94; d2001; trend; CPlinf_{t-1}; lnm1_{t-1}) \quad (2)$$

The last term in the expression is employed to eliminate the serial correlation in the error term, observed in low Durbin-Watson test statistics. Upon examining the various sub-versions of this model, a parsimonious regression is selected and reported along with its diagnostics below.

$$lnm1_t = 0.68 - 0.039 CPlinf_{t-1} + 0.93 lnm1_{t-1}$$

(2.31)** (3.27)*** (29.4)***

$$\bar{R}^2 = 0.98 ; N=95 ; DW= 1.98 ; \delta = 0.056 ; \text{Jaqua-Bera (Normality)}=2.82 (p=0.24)$$

$$\text{CHOW (1994)}=0.55 (p=0.65) ; \text{CHOW (2001)}=1.26 (p=0.29)$$

where the numbers in parantheses under the estimated coefficients are the t-ratios, ** indicate significance at 5% and *** indicate significance at 1% level. The estimation passes the usual diagnostics as shown by the tests are followed by their probability values). The Chow tests for 1994 and 2001 indicate that no significant structural break in the relationship is observed that cannot be estimated by the rest of specified model.

¹³ where $d2 = \begin{cases} 1 & \text{if } t \in [1994 : 2, 2001 : 1] \\ 0 & \text{otherwise} \end{cases}$; and $d3 = \begin{cases} 1 & \text{if } t \in [2001 : 2, 2010 : 4] \\ 0 & \text{otherwise} \end{cases}$

The actual and estimated money demand series based on the reported estimation are graphed in Appendix Figure A2.

While the Chow tests do not reveal significant differences in the behavior of $lnm1$, it is nonetheless useful to analyze the wealth changes in the three sub-periods separated by the two major economic crises in the recent past.¹⁴ While the inflation rate rises during the first period and falls in the two periods thereafter, M1 falls in the first period, continues to fall (slightly) in the second, and then starts to rise in the last period. Hence, the relationship between M1 and inflation yields an unexpected positive sign in the period between the two economic crises (1994:2-2000:4). This can be explained by the increase in the M2 and M2Y stocks during the same period, which reflects two related phenomena: first, while inflation fell during this interim period, it still remained high, leading people to substitute away from M1 into M2, given the high real interest rates and the short-term nature of term deposits. Similarly, hot money flows led to an increase in M2Y.

2.1.2 Calculating the Welfare Changes

In order to calculate the welfare changes, I use the differences between the beginning and the end of each subperiod of the estimated $lnm1$ series, multiplied by the average of the corresponding $CPIinf(-1)$ figures. This gives the area of the trapezoid under each line depicted in Figure 2. To develop an economically viable measurement, I also calculate another trapezoid by multiplying the same height (the average of the period-beginning and end values of $CPIinf$ in a given time period) with the difference in lny for each period.¹⁵ Taking the ratio of these two areas gives the measurement of the welfare gain with reference to income growth. The resulting number is free of scale and generates an ordinal measurement of welfare gain; I call this as the *Index of Welfare Change (IWC)*:

$$\begin{aligned} IWC &= d(Cpiinf)*d(lnm1_t) / d(Cpiinf)_t*d(lny_t) \\ &= d(lnm1_t)/d(lny_t) \end{aligned} \quad (3)$$

¹⁴ Results are available from the author upon request.

¹⁵ lny is the log of quarterly real GDP series, which is obtained from the electronic delivery system of CBRT.

where d refers to the change over the three time periods considered for the estimation (that is, for the sub-periods of 1994:1-1987:1; 2000:4-1994:2; and 2010:4-2001:1). This index can be considered superior to the cardinal measure obtained by the area of welfare gain without a reference to compare. As the expression in (3) shows, IWC is given by the ratio of the percentage change in (real) money stock as compared to the percentage change in (real) income. Table 4 summarizes the calculations of IWC .

