

## **Money, Inflation and Growth Relationship: The Turkish Case**

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**ABSTRACT:** There is a significant relation between inflation, which is known as an increase in the general level of prices in the broadest sense of the word, money and growth. While the course of the relationship between money supply and inflation is evident in general terms, an overall tendency related to the relationship between inflation and growth hasn't been clarified. This paper examines money, inflation and growth relationship in Turkey by using cointegration test. For this purpose, 1999.2 – 2012.2 period is taken and quarterly data of money supply (M2), GDP, velocity of money and deflator are used. According to the results from this paper, money supply and velocity of money is a main determinant of inflation in the long run in Turkey. On the other hand, 1% decreases in income directly reduces inflation by 1%.

**Keywords:** Money; Inflation; Growth; Cointegration Test; Turkey.

**JEL Classifications:** E31; E50; F43

### **1. Introduction**

In its simplest form, money supply is the amount of money, which is in circulation over a certain period of time. Increases in this amount causes increases in the prices, in other words, the inflation, by increasing consumption expenditures and investment expenditures. With regard to inflation's effect on economic growth, different economists suggest that it may have both positive and negative effects. While some economists, majority of which are members of Keynesian view, argue that inflation affects economic growth positively, some economists, who are members of Neoclassic view suggest that inflation affects economic growth negatively. When economic growth enters into a process of regression, amount of money, which constitutes people's income, also decreases. When expenditures decrease as a result of a reduction in money, amount of consumption and investment also decreases. Continuation of production and investments depends on demand. When demand decreases or ceases as a result of the decrease in the level of income, producers can't sell their products and services. Under these circumstances, they have to reduce or cease not only the production, but also their investments.

Inflation affects growth, development of financial sector and unprotected poor section of the population negatively. It is indisputably agreed that even mild levels of inflation damage real growth (Cecchetti, 2000). Inflation decreases real income and also increases uncertainty. Despite these adverse effects of inflation on economy, it is generally agreed that primary objective of world leading banks' monetary policy is price stability (King, 1999 and Blejer et al., 2000) and central banks devote themselves to low inflation (Goodfriend, 2000). Therefore, central banks adopt inflation as the main objective of their monetary policies, and have their objectives set for inflation explicitly and implicitly when necessary (Abdul, 2006:203).

In every country, ultimate aim of economic policy is to achieve sustainable economic growth with price stabilization. For this reason, monetary policy and financial policy must be implemented in a coordinated and effective manner so that economic growth and price stability can be achieved. Continuing sustainable growth and price stability synchronously, can be difficult for policy-makers. Contrary to Keynesian economy, some economic views emphasize the fact that inflation is a warning sign for economic growth (Mubarik, 2005.) However, according to rational expectation, price level, which increases gradually, may become price level, which can be harmful for economic growth and

lead to macro economic uncertainty (Feldstein,1982; Ocran,2007; Khan and Senhadji, 2001). Also, zero inflation level and disinflation may affect economic growth negatively by decreasing the motivation of producers (Hasanov, 2011:11).

Origin of the modern thought on money and growth is based on Tobin's (1965) study. Tobin assumed that there is a distribution between two assets such as money and real capital, and fixed saving movements. An increase in inflation rates, decreases real return rate of money. This is Tobin effect: Higher inflation rates as a result of higher capital stock and higher level of output per capita (Ireland, 1994:47). Sidrauski (1967) uses a model related to money with utility function. Stockman (1981) suggests a model, which specifies the negative relationship between monetary growth and capital (Gomme, 1991:2). According to Sidrauski's model, an increase in monetary growth, leads to an increase in anticipated inflation rate by decreasing real balances demand (Fischer, 1983:1).

When inflation occurs, purchasing power of money loses value, and people's income decreases. An inflationary environment decreases quality of life, eliminates people's happiness and their optimistic expectations towards future, and affects not only the individual but also his/her community, and ultimately, the society in general. This paper examines money, inflation and growth relationship in Turkey by using cointegration test. For this purpose, 1999.2 – 2012.2 period is taken and quarterly data of money supply(M2), GDP, velocity of money and deflator are used. According to the results from this paper, money supply and velocity of money is a main determinant of inflation in Turkey. On the other hand, 1% decrease in income directly reduces inflation by 1%.

This paper is organized as follows: Section II presents theoretical framework and literature. Section III presents the data and methodology used. Empirical results are discussed in Section IV. The final section draws some concluding remarks and suggestions.

## **2. Theoretical Framework and Literature**

Benefits of price stability, indicates the absence of inflation costs. Inflation is costly for some reasons. These costs can be avoided by achieving a reasonable stability at total price level, and sustaining this stability. Economic benefits of price stability, indicates a development in economic activity, when irregularities stemming from inflation are eliminated (Hakiko and Higgins, 1985:3-4).

The root cause for the necessity of price stability is that, it is essential for the stability of national life, and an indispensable prerequisite for economic development. Today, significance of price stability is widely accepted across the world. After World War I and II, following the hyperinflation experiences in some countries, it has been realized that a serious inflation may have sudden destructive effects on national life. There are three significant aspects related to the advantages of price stability (Bank of Japan, 2000:4-6);

- Signal function of relative prices,
- Less certainty in the economic activities planned for the future and
- Avoiding an undesirable effect on income distribution.

