

## NOMINAL GDP AND MACROECONOMIC POLICY CHOICE: ST. LOUIS MODEL ESTIMATES

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**Abstract:** In this study, we investigate the question of whether monetarist or Keynesian policies were more effective on GDP growth in Turkey. To this aim, we employ the St. Louis model and examine the statistical significance of the estimated parameters. The effects of changes in money supply or government expenditures on GDP growth are not only limited to the current period but might continue over time as well. Hence, we also include the lagged values of the explanatory variables in the model. The estimation period covers the 1981 – 2008 period. The model is estimated by OLS and captures the accumulated effects of the changes in the narrow and wide definitions of money supply (M1 and M2) and government expenditures on the growth of nominal GDP growth. These estimates correspond to the total or distributed lag multipliers for monetary and fiscal policies. The former is not found to be statistically significant whereas the latter is statistically significant. These findings indicate that Keynesian policies based on expansionary fiscal policy via increased government expenditures had more influence on GDP growth in Turkey than the monetarist approach. These results also reflect the various governments' populist approaches for political purposes. Overall, we find that the St. Louis equation approach is a valid and applicable model in the Turkish case.

**Key words :** Gross national product, GNP, Money supply, Monetary policy, St. Louis model, Least Squares, ordinary, ( OLS ).

**JEL:** E5, E6, G5

## НОМИНАЛЕН БВП И ИЗБОР НА МАКРОИКОНОМИЧЕСКАТА ПОЛИТИКА: МОДЕЛЪТ СЕЙНТ ЛУИС

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**Резюме:** В настоящата разработка се търси отговор на следния въпрос: Монетаристката или Кейнсианската политика е по-ефективна при настъпилите промени в номиналния БВП в Турция? Прогнозирайки параметрите на създаденият за тази цел модел Сейнт Луис, е изследвана статистическата значимост на получените резултати. Въздействието на промяната на паричното предлагане или публичните разходи върху БВП не е моментно, а варира във времето. Поради тази причина, в модела са включени и забавените стойности на обяснителните променливи. За изготвяне на модела са използвани хронологичните данни, обхващащи периода 1981 – 2008г. Резултатът от прогнозирането е оценен чрез използването на метода OLS, в тесен и широк смисъл, на база кумулативното въздействие на промените, настъпили в паричното предлагане (M1 и M2) и публичните разходи върху ръста на

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номиналния БВП. Относно паричното предлагане и публичните разходи, тези стойности са изчислени директно или чрез пролагане на забавено разпределение. От статистическа гледна точка, първото от тях не е значимо, но второто е от значение. Получените резултати навеждат към извода, че в Турция, през по-дълъг период от време, по-ефективна е Кейнсианската политика (финансова политика на база увеличаване на публичните разходи), а не политиката на парично предлагане (Монетаристкото становище). Това положение, в същото време изяснява и приложените с политически цели популистски подходи от страна на правителствата. Става ясно, че моделът е подходящ и може да се прилага в Турция.

**Ключови думи:** БВП (Брутен Вътрешен Продукт), Парично предложение, Публични разходи, Парична(Фискална) политика, Моделът на Сейнт Луис, Най-малките квадрати, по ред.

**JEL:** E5, E6, G5

## 1.INTRODUCTION

There are certain measurements for determining a society's prosperity level. But, the preferred measurement is the total annual production of goods and services. These are also referred to as economic outputs. In a given country or at others, the Gross National Product(GNP) consists of total output accrued in a year by the citizens of that country through the use of capabilities such as land, labour, capital and entrepreneurial talent(L.Brue and R.McConnel, 1996: 120). The end products, services produced within a certain year and boundaries of a given country, and valued according to the market prices of that year is referred to as nominal Gross Domestic Product(GDP). Stated differently, expression of goods and services produced in a year through prices current is called the nominal national income, and is calculated on the basis of GNP and GDP as follows( Ünsal, 2005: 52 -53):

$$\text{GNP} = \text{GDP} + \text{Contributions made by citizens to other countries' production} - \text{Contributions made by citizens of other countries to the subject country.}$$

Through equivalent factored incomes, it can also be calculated as:

$$\text{GNP} = \text{GDP} + \text{Factored incomes obtained from abroad by national production factors} - \text{Factored incomes accrued within the country by foreign production factors.}$$

Can growth rate variations in Nominal Gross National Product be explained by changes occurring in the money supply(Monetary) or public expenditures(Keynesian)? Put differently, were monetary or Keynesian policies more effective on variations in nominal GNP? Undoubtedly, it is not simple to answer this question since macroeconomics to be applied also changes according to the economic structure of countries. An implementation successful in one country may result differently in another country.

This research attempts to interpret on the basis of St. Louis model analysis results the question: which policy measures concerning nominal GNP changes are

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more effective and whether monetary or Keynesian policies have been more influential on GNP in Turkey?

## 2. LITERATURE

Although there are numerous theoretical and applied studies for the explanation of macroeconomic events, empirical studies measuring the effects of Monetarist or Keynesian policies on nominal GNP variations are limited. It is easier to understand through the findings obtained from St. Louis model application which of these two alternative policies are more effective on nominal GNP.

Origins of St. Louis model are based on the studies of Anderson and Jordan(1968). Their study was motivated by the studies of Ando&Modigliani(1965) and Friedman & Meiselman(1965). Friedman&Meiselman provided several advance critique on suspected points concerning independent government expenditures, and that reliable variables in a regression equation were inherent and reverse causation relationship was possible. Later, Anderson&Jordan conducted studies on financial expenditures in case of full employment and reduction of taxes, external problems and possible problems resulting fom causality relationship.

This model, referred to in literature as "The St. Louis" Model, was developed by Leonall C. Anderson and Keith M. Carlson(1970: 7-25). This nested model implementation has the form of a famous model foreseen and established by monetaristicly inclined St.Louis Federal Reserve Bank, USA. With the "St.Louis Model" first developed by Keith M. Carlson (1978), USA findings for the period from 1953-I to 1976-IV were obtained with respect to superiority of one model over the other. When the cumulative effects on  $Y$  of money supply(M1) in period  $t$  and public expenditures are compared, the thesis of monetarists arguing that money supply variations are determinant in nominal GNP changes have been found statistically meaningful.

After the studies in the USA, Batten and Hafer(1983) expanded the analysis and used the St. Louis equation for tri-monthly period data covering 6 countries: Canada, France, Germany, Japan, England and USA. Before combining the data they applied basic tests according to the countries. Additionally, they made two modifications in the details of standard St.Louis model. First they strengthened the usability of measurable financial variables which were non-adjustable for reliable periods. Secondly, perhaps other countries were in deficit during a stagnant economy after the USA. They incorporated in the model worthwhile data obtained for each country with the exception of the USA and Japan, and export as a reliable variable. Today, data obtainable on financial expenditures in case of full employment and taxes are calculated and published by OECD. Tri-monthly data were used in St. Louis equation generally in the old studies.

Miller&Russek(2003), in their study titled "Short term growth and major financial adjustment relationships under alternative financial policy management", used "Consumption equation", "Growth Accounting equation" models and also applied the St Louis equation as an alternative model. Authors, through the use of data from 20 OECD countries, analyzed with three different regression methods the effects of financial variables on economic activity. These three models include the fixed panel estimate of St.Louis equation. This study which measures the nonvariable effect of constant growth accounting panel estimate is similar to the studies of Revine&Renelt(1991). This study also carries similar characteristics to the study of Miller&Russek(1997) titled "Financial Structures and Economic Growth: International Proofs".