Table 4: Calculating IWC

	Change in			IWC
	CPI_{inf} (in %)	$lnm1$	lny	
1987:1-1994:1	11.91	-0.21	0.33	-0.64
1994:2-2000:4	-30.58	-0.04	0.41	-0.09
2001:1-2010:4	-5.60	0.97	0.64	1.51

As the table shows, the first period is associated with a welfare loss from an increase in the inflation rate (from an annual average of 38.5 percent in 1987 to 104 percent in 1994; see Appendix 1), which amounts to a welfare loss that is equivalent to 64 percent of the real GDP growth over that period. That is, assuming that the welfare gains can be proxied by the real GDP growth, one could conjecture that, had the inflation not risen, instead of the 31 percent cumulative growth over the 7 years, there could have been about 50 percent growth (in annual terms, this would amount to 6 percent growth per annum, as opposed to 4 percent) in that period. The next period: 1994 to 2001, is associated with a decrease in the inflation rate (from 104 percent to 53.5 percent; see Appendix Figure A1) that is nonetheless observed to be associated with a welfare loss of a magnitude: 9 percent of the GDP growth in that period.. This may partly be due to the repercussions of the 1997-98 Far-Eastern financial crises.

In the last sub-period: 2001-2010, the effects of the institutional reforms show themselves as a sharper decrease in the inflation rate (from 53 percent to 8.6 percent per annum) than the previous sub-period. This period is also associated with a welfare gain that amounts to more than 151 percent of the output increase of that period. While the real GDP has increased by about 54 percent over the first decade of the 2000s (or, 4.6 percent per annum), the observed welfare gain due to disinflation alone indicates a 81 percent rise in real GDP during that period. This would imply that that the Turkish

economy would have grown 11.6 percent per annum, instead of 4.6 percent during the 2000s had the economy internalized the welfare gains from disinflation. This should be considered in addition that the economy continues to grow at the average rate that it had in the past few decades, noting that the welfare gain estimates do not include the ordinary growth effects of technological progress and capital accumulation.¹⁶

2.1.3 Alternative Specifications of the Money Demand Function

In view of potential biases in estimating the cointegrated series using OLS (see, for example, Phillips, 1995), one can consider the Fully Modified OLS estimation method that allows for the heterogeneity in the cointegrating vector (see, for example, Phillips and Hansen, 1990). FMOLS modifies the estimation to account for serial correlation and for the endogeneity in the regressors resulting from potential cointegrating links. Hence, in the following, estimation of the above regression model using this method provides a robustness check of the above results.

In order to eliminate further possible biases in estimation, alternative to the lagged *CPlinf* term that represents the expected inflation (π_t^e) in Equation (1), forecasts of *CPlinf* (indicated by *CPlinf^e*) are obtained by an autoregressive model that takes into account the trend and period dummies. Table 5 reports the values of *IWC* resulting from the OLS and, alternatively FMOLS, estimations of Equation (2) using the alternative representations of π_t^e , namely *CPlinf* and *CPlinf^e*.

Table 5: *IWC* across different specifications

Dependent Variable:	<i>CPlinf</i>		<i>CPlinf^e</i>	
	OLS	FMOLS	OLS	FMOLS
<i>lnm1</i>				
1987:1-1994:1	-0.64	-2.37	-0.96	-2.25
1994:2-2000:4	-0.09	1.82	0.05	1.73
2001:1-2010:4	1.51	0.92	1.68	0.88

Table 5 provides robustness checks for the results reported in Table 4 (also reported in the first column in Table 5) in two dimensions: first, representing inflation expectations by *CPlinf^e* confirms that the welfare gain of disinflation during the 2000s are more than

¹⁶ Given this, one could conjecture that the per capita GDP (PPP) would have been about 24,000 USD, instead of 15,000 USD, in 2010.

1.5 fold of the real GDP gain during the period (estimated to be slightly higher this time: 1.68). Using this variable, instead of a welfare loss of the magnitude of 9 percent of output growth, one observes a welfare gain of about 5 percent of growth in the second period. On the other hand, using $CPIinf^e$ yields higher IWC values (in absolute value) than $CPIinf$, indicating a loss of about as much as the gain resulting from the output growth recorded in that period (0.96). Overall, using $CPIinf^e$ in estimating IWC seems to yield slightly greater IWC values. Secondly, comparing IWC across the OLS and FMOLS estimates reveals several differences: first, according to the FMOLS estimates, disinflation in the 1990s have led to notable welfare gains as well. On the other hand, the estimation results of FMOLS indicate less welfare gains from disinflation in the third period and more welfare losses in the first period.