Price stability is a both significant and desirable aspect due to the fact that an increasing price level (inflation) will be a burden on the society even at reasonable levels. These requires the following provisions (McDonough, 1997:2):

- Uncertainty about the decisions of business world and outcomes of profitability;
- Negative effects on capital costs, which stem from the interaction between inflation and tax system;
- Decreasing price and market system activity and
- Irregularities, which particularly draws non-productive activities and create adverse incentives.

It is probable that policies, which decrease inflation, will lead to higher levels of unemployment and lower economic growth temporarily. Higher unemployment leads to various social and psychological costs through deflationary policies. A person's losing his/her job, leads to disappointment, depression and unrest in the family. Like social costs, it is also difficult to measure the psychological costs of higher unemployment, which takes place as a result of disinflationary policies. But economic costs of disinflation or inflation can be measured through losses in production and income. These costs stem from the fact that prices, wages and expectations are adjusted slowly. As a result of this slow adjustment, disinflationary policies slows down monetary policies temporarily

and imposes a burden on cumulative losses in output. These losses can be used as a measurement of disinflation's economic cost (Hakkio and Higgins, 1985:6).

Central banks may influence prices through monetary policies, but it can be said that the relationship between monetary policy and prices is complicated, and there is a long and variable time difference between the changes in general price level and monetary policy. Effects of monetary policy on the prices, can be indicated by means of the differences between inflationary and disinflationary phases: in principle, while a central bank controls inflation through monetary tightening, and economic growth falls down for a short period of time; in a deflationary phase, it will have a limited effect on economy even if nominal interest rates are zero. In deflationary phase, as soon as interest rates reach to zero level, a central bank will not be able to make a policy by reducing interest rates. In this case, monetary policy can't increase the price level by means of lower interest rates. Also, if a decline in the prices decreases inflationary expectations and real interest rates, the difference between inflationary expectations and nominal interest rates will increase and lead to a downward pressure on the prices (Bank of Japan, 2000:8).

In inflationary environment, wage adjustments are slow due to variable economic conditions caused by open and implicit labour contracts. Open labour contracts are common in unionised industries. Workers' and companies' expectations related to inflation in the future period depend on wage agreements. High inflation expectations for contract period lead to union's demanding an increase in the wages proportionally and companies' agreeing with this demand. Implicit contracts between workers and employers may lead to an inertia related to the increase in the wages even in unionized industries. Due to both open and implicit contracts, a decline in inflation rates doesn't reflect on a decrease in the wages immediately<sup>1</sup>(Hakkio and Higgins,1985:6-7).

In an entirely flexible economy, which is dominated by full wage, price flexibility and full monetary policy, the struggle against inflation will be at no cost. Disinflation process will start when monetary authorities announce their disinflation policy; monetary authority declare their intention to reduce inflation by tightening monetary policy. Workers and business world will immediately revise their expectations about the direction of monetary policy in future because the announcement by monetary authorities will be considered completely credible. Workers and business world also know that this process will not result with an inertia due to their experiences about price and wage inflation. As a result, workers and business world will immediately lower their inflation expectations (Kahn and Weiner, 1990:7).

Prices also adjust according to the changing economic conditions slowly. As reaction to the decline in the sales, companies will probably make an inventory without the changes in sale prices in the first place. If the slowdown process becomes permanent, companies will decrease, or perhaps even stop the output. Companies with a substantial market power will take the changing price policies into account and try to balance supply and demand for their products. As a result, the recession in the increase of expenditure will not reflect on lower increases in product prices immediately. Expectations about inflation in future period, is not adapted to the changes in real inflation rate quickly. After an high inflation process, which continues for a long time, both workers and companies will expect that high inflation will continue. As a result, declines in expected inflation rate, will lead to a slow development in the decline of real inflation rate<sup>2</sup>. Disinflationary monetary policies may reduce production and income due to slow adjustment. Cumulative loss in output, reflects the fact that disinflation is a common method used for measuring economic cost (Hakkio and Higgins, 1985:6-7). In developing countries, it is said that there are four sources of inflation (Peiris, 2007:4):

- Demand pressure,
- Monetary and financial policies,
- Supply shocks,

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<sup>1</sup> Like inflationary costs, disinflationary costs also stem from the lack of corporate adaptation to a large extent. For instance, wage contracts, which are completely indexed to inflation rate, make nominal wages more sensitive to the changes in inflation rate. As a result, employment and output will not be affected by disinflationary policies substantially.

<sup>2</sup> As a result of the increase in the credibility of policy makers' intention to reduce inflation, price and wage determining behaviours will be more flexible. As a consequence, increasing credibility will increase the costs of inflation.

- Inertia.

In an economy, if the balance between supply and demand changes, general price level will also change. A factor variability leads to changes in the balance between supply and demand, and then in the prices. These are output gap, inflationary expectations, international commodity prices and exchange rates, which stem from the difference between real output and potential supply capacity. Although monetary policy influences general price level, the scope of monetary policy's effect will vary according to time horizon. This point can be explained as follows. If someone takes a particular point in a time period, monetary policy may have a far-reaching effect due to majority of above-mentioned factors and existing slight possibilities. If one extends the time period a little more, monetary policy, he/she affect monetary and loan sizes, and also changes such as interest rates, and lead a change in aggregate demand. Therefore, monetary policy will have a significant effect on general price level (Bank of Japan, 2000:7).

