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PUBLIC POLICY EFFECTIVENESS ON A LOSS TO SOCIETY FUNCTION AND INFLATION DYNAMICS

By

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«Καὶ ὅσο αὐξάνεται καὶ πληθύνεται ἡ φαντασία,
τόσο πάσχει ὁ νοῦς»
Ὅσιος Νεῖλος

Abstract*

The objective of this work is to test the effectiveness of public policy on a social loss function by considering the inflation dynamics. The paper develops a few models through a variety of partial equilibrium equations from the real and monetary sector of our economy by examining public policy objectives and optimization intentions for the society. The model considers a loss to society function and measures with the utilization of various specifications the growth of different target variables, which depend on central bank's and individuals' goals and uses these potential values to forecast inflation rate, to determine price levels, and to study the dynamics of our target variables. The preliminary empirical results support the theory that prices depend on the price of oil, on the rate of interest and money supply (monetary policy), on risk (uncertainty), on production, on savings, on financial market (stock market), on unemployment, on taxes (fiscal policy), and on consumer sentiment. They also reveal the ineffectiveness of our traditional public policy, due to dramatic changes and the complexity of our socio-economic system. JEL Classifications: C53, E31, E52.

Keywords: Forecasting, Price Level & Inflation, Monetary Policy (Targets, Instruments, & Effects).

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1. Introduction

The present paper develops a model and describes a procedure, based on the central bank's and society's objectives, which are satisfied by changing money supply growth, fiscal policy, consumers' preferences, risk, and confidence; consequently, determining inflation and price level. Factors like investment opportunities, income, employment, time preferences to consumption, taxes, savings, speculations, market expectations, uncertainty (risk), consumers' and investors' behavior,[1] and liquidity affect aggregate supply and demand and therefore, price levels and interest rates. Likewise, inflation rates are functions of monetary policy, time, expectations, market perceptions, and general risks (i.e., idiosyncratic, systematic, political, greed, corruption, ignorance, apostasy, globalization, terrorism, wars, ect.). Of course, a serious question rises, now. How can we quantify all these qualitative factors and forecast our target variables?

There is widespread agreement among economists and policy makers that price stability should be the number one objective of monetary policy (another group believes that unemployment must be first in priority of policy objectives). For us a dual (or a multiple) mandate recognizing two (or eight) objectives full employment and price stability (or full employment, price stability, optimal growth, sufficient savings, low risk, affordable interest rates, optimal liquidity, and a healthy financial market) and putting them on an equal footing would be very important for any advanced and welfare state. By setting an explicit numerical target for unemployment (i.e., $\bar{u} = 3\%\ or\ 0\%$) or any other target variable, we want to look at its dynamics and forecast the price level (the inflation rate, π^{e}_{t+1}) from a variety of partial equilibrium equations. We will set an explicit numerical target for unemployment and for some other objective variables and within the context of the dual (or multiple) mandate, the inflation rate will be determined and its impulse responses will be revealed.

The goal of maximum employment can be interpreted as maximum sustainable employment that can be maintained, if possible, without upward pressure on inflation. This objective does not mean promoting maximum sustainable growth, but optimal growth (equal to the growth of population plus a small growth due to innovations, improvements, technology, and productivity). If the economy were to grow above the optimal rate for a long period; overheating, higher inflation, and waste of resources would eventually follow. Maximum employment[2] can contribute to this optimal rate of growth in

productive capacity because the labor income will affect aggregate demand, which will create the necessary supply.

Meyer (2001, p. 4) says that "the appropriate goals for monetary policy depend on the structure of the economy and the preferences of the citizenry". Our support for an explicit unemployment target within a multiple mandate reflects our views about the ideal (optimal) structure of an economy and concerning the public's preference, which is full employment for every citizen. Low inflation is also desirable because it affects costs. These costs, due to high inflation, are decreasing purchasing power of consumers (we are becoming poorer and poorer every day) and increasing interest rates inasmuch as inflation premium.

There is a high correlation between money supply and inflation (consumer price index) ($\rho_{\ln M^s, \ln CPI} = .994$), but financial innovations have weakened it.[3] Others, than demand side inflation, are supply shocks that affect prices (price of energy, cost of production, price of resources, etc.) in the short-run until we will adjust our demand (make it elastic)[4] and taxes. In the long run, central bank has the tools to achieve price stability, but our analysis tries to determine (forecast) the monthly inflation rate.

We want to see a monetary policy rule, which can reduce the variability of output around its full-employment level ($u \cong 0$). Fiscal policy affects the level and growth in potential output (taxes and spending), too. Finally, growth of population, innovations, productivity, and technology affect production and employment.[5] For these reasons, it is necessary to combine public policies and growth of a variety of variables. Households and individuals are presumed to prefer full-employment, safety,[6] stable prices (low inflation), stable real income and rising with their productivity and efficiency, and some positive savings that can be used for future consumption or precaution. Businesses are different; they prefer low inflation, high income that can be spent for their products or services,[7] and low cost of capital.

One view of the relationship between money supply (monetary shocks) and interest rates movement is the Liquidity Effect (money and interest rates are negatively related) and the other is the Fisher Effect (the growth of money and interest rates are positively related).[8] We expect the money supply to affect interest rates; in other words to affect also the components of interest rates (real risk-free rate of interest, expected inflation, and risk premium) through the following equation,[9]

$$i_t = r_t^* + \pi_{t+1}^e + d_t \quad (1)$$

where, i_t = the nominal market rate of interest, r_t^* = the real risk-free rate of interest, π^e_{t+1} = the expected inflation rate, and d_t = the risk premium which varies over time. An "e" superscript denotes expected values of the variable on all available information, a mathematical expectation forecast can be defined as, $X_{t+1}^e = E(X_{t+1} \mid I_t)$.[10]

The determination of the inflation rate dynamics is far from easy and in some cases impossible, due to unanticipated movements of the factors (mostly, monetary shocks and supply side shocks, cost) that affect it and this is a major disadvantage for an economy. There are theories, which try to explain how and when inflation rates change over time, and why they exist.[11] Each of these theories suggests different factors affecting inflation rate. Current statistical techniques and data are very crude to generate a consistently accurate determination of inflation rate, because, we live in a dynamic economic world composed of billions of households, businesses, units of governments, and regulatory agencies, where all of them are affecting these "internationalized" markets continuously through their demands and supply of capital, goods, and services. Millions of these agents enter our markets as suppliers (producers and savers) or demanders (consumers and investors) or regulators (Central Banks and governmental agencies) or intermediaries (banks) or international institutions (IMF, World Bank, WTO, EU, etc.) affecting the world's real and financial markets. Any movement of the total demand and supply will affect the inflation rate. Consequently, we need an econometric model, which will incorporate those millions of markets decisions taking place every day. Even a simultaneous system of one thousand equations, cannot deal with our complex markets in today's open economies.

The present article is organized in the following five sections. Section 2 develops a social function and some partial equilibria for our economy. Next section presents different specifications, estimations, and dynamics of the inflation rate model. In section 4, some public policy effectiveness, implications, and social effects of inflation are offered. The last section provides some concluding remarks.

2. The Social Loss Function and Partial Economic Equilibria

Central banks by adjusting the instruments of monetary policy try to fulfill some ultimate targets (objectives or goals), which "are specified in law as maximum employment, stable prices, and moderate long-term interest rates".[12] These goals can be more specifically as: (1) Reasonable price stability / avoidance of inflation ($P^e_{t+1} = P_t$). (2) Full employment/unemployment rate at the natural level ($u^e_{t+1} = u_{Nt}$), (3) Sustainable economic growth/real output at the full employment level ($Q^e_{t+1} = Q_{Nt}$), (4) Equilibrium in the balance of payments ($CA^e_{t+1} = CA_t = 0$),[13] and (5) Moderate long-term interest rates ($i^e_{L\text{-}T\ t+1} = \bar{i}_{L\text{-}T\ t}$).[14]

Under the above objectives, the central bank has an inflation target and it raises nominal interest rates (reduces money supply) when inflation is above target. It also has an employment, an economic growth, a balance of current account, and moderate long-term interest rates targets. Monetary policy, contractionary (tight) or expansionary (easy) will raise nominal interest rates (reduce money supply) and bring an overheated economy back to its target or will lower nominal interest rates (increase money supply) and stimulate the economy that experiences a recession.[15]

A loss to society function[16] can be expressed as a weighted average of squared deviations of unemployment from its target, of risk, interest rate, inflation, output, saving, money supply, and financial market from their potential levels,[17]

$$L = w_u(u-u^*)^2 + w_R(d-d^*)^2 + w_i(i-i^*)^2 + w_\pi(\pi-\pi^*)^2 + w_q(q^*-q)^2 + w_s(s^*-s)^2 + w_m(m^s - m^{*s})^2 + w_{DJIA}(g_{DJIA^*} - g_{DJIA})^2 \quad (2)$$

where, $\Sigma w = 1$, L = the loss to society, u = the unemployment rate, d = risk, i = nominal short-term interest rate (federal funds rate), π = inflation rate, q = real output, s = saving, m^s = money supply, g_{DJIA} = growth of the Dow Jones Industrial Average Index, an "*" on a variable denotes the target rate of the variable ($u^* \cong 0$, $d^* \cong 3\%$, $i^* \cong r^*$, $\pi^* \cong 0$, $q^* \cong 3\%$, $s^* \cong 25\%$, $m^{*s} \cong 4\%$, $g_{DJIA^*} = 7\%$), w's = the weights, and r^* = the real risk-free rate of interest. Any deviation of the actual value of the above variables from their targets will cause

a loss for the society. Of course, the social objective will be the minimization of this social loss (L).[18]