Focusing on the last decade for the benefit of the paper's objective, the range of the IWC values obtained through all types of estimates is quite notable; based on all the estimations, the welfare gains from disinflation during the 2000s has been in the range of 88 to 168 percent of the cumulative output growth during that period. This implies that the addition to the trend annual growth rate in that period should have been between 8.7 and 12.3, had the welfare gains been internalized to yield increased economic growth.

In addition to the Cagan's money demand specification that provided the above benchmark estimates, the conventional specification of money demand, where opportunity cost of holding non-interest bearing asset: the nominal interest rate (lnR) and real income level (lny), to control for the transaction motive¹⁷ This specification is also examined via estimating Equation (4) using both OLS and FMOLS methods:¹⁸

$$lnm1_t = f(d2 ; d3 ; d94 ; d2001 ; trend ; lnR_t ; lny_t ; lnm1_{t-1}) \quad (4)$$

¹⁷ Stability properties of the lnR and lny series and the tests of their cointegration with the money stock series ($lnm1$, $lnm2$ and $lnm2y$) are provided in Appendix Table A1. Test results fail to reject the null of no cointegration of lnR and lny with both $lnm2$ and $lnm2y$. On the other hand, even though not co-integrated individually, the null of cointegratedness cannot be rejected for the regression relationship between lnR , lny and $lnm1$.

¹⁸ The FMOLS estimation results, which are very similar to OLS, are not reported for the benefit of space, but are available from the author.

As in all the alternative specifications outlined above, the regression models are selected on the basis of their parsimoniousness, which yields the following OLS estimation:

$$\begin{aligned} \ln m1_t = & 1.24 + 0.21 D2001 - 0.03 d3 - 0.16 \ln R + 0.13 \ln y + 0.78 \ln m1(-1) \\ & (3.06)^{***} (3.85)^{***} (-1.82)^* (-7.08)^{***} (3.83)^{***} (22.47)^{***} \\ \bar{R}^2 = & 0.99 ; N=95 ; DW= 1.83 ; \delta = 0.046 ; \text{Jaqua-Bera (Normality)}=1.15 (p=0.56) \end{aligned}$$

Both the OLS and FMOLS estimates of the above specification yield even higher *IWC* values for the last period, which are estimated to be 3.05 and 2.27 fold of the output gains, respectively. In conclusion, notwithstanding the variations in the estimates, it is possible to claim based on the above estimates that, had the welfare gains from disinflation were internalized effectively, the Turkish (real) GDP would have more than doubled over the past 10 years. This would have certainly any put the Turkish economy on a more sustainable development path than where it is now.

2.2 Socio-Economic Indicators of Welfare Gains from Disinflation

As Fischer (1981) points out, quantifying the real effects of inflation is much more difficult than computing the welfare costs as the area under money demand curve. This section elaborates on the effects of disinflation that are in addition to those arising from reduced transaction costs owing to holding larger real money balances. As discussed earlier, gains from disinflation are expected to manifest in increased investment and growth, as well as improved fiscal balances, bank performance and income distribution, whose trends are explored below.

2.2.1 *The Banking Sector*

A significant volume of transactions in any modern economy takes place in the financial sector. A reduction in inflation leads to increased volume of *contract-intensive* transactions between banks and the private sector. More specifically, credit and deposit transactions of banks with the private sector are expected to increase with the reduction in adverse selection and moral hazard risks that arise from uncertainty under high inflation. As Table 6 shows, the ratio of total deposits to GDP has indeed increased

steadily throughout the 2000s. While the share of time deposits has also increased in percentage of GDP, the composition of liabilities has not been much in favor of time deposits. An important improvement, on the other hand, has been with regards to bank capital, both in ratio to total liabilities and to GDP. While non-performing loans have declined till 2007, it rose following the 2008 crisis.