In the long term, inflation is only capable of affecting the inflation itself, but systematically, a higher inflation rate will not lead to a higher long-term growth. Long-term growth rate is determined by demographic changes, technology, education and real economic factors such as market efficiency. As most of the empirical observations suggest, up to the present, there has been a long-term relationship between inflation and growth. Higher inflation undermines economic studies by undermining the output (Backstrom, 1997:2).

The relationship between inflation and economic growth is one of the most important macroeconomic discussions among macro economists, policy-makers and monetary authorities in all countries. Particularly, whether inflation is necessary or harmful form economic growth constitutes the basis of the matter in question (Datta and Mukhopadhyay, 2011:415).

What can monetary policy do to influence the fluctuations in the long-term trends of economy, even if it is not capable of creating any permanent effects on the growth? This means the following: if resource utilization is low or high, monetary policy can be used for warning or dampening activities temporarily; but this is not a good aspect for the harmony of the economy. The problem arises when source utilization is too much, inflation accelerates as a result of this, and central bank doesn't implement interventionist policies. After this, people start to consider that inflation will be on the rise in the long-term. A higher inflation rate can be announced afterwards; in fact, the effects on production and employment will only be temporary. This is one of the reasons why central bank must act prudentially and give warnings about the development of inflationary expectations. Central bankers negotiate the importance of the credibility about determining the targeted interval for people's inflationary expectations. Level of credibility depends on conditions such as historical records of inflation and presence of the government's financial gaps (Backstrom, 1997:2-3).

Some countries started to take responsibility in terms of directing central banks to pursue objective price stability policies in accordance with the laws, and guaranteeing a high level of independence. Empirical researched conducted in recent years have shown that average inflation rate and its variability tends to decrease with central bank's increasing independence (McDonough, 1997:3-4).

Inflation is indisputably costly. It prevents savings and investment by creating uncertainty about the prices in future. It forces business world and individuals to spend time and money in order to predict the prices in future. It may increase tax burden by raising incomes and profits artificially due to its interaction with the tax system. All of these factors prevent growth, lower life standards, and leads to less efficient economy. But decreasing inflation is also costly. If historical signs suggest that, if economy is at full employment like today, the only way to reduce inflation is to create flexibility temporarily. Magnitude of total expenditures must be decreased in a manner that labour and capital sources become idle. Idleness of resources reduces the output, decreases employment and increases unemployment. Lower inflationary expectations will accelerate the process of price and wage adjustment. As a result of lower inflationary expectations, business world will reduce the rate of the price increase in the products immediately. In a lower inflation environment, workers will be able to sustain real wage thanks to the lower nominal wage growth. As a result, disinflation will be achieved at no cost. Inflationary expectations will be adjusted immediately. Price and wage inflation will be adjusted immediately. Unfortunately, the real world doesn't work out like this. Disinflation is costly, because economy is characterized by the solidity of expectations, prices and wages (Kahn and Weiner, 1990:6-7).

Results of not achieving price stability, in other words, depreciation caused by inflation in economic and social areas, is also observed in our country clearly. Primary reason of unequal income distribution in our country is that price stability hasn't been achieved for many years. The irregularity created by this unequal income distribution is felt in social life intensely. In our country, majority of people are both poor and deprived. Also, the segment, which feels the debilitating effect of inflation most is the segment, income level of which is lowest. All these factors, poverty and privation, inequitable distribution of income are results of high inflation and unstable environment it creates. Costs of living in a high inflationary environment for many years is quite harsh for our country's economy (TCMB, 2002:5-6).

The relationship between growth and inflation depend on the state of economy. If economy's potential output grows sufficiently in order to keep up with demand, achieving growth without inflation increase is possible. If real output is less than potential output (negative output gap) and sufficient reserve capacity is available for dealing with demand pressure, the same condition may apply. When real output becomes equal to potential output, reserve capacity doesn't remain the same and economy operates at full employment level and no gain is accomplished to the costs of rising inflation. If demand continues at this level and production capacity doesn't expand, the danger of quick increase in general price level without any further growth in the long term emerges. This phase of the rising inflation, may result with serious consequences for the economy (Ayyoub and et al., 2011:52).

In Turkey, economic instability created by high and continuing inflation for many years reduced growth performance, affected income distribution adversely, reduced the level of prosperity and caused instability in all areas. It is a well-known fact that high inflation decreases purchasing power and creates financial difficulties. On the other hand, it also affects individuals' life quality adversely. The fact that education, which is the most important aspect for the future of the country is ignored, individual's starting his/her working career at an early age, cutting back on expenditures related to social life such as book-newspapers, holiday, entertainment are examples of how negatively inflation can affect life quality (TCMB, 2004:14).

In Turkey, three types of monetary policy regimes, namely, monetary targeting, exchange rate targeting, implicit inflation targeting and open inflation targeting have been implemented since 1995. Among these monetary policy regimes, while monetary targeting and exchange rate targeting was not successful in terms of reducing inflation and achieving stability, implicit inflation targeting, which started to be implemented in 2002, and as a supplementary to it, open inflation targeting, which started to be implemented in 2006, have been successful in achieving stability in terms of keeping inflation at low levels. Monetary policy regime changes not only affect the level of inflation, but also sustainability level of inflation (Oğuz, 2010:1).