Empirical studies utilizing St.Louis model in Turkey are very limited. Nur Keyder (2005) has explained the St.Louis model theoretically in “Money Theory-Policy-Application” but did not conduct an applied study. The first study in this area is by Nedim Dikmen (2006) titled “Nominal GNP and Policy Preference: St. Louis Model Application”. In this study the effectiveness of monetarist and Keynesian policies on nominal GNP have been measured with St.Louis model estimate. But, lack of data used in the analysis and in particular, changes made in economic policy after 2002 necessitated a more comprehensive study in this area. 1981-2008 period data have been used. St.Louis model estimate results will enable better understanding of economic policy changes and preferences, and fill an important gap in this area.

### **3. MACROECONOMIC THEORY**

#### **3.1 Contemporary Economic Thought and Policies**

There are different theories in the application of economic policies such as Classic, Neo-Classic, Keynesian, Monetarism, Rational Expectations and Supply Side Economics. These contemporary thought schools offer alternative solution suggestions through analysis of economic problems from different perspectives. Consequently, macroeconomic general balance theories provide different results in terms of economic sizes.

##### **3.1.1 Classical Economic Thought**

Classical theory rooted in 1770s cover the first systematic efforts in explaining fundamental macroeconomic variables such as national income, general price levels, employment, consumption, savings and investment. Foundations of classical economic thought were laid by Adam Smith(1723-1790). Classical theory argues that the state should not intervene in economic life and it proposes the use of monetary policy vehicles should intervention becomes necessary to eliminate temporary imbalances. According to classicists, the main condition which balances the economy is competition. If a fully competitive environment is provided in an economy, operation of the free market mechanism will automatically enable balance. For this reason, the "*let them do-let them pass*" philosophy is applied. Classical economists rely on individualized gain and rational behaviour. Individual gain is in the interest of the society(Özgülven, 1997: 91). Thus, individual gain is the engine of all economic activity. While people are engaged in the pursuit of self-gain, an invisible hand draws them to also provide for the general benefit. Money and price mechanism is an example of this. Adam Smith saw capital accumulation as the condition of economic development. In brief, classicists defend the concept of "*each supply creates its own demand*" and money does not have any significance even for the short term in terms of total demand. In other words, they claim that level of employment will not have a problem requiring intervention of the State. According to classicist economists, if full competition rules are in effect then state intervention with monetary and financial policies are not required. Conversely, if insufficient competition rules are in effect then state intervention with monetary and financial policies (Bocutuğlu, 2011:15). However, beginning with the first quarter of 20th century, the economic balance advanced by classicists suffered, and with increasing imbalances as well as changes in the concept of social state, caused the modification of classic-liberal economic thought and increased intervention of the State in economy. The economic crisis which began in the USA during 2008 and became global, renewed the questioning of capitalism and pushed the understanding of social state to the forefront.

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### **3.1.2 Neo-Classic View**

1870s onward, Marginalism, which can be considered a revision of Classic view, was put forward. Also called the Neo-Classic thought, this theory pushed the supply and cost issues to the background and brought the consumption, demand and benefit concepts to the foreground. Marginalists have conducted much analysis of the behaviour of small decision units such as producers and consumers. Thus, while macroeconomic approach advanced by Classicists was being preserved the microeconomic issues came to forefront.

### **3.1.3 Keynesian Theory**

Up until the Great Depression, nearly everywhere around the world, the classical thought and *let them do* political view was in effect. While the classic economic thought was reversed by John Maynard Keynes' (1891-1947) study titled "General Theory of Employment, Interest and Money" published in 1936, the foundation of macroeconomic theories were laid. Behind the analysis developed by Keynes in General Theory were the shortcomings of Neoclassic model's ability to explain how the world operated and its inadequacy after 1929 world economic depression. In short, economists and politicians lost faith in classical theory when faced with the situation after the great depression, and economists were engaged in search of an alternative model which could explain the depression. In this respect, Keynes' General Theory was the best analysis which explained the depression and tabled the ways out of the crisis. In contrast with Classic and Neoclassic thought, the Keynesian theory argues that the balance reached by the economy will not always be the desired one, imbalance situations such unemployment, inflation and stagnation could be frequent, such situations could not be overcome by the economy itself, and therefore the State's intervention with the economic life is inescapable. When the State intends to intervene, it must initially use financial policy vehicles followed by monetary policy vehicles (Karakayalı, 2002: 282). Keynesian economics defends that prosperity level can be raised by the use of policies, mainly money, finance and credit, foreign trade, commerce, indirect controls, and government entrepreneurship (Aktan, 1990: 211).

The Keynesian theory which was widely accepted after the 1929 world economic crisis and viewed as revolutionary was questioned due to economic developments after the 2nd World war, and the theory was totally inadequate in the face of stagflation which began in the 1960s and became concrete in 1974 world petroleum crisis. Because, two events argued to have opposing relationship by Keynes and unforeseen to coexist, namely inflation and unemployment, were experienced jointly (Öcal, 1989: 236). Although Keynesian models were severely criticised after 1960s, his views even today are central to many arguments.

### **3.1.4 Monetarism**

As an alternative to these two macroeconomic approaches, the monetarist approach (Monetarist view) was proposed by Milton Friedman, a Nobel laureate professor of Chicago University. The M.Friedman thought labelled as Monetarism in 1968 by Karl Brunner who explained the effect of money on economic activities within the context of a mechanism different from the IS-LM model of the General Theory. According to economists defending this view, the real reason of instabilities in the economy are the monetary policies arbitrarily implemented by the governments. Increase in the money supply should be as much as the increase in national income. According to the Monetarist thought, in order to reach a certain a

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growth rate and to provide direction for the growth in pursuant years, increase in money and credit amounts is aimed. Monetarists desire to increase the money volume without due consideration of inelasticity of supply. Volume of money is expanded either by the Central Bank or by special credit institutions. When required, special credit institutions obtain the support of the Central Bank (Özgül, 1988: 171). For Friedman, economic instability is an event related to changes in the money supply amount and arises from the intervention of State and banks in the economic system. In this conjunct model developed by Milton Friedman, money supply is the determinant in national cash income, cash payments, their change limits and prices. Money supply affects with some delay the cash expenditure, income and prices. Although money supply is variable, the function of money demand is stable. Money supply is an external effect on the economic system. Changes with the effect of State and banking system, and is independent of price and cash income variations. The money supply variation limit takes place prior to conjuncture waves. Prior to peaking of general business life, money supply variation limit peaks. It dips prior to the leveling off of business life at the lowest point. The degree of periodic changes in cash income are more severe than the money volume. If this is the case then "money multiplier" can be mentioned: "Money Multiplier" is defined as the relative variation in relative income/relative money supply" (Kazgan, 2000: 255-258).

This new theory, unlike the classic theory or Keynesian theory, does not yet have a specific framework including all markets (labour, goods and money markets). What is more interesting, while Keynesian in regard of many subjects, it approaches the Classic theory in some respects (such as importance of money, stable speed of money changing hands, determination of consumption expenditures by money supply, increase of money supply causing price increases) (Savaş, 1982: 159). Even so, Monetarists have criticized the Classic Amount Theory from some angles. According to the Monetarists, in the Classical Amount Theory formula expressed as  $MV=PT$ , the money circulation speed ( $V$ ) is not constant and is a stable function of certain variables. The effect of money supply on nominal GNP materializes with portfolio sized changes present in money demand function (Şiir, 1981: 373-374). Monetarism developed by Friedman's analyses is also known as the "Modern Amount Theory" (see Vane and Thompson, 1979; Greenhut and Stewart, 1983). According to Monetarists, in order to survive economic crisis periods, increasing public expenditure by printing money paves the way for increase in inflation. For this reason, in order to overcome the crisis, the inflation must first be stopped. After the control of inflation, the economy will itself enter a process of revival (Pehlivan, 2008: 53).