Table 6: Trend in Bank Deposits, Non-performing loans (NPL) and Capital

	<i>In % of GDP</i>					<i>In % of Total Liabilities:</i>				
	Tot.Dep.	Dem.Dep.	Time Dep.	NPL	Bank Capital	Tot.Dep.	Dem.Dep.	Time Dep.	NPL	Bank Capital
1998	0.33	0.07	0.26	0.0049	0.04	0.68	0.14	0.54	0.01	0.09
1999	0.43	0.08	0.36	0.0033	0.03	0.70	0.12	0.58	0.01	0.05
2000	0.39	0.08	0.31	0.0032	0.04	0.68	0.13	0.55	0.01	0.06
2001	0.46	0.08	0.38	0.0035	0.06	0.72	0.13	0.59	0.01	0.10
2002	0.39	0.08	0.31	0.0026	0.06	0.70	0.14	0.56	0.00	0.12
2003	0.34	0.07	0.27	0.0024	0.07	0.68	0.15	0.53	0.00	0.14
2004	0.34	0.07	0.26	0.0023	0.07	0.67	0.14	0.52	0.00	0.14
2005	0.36	0.08	0.28	0.0017	0.07	0.65	0.14	0.51	0.00	0.13
2006	0.38	0.07	0.31	0.0016	0.07	0.65	0.12	0.53	0.00	0.11
2007	0.39	0.07	0.32	0.0070	0.08	0.65	0.11	0.54	0.01	0.13
2008	0.44	0.06	0.37	0.0049	0.07	0.66	0.10	0.56	0.01	0.11
2009	0.49	0.08	0.41	0.0046	0.10	0.65	0.11	0.54	0.01	0.13
2010	0.50	0.09	0.42	0.0051	0.10	0.64	0.11	0.53	0.01	0.13

Source: The World Bank, World Development Indicators.

Based on the term structure of bank deposits shown in Table 7, one does not observe a notable improvement with respect to contract-intensive money either (only a slight shift from deposits with up to one month of maturity towards that with up to three months). In conclusion, the anticipated effects of disinflation on banking sector performance have been somewhat mixed.

Table 7: Term Structure of Bank Deposits (in % of total)

year	Up to 1 month	1-3 mts	3-6 mts	6 mts-1 year	More than 1 year
2001	0.44	0.41	0.08	0.04	0.04
2002	0.37	0.45	0.10	0.04	0.04
2003	0.32	0.46	0.12	0.05	0.04
2004	0.33	0.46	0.09	0.04	0.07
2005	0.30	0.49	0.13	0.04	0.05
2006	0.35	0.52	0.07	0.02	0.04
2007	0.35	0.53	0.06	0.03	0.03
2008	0.37	0.54	0.04	0.03	0.03
2009	0.33	0.59	0.04	0.02	0.03

Source: Turkish Banking Association

2.2.2 Investment, Growth and Income Distribution

Turning to the asset side of the banking sector, Table 8 demonstrates that the banking sector has steadily attained its main function of credit expansion to the private sector during the disinflation episode, following a long period of holding high interest bearing government bonds in the asset portfolio. While the period also portrayed increased foreign as well as domestic investment in the first half of the decade, these trends notably declined with the global crises in the second half. Even prior to the global crises that took effect in 2008, however, developments with regard to investment, for example, cannot be considered remarkable improvements when compared to the previous decade that recorded an average of 23 percent investment to GDP ratio.

Table 8: Credit, Investment (in percentage of GDP) and Growth performance

	Credit to Private Sec.	Total Credit	FDI	Investment	GDP growth
1998	17.19	27.46	0.35	22.86	2.31
1999	16.63	36.76	0.31	18.94	-3.37
2000	17.75	37.91	0.37	20.39	6.77
2001	15.35	52.92	1.71	15.94	-5.70
2002	14.52	47.47	0.47	16.72	6.16
2003	14.55	42.77	0.56	17.01	5.27
2004	17.28	41.36	0.71	20.34	9.36
2005	22.25	45.63	2.08	21.03	8.40
2006	25.94	45.77	3.80	22.29	6.89
2007	29.50	49.26	3.41	21.84	4.67
2008	32.59	52.54	2.67	19.89	0.66
2009	36.48	63.02	1.37	16.87	-4.83
2010	43.90	69.17	1.26	19.15	8.95

Source: The World Bank, World Development Indicators.

