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OPTIMAL MONETARY POLICY FOR POSTWAR IRAQ

Bedri Kamil Onur Tas and Selahattin Togay

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Send Correspondence to:
Bedri Kamil Onur Tas, TOBB ETU Department of Economics

Email: onur-tas@etu.edu.tr

Abstract

This paper theoretically investigates the optimal monetary policy regime for post-war Iraq. We analyze the macroeconomic dynamics (inflation, output and exchange rate) and the credibility and reputation of the Central Bank of Iraq (CBI) under alternative monetary policy regimes. We construct a detailed and realistic model that can be used to analyze the macroeconomic structure and expectation dynamics of an oil-producing, open economy. The simulation results indicate that an independent central bank with inflation targeting achieves credibility and reputation. The model constructed in this paper can be used to investigate more oil producing open countries.

ملخص

تبحث هذه الورقة نظريا النظام الأمثل للسياسة النقدية للعراق بعد الحرب. فنحلل الديناميكيات الاقتصادية الشاملة (المدخلات والمخرجات وأسعار الصرف)، وكذا مصداقية البنك المركزي العراقي وسمعته في ظل نظم بديلة للسياسة النقدية. ونشكل بذلك نموذجا تفصيليا واقعيا يمكن استخدامه في تحليل البنية الاقتصادية الشاملة والديناميكية المتوقعة بالنسبة للاقتصاد المفتوح لإنتاج البترول، وتشير نتائج المحاكاة إلى أن المصداقية والسمعة تكون من نصيب البنك المركزي المستقل الذي يهدف إلى المدخلات. كما يمكن استخدام النموذج المشار إليه في هذه الورقة لبحث الدول المفتوحة المنتجة للبترول

1. Introduction

Determining an optimal monetary policy for postwar Iraq is not a trivial matter since many economic institutions and markets are not operational in Iraq and postwar conditions should be taken into account. This paper theoretically investigates the following question: What is the optimal monetary policy regime for postwar Iraq? We analyze and compare the theoretical implications of three alternative monetary policy regimes on inflation, growth, expectations, credibility and macroeconomic stability. As mentioned in Hanke and Sekerke (2003), the analyzed monetary policy alternatives are an independent central bank, a currency board or dollarization. While theoretically investigating these alternatives, we take into account the following conditions of postwar Iraq: 1) incomplete financial markets 2) lack of credibility 3) oil producing country 4) expectation dynamics.

We extend the control-theoretic model of Svensson and Woodford (2004) and Faust and Svensson (2000) with oil price and exchange dynamics. Also, we incorporate asymmetric information and the hierarchical information structure as in Townsend (1983) into the model to investigate expectation dynamics of the CBI and the private-sector. Then we solve and implement this model to investigate the optimal monetary policy regime for post-war Iraq. We analyze macroeconomic dynamics (inflation, output and exchange rate) and the credibility and reputation of the CBI under alternative monetary policy regimes. We construct a detailed and realistic model that can be used to analyze the macroeconomic structure and expectation dynamics of an oil-producing open economy.

There are several studies like Hanke and Sekerke (2003) and Roubini and Setser (2003) that analyze and propose monetary policy for postwar Iraq. All of these studies are descriptive and do not conduct any theoretical investigations. Thus, this study makes several important contributions to the literature. First of all, this is the first study which theoretically investigates an optimal monetary policy for postwar Iraq. Second, this study contributes to the discussion of pegging the currency to export prices. We construct a model of signaling and learning as in Tas (2007, 2008) to investigate the changes in the expectations of the public under a currency board (peg the currency to oil price). This forward-looking model allows us to analyze changes in expected inflation and output under a currency board regime. Frankel and Saiki (2002), Frankel (2005) and Setser (2007) indicate that pegging to the export price may be a better option and is robust to terms of trade shocks. Frankel (2003) analyzes the case of Iraq and proposes that Iraq include oil to the basket of currencies, to which the dinar is pegged. All of these studies are descriptive. This study models the arguments put forward by these studies and investigates the implications. Finally, this study takes into account the credibility issue and the effect of different policies on the public's expectations.

2 Economic and Structural Conditions of Post-war Iraq

While constructing the model on economic dynamics of the postwar Iraq, we took into account the following special conditions of the country. The modeling specifics are explained in detail in section 4.

1. Incomplete financial markets: by November 2006, there were 6 state-owned and 23 private banks in Iraq. Two state-owned banks (Rafidain bank and Rashid bank) had an 80% share of the banking sector. As mentioned by Looney (2005), the interbank money market is not developed in Iraq and the banking sector is about 5% of the GDP.
2. Lack of credibility: since there is not a central bank of Iraq, CBI starts with very low credibility.

3. Oil producing country: oil production makes almost 60% of Iraqi GDP. The Iraqi economy is vulnerable to resource curse and oil price shocks.
4. Expectation dynamics: expectations of the private sector are crucial to maintain the stability and credibility of the CBI.

3. Monetary Policy Alternatives for Postwar Iraq

As mentioned in Hanke and Sekerke (2003), we investigated and compared three monetary policy alternatives for postwar Iraq.

An independent central bank with and without inflation targeting, a currency board and dollarization.