When price stability is achieved, concerns about the negative effects of inflation will be unnecessary, and it will be possible to focus on using resources efficiently and sturdily in order to achieve economic growth and development. It should not be forgotten that, it is a right for people to live in an environment, where price stability is achieved. In our country also, achieving price stability will not only contribute to the process of achieving economic stability, but also life quality will improve, people's trust to each other and their future will increase, and this process will pave the way for the improvements in social area (TCMB, 2004:16). Indeed, there is another aspect, which should be taken into account. That is the crises, inflation and therefore, political instabilities caused by economic instabilities. It is extremely important to achieve not only economic stability, but also political stability for the prosperity and future of the country. Economic instabilities caused many political instabilities, uncertainty predominated the country and led to a confidence crisis. For this reason, achieving and sustaining price stability is highly important. If this objective is accomplished, effects of inflation's economic and social costs will be minimized, and take the country further in every aspects thanks to economic and political stability.

During the last forty years, different inflationary processes have been confronted in Turkey, like all countries in the world (TCMB, 2002:19-21):

- In the period from the second half of 1970's to the beginning of 1980's, while many studies and projects related to the fight against inflation and bringing price stability into the forefront were carried out in developed countries, it is observed that inflation accelerates since public deficits are financed by the funds of Central Bank.

- It is observed that, following the above-mentioned period, the pressure created by the public deficits from the past on the economy of our country has led to an increase in the prices and an inflationary effects starting from the second half of 1980's. The sluggishness, which was created because of the fact that public deficits were closed by means of Central Bank, led to a process, in which disciplinary habits in public expenditures were abandoned, consumption patterns changed and social structure deteriorated.
- By the beginning of 1990's, we observe that loose financial policies and monetary policies in accordance with these policies were implemented, and stability came out as a priority.

It is a well known fact that, during this forty-year period, price stability was not adopted as the primary objective, but left to daily policies, and structural arrangements required for achieving price stability were ignored. Both the independence of Central Bank, and the fact that structural arrangements were not made, brought about many problems. In these periods, applications which produce profit in the short term, but conflict with price stability and therefore undermine economic stability, which is the ultimate objective in the long term, and the fact that Central Bank was asked to address different priorities paved the way for the rise and continuity of inflation. When we look at these periods, it is observed that average growth rates decline gradually and destabilize. In Table 1, average values of Inflation and Growth rates for the years 1970-2012 are shown.

**Table 1. Inflation and Growth Rates in Turkey (Average)**

	1970-1979	1980-1989	1990-2001	2002-2012
Inflation	24	49,6	74,8	9,3
Growth	4,8	4	3,2	5,1

Source: TUIK, TCMB, Republic of Turkey Ministry of Finance and Republic of Turkey Ministry Undersecretariat of Treasury.

While inflation is at 24% average values in the 10-year period between 1970-1979, it doubled in the next 1 year period and almost reached to the level of 50%. This increase didn't slow it down and it reached to the levels of 75% in the next 11-year period. After the crises and financial crisis confronted in banking sector during the crisis of November 2000 and February 2001, structural arrangements were done; effect of these changes affected inflation rates of the next 10-year period. With the legal legislation enacted on the independence of TRCB, TRCB focused on price stability as the ultimate objective, and within this framework, adopted implicit inflation targeting in 2002 in order to reduce and control inflation, and officially adopted open inflation targeting in 2006. Within the same process, floating rate regime was adopted, and exchange rates were determined according to supply and demand conditions. Inflation declined to single-digit numbers with the affect of structural arrangements, which achieved a financial discipline and decreased public deficits even without switching to open inflation targeting. Although it reached to double-digit numbers in recent years, it followed a course of approximately 10%, and achieved a relative stability compared to the past.

Like in the majority of industrialized and developing countries, one of the main objectives of macro-economy policy is to sustain high economy growth with low inflation rates. The relationship between growth and inflation, and important discussions on the nature of this relationship is not a surprise. It is especially agreed that macro-economic stability, which is defined as low inflation, is in a positive relationship with economic growth. Macro-economists and policy makers often emphasize the costs with high and variable inflation. Inflation imposes negative externalities on economy when an economic activity is prevented. Inflation may cause uncertainty about the profitability of investment projects in future, when inflation rates are high along with price volatility. This may cause lean investment projects, and ultimately, low investment levels and economic growth. Inflation also makes exportation relatively more expensive, and therefore affect balance of payments and decrease the international competitive power of a country. Also, inflation and tax system may affect each other, and cause irregular borrowing and loaning patterns (Gokal and Hanif, 2004:2).