The growth performance closely parallels the investment trends. Although the economy exhibits significant vulnerability to global shocks, as reflected in the downturn in 2008 and 2009, the recovery has been fast. This has been, however, observed to be a common characteristic of emerging economies.

External indicators also show signs of unresolved, and even somewhat increasing, inefficiencies in the economy. For example, external debt (though owing mainly to the private sector) and current account imbalances (even prior to the great recession) have increased during the 2000s as compared to the previous decade: average current

account deficit to GDP ratio during the 2000s was 3.5 as opposed to 1 percent during the 1990s, while the debt ratio increased from an average of 41 to 43.5.

Table 9: Ratio of population under poverty line

	Food Poverty	Poverty (Food + Non-Food)	Below \$2.15/day per cap.	Below \$4.3/day per cap.
2002	1.35	26.96	3.04	30.3
2003	1.29	28.12	2.39	23.75
2004	1.29	25.6	2.49	20.89
2005	0.87	20.5	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: Turkish Statistical Institute

These observations indicate that the economy needs to undergo further structural reforms to achieve sustainable development. Looking further into socio-economic indicators, we observe improvements with regards to age dependency ratio, which has been reduced from 55 percent in the beginning of the decade of the 2000s to 45 percent at the end of it, and secondary school enrollment, which rose to 74 percent in 2008 from 62 percent in 2000. In lines with those, there is also improvement with regards to poverty reduction (see Table 9). With regard to overall income distribution, however, no major improvement is observed: the GINI coefficient was measured as 43.6 in 1987; it was reduced to 41.5 in 1994 and increased to 43 again by 2005; as of 2008 the figure is 39.7 (source: The World Bank). It is fair to say that all these figures do not bode with the correction in income distribution that is expected to obtain from reducing chronic high inflation, which is known to be associated with severe distributional effects.

3 Conclusion

Following three decades of chronic high inflation experience, Turkey underwent an exemplary case of disinflation during the 2000s. Using Bailey (1956)'s methodology, this paper presents original measurement of the welfare gains from disinflation during this period. The measures (index of welfare change: *IWC*) indicate that the economy would have benefited largely from the improvements in the macroeconomic environment emanating from increased price stability. Our investigation of the

economic developments during the mentioned period, however, does not verify that the Turkish economy fully reaped these benefits.

The analysis presented here indicates that, had the welfare gains been utilized efficiently, the growth rate should have been at least 88 percent more than the 54 percent cumulative growth Turkey experienced in the last decade. This means that the allocational inefficiencies continue to rule the economy; hence further structural reforms need to be designed and implemented to achieve sustainable development. Now that a low inflation environment in Turkey offers a much improved investment climate than the preceding decade, pending reforms, mainly concerning the fiscal and property rights aspects, should be undertaken much more easily than before. Rising inflation in the aftermath of the global crisis reinforce this need by raising the concern for the sustainability of these welfare gains attained in the first decade of the 200s.