Theoretically, it is possible to achieve full employment (Q_F or u_F) and price stability simultaneously, but in reality a tradeoff between the variability of output and the variability of inflation exists.[19] Let us assume that a supply shock takes place (increase in the price of oil[20] due to a war). This will increase the cost of production and raise inflation; it will also lower aggregate demand (reduction of the purchasing power of consumers). Then, we have higher inflation and lower output (higher unemployment) in this economy, now. The monetary policy faces a dilemma at this point. If it eases (expansionary policy) the output can increase and we will have inflation.[21] If it tights (contractionary policy) the price will fall, but we will experience unemployment.[22] The choice must be the one that satisfies individuals' preference. Then, we need an exansionary (easy money) policy, which will increase output, reduce unemployment,[23] and improve the financial markets.[24]

Initially, we take some partial equilibria in different sectors and markets of our economy to determine the variables including in the loss function and we generate eight equations. We lay out a slight variant (augmented) of the model that forms the basis of the loss function, eq. (2), above.[25] First, the aggregate demand (AD) is considering a function of the following variables

$$\begin{aligned} &q_t = f(\pi_t, i_t, u_t, d_t) \\ &f_\pi < 0,\ f_i < 0,\ f_u < 0,\ f_d < 0 \end{aligned} \tag{3}$$

where, d_t = a measurement of risk (i_{Baa}-i_{RF}).

Rewriting eq. (3) as a deviation between actual and potential variables, we have the output gap form:

$$q_t - q_t^* = \alpha_0 + \alpha_1(\pi_t - \pi_t^*) + \alpha_2(i_t - i_t^*) + \alpha_3(u_t - u_t^*) + \alpha_4(d_t - d_t^*) + \varepsilon_t^{AD} \tag{3´}$$

Now, the aggregate supply (AS), as a price setting equation, takes the following general function

$$\begin{aligned} &\pi_t = f(q_t, i_t, u_t, T_t) \\ &f_q > 0,\ f_i < 0,\ f_u < 0,\ f_T > 0 \end{aligned} \tag{4}$$

where, T_t = taxes.

In deviations forms, the same equation becomes

$$\pi_t - \pi_t^* = \beta_0 + \beta_1(q_t - q_t^*) + \beta_2(i_t - i_t^*) + \beta_3(u_t - u_t^*) + \beta_4(T_t - T_t^*) + \varepsilon_t^{AS} \qquad (4')$$

By modifying the Taylor (1993) rule and taking into consideration the loss function described in eq. (2), we have the following monetary policy rule (MP)

$$\begin{aligned} i_{FF_t} &= r_t^* + \pi_t + \gamma_1(d_t - d_t^*) + \gamma_2(u_t - u_t^*) + \gamma_3(\pi_t - \pi_t^*) + \gamma_4(q_t - q_t^*) + \gamma_5(s_t - s_t^*) \\ &+ \gamma_6(m_t - m_t^*) + \gamma_7(g_{DJIA} - g_{DJIA^*}) + \varepsilon_t^{MP} \end{aligned} \qquad (5)$$

where, i_{FF} = the target nominal federal funds rate.

Equation (5) shows the adjustment of the federal funds rate in response to the deviation from target values of the variables that will give rise to costs to society. Any deviation from the target will affect interest rate.[26] If $\gamma_1 = \gamma_2 = \gamma_3 = \gamma_4 = \gamma_5 = \gamma_6 = \gamma_7 = 0$, no costs were associated with deviation of the variables from their potential level and

$$i_{FF_t} = r_t^* + \pi_t \qquad (5')$$

The most difficult task of policy makers will be to keep the above variables on target, the economy at its potential level, the social cost (loss) at a zero level, public's confidence on policy decisions at the highest level and restrain inflation expectations, persuade markets to trust policy makers and the government, balance central bank's independence and regulators' power by their accountability. Businesses objective must be in line with social objectives. Global convergence and synchronization[27] are not necessary because this increasing globalization has led the entire world to a recession, an awful uncertainty, and could exacerbate the business cycle, which will affect negatively the domestic economy and undermine public policies.

In addition, a Phillips curve[28] is given with the equation,

$$u_t - u_t^* = \delta_0 + \delta_1(\pi_t - \pi_t^*) + \varepsilon_t^{PC} \qquad (6)$$

Another equation can be the saving function (SF),

$$s_t = f(\pi_t, i_t, q_t, u_t, d_t)$$
$$f_\pi < 0,\ f_i > 0,\ f_q > 0,\ f_u < 0,\ f_d > 0 \tag{7}$$

which in deviations forms becomes

$$s_t - s_t^* = \zeta_0 + \zeta_1(\pi_t - \pi_t^*) + \zeta_2(i_t - i_t^*) + \zeta_3(q_t - q_t^*) + \zeta_4(u_t - u_t^*) + \zeta_5(d_t - d_t^*) + \varepsilon_t^{SF} \tag{7´}$$

When interest rate will increase, individuals will not borrow, due to high cost of borrowing money, but they will save more (incentive to save) to accumulate the amount they need to buy, in the future, durables and other assets. Maximization of savings must be the first priority of our society.

A very important function in our days is the risk (objective measurement of uncertainty) function (RF).

$$d_t = f(u_t, i_t, DJIA_t, DG_t, P_{oil_t}, Wars_t, DVS_t)$$
$$f_u > 0,\ f_i > 0,\ f_{DJIA} < 0,\ f_{DG} > 0,\ f_{P_{oil}} > 0,\ f_{Wars} > 0,\ f_{DVS} > 0 \tag{8}$$

where, DJIA = Dow Jones Industrial Average Index, DG = degree of globalization,[29] P_{oil} = price of oil, Wars = declaration of war or fear of expected wars, and DVS = deterioration of our value system.[30]

This equation in deviations forms becomes

$$d_t - d_t^* = \theta_0 + \theta_1(u_t - u_t^*) + \theta_2(i_t - i_t^*) + \theta_3(DJIA_t - DJIA_t^*) + \theta_4(DG_t - DG_t^*)$$
$$+ \theta_5(P_{oil_t} - P_{oil_t}^*) + \theta_6(Wars_t - Wars_t^*) + \theta_7(DVS_t - DVS_t^*) + \varepsilon_t^{RF} \tag{8´}$$

where, DG* = 0 (economic, political, social, cultural, and religious independence, non-integration, and perfect negative correlation between countries).

A money demand (MD) equation is the well known one

$$m_t^d - p_t = \kappa'_0 + \kappa'_1\, i_t + \kappa'_2\, q_t + \varepsilon_t \tag{9}$$

or in deviations,

$$m_t^d - m_t^{*d} = \kappa_0 + \kappa_1(i_t - i_t^*) + \kappa_2(q_t - q_t^*) + \kappa_3(p_t - p_t^*) + \varepsilon_t^{MD} \tag{9'}$$

The last equation is the money supply (MS)

$$i_t = \lambda_0 + \lambda_1(m_t^s - m_t^{*s}) + \varepsilon_t^{MS} \tag{10}$$

Assuming that money demand is equal to money supply, we have an equilibrium in the money market (they are equal to the stock of money), then,

$$m_t^d = m_t^s = m_t \tag{11}$$

The last equation represents the financial market (FM). We can use a function to determine the value of the DJIA stock index.[31]

$$\begin{aligned} &DJIA_t = f(Divs_t, d_t, i_{FF}, EBIT_t, T_t, u_t, CS_t, q_t) \\ &f_{Divs} > 0,\ f_d < 0,\ f_i < 0,\ f_{EBIT} > 0,\ f_T < 0,\ f_{CS} > 0,\ f_q > 0 \end{aligned} \tag{12}$$

where, Divs = dividends, EBIT = earnings before interest and taxes, T = taxes, and CS = consumer sentiment.

The above equation in deviations forms becomes

$$\begin{aligned} &g_{DJIA} - g_{DJIA^*} = \mu_0 + \mu_1(\mathrm{Divs_t} - \mathrm{Divs_t^*}) + \mu_2(\mathrm{d_t} - \mathrm{d_t^*}) + \mu_3(\mathrm{i_t} - \mathrm{i_t^*}) + \mu_4(\mathrm{EBIT_t} - \mathrm{EBIT_t^*}) \\ &+ \mu_5(\mathrm{T_t} - \mathrm{T_t^*}) + \mu_6(\mathrm{u_t} - \mathrm{u_t^*}) + \mu_7(\mathrm{CS_t} - \mathrm{CS_t^*}) + \mu_8(\mathrm{q_t} - \mathrm{q_t^*}) + \varepsilon_t^{FM} \end{aligned} \tag{12'}$$

The form of the above structural model is given from the underlying theory. It contains endogenous variables on the left-hand side and endogenous as well as predetermined variables on the right-hand side. We solve the equations for each of the endogenous variables as a function solely of the predetermined variables in the model.