Gomme (1993) researched the extent, at which money is connected to the growth by using human capital accumulation instead of capital accumulation. Ireland (1994) added an internal selection characteristic to the payments, and focused on the effects of growth on the monetary system in the

model he developed. Van der Ploeg and Alogoskoufis (1994) addressed Sidrauski's (1967) model, in which utility was used instead of cash, and researched inflation's effects on growth (Blackburn and Hung, 1996:2). Barro (1995) concludes that there is a significant negative relationship between inflation and economic growth. He reaches to the conclusion that 10% inflation increase reduces real gross national product at a rate between 0.2-0.3% annually. In a study he conducted for South Africa, Nell (2000) concluded that when inflation is at single-digit numbers, it can be profitable in terms of growth, however, when it reached to double digit numbers, it imposes costs and slow down the growth. In a study conducted for Brasil, Faria and Carneiro (2001) reached to the conclusion that inflation may have real effects on the output in the short term, but it doesn't have any real effects in the long term. In a study conducted for Bangladesh, India, Pakistan and Sri Lanka, Malik and Chowdury (2001) reached to the conclusion that there is a long-term positive relationship between inflation and growth rate, and moderate inflation may have positive effects on growth. Gokal and Hanif (2004) concluded that there is a weak and negative correlation between inflation and growth. According to McCandless and Weber (1995) while there is a high correlation between money supply and inflation, there is no correlation between money supply and growth and there is no correlation between inflation and growth. Paper of Rolnick and Weber (1998) finds that a high correlation between money growth and inflation.

### 3. Data and Methodology

For this paper we use money supply, deflator, income and velocity of money data from 1999.2-2012.2. The data were obtained from Turkish Statistical Institute (TUIK) and Central Bank of the Republic of Turkey (TCMB). Velocity of money is calculated using equation of Quantity Theory of Money. According to Quantity Theory of Money, real economic activity model requires that monetary balances and price level, which is controlled by nominal money supply must be kept at a certain level. Concerning the nominal money supply, which is determined monetary authorities externally, price level equals the purchasing power of money supply to the required level of real balances. If money supply deviates from the level of real balances, central bank will intervene in the situation. After this, price level must be entirely flexible, and determined by nominal money supply only externally (Lozano, 2008:3).

Quantity Theory of Money was dominant to macroeconomic theory before Keynesian views. Quantity Theory Equation;  $MV=PY$

Where  $M$  is money supply,  $V$  is velocity of money,  $P$  is the general level of prices and  $Y$  is income level. The money supply determined outside the system as exogenous. Equation can be written into price equation as;  $P=MV/Y$

Taking log of the equation;  $\log P = \log M + \log V - \log Y$

By differentiation of this equation for inflation;  $g_p = g_m + g_v - g_y$

This equation indicates the price increase (inflation rate), which is determined by the increase in cash flow rate and real income. In a simple version of quantity theory, it is assumed that real income will increase in the long-term, and cash flow rate will remain stable. According to this assumption, inflation is determined by the changes in money supply. However, Friedman and Schawarts (1982) argued that stability of velocity of circulation is an extreme suggestion, which must be ruled out. Velocity of circulation and income increases slowly, and this behaviour is independent of money supply or behaviour of prices. Quantity theory explains that money supply is a key factor, which affects the affect of money supply on price levels (Laidler, 1997). If we add the term 'error' in order to capture the effects of other variables, our model for the analysis of inflation becomes as follows;

$$g_p = \beta_0 + \beta_m g_m + \beta_v g_v + \beta_y g_y + u$$

This equation indicates the relationship between price level and factors affecting it. These factors consist of money supply, real income and other factors affecting money demand. These other factors, which include velocity, can be called proportionality factor. If other determinants of real income and money supply are constant, this equation indicates the direct relationship between money supply and increase in inflation rate (Abdul, 2006:205).

Ultimately, the relationship between inflation and growth of money are based on money demand and money supply. When considered in historical context, it is observed that changes in the amount of certain commodities such as golden are affected by money supply. In modern economies,

central banks have influenced the nominal amount of money through political movements intentionally or unintentionally at least from the beginning of 1970's. These political movements may include selling or buying treasury bills by changing reserve requirements or interest rates. Other factor with regard to the relationship between monetary growth and inflation is money demand. People keep money in order to purchase commodity and service. As a result, the company and household demand real amount of money. If prices rise, people want to keep more money in order to purchase the same amounts. If M is nominal amount of money, and P is price level, amount of real money is M/P. Price level is commonly measured with general price indices such as consumer price index and gross domestic production deflator. The only and most significant factor affecting money demand is real income. Spending more money becomes easier since people have a higher income and can keep more money. Proportional relationship between required amount of real money and real income, is an appropriate expression of money demand's dependence on real income. This relationship can be written as follows(Dwyer and Hafer, 1999:33-34):

$$M/P=ky$$

y is real income, k is proportionality factor. Proportionality factor is not constant. Here, essential aspect is that changes in the opportunity of kept money affect the amount of money demanded. Opportunity cost of kept money can be summarized as the interest income, which is resigned due to the fact that money is kept instead of other assets. If opportunity cost of keeping money increases, money demand decreases; if opportunity cost of keeping money decreases, money demand increases. In financial intermediation, other factors such as payment methods and technological progress can also affect money demand.

Real income changes over the course of time and affects money demand. The main factor affecting the increase of real income over the course of time is the growth of current resources, which produces commodities, services and technological change. Money doesn't create more labour or real capital, which produces commodity and service or affects technological change. After this phase, we can at least suggest that real income is independent of nominal amount of money and price level in the long term. Changes in real income affect price level; but there is a proportional relationship between price level and nominal amount of money compared to real income (Dwyer and Hafer, 1999:34).