### ***3.1.5 Theory of Rational Expectations***

Rational Expectations Theory has been first advanced by J. Muth in 1961. Muth, in his article titled "Rational Expectations and Price Movements Theory", explained that economic units possess rational expectations during inflationary periods (Muth, 1961: 315-335). In 1970s, this theory further developed by R. Lucas, T. Sargent, N. Wallace and Robert Barro has formed an important stage in economic analyses (see Lucas and Rapping (1969); Sargent (1976); Kantor (1979)). In rational expectations theory, reflections of future expectations on economy have been included in the analysis. According to new classic economists, people take optimal decisions by using all existing information. In the Rational Expectations Theory, the future expectations of decision units in view of policies and the assumption that they will immediately react is at the forefront. So much so that according to this theory, governments' desire to affect changes on the employment and national income by

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applying decisions concerning money supply, expenditures and taxes can be rendered ineffective by the assumptions and, based on these assumptions, the reactions of households and companies(Dinler, 1995: 282).

### ***3.1.6 Supply Side Economics***

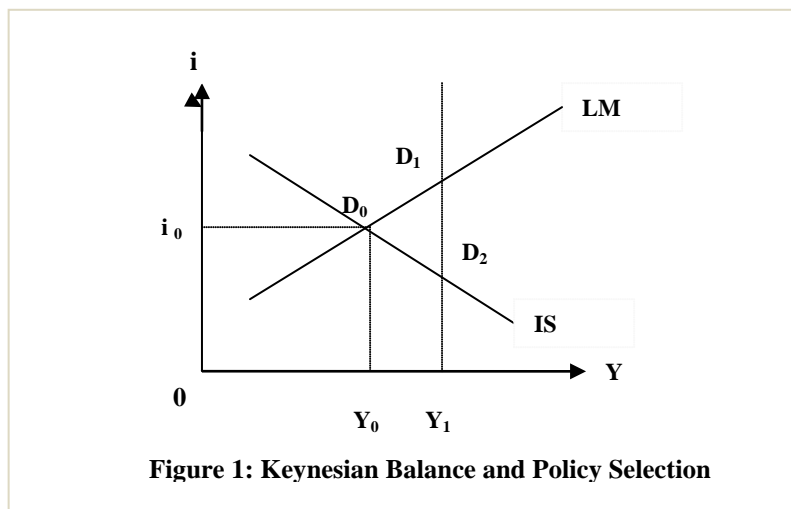
American economist Milton Friedman is the pioneer of supply side economics. This thought is a new view oriented toward renewed importance and reinclusion of classical economy understanding in the agenda. Supply side economic policies generally involve reduction of public sector share in the economy, limitation of expenditures for fighting inflation and tight monetary policy measures. Supply side economy has been applied by the US president Reagan and British prime minister Thatcher in the 1980s. Supply side economic policies which put production related measures at the forefront are also known as “Reaganomics” or “Thatcherism”. According to supply side economists, most problems such as unemployment, growth inflation and balance of payments are related to the supply side of the economy. Majority of the supply side economics involve market oriented policies such as downsizing of public sector, reduction of public expenditure, tax reductions to incentivize production, weakening of labour unions, privatization, liberalization, free trade and capital movements(Parasız, 1996: 14). In short, for revival in supply side economics, production must be encouraged.

As seen, for increasing total demand following the 1929 great crisis, Keynesian thoughts which defended increase in public expenditures have lost their importance from 1980 onward and were replaced by views oriented toward limitation of public expenditures in 1990s.

### **3.2 Keynesian Theory and Policy Determination**

J.M.Keynes’ thoughts found in the General Theory turned upside down the theoretical basis and basic principles of traditional Classic and Neo-Classic concept of "self-construed employment balance". New concepts and analysis techniques brought by Keynes to the theory of economics created new horizons for the theory of economics and econometrics in latter periods.

Keynesian system, from an analytic perspective, basically emphasizes two points: **a)** In the IS-LM model, economy can not self-balance in full employment. Possibility of balance is a special situation. There may be insufficient employment levels and balance points. **b)** Balancing of economy in full employment requires financial policies in the event monetary policy becomes inadequate under certain conditions. In this regard there are two alternative applicable policies: monetary policy and financial policy, as shown in Figure-1.



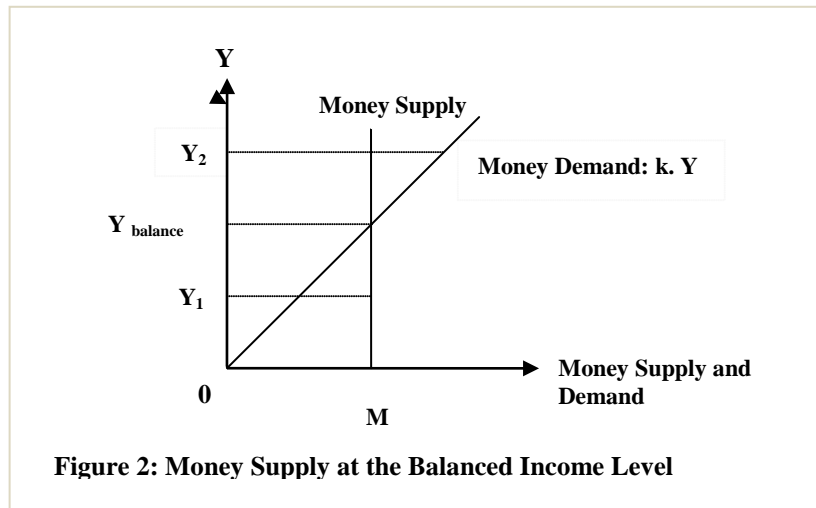
In Figure-1, economy is in balance at  $D_0$ , the intersection of IS-LM curves.  $D_0(i_0 - Y_0)$  balance point, shows the  $Y_0$  product plane in insufficient employment. In order to carry the economy to  $Y_1$  full employment product plane, one of the two alternative policies is to force the IS curve to the right in a way to cross the  $D_1$  point by following expansionist finance policy. The second way of moving economy to full employment is to force the LM curve to the right in a way to cross the  $D_2$  point by following expansionist monetary policy. Although the effects of Figure-1 depicted alternative policies on GNP are identical, their effects on public and private sector will be different. Finance policy causes a reduction of dynamism and an increase of public sector share-weight in the economy.

In contrast, the monetary policy, as opposed to finance policy, through lowering of interest rate and increasing of investments, on the one hand raises business sector share-weight in the economy and on the other, speeds up economic growth (Ünsal, 2005: 228-229). For this reason, growth based on private sector prefers monetary policy, and Statism based growth in lieu of market mechanism prefers finance policy.

### 3.3 Money and Nominal GNP Relationship According to Monetarist View

According to Monetarist theory, the parameters determining the relationship between money supply and GNP show different characteristics depending on recession and full employment status of the economy. In a narrower sense monetarism implies that the money supply amount is the most influential variable on the nominal GNP, and in a wider sense, it could be said that monetary approach includes a series of fundamental key propositions. According to American economist Milton Friedman, although not absolute, there is a relationship between the growth rate in money supply and nominal income growth rate. On the average, increase in the money supply affects nominal incomes within 6 to 9 months.