3. Specifications and Estimations of an Inflation Dynamic Model

The reduced form for the above model with eight endogenous variables[32] can be written as

$$X_t A_0 = C + X_{t-1} A_1 + X_{t-2} A_2 + \varepsilon_t \tag{13}$$

where,

$$X_t = (q_t, \pi_t, i_t, u_t, s_t, d_t, m_t, g_{DJIA}),$$

$$\varepsilon_t = (\varepsilon_t^{AD}, \varepsilon_t^{AS}, \varepsilon_t^{MP}, \varepsilon_t^{PC}, \varepsilon_t^{SF}, \varepsilon_t^{RF}, \varepsilon_t^{MD}, \varepsilon_t^{FM}),$$

and C = a vector of intercept terms.

We take the exogenous disturbances to be i.i.d. with $\varepsilon_t \sim N(0, I)$. Also, we treat potential (target or optimal) variables (X*) as exogenous and estimate an AR(p) or ARMA(p, q) processes for them. The lagged endogenous variables are predetermined variables (observables). We can solve each one equation for inflation and determine the inflation rate or the price level of our economy. Of course, we can combine and solve two or more equations of the model as simultaneous equations and determine the price level or inflation.

All data are monthly from 1950:01 to 2005:03[33] and are coming from Economic Time Series Page by Eveline Tainer at http://www.economagic.com. They are, q = the real gross domestic product (GDP), p = the CPI, π = the inflation rate, i_{FF} = the federal funds rate, i_{RF} = the 3-month T-bill rate, i_{Baa} = Moody's corporate Baa bond rate, q* = the potential (target or optimal) real GDP, and all the above mentioned variables. We choose to estimate data in terms of levels, rather than growth rates; of course, depending on their stationarity.[34] We impose all the linear restrictions implied by the model and variables are in levels (X), natural logarithms (x) or growths (g_X), except interest rates, unemployment rate, and other variables, which are in percentage.

In the models reported below, we display not only the estimated parameters, but also the impulse functions computed from,[35]

$$X_t = B(L)\,\varepsilon_t \tag{14}$$

Solving eq. (2), the loss function, for π by putting L = 0, we get an equation that shows a type of variance among these policy variables.

$$\begin{aligned}(\pi-\pi^*)^2 &= \frac{w_u}{w_\pi}(u-u^*)^2 + \frac{w_R}{w_\pi}(d-d^*)^2 + \frac{w_i}{w_\pi}(i-i^*)^2 + \frac{w_q}{w_\pi}(q-q^*)^2 \\ &+ \frac{w_s}{w_\pi}(s-s^*)^2 + \frac{w_{m^s}}{w_\pi}(m^s-m^{*s})^2 + \frac{w_{DJIA}}{w_\pi}(g_{DJIA}-g_{DJIA^*})^2\end{aligned} \tag{15}$$

Then, loosely, the inflation can be determined as

$$\begin{aligned}\pi &= \pi^* + \xi_1(u-u^*) + \xi_2(d-d^*) + \xi_3(i-i^*) + \xi_4(q-q^*) + \xi_5(s-s^*) \\ &+ \xi_6(m^s-m^{*s}) + \xi_7(g_{DJIA}-g_{DJIA^*}) + \varepsilon_t\end{aligned} \tag{16}$$

Substituting one equation into another, we can solve the above system [eqs. (2) to (12)] for p_t or $\pi_t = p_t - p_{t-1}$, which yields a first-order difference equation describing the evolution of equilibrium inflation. Solving simultaneously eqs. (3′), (4′), and (6) we receive:

$$\begin{aligned}\pi_t &= \frac{\beta_0+\alpha_0\beta_1+\delta_0(\alpha_3\beta_1+\beta_3)}{1-\alpha_1\beta_1-\delta_1(\alpha_3\beta_1+\beta_3)} + \pi_t^* + \frac{\alpha_2\beta_1+\beta_2}{1-\alpha_1\beta_1-\delta_1(\alpha_3\beta_1+\beta_3)}(i_t-i_t^*) \\ &+ \frac{\alpha_4\beta_1}{1-\alpha_1\beta_1-\delta_1(\alpha_3\beta_1+\beta_3)}(d_t-d_t^*) + \frac{\beta_4}{1-\alpha_1\beta_1-\delta_1(\alpha_3\beta_1+\beta_3)}(T_t-T_t^*) \\ &+ \frac{\alpha_3\beta_1+\beta_3}{1-\alpha_1\beta_1-\delta_1(\alpha_3\beta_1+\beta_3)}\varepsilon_t^{PC} + \frac{\beta_1}{1-\alpha_1\beta_1-\delta_1(\alpha_3\beta_1+\beta_3)}\varepsilon_t^{AD} \\ &+ \frac{1}{1-\alpha_1\beta_1-\delta_1(\alpha_3\beta_1+\beta_3)}\varepsilon_t^{AS}\end{aligned} \tag{17}$$

From eqs. (7′) and (8′), we get the following solution:

$$\pi_t = -\frac{\zeta_0 + \zeta_5\theta_0}{\zeta_1} + \pi_t^* + \frac{1}{\zeta_1}(s_t - s_t^*) - \frac{\zeta_2 + \zeta_5\theta_2}{\zeta_1}(i_t - i_t^*) - \frac{\zeta_3}{\zeta_1}(q_t - q_t^*)$$
$$-\frac{\zeta_4 + \zeta_5\theta_1}{\zeta_1}(u_t - u_t^*) - \frac{\zeta_5\theta_3}{\zeta_1}(DJIA_t - DJIA_t^*) - \frac{\zeta_5\theta_4}{\zeta_1}(DG_t - DG_t^*) - \frac{\zeta_5\theta_5}{\zeta_1}(P_{oil_t} - P_{oil\,t}^*) \quad (18)$$
$$-\frac{\zeta_5\theta_6}{\zeta_1}(Wars_t - Wars_t^*) - \frac{\zeta_5\theta_7}{\zeta_1}(DVS_t - DVS_t^*) - \frac{\zeta_5}{\zeta_1}\varepsilon_t^{RF} - \frac{1}{\zeta_1}\varepsilon_t^{SF}$$

Also, from eqs. (9´) and (3´), we have a solution for the inflation rate:

$$\pi_t = -\frac{\kappa_0 + \kappa_2\alpha_0}{\kappa_2\alpha_1} + \pi_t^* + \frac{1}{\kappa_2\alpha_1}(m_t - m_t^*) - \frac{\kappa_1 + \kappa_2\alpha_2}{\kappa_2\alpha_1}(i_t - i_t^*) - \frac{\alpha_3\kappa_2}{\kappa_2\alpha_1}(u_t - u_t^*)$$
$$-\frac{\alpha_4\kappa_2}{\kappa_2\alpha_1}(d_t - d_t^*) - \frac{\kappa_3}{\kappa_2\alpha_1}(p_t - p_t^*) - \kappa_2\varepsilon_t^{AD} - \varepsilon_t^{MD} \quad (19)$$

From eqs. (9´) and (12´), we have the following solution:

$$p_t = (\mu_0 - \frac{\kappa_0\mu_8}{\kappa_2})\frac{\kappa_2}{\kappa_3\mu_8} + p_t^* - \frac{\kappa_2}{\kappa_3\mu_8}(g_{DJIA} - g_{DJIA^*}) + \frac{\mu_1\kappa_2}{\kappa_3\mu_8}(Divs_t - Divs_t^*) + \frac{\mu_2\kappa_2}{\kappa_3\mu_8}(d_t - d_t^*)$$
$$+(\mu_3 - \frac{\kappa_1\mu_8}{\kappa_2})\frac{\kappa_2}{\kappa_3\mu_8}(i_t - i_t^*) + \frac{\mu_4\kappa_2}{\kappa_3\mu_8}(EBIT_t - EBIT_t^*) + \frac{\mu_5\kappa_2}{\kappa_3\mu_8}(T_t - T_t^*) + \frac{\mu_6\kappa_2}{\kappa_3\mu_8}(u_t - u_t^*)$$
$$+\frac{\mu_7\kappa_2}{\kappa_3\mu_8}(CS_t - CS_t^*) + \frac{1}{\kappa_3}(m_t - m_t^*) - \frac{1}{\kappa_3}\varepsilon_t^{MD} + \frac{\kappa_2}{\kappa_3\mu_8}\varepsilon_t^{FM} \quad (20)$$