Price level can't be explained with money demand, If nominal amount of supplied money is equal to the demanded amount,  $M/P = ky$  equation summarizes the relationship between several variables. These variables are other factors, which affect nominal amount of money, price level, real income and money demand (Dwyer and Hafer, 1999:34-35). Application takes Abdul (2006) by reference. In this study we employ the Augmented Dickey-Fuller (hereafter, ADF) unit root test to examine for the stationarity of variables. The regression models of the ADF unit root test below:

$$\Delta y_t = \gamma y_{t-1} + \sum_{i=1}^k \alpha_i \Delta y_{t-i} + \varepsilon_t$$

$$\Delta y_t = a_0 + \gamma y_{t-1} + \sum_{i=1}^k \alpha_i \Delta y_{t-i} + \varepsilon_t$$

$$\Delta y_t = a_0 + \gamma y_{t-1} + a_2 t + \sum_{i=1}^k \alpha_i \Delta y_{t-i} + \varepsilon_t$$

where  $a_0$  is intercept, t is linear time trend, k is the number of lagged first differences, and  $\varepsilon_t$  is error term. The null hypothesis is unit root and the alternative hypothesis is level stationarity. (Enders, 2004: 183). If the coefficient of the lag of  $y_{t-1}$  ( $\gamma$ ) is significantly different from zero, then the null hypothesis is rejected.

Johansen (1988) and Johansen and Juselius (hereafter, JJ) (1990) maximum likelihood (ML) procedure is a very popular cointegration test and useful method to determine the long-run relationship among nonstationary variables. The model is based on the error correction representation given by

$$\Delta X_t = \mu + \sum_{i=1}^{p-1} \Gamma_i \Delta X_{t-i} + \Pi X_{t-1} + \varepsilon_t$$

where  $X_t$  is an (nx1) column vector of p variables,  $\mu$  is an (nx1) vector of constant terms,  $\Gamma$  and  $\Pi$  represent coefficient matrices,  $\Delta$  is a difference operator, k denotes the lag length, and  $\varepsilon_t$  is p-

dimensional Gaussian error with mean zero and variance matrix (white noise disturbance term). The coefficient matrix  $\Pi$  is known as the impact matrix and it contains information about the long-run relationships. This Equation resembles a vector autoregressive (hereafter, VAR) model in first differences, except for the inclusion of the lagged level of  $X_{t-1}$ , an error correction term (hereafter, ect), which will contain information about the long run among variables in the vector  $X_t$ . The vector error correction (hereafter, VEC) method equation above allows for three model specifications:

(a) If  $\Pi$  is of full rank, then  $X_t$  is stationary in levels and a VAR in levels is an appropriate model. (b) If has zero rank, then it contains no long run information, and the appropriate model is a VAR in first differences. (c) If the rank of  $\Pi$  is a positive number,  $r$  and is less than  $p$  (where  $p$  is the number of variables in the system), there exists matrices  $\alpha$  and  $\beta$ , with dimensions  $(p \times r)$ , such that  $\beta\alpha'=\Pi$ . In this representation  $\beta$  contains the coefficients of the  $r$  distinct long run cointegrating vectors that render  $\beta'X_t$  stationary, even though  $X_t$  is itself non-stationary, and  $\alpha$  contains the short-run speed of adjustment coefficients for the equations in the system (see Awokuse, 2003).

Johansen's methodology requires the estimation of the VAR equation (2) and the residuals are then used to compute two likelihood ratio (LR) test statistics that can be used in the determination of the unique cointegrating vectors of  $X_t$ . The first test which considers the hypothesis that the rank of  $\Pi$  is less than or equal to  $r$  cointegrating vectors is given by the trace test below:

$$Trace = -T \sum_{i=r+1}^n \ln(1 - \lambda_i)$$

The second test statistic is known as the maximal eigenvalue test which computes the null hypothesis that there are exactly  $r$  cointegrating vectors in  $X_t$  and is given by:

$$\lambda_{max} = -T \ln(1 - \lambda_r)$$

The distributions for these tests are not given by the usual chi-squared distributions. The asymptotic critical values for these likelihood ratio tests are calculated via numerical simulations (see Johansen and Juselius, 1990; and Osterwald-Lenum, 1992).

#### 4. Empirical Results

The integration analysis of variables was examined using of ADF unit root test. The optimal lags for unit root tests are to include lags sufficient to remove any serial correlation in the residuals. The optimal lags for unit root tests are determined according to the Schwarz Criterion. Results from the ADF unit root tests are presented in Table 2. These results show that the null hypothesis of a unit root in each time series were failed to reject at 5 percent significance level but strongly rejected at their first difference. This implies that all variables are non-stationary at levels but stationary at the first differences.

**Table 2.** ADF Unit Root Test Results

Variable	Level	First Difference	Result
<b>M</b>	-1.9377 (-3.4907) [ 0, c+t ]	-6.4245 (-2.9145) [0, c ]	<b>I (1)</b>
<b>P</b>	-2.7614 (-3.4907) [ 0, c+t ]	-2.2703 (-1.9475) [ 0, none c+t ]	<b>I (1)</b>
<b>Y</b>	-2.6017 (-3.4921) [ 1, c+t ]	-5.8681 (-2.9145) [0, c ]	<b>I (1)</b>
<b>V</b>	-2.4893 (-3.4970) [ 0, c+t ]	-3.0584 (-2.9177) [3, c]	<b>I (1)</b>

Notes: MacKinnon critical values at 5% are in ( ) and number of lags, and model specification, are in [ ], respectively. The optimal lags for unit root tests are determined according to the Schwarz Criterion. Models **c+t**, **c** and **none c+t** contain constant and trend; only intercept, and none of constant and trend, respectively.