References

- Altug, S., M. Emin, B. Neyapti, (2011), "Institutions and Business Cycles", *Koc-Tusiad Economic Research Forum, Working Paper* 1109.
- Arnone, M., B.J. Laurens, J-F. Segalotto and M. Sommer (2007), "Central Bank Autonomy: Lessons From Global Trends", *IMF Working Paper* 07/88.
- Bailey, M. J. (1956), "The welfare cost of inflationary finance", *The Journal of Political Economy* 64, 93-110.
- Barnea, E. and N. Liviatan (2008), The chronic inflation process: a model and evidence from Brazil and Israel, *Journal of Economic Policy Reform* (U.S.) 11, 151-62.
- Bruno, M., G. Di Tella, R. Dornbusch and S. Fischer, (1988), *Inflation Stabilization, The Experience of Israel, Argentina, Brazil, Bolivia, and Mexico*, MIT Press.
- Cagan, P. (1956), "The Monetary Dynamics of Hyperinflation", In Friedman, Milton (ed.). *Studies in the Quantity Theory of Money*. Chicago: University of Chicago Press.
- Celasun, M., (2002), 2001 Krizi, Öncesi Ve Sonrası :Makroekonomik ve Mali Bir Değerlendirme, *manuscript*.
- Cetinkaya, A., D. Yavuz (2002), "Calculation of Output-Inflation Sacrifice Ratio: The Case of Turkey", Working Paper 11, The Central Bank of the Turkish Republic.
- Banerjee, A., J. Dolado, J.W.Galbraith and D.F.Hendry (1996), *Co-Integration, Error-Correction, and the Econometric Analysis of Non-Stationary Data*, Oxford Univ. Press Inc., New York.
- Cukierman, A., B. Neyapti and S. Webb (1992), " Measuring the Independence of Central Banks and Its Effect on Policy Outcomes", *World Bank Economic Review* 6, 353-397.
- Cukierman, A., G. Miller and B. Neyapti, (2002), "Central Bank Reform, Liberalization and Inflation in Transition Economies - An International Perspective", *the Journal of Monetary Economics* 49, 237-264.
- Cukierman, A., (2008), "Central Bank Independence and Monetary Policymaking Institutions -- Past, present and future," *European Journal of Political Economy*, 24, 722-736.
- De Haan, J. and W.J.Kooi (2000), "Does Central Bank Autonomy Really Matter: New Evidence for Developing Countries Using a New Indicator", *Journal of Banking and Finance* 24, 643-664.
- De Haan, J., D. Masciandaro and M.Quintyn (2008), "Does Central Bank Independence Still Matter?", *European Journal of Political Economy* 24, 717-721
- Eijffinger S. and E. Schaling (1993), "Central Bank Independence in Twelve Industrial

- Countries”, *Banca Nazionale del Lavoro Quarterly Review*, 184, 64-68.
- Eijffinger S. and M. van Keulen (1995), “ Central Bank Independence in Another Eleven Countries”, *Banca Nazionale del Lavoro Quarterly Review* 192, 39-83.
- Grilli V. D. Masciandro and G. Tabellini (1991), “ Political and Monetary Institutions and Public Financial Policies in The Industrial Countries”, *Economic Policy* 13, 341-92.
- Fisher, S. (1981), “Towards an Understanding of the Costs of Inflation”, II.Carnegie-Rochester Conference Series on Public Policy 15, 5-41.
- Gupta, R. and J. Uwilingiye (2008), |Measuring the Welfare Cost of Inflation in South Africa”, *South African Journal of Economics* 76:1, 16-25.
- Lucas, R. E., Jr. (2000), “Inflation and welfare”, *Econometrica*, 68 (2), 247-274.
- Metin, K., I. Muslu (1999), “Money Demand, The Cagan Model, Testing Rational Expectations vs Adaptive Expectations: The Case of Turkey”, *Empirical Economics*, 24, 415-426.
- Montiel, P. (1989), “Empirical Analysis of High Inflation Episodes in Argentina, Brazil and Israel”. IMF Staff Papers 36:3.
- Neyaptı, B. (2009), “Monetary Institutions And Inflation Performance: Cross-Country Evidence”, Bilkent University Working Paper 09-02.
- Phillips, P.CB. (1995), “Fully Modified Least Squares and Vector Autoregression”, *Econometrica* 63, 1023-1078.
- Phillips, P.CB. and B.E.Hansen (1990), “Statistical Inference in Instrumental Variables Regressions with I(1) Processes”, *Review of Economic Studies* 57, 99-125.
- Reinhart, C. and C. Vegh (1994), “Inflation stabilization in chronic inflation countries: The empirical evidence”, *MPRA Working Paper* 13689.
- Serletis A., K.Yavari (2004), “The welfare cost of inflation in Canada and the United States”, *Economic Letters* 84, 199-204.