Now, solving the monetary policy rule, eq. (5), for the inflation rate, we get the equation

$$\pi_t = \frac{\gamma_3}{1+\gamma_3}\pi_t^* + \frac{1}{1+\gamma_3}i_{FF_t} - \frac{1}{1+\gamma_3}r_t^* - \frac{\gamma_1}{1+\gamma_3}(d_t - d_t^*) - \frac{\gamma_2}{1+\gamma_3}(u_t - u_t^*)$$
$$-\frac{\gamma_4}{1+\gamma_3}(q_t - q_t^*) - \frac{\gamma_5}{1+\gamma_3}(s_t - s_t^*) - \frac{\gamma_6}{1+\gamma_3}(m_t - m_t^*) - \frac{1}{1+\gamma_3}\varepsilon_t^{MP} \quad (21)$$

We run eqs. (17), (18), (19), (20), and (21) with an Ordinary Least Squares (OLS) method[36] and then, the reduced-form for eq. (21) is also estimated by using an OLS method and taking the lagged values of the endogenous variables and the exogenous ones, where we have the following:

$$\pi_t = \Theta_1 \pi_t^* + \Theta_2\, i_{FF_{t-1}} + \Theta_3\, r_t^* + \Theta_4 (d_{t-1} - d_t^*) + \Theta_5 (u_{t-1} - u_t^*) + \Theta_6 (q_{t-1} - q_t^*) + \Theta_7 (s_{t-1} - s_t^*) + \Theta_8 (m_{t-1} - m_t^*) + \varepsilon_t \tag{22}$$

Consequently, this indirect least-squares estimation process can be used to obtain consistent parameter estimates.

$$\hat{\Theta}_2 = \frac{1}{1+\gamma_3} \quad \Rightarrow \quad \gamma_3 = \frac{1}{\hat{\Theta}_2} - 1$$

$$\hat{\Theta}_1 = \frac{\gamma_3}{1+\gamma_3} \quad \Rightarrow \quad \gamma_3 = \frac{\hat{\Theta}_1}{1-\hat{\Theta}_1}$$

$$\hat{\Theta}_3 = -\frac{1}{1+\gamma_3} \quad \Rightarrow \quad \gamma_3 = -1 - \frac{1}{\hat{\Theta}_3}$$

$$\hat{\Theta}_4 = -\frac{\gamma_1}{1+\gamma_3} \quad \Rightarrow \quad \gamma_1 = -\frac{\hat{\Theta}_4}{\hat{\Theta}_2}$$

$$\hat{\Theta}_5 = -\frac{\gamma_2}{1+\gamma_3} \quad \Rightarrow \quad \gamma_2 = -\frac{\hat{\Theta}_5}{\hat{\Theta}_2}$$

$$\hat{\Theta}_6 = -\frac{\gamma_4}{1+\gamma_3} \quad \Rightarrow \quad \gamma_4 = -\frac{\hat{\Theta}_6}{\hat{\Theta}_2}$$

$$\hat{\Theta}_7 = -\frac{\gamma_5}{1+\gamma_3} \quad \Rightarrow \quad \gamma_5 = -\frac{\hat{\Theta}_7}{\hat{\Theta}_2}$$

$$\hat{\Theta}_8 = -\frac{\gamma_6}{1+\gamma_3} \quad \Rightarrow \quad \gamma_6 = -\frac{\hat{\Theta}_8}{\hat{\Theta}_2}$$

Here, we do not mind for the existence of identification problem because knowledge of the structural parameters is not absolutely necessary. We are interested in determining the price level and in predicting and forecasting the inflation rate and this primary objective can be obtained through the different reduced-form equations directly. The most of the equations are identified (values of the parameters from the reduced-forms are obtained), some are exactly identified (a unique parameter value exists), some are overidentified (more than one value is obtained for some parameters), and some are unidentified (we cannot estimate the structural parameters from the reduced form). Certainly, the simplest forecasting equations can be univariate time-

series models of ARMA (p, q) processes.[37] The number of lagged values of each variable retained in an equation, were those that they were significant at the 5 percent level or higher. All target variables (X*) are estimated by using an ARMA (2, 2) process.

The specification of the risk and its risk premium (d_t) is not a critical issue to the current outcome, however, Kallianiotis (2004a, c, 2001, and 2002a) deals with it extensively. At the moment, the empirical tests that are undertaken are tests for the liquidity and Fisher effects, demand-pull and supply-push effects,[38] by using correlation statistics (Table 1), Augmented Dickey-Fuller Unit Root Tests (Table 2), Pairwise Granger Causality (Table 3), Regression (OLS) Analyses (Tables 4-7), and Vector Autoregression (VAR) estimates of eq. (22) with exogenous public policy variables (Tables 8 and 9). In all periods, money demand is estimated to have a negative interest elasticity and positive price and income elasticities.[39]

We examined the empirical evidence relevant to the correlation between price level (p) and inflation rate (π) and a variety of variables (X) [$\varrho_{p,X}$] and [$\varrho_{\pi,X}$], the optimal (target) growth rate (g^*) of some economic variables, the growth of these variables over their target [g_X-g_X^*], and the variance (standard deviation) of these variables ($\sigma_X, \sigma_x, \sigma_{\bar{g}_X}$). The results are reported in Table 1. Price of oil has a high positive correlation coefficient (ϱ=+.834), risk (ϱ=+.564), real income (ϱ=+.971), savings a negative one (ϱ=-.899), money supply (ϱ=+.946), DJIA (ϱ=+.907), and taxes (ϱ=+.977), interest rates have a negative one (from ϱ=-.497 to ϱ=-.916), unemployment (ϱ=-.731), government spending (ϱ=+.970), wages and salaries (ϱ=+.985), exchange rate (TWXI)[40] (ϱ=-.541), dividends (ϱ=+.963), corporate profits (ϱ=+.946), and consumer sentiment index (ϱ=+.390).

Table 2 reveals the results of the Unit Root test for all the variables. Twenty five variables are integrated of order zero [I(0)] and twenty two are integrated of order one [I(1)]. Next, Table 3 presents Pairwise Granger Causality tests of all the variables in question. Interest rates cause prices to decline. Savings and exchange rate the same causal relationship, too. The DJIA, taxes, price of oil, wages and salaries, and corporate profits cause an increase in prices. On the other hand, an increase in price level causes an increase in GDP, in money supply, risk, government spending, and in consumer sentiment. Further, an increase in prices causes a reduction in unemployment rate.

Table 4 gives the results of an OLS estimation of eq. (17). We could see that interest rate deviation has a negative effect on inflation, taxes have a mixed effect on price level, risk has no significant effect, and the targets π^* and p^* have an one-to-one effects. When interest rate exceeds its target, money demand is falling and prices of goods and services are following. Also, when taxes are going up, disposable income is falling and this reduction in aggregate demand reduces prices (tight public policy). Table 5 provides an OLS estimation of eq. (18). Saving has mostly a negative effect on inflation, interest rate mainly a positive one, income a positive and unemployment a mixed effect. The DJIA has a mixed effect, too. The price of oil primarily is affected positively inflation. Finally, consumer sentiment has generally a negative effect on prices. The target inflation has an one-to-one effect. Table 6 presents an OLS estimation of eqs. (19) and (20). The money supply has a positive effect on prices, interest rate a negative one and unemployment a positive one. Risk is insignificant; DJIA, dividends, and taxes have a negative effect. Corporate profits and consumer sentiment have no significant effects. Table 7 offers the estimation of eqs. (21) and (22). On the one hand, the target inflation rate has a positive effect on inflation, the real risk-free rate of interest a negative one, the deviation of risk has a positive effect and the same is true for unemployment. On the other hand, the lagged value of federal funds has a negative effect on inflation. As i_{FF} is increasing (tight money policy) inflation will fall. The same negative effect appears for the risk. An increase in the deviation of risk, people will reduce demand and prices will fall. GDP, saving, and money supply deviations have no significant effects on inflation rate.

In addition, for eq. (22), we run a VAR with endogenous variables π, r^*, d, u, q, and S and two lag intervals; the exogenous variables were the two policy tools, i_{FF} and M2 (monetary ones).The results appear in Table 8. Each independent variable contains information for the dependent ones. Lagged values of inflation are highly significant in predicting inflation, real risk-free rate of interest, risk, and savings rate. The lagged values of real risk-free rate of interest have significant effects on inflation, real risk-free rate of inflation, risk, and savings. The lagged values of risk have significant effects on inflation, real risk-free rate of interest, risk, and savings. The lagged values of unemployment rate are highly significant in predicting risk, unemployment, and production. The lagged values of GDP are predicted real risk-free rate of interest, risk, unemployment, and output. The lagged values of savings are predicted inflation, real risk-free rate of interest, and current savings. The monetary

policy (i_{FF} and m) impacts inflation, real risk-free rate of interest, risk, and unemployment, but has no effect on output and savings.

Also, we can take T and G for exogenous variables to see the fiscal policy tools and their effects on inflation, price levels, and the other dependent variables (Table 9). We observe many lagged values of the independent variables that have highly significant effect in predicting the dependent variables. But, the monetary policy (i_{FF} and m) has significant effects only on inflation, real risk-free rate of interest, and risk. Unemployment, growth of GDP, and savings are not affected by this policy. The fiscal policy (t and g) is affecting all our dependent variables except the logarithm of the GDP. This absence of a strong effect of our public policies on some target variables of our economy suggests that the Keynesian public policy tools might be missing something in our today's complex economy and revised socio-economic culture.