The results from JJ cointegration tests indicate that there is a unique long-term or equilibrium relationship between variables. Both trace statistics and  $\lambda$ -max statistics show that there exist two cointegrating vectors at 5% significance level (see Table 3). The long-run and short-run coefficients are obtained from VEC model.

The long-run coefficients for the variables  $Y$  is negative and variables  $M$  and  $V$  are positive. The long-run coefficients are strongly statistically significant in all models. In addition, the estimated ect are presented that their coefficients are negative and statistically significant. ect indicate that any

deviation from the long-run equilibrium of between variables is corrected about 35.6 % for each period and takes about 3 periods to return the long-run equilibrium level (see Table 3).

**Table 3.** Johansen-Juselius Cointegration Tests Results

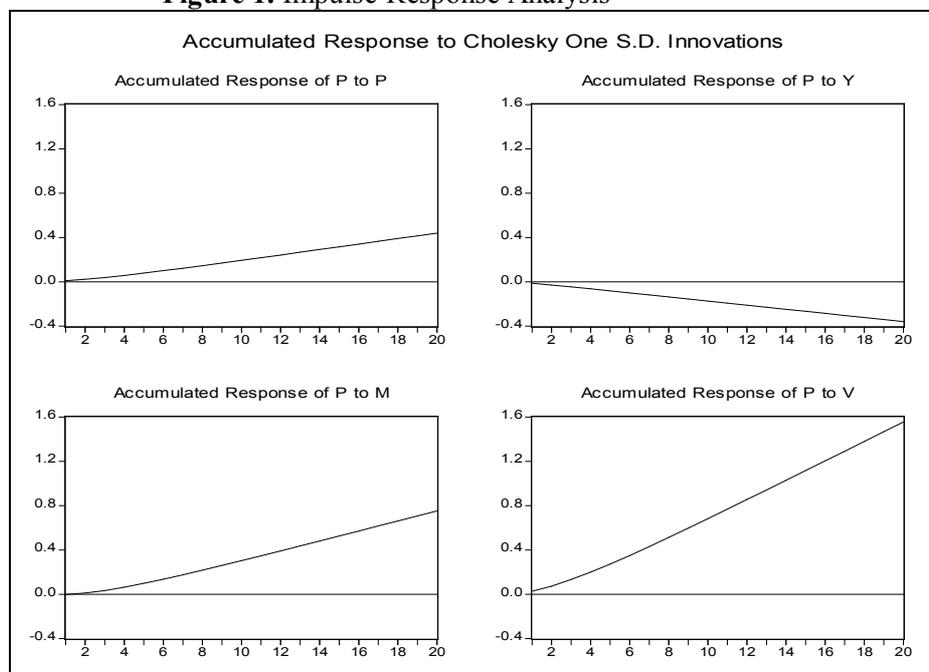
Trend assumption: Linear deterministic trend							
Sample (adjusted): 1998Q3 2012Q2							
Included observations: 56 after adjustments							
H <sub>0</sub>	H <sub>1</sub>	Trace Statistics	5 % Critical Value	p-value	λ-max Statistics	5 % Critical Value	p-value
r=0	r=1	104.0580	47.85613	0.0000	65.17731	27.58434	0.0000
r≤1	r=2	38.88068	29.79707	0.0034	25.22882	21.13162	0.0125
r≤2	r=3	13.65186	15.49471	0.0930	10.68427	14.26460	0.1708
r≤3	r=4	2.967591	3.841466	0.0849	2.967591	3.841466	0.0849
<b>Notes:</b> Number of optimal lags, 3, based on FPE, AIC, SIC and HQ information criteria's results. r is the number of cointegrating vectors. Critical values used are taken from Osterwald-Lenum (1992).							

**Table 4.** The Long-run and Short-run Coefficients

The Long-run Coefficients				The Short-run Coefficients			
Variables	Coefficient	Standard Errors	t-Statistics	Variables	Coefficient	Standard Errors	t-Statistics
Constant	4.7400			Constant	0.0004	0.0080	0.0499
				ΔP <sub>t-1</sub>	0.6930	0.1089	6.3666
Y	- 1.0087	0.0144	-70.02	ΔY <sub>t-1</sub>	0.2376	0.1904	1.2483
M	1.0006	0.0024	414.34	ΔM <sub>t-1</sub>	0.0944	0.0811	1.1644
V	0.9974	0.0049	203.78	ΔV <sub>t-1</sub>	-0.0893	0.0539	-1.6562
				ect	-0.3555	0.0763	-4.6582