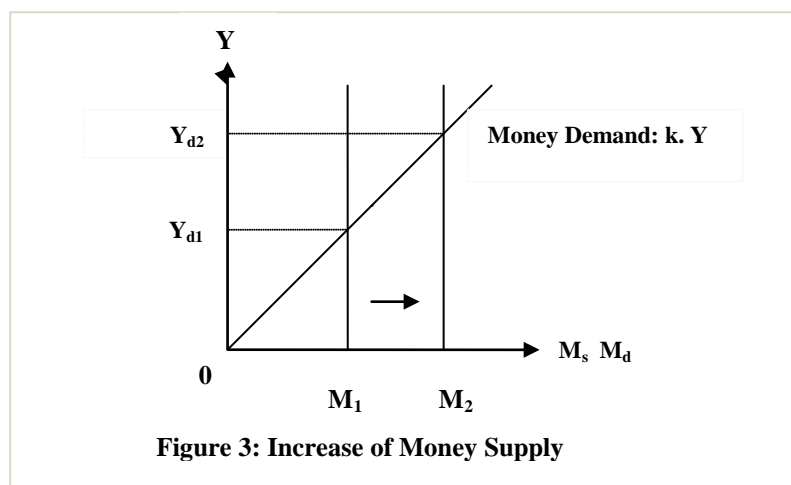




If the money supply is increased during the economic recession period then expenditures, employment and real production also rises. If the economy is at balance in full employment situation, then, the increase in GNP due to risen money supply will be a nominal increase affecting the general price levels.

According to Monetarists, the expenditures for real goods and services increases the GNP up to a certain point. Thus the relationship between the money supply and GNP will be same with the one prior to Central Bank's increase of the money supply. In this relationship assessed according to the money circulation speed, when the GNP reaches a point equal to its initial rate, people will hold the increased money supply only as a tool of exchange and hence expenditures will reach Y balance position at a certain level.

In Figure-2, at the intersection of money supply and money demand, the balanced income level is formed. If the money in the hands of people is less than the desired ( $Y_2$ ) then expenditures will decrease and the income will drop to Y balance position. If the money on hands is higher than the desired then expenditures will increase and income will rise to Y balance position. In the event when people have more money than the expected, this will increase the expenditures until money supply and money demand equality is reached.



Money demand is expressed as a simple ratio ( $k.Y$ ) of income. If income is expressed as multiple of money supply, the amount of money demanded will be equal

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to money supplied(Figure-3)(Karakayalı age., 2002: 294). According to the modern theory, acceptance of money circulation speed as constant is the basic characteristic which equates the increases in money supply and money demand.

#### 4. ECONOMETRIC THEORY AND METHODOLOGY

St. Louis model can be easily used in the measurement of short term interactions between money supply, public expenditures, prices, production and unemployment. Purpose of the model is to shed light on stability policies by measuring the potential effect of monetary expansion on total expenditures in addition to providing information on how monetary and finance policy parameters affect economic activity through which strategic variables (Keyder, 2005: 423).

The effect of a unit change in money supply or public expenditure on nominal GNP is not momentary and spreads over time. The St.Louis model formed for this purpose is one of the examples with delay distribution. In order to determine whether Nominal GNP variations can be explained either by changes in the money supply(monetarism) or public expenditures(Keynesian), two model types below have been developed(Gujarati, 1999: 489-500):

$$\begin{aligned}\Delta Y_t &= \alpha + \beta_0 \Delta M_{1t} + \beta_1 \Delta M_{1t-1} + \beta_2 \Delta M_{1t-2} + \beta_3 \Delta M_{1t-3} + \dots + \beta_i \Delta M_{1t-i} + u_{1t} \\ &= \alpha + \sum_{i=0}^k \beta_i \Delta M_{1t-i} + u_{1t}\end{aligned}\quad (1)$$

$$\begin{aligned}\Delta Y_t &= \alpha + \beta_0 \Delta M_{2t} + \beta_1 \Delta M_{2t-1} + \beta_2 \Delta M_{2t-2} + \beta_3 \Delta M_{2t-3} + \dots + \beta_i \Delta M_{2t-i} + u_{1t} \\ &= \alpha + \sum_{i=0}^k \beta_i \Delta M_{2t-i} + u_{1t}\end{aligned}$$

$$\begin{aligned}\Delta Y_t &= \gamma + \lambda_0 \Delta E_t + \lambda_1 \Delta E_{t-1} + \lambda_2 \Delta E_{t-2} + \lambda_3 \Delta E_{t-3} + \dots + \lambda_4 \Delta E_{t-4} + u_{2t} \\ &= \gamma + \sum_{i=0}^k \lambda_i \Delta E_{t-i} + u_{2t}\end{aligned}\quad (2)$$

(3)

Here,  $\Delta Y_t$  = Nominal GNP growth rate in period t

$\Delta M_{1t}$  = money supply(in  $M_1$ ) growth rate in period t

$\Delta M_{2t}$  = money supply(in  $M_2$ ) growth rate in period t

$\Delta E_t$  = growth rate of public expenditure at full or high employment level in period t

These models are  $k$  period, finite and delay distributed.  $\beta_0$  and  $\lambda_0$  coefficients in models (1), (2) and (3) are known as short term or effect multiplier, and expresses the change in mean value of Y against unit change in M and E for the same period. If changes in M and E are kept the same,  $(\beta_0 + \beta_1)$  and  $(\lambda_0 + \lambda_1)$ , also  $(\beta_0 + \beta_1 + \beta_2)$  and  $(\lambda_0 + \lambda_1 + \lambda_2)$  values in the next period explain the variation in mean value of Y for the next period in both models. These partial sums are referred to as interim period or interim multipliers. Finally, at the end of  $k$  period, becomes:

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$$\sum_{i=0}^k \beta_i = \beta_0 + \beta_1 + \beta_2 + \dots + \beta_k = \beta$$

(4)

$$\sum_{i=0}^k \lambda_i = \lambda_0 + \lambda_1 + \lambda_2 + \dots + \lambda_k = \lambda$$

(5)

and for both models, providing that  $\beta$  and  $\lambda$  sum exists, it is defined as long term or delay distributed multiplier. Model's "standardized"  $\beta_i$  and  $\lambda_i$  sum is calculated with the formula  $\beta_i^* = \beta_i / \sum \beta_i$  ve  $\lambda_i^* = \lambda_i / \sum \lambda_i$  and these values provide the total or long-term effect ratio occurring in a certain period.

In regression models formed with the use of time series, if the model descriptive variables include the current and delayed(past) values, then this is referred to as distributed delay model(Gujarati, 1999: 584). When model-specific estimated descriptive variables  $M_t$  and  $E_t$  of delay distributed models are assumed as improbable(or, at least as unrelated to  $u_t$  distortion then  $M_{t-1}$ ,  $M_{t-2}$ , and  $E_{t-1}$ ,  $E_{t-2}$ , in the model and others that follow are also improbable. If that is the case, ordinary least squares method in principle can be applied to the St.Louis model.

Since it is difficult to select either of competing models, they are combined as follows:

$$\Delta Y_t = \varphi + \sum_{i=0}^k \beta_i \Delta M_{1t-i} + \sum_{i=0}^k \lambda_i \Delta E_{t-i} + u_{3t}$$

(6)

Resulting model is the famous nested model formed and foreseen by the monetarist St.Louis Reserve Bank(Gujarati, 1999:489)<sup>1</sup>. Effect of nominal GNP on growth rate for the period of 1953-I to 1976-IV in the USA has been investigated with this model(M.Carlson, 1978: 17-18).