Now, we look at the dynamics (impulse responses) implied by these regression estimates (VAR). By using monetary policy (i_{FF} and M2) and fiscal one (T and G) as exogenous, we want to see the impact that shocks to public policy variables (tools) have on the goods market (their prices), on the financial markets (real risk-free rate of interest and market risk premium), on the labor market (unemployment rate), on the total production (real output), and on the saving rate (Chart 1). The impulse response functions for the public policy variables as endogenous ones are not shown here, but they are as follows. A federal funds shock has a positive effect on inflation, on real risk-free rate of interest and then, they decline; the risk premium is increasing and the unemployment is falling; the output response to the funds rate shock is insignificant; and the savings are increasing a little (incentive to save). The shock of money supply on inflation is very small, the real risk-free rate of interest is declining and the risk is increasing; the unemployment is increasing, too; the real income is drastically declining and then increases slowly to reach its previous level; and the savings are substantially declined. The shocks on taxes reduce inflation gradually; increase real risk-free rate of interest; reduce risk; reduce unemployment at the beginning and then unemployment is coming back to its previous level; the real income is declining drastically and then, it starts increasing a little; the personal savings rate is falling at the beginning and then, increases. Finally, the government spending causes a little inflation; the real risk-free rate of interest is increasing; the risk premium is going up at the beginning and stays flat at this higher level; the effect on unemployment is insignificant; the real income is falling initially and then, stabilizes; the personal savings rate is increasing a little.

4. Public Policy Effectiveness, its Implications and Social Effects of Inflation

If the Fed targets inflation rate ($\overline{\pi} \cong 0$), the expected inflation can be zero and inflation premium follows it, then, the cost of capital is minimized, which will help businesses to borrow with a low cost of capital and financial markets to be improved (price of securities will increase).On the other hand, if Fed targets unemployment ($\overline{u} \cong 0$), labor income will be maximized for individuals and labor cost will be high for businesses. But, this high labor income will help individuals and businesses because workers can buy more goods and services from them. Hence, the second target (unemployment) must be first in priority of public policy objective because maximizes the social welfare of the country by maximizing every single individual's income and utility and can improve fairness in the distribution of income and wealth in our society.

Anchoring inflation expectations at the targeted rate of inflation is a very important goal for monetary policy because reduces inflation premium and consequently, interest rates, and at the same time, increases the purchasing power of individuals. But, our data show that the average inflation rate for the U.S. is 3.817% p.a. with a $\sigma_{\pi} = \pm 4.065\%$ the last 54 years, which reveals the ineffectiveness of monetary policy. Of course, there are differences in policy preferences, different views about the economic outlook, different views about the structure of the economy, different views about the optimal level of unemployment or output, different views about government interventions and regulations, different view about our financial markets, different views about the operation of the free-market system, different views on global issues, interdependence, and on the late epidemic of globalization, and different views on social welfare issues and value oriented issues. Given all these tremendous differences, we hope that the general public has more or less (depending on his knowledge, philosophy, and values) the same needs, objectives, and purpose in life, to minimize his risk, maximize his social welfare, and live in an environment, which will help him to satisfy his needs, to learn the truth, and to reach perfection. Can we help the public to reach its objective with the existing policies?

Many observers believe that policies (monetary and fiscal) have been excellent in recent years, but this is not true.[41] The risk in our economy has increased (the same happened to the risk premium), interest rates have made the cost of capital the highest in the industrial world (Table 1), savings have become negative for all sectors of the economy, taxes have gone up, corruption

in business and who knows where else has become the rule (norm), a trend towards monopolistic markets has caused serious social problems, the tremendous cost of investment in fast-depreciating technology has increase the cost of living, the monetary and opportunity cost of information has made individuals' and businesses' lives very difficult, globalization has increased economic and social risk at a level that none could have predicted ten years ago, education has deteriorated and morality, ethics, justice, democracy,[42] knowledge, and wisdom do not consider important values in our modern societies, and many other serious problems that our policies cannot resolve or they ignore or some special interest groups are more powerful than we think.[43]

The impulse responses show the liquidity effect on i_{FF}, i_{RF}, and i_P and the Fisher effect, too. The first two interest rates experience the inflation effect after 8 months and the prime after 5 months. The i_{Baa} corporate bond rate continues to experience the liquidity effect over 10 months. Also, the impact on the stock prices is obvious (DJIA is increasing drastically). The price level (CPI) is increasing gradually (price inertia), but unfortunately, the real income is not improving (crowding out effect) and unemployment is deteriorating. The federal funds rate has very little effect on stock prices, on prices, and on real output, but not on unemployment. Then, the real sector of the economy cannot be affected with monetary policy. On the other hand, fiscal policy (T and G) has a gradual (sluggish) effect on the real economy. A reduction in taxes deteriorates government spending and real income in the short-run, but it improves the financial market (DJIA) and increases the prices (inflation) and unemployment is declining, too. An increase in government spending deteriorates the financial market (DJIA is falling), it causes inflation, it improves production and employment after 5 months. Then, fiscal policy (T) is a little more effective on the real sector of the economy and monetary (i_{FF}) on prices of goods, interest rates, and stock market. To succeed with our public policies, we need a mixed (monetary and fiscal) policy, here.

The proneness of inflation rates to move, with the economic business cycle, with seasonal factors, with changes in public policies, with shifts in our behavior, with the risk aversivety, and with high cost of production, has led financial analysts and academics to try to determine price levels and interest rate movements.[44] Longer term movements in interest rates might be determined from monetary growth by using variables that reflect changing target economic conditions[45] (hoping that we can make an ex ante provlepsis of them) or simply by pure time-series models, as long as we have determined the factors affecting the variables in question. Of course, Central Banks'

interventions cannot be predicted. The inflation rate is one important variable for an economy because it determines interest rates, the level of investment, and the cost of living; and as a result the economic growth, the international competitiveness of a country, the social fairness, and the welfare of its citizens. And because we are acting as merely consumers, our lives have become spending, borrowing, and capital intensive and this cost of capital depends on inflation premium and on the supply of savings.

Comparing the average growth of our variables in question, here, with their target values, for the last 50 years, we can observe that the inflation rate is relatively high, having a deviation from its target 3.817% p.a., but the real GDP, it was on the average on target. A serious problem exists with the interest rates, the federal funds rate is 3.756% above its target, the T-Bill rate 3.018% above the target and similar deviation from their targets exist for prime (2.170%) and corporate bonds rate (2.981%). The real risk-free rate of interest is below its target by -0.785%. Then, the poor savors do not cover even the inflation risk. There are no incentives for savors to save and for this reason the personal saving rate is by -17.502% below its target. This can be interpreted as a short-term thinking and strategy from our authorities and temporariness in individuals' behavior. An economy without long-term objectives for growth, employment, savings, investments (capital formation), strong value system and ethics cannot have a future. Incentives are necessary for all parties in our society and these are parts of our justice and fair socio-economic system.

Further, money supply is also above its target by 2.730%, which has caused inflation, has not reduced the short-term interest rates, and has not improved our financial market. Unemployment is above its target by 5.663% and it seems that this high unemployment is mostly structural, due to innovations, technology, and pressure from the financial market on our firms to increase profitability and this can happen with reduction of the labor cost, but also the destruction of the small businesses and the abandonment of the small towns and villages and concentration in big cities. The risk, as it is measured here, it is not very high (close to its target), but people are not very confident for their future. Unfortunately, the risk premia on borrowers (credit cards) are 15%, which is outrageous and discriminatory for our poor citizens and small businesses. The financial market is growing close to its target, but it is very risky; $\sigma_{g_{DJIA}} = \pm 50.180\%$. Small investors are in real trouble because they are going to lose their savings. This market has become a speculative one,

inefficient, and corrupted, then, we cannot trust it to invest our private pension funds and the public pension system is running out of money. Taxes are also high, with an annual growth more than 6% above the target and with a tremendous fluctuation, $\sigma_{g_T} = \pm 25\%$. This causes redistribution of wealth from citizens to government (taxes are growing by 7.339% p.a. and wages and salaries by 3.702% p.a.). Government spending is very high, too, and this money does not go for public investment in civilian projects; more than 6% above its target and with a $\sigma_{g_G} = \pm 16.667\%$. The national debt continuous to go up (68% of the real GDP)[46] and this creates a serious problem on the interest rates, on the future generations, and on the global economic stability.