**Notes:** Δ is the first difference operator.

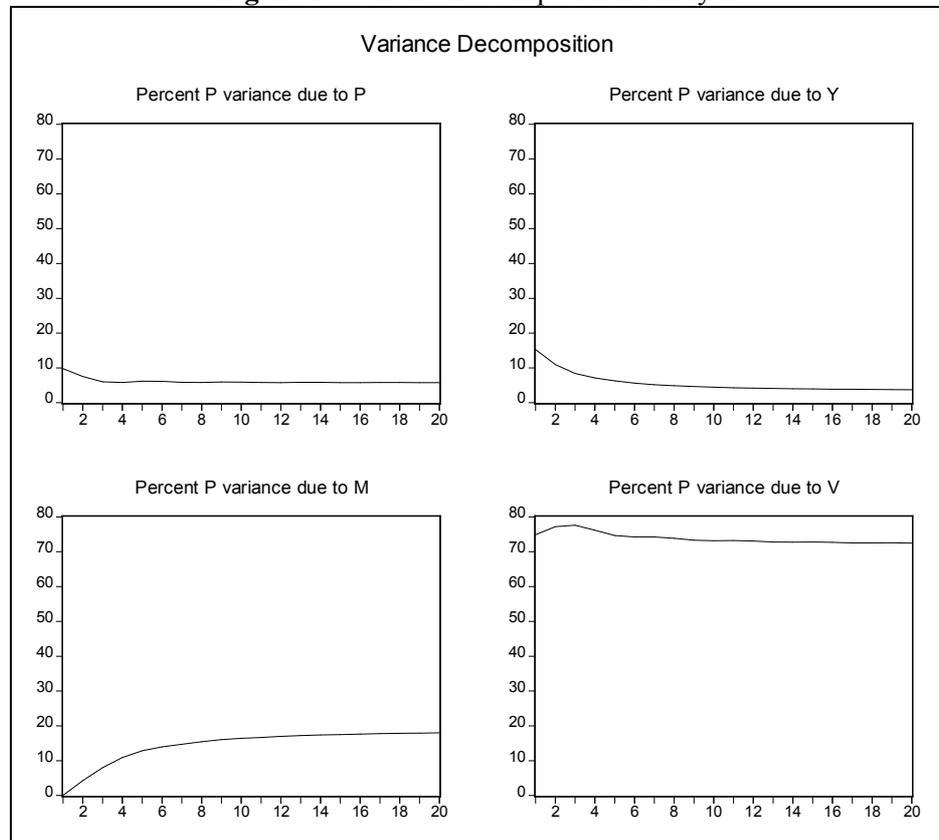
**Figure 1.** Impulse-Response Analysis



Impulse-response analysis employed the response to Cholesky one standard deviation innovations. An impulse response function traces the effect of a one-time shock to one of the innovations on current and future values of the endogenous variables. While the responses of prices

(deflator) to itself, real money supply and velocity are positive, to real gdp is negative (see Figure 1). On the other hand the variance decomposition provides information about the relative importance of each random innovation in affecting the variables in the VAR. The variance decomposition analysis show the variation in inflation arise about %10 from itself, about %10 from real money supply, about %10 from real gdp and about %70 from velocity (see Figure 2).

**Figure 2. Variance Decomposition Analysis**



## 5. Conclusion

According to my findings the increases in the money supply and velocity of money causes inflation in the long run. This result is similar to result of McCandless and Weber(1995). Also this result seem to be consistent with findings of Rolnick and Weber(1998) who provided empirical evidence that there is a high correlation between money supply and inflation. According to Dwyer and Hafer(1998), an increase in the growth rate of money causes an equal increase in the rate of inflation. Therefore my result at the same time is similar to result of Dwyer and Hafer(1998). This also shows that money supply is the main determinant of inflation.

Although inflation, which increased up to the levels of 30% after 2001 crisis, was reduced to 6.2% in 2012, this decline couldn't be sustained, and increased to 7.4% in 2013. This increase was significantly influenced by the rapid increase of money supply in 2013 (While M2 money supply was 743 Billion TL in 2012, this amount was 879 Billion TL in 2013), approximately 20% devaluation of TL as a result of the increase in the exchange rates, and increase in food prices. The fact that we have elections in near future, increase in public expenditures, which has become a tradition for the period before elections, and the expectation that these increases will be over inflation level indicate that TRCB will probably not be able to achieve 5.3%, which is the inflation level for 2014, or even 6.6% estimation, which was announced for this target afterwards.

Up to this time, Turkey has always been able to grow by having a deficit in the budget or taking a risk of an increase in current account deficit. In other words, we pursued a strategy, which is based on growing by becoming indebted. In order to prevent this, we must adopt a growing policy, in which we can replace the commodities we Our dependency to foreign markets in energy sector can't prevent the increase in current account deficit, and we are becoming a country, which gives weight to

importation instead of domestic production. In addition to this, the fact that increase in the prices of the products we import is reflected on the domestic prices, makes the fight against inflation more difficult. It is essential that inflation is reduced to the levels of 2-3%. When monetary policy is remains incapable of combating against inflation, the process must be supported with financial policy and spending policy.

In an environment of high current account deficit due to high inflation rates, low levels of growth and external financing needs, decreasing inflation and current account deficit, and increasing the growth don't seem to be likely. When developments and figures of 2013 are considered, it is not difficult to say that the increase in exchange rates will continue in 2013, and correspondingly, inflation will not decrease even if current account deficit decreases at a certain amount, or even increase further, and the growth will decrease. Therefore, we must plan and implement the structural arrangements, which will decrease our dependence on foreign market in terms of financing needs in the short-term, and eliminate this dependence in the long term. It shouldn't be forgotten that living in an environment of growth, which improves life standards of living, and of steady prices, which help people to have a more positive view towards life, is the right of our society, too.

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