Appendix

Figure A1: Trend in CPI Inflation in Turkey: 1961-2009

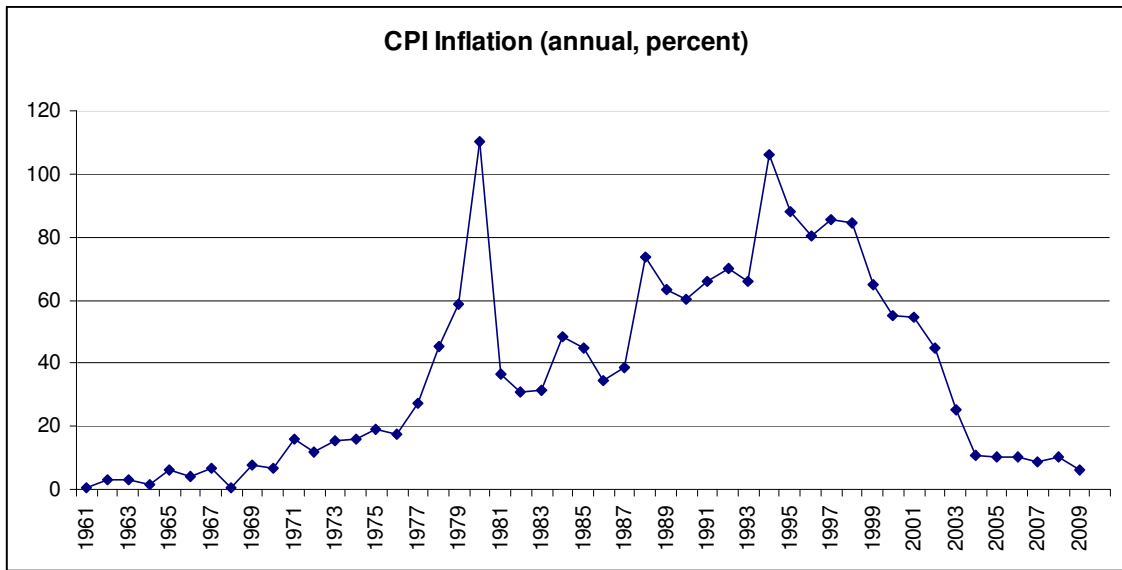


Figure A2: Actual and Estimated $lnm1$.

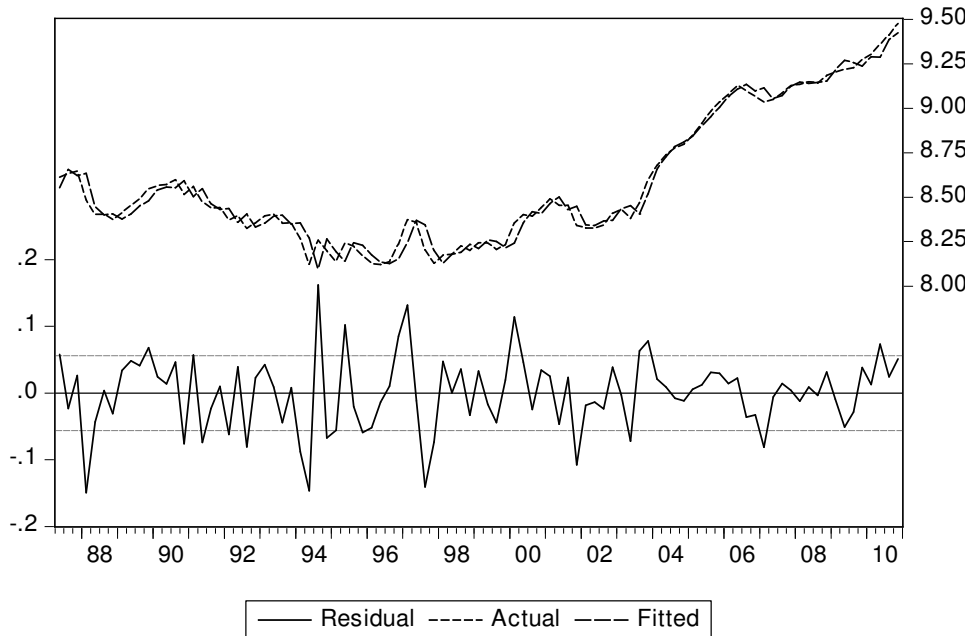


Figure A3: Actual and Estimated $\ln M1$ based on Equation (4)