In addition, the price of oil is growing very fast and its growth is 4.621% above its target, with a $\sigma_{g_{Poil}} = \pm 77.376\%$. Its demand is very inelastic, expectations are bad, and the oil companies are playing games with consumers and economies. Citizens must have in their minds one economic objective: to make their demands for all goods and services very elastic (almost horizontal), otherwise, their lives will be very difficult in the near future. Nominal wages and salaries are growing by 2.702% above the target every year, but the real growth is negative (-1.115%).[47] The exchange rate is bellow its target (the U.S. dollar is losing value) and has a high fluctuation, $\sigma_E = \pm 20.510\%$; but even though that the dollar is depreciated the trade account is not improving. One explanation is the inelastic demands for imports, the huge bank credits, and the lack of confidence on domestic products. Dividends are above the target by 4.585% and a $\sigma_{Divs} = \pm 23.492\%$; high risk and very small proportion of citizens who make this type of income. Corporate profits are above the target by 3.616% and $\sigma_{CP} = \pm 39.812\%$, but this income is just increasing the inequality among citizens and nothing else. Lastly, the consumer sentiment is stable close to zero growth (0.196), but $\sigma_{CS} = \pm 50.059\%$. This shows the uncertainty, the pessimism, the lack of confidence and the risk, in which our people are in and we (and the authorities) have to do something for them.

It will be a major advantage to all economic agents to be able to determine price level and forecast inflation rate, interest rates, and consequently, the price of our assets. An accurate determination of the inflation rate will reduce the cost of capital to both individuals and businesses. Lenders can minimize their interest rate risk by settling accurately the factors that affect the interest rate.

Consequently, the prognosis of these coefficients can reduce social cost and improve social welfare in our society; implications which are decisive in our growing-costs and depleting-resources economy. Also, one important resource for our society is saving and through this, the wealth and the long run economic growth and confidence that it creates. Kester and Luebrman (1992, p. 30) said that "Japan's historically high national savings rate has produced a large, captive pool of savings that the government has, in turn, allocated on very favorable terms to targeted sectors of Japanese industry." Monetary policy is a little effective in the short-run, especially federal funds rate, on prices and interest rates and less on the real sector of the economy. Fiscal policy is also affecting inflation and interest rates through taxes and disposable income, and lastly, through national debt (crowding out), which affect production (aggregate supply) and consumption, investment, exports (aggregate demand) and saving. Lastly, social and personal risk must be minimized and certainty ought to be the obligation of governments and international institutions; globalization, modernization or pseudo-progressiveness, and leveling of seven thousand years old values will not improve global welfare.

5. Concluding Remarks

The above policy objectives should be made explicit and Fed must be encouraged to adopt an explicit target for full employment and to balance the other seven objectives (short-run remedies). The non-accelerating inflation rate of unemployment (NAIRU or u_N)[48] cannot be the threshold for full employment because this number is pretty high. There is no need the unemployment target to be a point, but it can be a range. We can set a mean value of full employment with some standard deviation that policy makers with collaborated policies have to minimize [$E(u^*)$, σ_u^*]. When the unemployment will be on target the policy objective will be on inflation, on risk, on interest rate, production, money growth, on wealth creation (maximizing saving rates) and on financial markets. The objective of full employment can not be achieved with today's conditions; we need to change gradually the structure of the economic system and the urban performance of the population, which has been created the last 40 years. Small cities and towns have to be revitalized with appropriate incentives and policies.

The empirical results show that price level can be determined or forecasted (Root Mean Squared Error is minimized) and depend positively on previous prices, interest rate, money supply, taxes, production, and price of energy,[49] negatively on risk, savings, and real risk-free rate of interest, unemployment,

growth of DJIA, and consumer sentiment. Also, how changes in the money stock affect inflation and interest rates depends not only on what is happening to money today, but also on what is expected to happen to money in the future. If the money stock is changed today, but future money growth rates are not expected to change, then interest rates move in the opposite direction as the money stock, which is the liquidity effect view. But if the money stock is changed today and future money growth rates are expected to move in the same direction, then interest rates move in that direction, too, which is the Fisher effect view. The preliminary analysis, here, shows that the appropriate domestic public policies mixture can improve (reduce) prices through incentives for savings, moderate money supply, taxes, business earnings, and government spending and also, foreign policies can improve national debt, certainty, safety, and confidence for the future of our socio-economic system. Of course, further empirical testing of the current theoretical model of inflation forecasting and price level determination through a social loss function and the dynamics of our target variables is needed. Our policy objective must be a long-run one and it has to include every single citizen of the country. Lastly, the traditional public policy tools need some revision and citizens must learn to behave as persons and not as mere consumers.

Notes

1. Individuals have become just "consumers" with their inelastic demands for almost all goods and services. We have been deceived that all products are necessities, $|\varepsilon_p|<1$, but this is not true. This behavior, together with our greediness, has created all these social and global problems that we face today. For example, George Soros was found guilty of insider trading by a French appeals court. (Bloomberg.com, March 24, 2005).

2. Cottle (2001, p. 283) criticizes the natural rate of unemployment by saying that the term "meant to disguise an ideological bias, namely, that for our culture to 'work', a certain number of people must be out of work". Unemployment is the worst deficiency of our socio-economic system. $\bar{u} \sim N(5.66\%, \pm 1.52\%)$ and $u_t = 4.890^{***} + 0.002^{***} time$ (Data: 1950:01-2005:02).

3. Monetary policy by targeting federal funds rate still determines the inflation rate in the long run. The last fifty years, the average growth of M2 was 6.73% p.a. and the average inflation rate 3.82%. Assuming zero growth of velocity, we had a growth of the real output of 2.91% p.a., which seems normal, but the inflation rate was pretty high. The unemployment rate was much higher, on the average 5.66%. See, Kallianiotis and Petsas (2005c, Table 1).

4. It is very important for our society to learn how to keep its demand elastic (flat) that means, there are other substitute goods, which can satisfy our needs and our needs are not unlimited.

5. See, Kallianiotis and Petsas (2005a).

6. Safety is a very general term, which includes freedom, justice, fairness, law-abiding, incentives, low risks, high value system, knowledge of the truth, etc.

7. The U.S. business world was in a very bad crisis lately, which had contributed to our last (2001) recession. See, Kallianiotis (2003 and 2002g) and Kallianiotis, Frear, and Mangan (2002).

8. There is a short term "liquidity effect" and a long term "Fisherian" or "expected inflation" effect. See, Taylor (1998).

9. Their Correlation Matrix is

	M2	i_{FF}	i_{RF}	i_P	i_{Baa}	r^*	π^e	d
M2	1.00							
i_{FF}	-.20	1.00						
i_{RF}	-.19	.98	1.00					
i_P	.02	.95	.95	1.00				
i_{Baa}	.09	.80	.83	.87	1.00			
r^*	.04	.19	.24	.24	.26	1.00		
π^e	-.21	.70	.66	.65	.54	-.22	1.00	
d	.50	-.31	-.28	-.14	.29	.03	-.21	1.00

10. Here, we used an ARMA (p,q) process to determine X_{t+1}^{e}.

11. See, Atkeson and Ohanian (2001), Bernanke and Woodford (1997), Fuhrer and Moore (1995), Gail and Gertler (1999), Kallianiotis (2005a, 2004a and b), Kallianiotis and Bootwala (2002), Kallianiotis and Petsas (2005a, b, c, and 2003), Leeper and Zha (2001), Meyer (2001), Owyang (2001), Sims (1994), Svensson (1997), Taylor (1993), and Woodford (1998).

12. See, *The Federal Reserve System: Purposes & Functions,* Board of Governors of the Federal Reserve System, Washington, D.C., 1994, p. 19.

13. See also, Rose (2003, pp. 358-359).

14. See, Kallianiotis (2002e and 2005b).

15. See, Hadjimichalakis (1982). On November 6, 2002, Fed reduced the federal funds rate to 1.25% to stimulate the financial market and the real sector of the economy and from June 2003 until July 2004, it kept this rate at 1%, its lowest value since July 1958. (Economagic.com). Now, due to inflationary pressures, the federal funds rate has been raised to 3%. (Bloomberg.com, May 3, 2005).

16. See, Meyer (2001, p. 5) for a two-deviation variables loss function.

17. See, Kallianiotis (2004b and 2005a) and Kallianiotis and Petsas (2005b, c, and 2003).

18. Our objective is to minimize the deviations from the target variables. A negative deviation is reducing the loss and a negative loss represents social benefits.

19. We have: $\sigma_u = \pm 1.524\%, \sigma_\pi = \pm 4.065\%, \sigma_{g_Q} = \pm 12.361\%, and\ \rho_{g_Q,\pi} = -0.177$. (Tables are available from the authors upon request).

20. The price of crude oil reached $60.85 per barrel. (Bloomberg.com, June 27, 2005).

21. The U.S. inflation was about 2.8% in May 2005. (*The Wall Street Journal*, June 27, 2005, p. C10).

22. The U.S. unemployment rate, in May 2005, was 5.1%. (Economagic.com).

23. Or we need a combination of policies that can stimulate aggregate demand and increase output and at the same time a reduction in cost to stimulate aggregate supply. Even better, we need some gradual structural changes in our socio-economic system.

24. The DJIA has fallen to 10,275. (Bloomber.com, June 27, 2005).

25. Similar equations have been used by Taylor (1993), Meyer (2001), and Leeper and Zha (2001).

26. During this period, the Fed is increasing i_{FF} to bring π to its target (π^*), because the $\rho_{p,i_{FF}} = -0.822$ (Table 1) and when $i_{FF} \uparrow \Rightarrow causes\ \pi \downarrow$ (Table 3). Kallianiotis (2005a, Table 4) has estimated eq. (5) and he found: $\gamma_3 = -0.035$.