When estimating distributed delay models progress is made in stages, regressions are obtained first of  $Y_t$  to  $M_t$ , later of  $Y_t$  to  $M_t$  and  $M_{t-1}$ , then of  $Y_t$  to  $M_t$ ,  $M_{t-1}$  and  $M_{t-2}$  and so it continues. Similarly, same is applied to the descriptive  $E_t$  variable. This step by step progress stops when the coefficients of delayed variables become statistically meaningless and/or when at least one variable coefficient sign changes from positive to negative or vice versa(Alt 1942: 113-129). If in period t the growth rate of nominal GNP is non-dependent variable  $\Delta M_{1t}$  effective on dependent variable  $\Delta Y_t$  then  $\beta_i$  parameter's, otherwise the  $\lambda_i$  coefficients of  $\Delta E_t$  variable should be statistically meaningful. Thus, in this nested model, the correct model explaining the dependent variable is decided. In particular, in determining the effect of competing descriptive variables on the dependent variable, even though the artificially nested model has no economic meaning, is helpful in the identification of influential variable from analysis perspective.

In this study an analysis, for determining which of the monetarist or Keynesian policies are more effective on nominal GNP variations, has been done by forming

<sup>1</sup> A model defined as  $Y_t = \beta_1 + \beta_2 X_{2t} + \beta_3 Z_{2t} + u_t$  in econometry can be a nest for C and D models or comprise them. In both of C and D models, same descriptive variables can be permitted. In this case a linear function of Y, X<sub>2</sub> and X<sub>3</sub> in C model, and in the D model a linear function of Y, X<sub>3</sub> and Z<sub>2</sub> can be presejnt. Here, C is nested in D. Because in C, Z<sub>2</sub> does not exist. D is nested in the C model. Because in D, the X<sub>2</sub> is absent.

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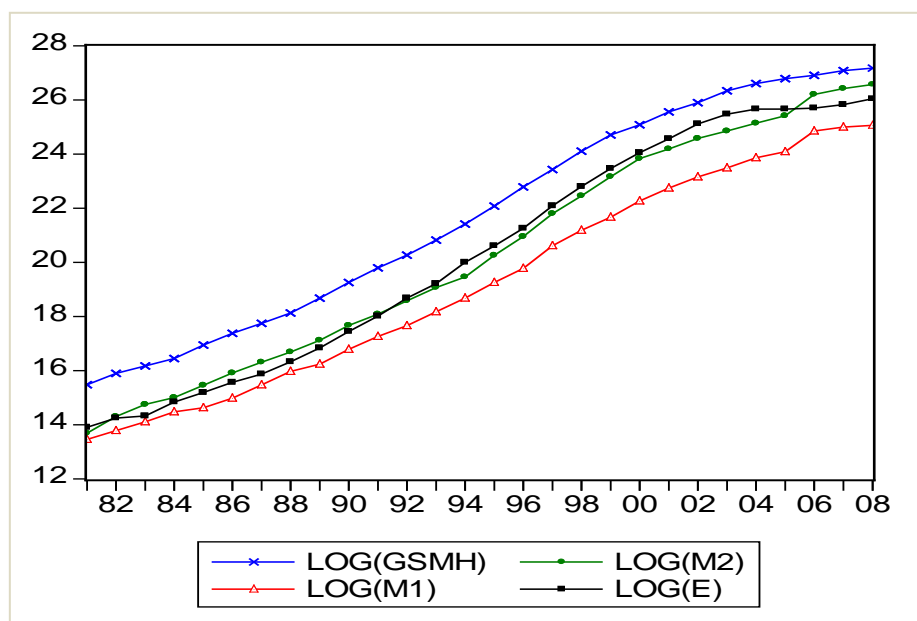
St.Louis model, and the parameters obtained have been interpreted according to statistical test results, and the validity of the model for Turkey has been investigated.

## 5. DATA

Objective of data collection for econometric studies is to measure truth in order to establish economic reality and relevant relationships, and to express it numerically for the benefit of econometry(Kılıçbay, 1983: 424).

Econometricians working with the time series often use delayed data. It is observed that in many economic models the time series variables are delayed or prioritized. A variable's delay or prioritization, for example, on a variable such as  $Y_t$ , is done by a similar function. Generally, the delay notation is defined as  $Y_{t-i}$ ,  $i = 1, \dots, k$ . Here,  $i = 1$  is the beginning of delay and  $i = k$  represents the longest(highest) delay. In the time series, delay and prioritization are used on the basis of symmetry principle(Sevüktekin and Nargeleşkenler, 2005: 100-101). The time series data concerning the variables used in this study are in annual terms and cover the period of 1981–2008. In order to determine the relationships among dependent and non-dependent variables in the St. Louis model, EViews 5.0 software package has been used for data analysis.

All of the data for variables in the model has been sourced from Central Bank of Turkey and Institute of Statistics in Turkey. GNP growth rate, Money supply and growth rate in public expenditure have been calculated from data for the mentioned period and have been used in model analysis. Data concerning 1981–2008 period regression variables are presented in the appendix. Figure-4 shows the logarithmic time graph of data used in the analysis.



**Figure 4: Nominal GNP, M1 and M2 Money Supply, Public Expenditure Data(1981-2008)**

It can be seen that the time series data for dependent(GNP) and non-dependent variables in the model have an rising structure which follows a linear gradient, in other words have an intersecting and increasing trend. Since annual growth rates are

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used in the variables of St. Louis model it was deemed unnecessary to apply separate unit root test.

In an economy, the amount of money in circulation is called money supply. Economists money consisting of cash, non-term and similar deposits against which a cheque can be issued as transaction monies or as M1 in short. The sum of M1 (transaction money) and similar (term deposits convertible to non-fixed term deposits or similar less liquid assets) (Ünsal, 2005: 505-506).

In modern economies, large portion of expenditures are made with M1. In developed countries, this ratio is above 80%. M1 is an important financial asset ready to be used in the economy at any time. Money in circulation does remain entirely in the hands of people. A portion of the cash remains in the vaults of treasury, central bank and commercial banks. When fixed-term deposits are added to the M1 money definition, M2 money definition is formed. A financial asset's ease and speed of conversion to a tool of exchange is referred to as *liquidity*. In this respect, financial assets within the scope of M1 are the most liquid or fully liquid assets. In interpreting economic events it is very important to know what money supply is. There is a strong relationship between the money supply variable and macroeconomic events. According to Monetarist economists, if money supply is known, the effect of money on economy can be easily calculated. For this reason, in the study subject St. Louis equation, M1 and M2 monetary amounts are included in the analysis and the model is applied.

$$M1 = \text{Cash} + \text{Non-Term Deposit} + \text{Other Chequing Deposits}$$

$$M2 = \text{Cash} + \text{Non-Term Deposit} + \text{Other Chequing Deposits} + \text{Term Deposits and Similar (less liquid) assets}$$

In addition to these, defined by the Central Bank of Turkey, there are two more separate monetary quantities as M2Y and M2YR. These included in the total money supply of economy are:

$$M2Y = M2 + \text{National Foreign Currency Accounts}$$

$$M2YR = M2Y + \text{Repository Purchase Agreements}$$

and consist of money and similar financial assets. However, these have not been included in the regression analysis of St. Louis model.