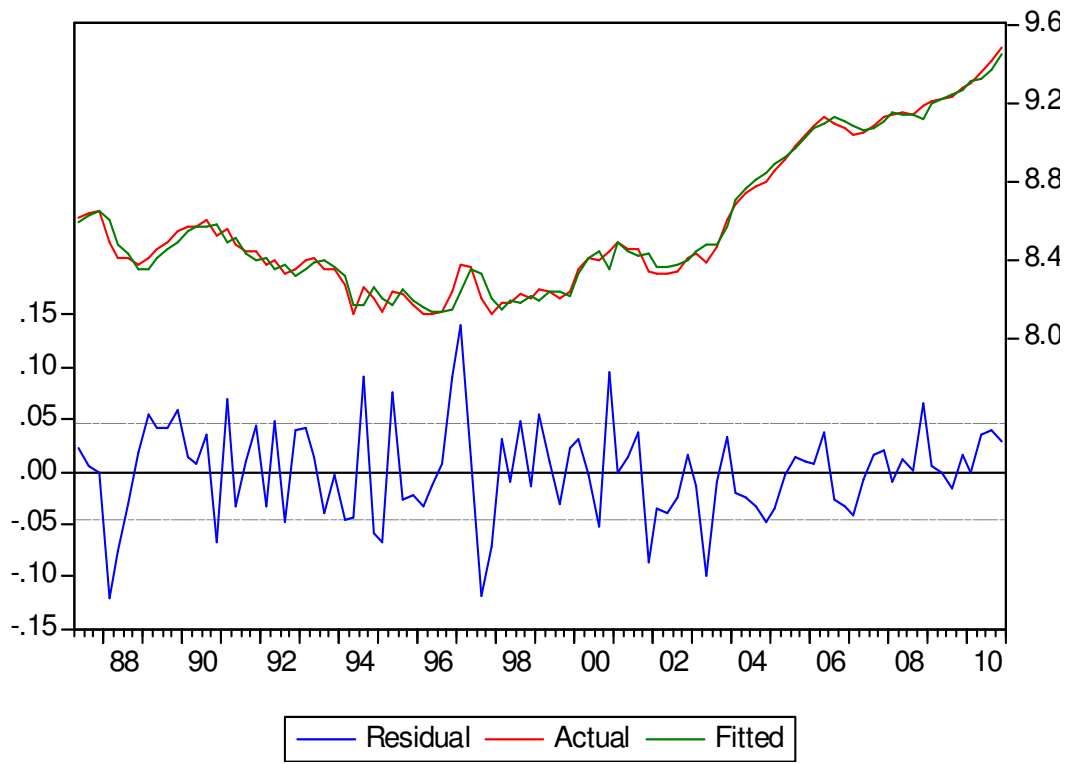


Table A1: Stability and Cointegration Checks for *lnR* and *lny***Table A1a:** Additional Unit Root Test Results

	ADF		PP	
	with Intercept	with Trend and Intercept	With Intercept	With Trend and Intercept
<i>lnR</i>	-1.05	-2.27	-1.05	-2.27
<i>lny</i>	-0.05	-2.53	-0.51	-3.13
<i>d(lnR)</i>	-10.71		-10.71	
<i>d(lny)</i>	-7.59		-10.16	
Critical Value (at 5%)	-2.89	-3.43	-2.87	-3.43

Table A1b: Johansen Cointegration Test Results and Critical Values

Variables		Eigenvalue Test		Trace Test	
LHS	RHS	Hypothesized Number of Cointegrating Equations (r)			
		H ₀ (r=0)	H ₀ (r≤1)	H ₀ (r=0)	H ₀ (r≤1)
<i>lnm1</i>	<i>lny</i>	9.00	0.01	9.00	0.01
	<i>lnR</i>	12.45	0.93	13.39	0.93
<i>lnm2</i>	<i>lny</i>	11.95	0.23	12.19	0.23
	<i>lnR</i>	9.77	1.19	8.59	1.19
<i>lnm2y</i>	<i>lny</i>	17.85	0.42	17.43	0.42
	<i>lnR</i>	9.96	0.01	9.97	0.01
Critical Value (at 5%)		14.07	3.76	15.41	3.76