27. See, "United we Fall", The Economist, September 28, 2002, pp. 24-25.

28. See, Atkeson and Ohanian (2001, p. 6), Owyang (2001, p. 44), and Kallianiotis (2004a, p. 33) for a variety of expectations-augmented Phillips curves.

29. The degree of globalization can be measured as the average of the correlation coefficients of income growth, stock market index growth, and trade growth between two countries: $DG = (\rho_{g_Y, g_{Y^*}} + \rho_{g_{SMI}, g_{SMI^*}} + \rho_{g_{(X+M)/\Sigma(X+M)}, g_{(X^*+M^*)/\Sigma(X^*+M^*)}})/3$, where, Y= income, SMI = stock market index, X+M = the size of trade, $-1 \leq DG \leq +1$ and if DG>0 the degree of globalization is high.

30. For the deterioration of the value system (DVS), we can use some criminal justice statistics; i.e., (1) Rate of Sentenced Prisoners (RSP), (2) Federal Prison Population (FPP), (3) Federal Prison Population Drug Offenses (FPPDO), (4) Person Under Death Sentence (PUDS), (5) Rate of Prisoners in Custody Index (RPCI), Violation of Drug Laws (VDL), (7) Defendants Disposed in District Courts (DDDC), etc. In our empirical work, here, the consumer sentiment index (CS) is used as a proxy for the uncertainty; $\sigma_{g_{CS}} = \pm 50.059\%$ (Table 1).

31. See, Kallianiotis (2003, p. 200) for a similar function.

32. See, Leeper and Zha (2001) for a similar reduced form with three endogenous variables.

33. We can divide the data into sub-periods to see the different in policies and their effects

on inflation, i.e., pre-1979.09 period, post-1979.09 period, 1979.09-1982.09 period, 1982.09-1987.06 period, and 1987.06-present. This will be part of our future analysis on the problem in question.

34. A stationary series has zero unit root, I(0), integrated of order zero. See, Dickey and Fuller (1979).

35. From eq. (13) we have

$$\varepsilon_t = X_t A_0 - C - X_{t-1} A_1 - X_{t-2} A_2$$
$$\Rightarrow \varepsilon_t = X_t (A_0 - A_1 L - A_2 L^2)$$
$$\Rightarrow X_t = \frac{\varepsilon_t}{A_0 - A_1 L - A_2 L^2}$$
$$\Rightarrow X_t = \frac{1}{A_0 - A_1 L - A_2 L^2} . \varepsilon_t$$
$$and \quad X_t = B(L) . \varepsilon_t$$

36. Kallianiotis and Petsas (2005b) have estimated similar equations by using a Two Stage Least Squares (2SLS) method.

37. The Root Mean squared Error is computed as, $RMSE = \sqrt{\sum_{t=T+1}^{T+n} (\hat{X}_t - X_t)^2 / (n+1)}$, where, Xt = the actual value, $\hat{X}_t$ = the forecasted value, and the forecast sample is from T+1 to T+ n.

We plan to use a variety of specifications of these forecasting equations and we will choose the ones with the best robustness of their results.

38. See, Kallianiotis (2005a) for an estimation of a demand-pull and supply-shock inflation determination.

39. Due to space limitation, Tables 1, 2, 3, 4, and 6 are not reported here, but can be requested from the authors.

40. The increase in the TWXI means appreciation of the U.S. dollar and then, the U.S. prices are following.

41. The Fed is tightening the money since last summer to curb inflation, but in March 2005 the CPI rose 0.6% or 7.2% p.a. (Bloomberg.com, April 20, 2005).

42. The "democratic" Greek Parliament approved the European Constitution without a referendum, even though that 82.8% wanted a referendum, and without informing the citizens about the benefits and costs of this law that overrides the National (Greek) Constitution. (TV News *MEGA, ERT*, and *ANTENNA*, April 19, 2005 and June 1, 2005).

43. With all these crises, people try to buy insurance ("safety") for everything to reduce this enormous risk, but they cannot afford the high insurance premium. Then, they have no choice,

than to be exposed to this risk and because of their unawareness (lack of correct information) they have lost their hope and they have become aggressive towards their fellow citizens and suicidal towards themselves.

44. See, Rose (1984), Morris (1990), and Arize et al. (2000, pp. 186-188).

45. See, Kallianiotis, Masrur, and Saymaz (2000), Kallianiotis (2000a, b, 2001, and 2002a, b, and c), and Kallianiotis and Petsas (2005a).

46. See, *National Economic Trends*, December 2004.

47. A compensation of $3,000 in 1983 has become today, due to inflation $1,570, but people are making the same nominal income today. Then, workers are worse off every year. If this nominal overload compensation would have followed the CPI, it should have been $5,733 today.

48. This unemployment rate (u_N) is determined by the structure of the economy, including the effectiveness of institutions, markets, and governments in matching vacancies and unemployed workers in a large geographically and complex economically society, and by policies, such as the levels of unemployment compensation, minimum wage rates, subsidies and welfare programs, etc. Also, it can be refined through improvement of the primary and secondary sectors of the economy (farming, manufacturing, etc).

49. The price of crude-oil climbed above $31 a barrel on concerns about war with Iraq and the paralysis of Venezuela's oil industry. See, *The Wall Street Journal*, December 19, 2002, pp. A1 and C12. The price of oil reached $60.85 per barrel on June 27, 2005; an increase by 433.55% since December 1998. (See, economagic.com).

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TABLE 5
Ordinary Least Squares (OLS) Estimations of Eq. (18)

Variables	π_t	π_t	π_t	π_t		π_t
C	-0.109***	0.109***	0.077***	-0.077***		0.0006***
	(0.0003)	(0.004)	(0.007)	(0.0001)		(0.00003)
π_t^*	1.007***	0.993***	1.000***	0.999***	p_t^*	0.999***
	(0.00006)	(0.0008)	(0.001)	(0.00002)		(0.000007)
$s_t - s_t^*$	0.046***	-0.045***	-0.047***	0.047***		-0.00004***
	(0.0003)	(0.004)	(0.007)	(0.0001)		(0.000007)
$i_t - i_t^*$	-0.206***	0.203***	0.205***	-0.204***		0.0001***
	(0.0004)	(0.006)	(0.009)	(0.0002)		(0.0001)
$q_t - q_t^*$	-	-	13.233***	-13.146***		0.010***
			(0.924)	(0.016)		(0.0008)
$u_t - u_t^*$	0.087***	-0.085***	0.011	-		-0.000004
	(0.01)	(0.017)	(0.028)			(0.00003)
$djia_t - djia_t^*$	-	-0.112*	-0.108	0.107***		-0.0002*
		(0.067)	(0.109)	(0.002)		(0.0001)
$p_{oil_t} - p_{oil_t}^*$	0.009***	-0.011	0.049	-0.048***		0.0001**
	(0.003)	(0.042)	(0.069)	(0.001)		(0.00007)
$cs_t - cs_t^*$	-0.132***	0.147**	0.071	-0.071***		-0.0000008
	(0.005)	(0.068)	(0.111)	(0.002)		(0.0001)
R^2	0.999	0.999	0.999	1.000		1.000
SSR	0.012	2.312	6.131	0.002		0.000006
D-W	2.080	2.184	2.229	2.371		2.105
F	60590432	275478	90693	328000000		2690000000
N	546	546	546	546		546
RMSE	0.140698	0.139781	0.155171	0.155113		0.000132

Note: $\overline{X}$ = the average value of the variable, σ_X = the standard deviation of the variable, $\overline{x}$ = the average of the ln of the variable, σ_x = the standard deviation of the ln of the variable, $\overline{g}_X$ = the average rate of growth of the variable, $\sigma_{\overline{g}_X}$ = the standard deviation of $\overline{g}_X$, $\varrho_{p,X}$ = correlation coefficients between price level and variable X, g_X^* = the optimal (target) growth of

variable X, $\bar{g}_X - g_{X^*}$ = the deviation between the actual growth of X and its target growth, p = the ln of CPI, π = the inflation rate, p_{oil} = the ln of the price of oil, g_{poil} = the growth of the price of oil, r* = the real risk-free rate of interest, i_{FF} = the federal funds rate, i_{RF} = the risk-free rate of interest (the 3-month T-bill rate), d = the risk premium (i_{Baa}-i_{RF}), i_{Baa} = Moody's corporate Baa bond rate, u = unemployment rate, q = the ln of real output (GDP), g_q = the growth of GDP, s = the personal savings rate, m^s = the ln of money supply (m2), djia = the ln of DJIA, g_{DJIA} = the growth of DJIA, T (GRM) = Government Receipts; Total (taxes), T (USFGRM) = the Federal Government Receipts (taxes), g_T = growth of taxes, P_{oil} = price of oil, w (WS) = Employment Cost Index: Wages and Salaries, E (TWXI) = exchange rate: trade-weighted exchange index (FC/$), Divs = dividends, EBIT (CP) = corporate profits with IVA and CCadj., and CS = consumer sentiment (University of Michigan, 1966Q1=100). *** (**) (*)= significant at the 1% (5%) and (10%) respectively, i_t = the federal funds rate, a lower case letter represents the natural logarithm of the upper level one, R^2 = R-squared, SSR = sum of squared residuals, D-W = Durbin-Watson statistic, F = F-statistic, N = number of observations, and RMSE = root mean squared error.