## 6. EMPIRICAL FINDINGS

The St. Louis regression model formulated for identification of policies effective on the variations occurring in the nominal GNP of our country has been estimated through the use of OLS method. In the study, an assumption is made which accepts that the delayed values during the  $t$  and  $t-i$  periods of M1 money supply and (E) public expenditure variables are effective on nominal GNP. In two separate delay distributed models formed for this purpose, the EViews 5.0 software package estimated results of parameters which indicate the regression relationship between the dependent and non-dependent variables have been provided as attachment at the end. Initially, the nominal GNP, money supply (M1) and public expenditure relationship St. Louis model has been estimated, and the findings obtained are shown below:

**Table 1:** Nominal GNP, Money Supply(M1) and Public Expenditure Relationship

St.Louis Model Estimate Results

$$\Delta Y_t = \phi + \sum_{i=0}^k \beta_i \Delta M_{1t-i} + \sum_{i=0}^k \lambda_i \Delta E_{t-i} + u_{3t}$$

<i>Parameters</i>	<i>Estimate Values</i>	<i>Standard estimate values</i>	<i>s(β<sub>i</sub>)</i>	<i>t ratio</i>
$\phi$	0.247478		0.09247	2
$\beta_0$	0.094556	-0,349847194	0.10629	6
$\beta_1$	0.034968 <sup>1</sup>	-0,1293779	0.09755	0
$\beta_2$	-0.180848	0,669118463	0.10016	9
$\beta_3$	-0.218954	0,810106631	0.10549	6
$\sum_{i=0}^3 \beta_i$	- <b>0.270278<sup>2</sup></b>	<b>1</b>		
$\lambda_0$	0.269921 <sup>1</sup>	0,348976811	0.13306	6
$\lambda_1$	0.609352	0,787822058	0.13994	2
$\lambda_2$	0.113001	0,146097297	0.11940	7
$\lambda_3$	-0.218810	-0,282896166	0.12408	2
$\sum_{i=0}^3 \lambda_i$	<b>0.773464<sup>2</sup></b>	<b>1</b>		
	<b>R<sup>2</sup> = 0.9010</b>	<b>R̄ = 0.8515</b>	<b>D.W = 2.0524</b>	<b>F =</b>
<b>18.214</b>	<b>S.E = 0.1086</b>	<b>n = 25</b>	<b>sd = 16</b>	

<sup>1</sup> Short term multiplier, <sup>2</sup> Long term multiplier.

The regression relationship between Money supply M1 and M2 variables, and nominal GNP yielded similar results. The EViews 5.0 software estimate parameters, when instead of model non-dependent M1 variable, M2 series is taken which is a money supply variable in a wider context:

**Table 2:** Nominal GNP, Money supply(M2) and Public Expenditure Relationship

St.Louis Model Estimate Results

$$\Delta Y_t = \phi + \sum_{i=0}^k \beta_i \Delta M_{2t-i} + \sum_{i=0}^k \lambda_i \Delta E_{t-i} + u_{3t}$$

<i>Parameters</i>	<i>Estimate</i>	<i>Standard Estimate</i>	<i>s(β<sub>i</sub>)</i>	<i>t ratio</i>
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	<i>Values</i>	<i>values</i>		
$\Phi$			0.06084	
	0.224996		1	3.698100
$\beta_0$	0.073585 <sup>1</sup>	-0,310152832	0.07237	1.016682
			7	
$\beta_1$	0.079003	-0,332989117	0.07053	
			6	1.120043
$\beta_2$	-0.196371	0,827682568	0.07559	-
			4	2.597720
$\beta_3$	-0.193471	0,815459381	0.07963	-
			2	2.429556
$\sum_{i=0}^3 \beta_i$	-	<b>1</b>		
	<b>0.237254<sup>2</sup></b>			
$\lambda_0$	0.314654 <sup>1</sup>	0,39041186	0.11329	
			3	2.777360
$\lambda_1$	0.638521	0,792254893	0.12840	
			4	4.972765
$\lambda_2$	0.005690	0,007059956	0.09866	
			6	0.057667
$\lambda_3$	-0.152911	-0,189726709	0.09188	-
			3	1.664181
$\sum_{i=0}^3 \lambda_i$		<b>1</b>		
	<b>0.805954<sup>2</sup></b>			
	<b>R<sup>2</sup> = 0.9298</b>	<b><math>\bar{R} = 0.8947</math></b>	<b>D.W = 1.9551</b>	<b>F</b>
	<b>= 26.498</b>			
	<b>S.E = 0.0915</b>	<b>n = 25</b>	<b>sd = 16</b>	

<sup>1</sup> Sort term multiplier, <sup>2</sup> Long term multiplier

Two separate St.Louis models formed in consideration of money supply M1 and M2 variables yielded approximately identical estimate results. For this reason, statistical tests and interpretation was done according to parameter estimates on the basis of money supply M2 variable values. Parameters obtained through the solution with M2 values show that money supply delay distributed effects are progressively reduced. Similarly, the coefficients of delayed non-dependent variables identifying the relationship between the public expenditure and nominal GNP are also progressively reduced, becomes negative in the period t-3 and loses statistical meaning. The negative values of delayed effects in some years show the instability of policies applied.

In the short term St. Louis equation, the marginal effect of M2 money supply variable on nominal GNP has been calculated as 0.073585. That is, a single unit variation in M2 money supply creates a 0.073585 unit change in the nominal GNP. The *t* statistic calculated for  $B_0$  parameter in the model is not meaningful. The effect of delayed values of M2 money supply variables for the period  $t - 1$  have a positive delayed effect on the GNP, and the effect of delayed values for the  $t - 2$  and  $t - 3$  periods are negative. With an error margin of  $\alpha = 0.05$ , the model yielded *t* statistic values of  $\beta_0, \beta_1$  parameters are meaningless, and the *t* statistic values of  $\beta_2, \beta_3$  parameters are meaningful.

The effect of variations in public expenditure(E) on nominal GNP during period  $t-1$  is 0.314654 and positive, and the  $t - 1$  and  $t - 2$  periods effects are calculated respectively as 0.638521 and 0.005690. The  $\lambda_0, \lambda_1, \lambda_2$  parameter values show that there is a positive and linear regression relationship between the public expenditures and nominal GNP. The  $t - 3$  period parameter value is  $\lambda_3 = -0.152911$ , and shows that there is a negative direction relationship. In the model, statistical parameter values calculated for public expenditures  $E_t$  and  $E_{t-1}$  are found to be statistically meaningful. However, as the delay period increases, the degree of effect decreases. When the cumulative effects of variations in the money supply(M2) and public expenditures on the nominal GNP growth rate are compared, the values  $\sum_{i=0}^3 \beta_i = -0.23725$  and  $\sum_{i=0}^3 \lambda_i = 0.80595$  are found in order. These values are either total or distributed delay multipliers for money supply and public expenditure variables. While the first of these is not statistically meaningful, the second is. According to this coefficient value, the single unit variation of non-dependent M2 in  $t$  period causes a -0.237254 unit change on the long term on dependent variable Y. In a similar way, a single unit variation of public expenditures(E) in period  $t$  causes in the long term a 0.805954 unit change on dependent variable Y. The findings obtained by St. Louis model analysis results imply that determinant policy is the expansionist finance policies(Keynesian policies) based on increased public expenditures.

In the model, regression standard error is  $s=0.091505$ . In an economic model the first measure of the suitability of regression line is the standard error of estimate. Standard error of estimate is dependent on the size of differences between  $s, Y_i$  and  $\hat{Y}_i$ . Low value of  $\sum(Y_i - \hat{Y}_i)^2$  is indicative of  $\hat{Y}_i$  approaching  $Y_i$ , in other words suitability of regression line(Genceli, 1989: 97-98). The standard error of estimate in the model is a measure of distribution around the regression line representing average relationship. Additionally, model's  $s(\beta_i)$  standard error values can be seen to be close to coefficients of variables, and lower than parameter coefficients for all variables. For this reason, it can be stated that the model is valid and fairly good.