Source: Economic Time Series Page by Eveline Tainer at http://www.economagic.com

TABLE 7
Ordinary Least Squares (OLS) Estimations of eqs. (21) and (22)

Variables	(21)π_t		(22)π_t
π_t^*	0.964***	π_t^*	1.079***
	(0.007)		(0.004)
$i_{FF_t}^*$	0.024***	$i_{FF_{t-1}}^*$	-0.062***
	(0.006)		0.003)
r_t^*	-0.041***	r_t^*	0.084***
	(0.007)		(0.004)
$d_t - d_t^*$	0.134***	$d_{t-1} - d_t^*$	-0.106***
	(0.011)		(0.015)
$u_t - u_t^*$	0.116***	$u_{t-1} - u_t^*$	-0.043
	(0.024)		(0.035)
$q_t - q_t^*$	-0.904	$q_{t-1} - q_t^*$	0.216
	(0.775)		(0.284)
$s_t - s_t^*$	0.006	$s_{t-1} - s_t^*$	-0.003
	(0.006)		(0.008)
$m_t - m_t^*$	1.046	$m_{t-1} - m_t^*$	0.232
	(0.832)		(0.538)
R^2	0.999		0.999
SSR	4.414		1.349
D-W	2.319		1.908
N	546		546
RMSE	0.098421		0.091713

Note: See, Table 5; *** (**) (*)= significant at the 1% (5%) and (10%) respectively.
Source: See, Table 5.

TABLE 8
Vector Autoregression Estimates of eq. (22) with exogenous monetary policy

Variables	π_t	r_t^*	d_t	u_t	q_t	S_t
π_{t-1}	1.174*	-0.384	0.456***	-0.023	-0.0002	0.339**
	(0.688)	(0.693)	(0.077)	(0.042)	(0.002)	(0.169)
π_{t-2}	-1.620**	1.337**	-0.055	0.064	0.0003	-0.256
	(0.652)	(0.657)	(0.073)	(0.040)	(0.002)	(0.160)
r^*_{t-1}	0.973	-0.184	0.452***	-0.028	0.0001	0.346**
	(0.691)	(0.696)	(0.078)	(0.043)	(0.002)	(0.169)
r^*_{t-2}	-1.710***	1.445**	-0.073	0.058	0.0005	-0.269*
	(0.646)	(0.651)	(0.073)	(0.040)	(0.002)	(0.158)
d_{t-1}	1.685**	-1.600**	1.214***	-0.006	-0.001	0.300*
	(0.743)	(0.749)	(0.084)	(0.046)	(0.002)	(0.182)
d_{t-2}	-2.239***	2.185***	-0.275***	0.042	0.001	-0.256
	(0.739)	(0.744)	(0.083)	(0.046)	(0.002)	(0.181)
u_{t-1}	0.664	-1.054	0.325***	0.969***	-0.006***	-0.027
	(0.722)	(0.727)	(0.081)	(0.045)	(0.002)	(0.177)
u_{t-2}	0.155	0.233	-0.311***	-0.023	0.007***	0.068
	(0.707)	(0.712)	(0.080)	(0.044)	(0.002)	(0.173)
q_{t-1}	-0.454	3.499	-2.478*	-2.083***	0.616***	2.903
	(12.693)	(12.784)	(1.428)	(0.783)	(0.041)	(3.111)
q_{t-2}	19.459	-23.103*	2.973**	1.642**	0.389***	-2.713
	(13.034)	(13.127)	(1.466)	(0.804)	(0.042)	(3.194)
S_{t-1}	-0.130	0.123	-0.006	0.012	-0.0004	0.693***
	(0.174)	(0.174)	(0.019)	(0.011)	(0.0006)	(0.043)
S_{t-2}	0.318*	-0.292*	-0.014	-0.015	0.0004	0.189***
	(0.174)	(0.175)	(0.020)	(0.011)	(0.0006)	(0.043)
C	-110.121***	113.304***	-2.655	2.731**	-0.016	1.127
	(17.579)	(17.705)	(1.977)	(1.084)	(0.057)	(0.262)
$i_{FF\,t}$	0.801***	-0.397**	-0.326***	-0.011	-0.0007	-0.003
	(0.186)	(0.187)	(0.021)	(0.011)	(0.0006)	(0.046)
m_t	-6.461***	6.699***	-0.186	0.130*	-0.003	-0.358
	(1.210)	(1.218)	(0.136)	(0.075)	(0.004)	(0.296)

cont'd

Variables	π_t	r_t^*	d_t	u_t	q_t	S_t
R^2	0.475	0.326	0.962	0.986	0.999	0.939
SSR	4358.741	4421.467	55.134	16.579	0.046	261.815
F	34.422	18.390	970.298	2591.943	55808.23	580.691
N	547	547	547	547	547	547

Note: See, Table 5; *** (**) (*)= significant at the 1% (5%) and (10%) respectively.
Source: See, Table 5.

TABLE 9

Vector Autoregression Estimates of eq. (22) with exogenous monetary and fiscal policy

Variables	π_t	r_t^*	d_t	u_t	q_t	S_t
π_{t-1}	1.198*	-0.404	0.448***	-0.033	-0.0001	0.315*
	(0.691)	(0.695)	(0.078)	(0.043)	(0.002)	(0.169)
π_{t-2}	-1.635**	1.349**	-0.051	0.069*	0.0003	-0.245
	(0.652)	(0.655)	(0.073)	(0.040)	(0.002)	(0.160)
r^*_{t-1}	1.005	-0.213	0.445***	-0.038	0.0002	0.325*
	(0.692)	(0.699)	(0.078)	(0.043)	(0.002)	(0.170)
r^*_{t-2}	-1.716***	1.448**	-0.068	0.063	0.0004	-0.256
	(0.645)	(0.649)	(0.073)	(0.040)	(0.002)	(0.158)
d_{t-1}	1.694**	-1.603**	1.205***	-0.016	-0.001	0.274
	(0.745)	(0.750)	(0.084)	(0.046)	(0.002)	(0.183)
d_{t-2}	-2.350***	2.304***	-0.279***	0.049	0.002	-0.269
	(0.738)	(0.743)	(0.083)	(0.046)	(0.002)	(0.181)
u_{t-1}	0.728	-1.120	0.325***	0.962***	-0.006***	-0.029
	(0.721)	(0.726)	(0.081)	(0.045)	(0.002)	(0.177)
u_{t-2}	0.096	0.289	-0.303***	-0.009	0.007***	0.094
	(0.714)	(0.718)	(0.080)	(0.044)	(0.002)	(0.175)
q_{t-1}	0.337	2.610	-2.370*	-2.064***	0.614***	3.199
	(12.659)	(12.738)	(1.427)	(0.782)	(0.041)	(3.103)
q_{t-2}	19.600	-23.309*	3.068**	1.715**	0.387***	-2.450
	(13.007)	(13.088)	(1.466)	(0.803)	(0.042)	(3.188)
S_{t-1}	-0.178	0.175	-0.010	0.012	-0.0003	0.679***
	(0.175)	(0.176)	(0.020)	(0.011)	(0.0006)	(0.043)
S_{t-2}	0.328*	-0.302*	-0.015	-0.017	0.0004	0.186***
	(0.174)	(0.175)	(0.020)	(0.011)	(0.0006)	(0.043)
C	-122.459***	126.994***	-4.065*	2.685**	0.012	-2.724
	(18.714)	(18.831)	(2.109)	(1.155)	(0.061)	(4.587)
$i_{FF\,t}$	0.811***	-0.410**	-0.321***	-0.008	-0.0007	0.010
	(0.188)	(0.189)	(0.021)	(0.012)	(0.0006)	(0.046)

cont'd

Variables	π_t	r_t^*	d_t	u_t	q_t	S_t
m_t	-1.355	1.397	-0.178	-0.377	-0.008	-0.372
	(3.956)	(3.981)	(0.446)	(0.244)	(0.013)	(0.970)
t_t	-5.033*	5.575**	-0.561*	-0.006	0.012	-1.532**
	(2.614)	(2.631)	(0.295)	(0.161)	(0.008)	(0.641)
g_t	0.184	-0.536	0.547	0.482*	-0.006	1.528
	(4.484)	(4.512)	(0.505)	(0.277)	(0.015)	(1.099)
R^2	0.481	0.335	0.963	0.986	0.999	0.939
SSR	4311.396	4365.758	54.758	16.432	0.045	259.017
F	30.699	16.658	851.850	2279.989	48841.72	512.022
N	547	547	547	547	547	547

Note: See, Table 5; *** (**) (*)= significant at the 1% (5%) and (10%) respectively. **Source:** See, Table 5.

CHART 1

Impulse Responses by using i_{FF}, M_2, T, and G as exogenous variables