When statistical meaningfulness is mentioned in econometry, what's understood is the test which determines whether the estimated coefficient of any variable is statistically equal to zero or non-zero(Yamak and Köseoğlu, 2001: 309). In the model, the  $t$  distribution is  $t_{0.05,16} = 2.120$  according to degree of freedom. The  $t$  test is not in the direction of model's partial regression parameters as being equal to zero as a whole. In the model, the  $t$  statistics values calculated for  $\beta_2, \beta_3, \lambda_0, \lambda_1$  parameters have been found to be greater and more meaningful than the critical  $t_{tab}$  value. Whereas, the  $t$  statistics values calculated for  $\beta_0, \beta_1, \lambda_2, \lambda_3$  parameters have been found to be much smaller than  $t_{tab}$  and meaningless. In the model, the effect of  $\beta_0, \beta_1, \lambda_2, \lambda_3$  parameters on the dependent variable is zero and meaningless. Whereas, the effect of variations formed in the  $\lambda_0, \lambda_1$  parameters on the dependent variable have been found to be important and statistically meaningful.

In order to test the estimate parameters as a whole it is necessary to use the F test. In an econometric model, with the F test meaningfulness of the parameters in their entirety, excluding the constant parameter in the multi-linear regression, can be tested(Gürüş ve Çağlayan, 2000: 246). In the F test, two hypotheses, one being the foundation and other an alternative, are established:

$$H_0: \beta_0 = \beta_1 = \dots = \beta_k = 0$$

$$H_1: \beta_0 \neq \beta_1 \neq \dots \neq \beta_k \neq 0$$



Alternative hypothesis expresses incorrectness of the basic hypothesis. In the F test, the explained variation is proportioned to the unexplained variation. Model's F table value, according to degrees of freedom, is seen to be at the meaningfulness level  $\alpha = 0.05$  as  $F_{\text{tab}} = 2.59$ . It was calculated that  $F_{\text{hes}} = 26.498$ . In the St.Louis model,  $F_{\text{tab}} < F_{\text{hes}}$  and  $H_0$  hypothesis is rejected.  $H_1$  is accepted. In this situation it can be said that estimate parameters are non-zero and meaningful.

In the St.Louis model, multi-specificity coefficient is  $R^2 = 0.9298$  and  $(1 - R^2) = 0.0702$ . This means that 92,98% of variations in the growth rate of nominal GNP is caused by changes in the M2 money supply and public expenditures, and 7.02% is due to non-specific reasons outside of non-dependent variables. The multicorrelation coefficient is calculated as  $R = 0.9642$ . Multicorrelation coefficient(R) shows the degree of relationship between the dependent Y variable and  $M2_i$  as well as  $E_i$  non-dependent variables. This means that to the degree it approaches 1, the correlation coefficient shows that relationship between the dependent and non-dependent variables are strong, and as it nears zero, the weakening of relationship. In general, it can be said that in the St.Louis model there is a strong positive relationship between the dependent variable Y and non-dependent variables affecting the nominal GNP growth rate.

In the St. Louis model, D.W=1.9551 has been obtained. In accordance with data sample size and number of data descriptive variables, the  $d_L$  and  $d_U$  threshold values at the 5% meaningfulness level is found in the Durbin-Watson d statistic table as  $d_L = 0.702$  and  $d_U = 2.280$ . Since the relationship between the calculated critical table value and d statistic is  $d_L \leq d \leq d_U$ , numerically  $0.702 \leq 1.9551 \leq 2.280$ , the d statistic falls into the uncertainty area. For this reason, it is not possible to decide whether there is a positive or negative sequential dependence in the model.

## 7. CONCLUSION

Money supply and public expenditures are important quantities in terms of macroeconomics. In a country, money supply and public expenditure policies are variables extremely effective on GNP. The economic policies must be stable in terms of macroeconomic growth.

Goal of this study was to respond to the question whether monetary policies or Keynesian policies had been more effective on the variations of nominal GNP. The applicability of St. Louis model formed with this purpose was tested for Turkey and the results were interpreted. Findings indicate that this model is valid for our country.

In the short term St. Louis equation the marginal effect of E variable, money supply, M2 and public expenditures on nominal GNP is positive. In the model, the effectivity degree of delayed values of non-dependent variables on nominal GNP decreases in relation to delay duration lengths. It has been found that with the exception of  $\beta_2, \beta_3$  parameters, for delayed values of M2 variable the t test is meaningless, and for E public expenditures, the t statistic is meaningful for  $E_t$  and  $E_{t-1}$  variables.

What meaning is there in the analysis findings of the St. Louis model? If we compare the cumulative effects of variations in the money supply(M2) and public expenditures on the growth rate of nominal GNP, respective  $\sum_{i=0}^3 \beta_i = -0.23725$  and  $\sum_{i=0}^3 \lambda_i = 0.805954$  values are found. These values are either total or delay distributed multipliers for money supply and public expenditures variables. While first of these is not statistically meaningful, second one is meaningful. This comparison provides similar results as the famous St.Louis model developed by the

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monetaristically inclined St.Louis Federal Reserve Bank and applied in the USA from 1953-I to 1976-IV. The parameters obtained from analysis and statistical tests exhibit an inclination in support of the Keynesian thesis that public expenditures variations are determinant in nominal GNP variations. In other words, the answer to the question whether monetary or Keynesian policies have been effective on the variations of nominal GNP in Turkey is that the determinant policy has likely been the Keynesian policy(expansionist finance policies based on increased public expenditures). It can be said that Keynesian policies play a more effective role in the growth rate of nominal GNP. This situation also reveals the populist approaches applied by governments for political goals. Expansionist financial policies based on increased public expenditures are important tools used for keeping the employment and product at a certain level. But, while this situation reduces the weight of the private sector within economy, it causes an increase in the influence of the State. In this regard, the St. Louis model implementation will assist in the comparison of two alternative policies and help researchers engaged in economy and econometry fields select a better policy.

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- \_\_\_\_\_, TCMB, <http://www.tcmb.gov.tr/>

**APPENDIX-1 : St. Louis Model Time Series Data****Table 3: GNP, Money Supply and Public Expenditure Data(1980-2008)**

<b>Years</b>	<b>GNP (Milion TL)</b>	<b>MoneySupply M1 (Million TL)</b>	<b>Money Supply M2 (Million TL)</b>	<b>Public Expenditures (Milion TL)</b>
1980	5.303.210	704.000	881.900	1.101.698
1981	8.022.745	972.100	1.637.200	1.544.289
1982	10.611.859	1.341.900	2.554.200	1.664.198
1983	13.933.008	1.941.100	3.288.400	2.790.371
1984	22.967.740	2.252.700	5.179.000	3.973.317
1985	35.350.318	3.208.700	8.145.500	5.766.727
1986	51.184.759	5.255.100	12.173.200	7.844.080
1987	75.019.388	8.629.100	17.648.000	12.276.018
1988	129.175.104	11.311.600	27.194.200	20.538.796
1989	230.369.937	19.557.700	47.139.200	37.750.236
1990	397.177.547	31.398.000	71.569.600	66.820.002
1991	634.392.841	46.793.000	117.118.300	129.235.752
1992	1.103.604.909	78.341.100	190.736.200	221.214.881
1993	1.997.322.597	129.087.100	282.441.990	484.101.287
1994	3.887.902.917	230.846.900	630.348.000	890.425.204
1995	7.854.887.167	388.184.500	1.256.631.500	1.704.845.122
1996	14.978.067.282	896.854.600	2.924.893.300	3.916.254.060
1997	29.393.262.147	1.581.210.000	5.658.800.400	7.993.610.169
1998	53.518.331.580	2.562.478.100	11.423.197.800	15.466.377.899
1999	78.282.966.809	4.681.181.000	22.401.817.000	27.841.439.384
2000	125.596.128.755	7.549.243.000	31.912.095.000	46.384.290.612
2001	176.483.953.021	11.368.782.000	47.241.075.000	80.186.248.000
2002	275.032.365.953	15.827.629.700	61.879.758.700	114.963.019.060
2003	356.680.888.222	23.014.336.400	82.712.966.400	139.488.824.000
2004	428.932.343.026	28.793.391.600	108.539.245.600	139.224.735.000
2005	486.401.032.274	61.991.240.520	238.801.377.500	143.685.761.000
2006	575.783.962.136	71.770.961.550	297.734.742.600	164.151.710.000
2007	631.393.000.000	76.350.721.000	344.376.752.000	204.100.000.000
2008	702.614.000.000 <sup>1</sup>	83.199.899.000	422.482.232.000	229.535.000.000

GNP : Nominal (GNP) with total income approach (according to current producer prices)  
(<sup>1</sup>) estimated value. Source : *TUİK, İstatistik Göstergeler (2008)*, [www.Tuik.gov.tr](http://www.Tuik.gov.tr)

## APPENDIX-2 : Growth Rates

Table 4: GNP, Money Supply and Public Expenditure Growth Rates (1981-2008)

Years	GNP	Money Supply (M1)	Money Supply (M2)	Public Expenditure s
	Rate of Increase $\Delta Y/Y$	Rate of Increase $\Delta M1/M1$	Rate of Increase $\Delta M2/M2$	$\Delta E/E$
1981	0.5128	0.3808	0.8564	0.4017
1982	0.3227	0.3804	0.5601	0.0776
1983	0.3130	0.4465	0.2874	0.6767
1984	0.6484	0.1605	0.5749	0.4239
1985	0.5391	0.4244	0.5728	0.4514
1986	0.4479	0.6378	0.4945	0.3602
1987	0.4657	0.6420	0.4497	0.5650
1988	0.7219	0.3109	0.5409	0.6731
1989	0.7834	0.7290	0.7334	0.8380
1990	0.7241	0.6054	0.5183	0.7701
1991	0.5973	0.4903	0.6364	0.9341
1992	0.7396	0.6742	0.6286	0.7117
1993	0.8098	0.6478	0.4808	1.1884
1994	0.9466	0.7883	1.2318	0.8393
1995	1.0203	0.6816	0.9936	0.9146
1996	0.9068	1.3104	1.3276	1.2971
1997	0.9624	0.7631	0.9347	1.0411
1998	0.8208	0.6206	1.0187	0.9348
1999	0.4627	0.8268	0.9611	0.8001
2000	0.6044	0.6127	0.4245	0.6660
2001	0.4052	0.5059	0.4804	0.7287
2002	0.5584	0.3922	0.3099	0.4337
2003	0.2969	0.4541	0.3367	0.2133
2004	0.2026	0.2511	0.3122	-0.0019
2005	0.1340	1.1530	1.2001	0.0320
2006	0.1838	0.1578	0.2468	0.1424
2007	0.0966	0.0638	0.1567	0.2434
2008	0.1128 <sup>1</sup>	0.0897	0.2268	0.1246

GNP : Nominal (GNP) with total income approach (according to current producer prices)

(<sup>1</sup>) estimated value. Source : TUIK, *İstatistik Göstergeler (2008)*, [www.Tuik.gov.tr](http://www.Tuik.gov.tr)

Nedim Dikmen

**APPENDIX-3 : St. Louis Model EViews 5.0 Software Package Based Estimate Results-I**

In the initial model, an estimate has been made on the basis of M1 money supply and public expenditures variables' current year and delayed values. In the model, data in Table 4 are taken as basis.

Dependent Variable: SER01

Method: Least Squares

Date: 07/24/12 Time: 10:06

Sample (adjusted): 1984 2008

Included observations: 25 after adjustments

$$\text{SER01} = \text{C}(1) + \text{C}(2) * \text{SER02} + \text{C}(3) * \text{SER03} + \text{C}(4) * \text{SER04} + \text{C}(5) * \text{SER05}$$

$$+ \text{C}(6) * \text{SER06} + \text{C}(7) * \text{SER07} + \text{C}(8) * \text{SER08} + \text{C}(9) * \text{SER09}$$

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.247478	0.092472	2.676248	0.0166
C(2)	0.094556	0.106296	0.889549	0.3869
C(3)	0.034968	0.097550	0.358467	0.7247
-	-	-	-	-
C(4)	0.180848	0.100169	-1.805433	0.0899
-	-	-	-	-
C(5)	0.218954	0.105496	-2.075468	0.0544
C(6)	0.269921	0.133066	2.028481	0.0595
C(7)	0.609352	0.139942	4.354302	0.0005
C(8)	0.113001	0.119407	0.946346	0.3580
-	-	-	-	-
C(9)	0.218810	0.124082	-1.763423	0.0969
R-squared	0.901059	Mean dependent var		0.567660
Adjusted R-squared	0.851589	S.D. dependent var		0.282030
-	-	-	-	-
S.E. of regression	0.108650	Akaike info criterion		1.327666
-	-	-	-	-
Sum squared resid	0.188876	Schwarz criterion		0.888871
Log likelihood	25.59582	Durbin-Watson stat		2.052476

Nedim Dikmen

**APPENDIX-4 : St. Louis Model EViews 5.0 Software Package Estimate Results-II**

In the second model, an estimate has been made on the basis of M2 money supply and public expenditures variables' current year and delayed values. In the model, data in Table 4 are taken as basis.

Dependent Variable: SER01

Method: Least Squares

Date: 07/24/12 Time: 10:04

Sample (adjusted): 1984 2008

Included observations: 25 after adjustments

$$\text{SER01} = \text{C}(1) + \text{C}(2) * \text{SER02} + \text{C}(3) * \text{SER03} + \text{C}(4) * \text{SER04} + \text{C}(5) * \text{SER05}$$

$$+ \text{C}(6) * \text{SER06} + \text{C}(7) * \text{SER07} + \text{C}(8) * \text{SER08} + \text{C}(9) * \text{SER09}$$

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.224996	0.060841	3.698100	0.0020
C(2)	0.073585	0.072377	1.016682	0.3244
C(3)	0.079003	0.070536	1.120043	0.2792
-	-	-	-	-
C(4)	0.196371	0.075594	-2.597720	0.0194
-	-	-	-	-
C(5)	0.193471	0.079632	-2.429556	0.0273
C(6)	0.314654	0.113293	2.777360	0.0135
C(7)	0.638521	0.128404	4.972765	0.0001
C(8)	0.005690	0.098666	0.057667	0.9547
-	-	-	-	-
C(9)	0.152911	0.091883	-1.664181	0.1155
R-squared	0.929820	Mean dependent var		0.567660
Adjusted R-squared	0.894730	S.D. dependent var		0.282030
S.E. of regression	0.091505	Akaike info criterion		1.671126
Sum squared resid	0.133972	Schwarz criterion		1.232331
Log likelihood	29.88908	Durbin-Watson stat		1.955147