4. The Model of Learning and Expectation Dynamics

4.1 Macroeconomic Dynamics of an Oil Producing Open Economy:

The generic economic dynamics of this paper is an extended and modified version of the model used in Svensson and Woodford (2004) and Aoki (2003). As in Svensson and Woodford (2004), inflation and output are determined by the following VAR(1) process. Iraq is a country where output is dominated by production of oil as mentioned in Bayoumi and Eichengreen (1994).

In those countries, a change in relative prices is likely to show up as both an aggregate supply disturbance and an aggregate demand disturbance. A rise in oil prices is likely to affect Indonesia, for example, both by raising the underlying level of output through the increased incentive to produce oil and by boosting aggregate demand through the favorable impact of the terms of trade on real incomes.

Thus, to take into account the changes of oil prices on the economy of Iraq and determine the optimal monetary policy regime for an oil-producing economy we define an AR(1) equation for the oil prices and model the responses of inflation and output to the changes in oil prices.

Rautava (2004) indicates that “over the long run, a 10% permanent increase (decrease) in international oil prices is associated with a 2.2% growth (decline) in the level of Russian GDP. In addition, a 10% real appreciation (depreciation) of the ruble is associated with a 2.7% decrease (increase) in the level of GDP in the long run.”

Exchange rate pass through: as explained in Gagnon and Ihrig (2004) the exchange rate affects both inflation (exchange rate pass-through) and output. The generic economic dynamics of the economy are as the following:

$$\pi_{t+1} = \beta_{11}\pi_t + \beta_{12}x_t + \beta_{13}E(\pi_t|\Omega_t^{PRI}) + \beta_{14}E(\pi_t|\Omega_t^{PRI}) + \beta_{15}OilP_t + \beta_{17}ex_t + \varepsilon_{t+1}^{\pi}$$

$$x_{t+1} = \beta_{21}\pi_t + \beta_{22}x_t + \beta_{23}E(\pi_t|\Omega_t^{PRI}) + \beta_{24}E(\pi_t|\Omega_t^{PRI}) + \beta_{25}OilP_t + \beta_{26}r_t +_{27}\ ex_t + \varepsilon_{t+1}^{x}$$

$$OilP_{t+1} = \beta_{35}OilP_t + \varepsilon_{t+1}^{OilP}$$

$$ex_{t+1} = \beta_{46}r_t + \beta_{47}ex_t + \varepsilon_{t+1}^{ex}$$

The inflation, output and oil price equations can be displayed in a convenient state space representation as the following:

$$\begin{bmatrix} \pi_{t+1} \\ x_{t+1} \\ OilP_{t+!} \\ ex_{t+1} \end{bmatrix} = \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{15} & \beta_{17} \\ \beta_{21} & \beta_{22} & \beta_{25} & \beta_{27} \\ 0 & 0 & \beta_{35} & 0 \\ 0 & 0 & 0 & \beta_{47} \end{bmatrix} \begin{bmatrix} \pi_t \\ \pi_t \\ OilP_t \\ ex_t \end{bmatrix} + \begin{bmatrix} \beta_{13} & \beta_{14} & 0 \\ \beta_{23} & \beta_{24} & \beta_{26} \\ 0 & 0 & 0 \\ 0 & 0 & \beta_{46} \end{bmatrix} \begin{bmatrix} E(\pi_t|\Omega_t^{PRI}) \\ E(x_t|\Omega_t^{PRI}) \\ r_t \end{bmatrix} + \begin{bmatrix} \varepsilon_{t+1}^{\pi} \\ \varepsilon_{t+1}^{x} \\ \varepsilon_{t+1}^{OilP} \end{bmatrix} \qquad (1)$$

Or $\varsigma_{t+1} = A\varsigma_t + B\Upsilon_t + v_{t+1}$

π is inflation and x is output. *E(π)* and *E(x)* are inflation and output expectations of the private sector. The equation for inflation is a Phillips curve equation that relates inflation positively to lagged output, lagged inflation, private sector expectations of inflation and output and world oil price. The equation for output relates output to lagged inflation, output, inflation and output expectations of the private sector, the interest rate and the world oil price. ε denotes the shock error terms. World oil price is assumed to follow an AR(1). ε components are assumed to be the sum of an autoregressive component and a completely transitory component such that

$$\varepsilon^{\pi}_{t+1} = \theta^{\pi}_{t+1} + z^{\pi}_{t+1}$$

$$\varepsilon^{x}_{t+1} = \theta^{x}_{t+1} + z^{x}_{t+1}$$

θ^{π}_{t+1} and θ^{x}_{t+1} follow an AR(1) process as:

$$\theta^{\pi}_{t+1} = \rho^{\pi}\theta^{\pi}_{t} + e^{\pi}_{t+1} \qquad (2)$$

$$\theta^{x}_{t+1} = \rho^{x}\theta^{x}_{t} + e^{x}_{t+1} \qquad (3)$$

Where $\varepsilon^{OilP}_{t+1}, e^{\pi}_{t+1}, e^{x}_{t+1}, z^{\pi}_{t+1}, z^{x}_{t+1}$ are jointly normally distributed, independent among themselves and over time, with mean zero and variances $\sigma^2_{OilP}, \pi\sigma^2_e, x\sigma^2_e, \pi\sigma^2_z, x\sigma^2_z$ respectively.

4.2 Agents and Information Structure

The model features two agents, the CBI and a representative private sector agent. The information structure is hierarchical since the CBI is assumed to possess private information that the private sector agent tries to deduce by observing the CBI's actions. Hierarchical information structure and the source of asymmetric information (private signals) are modeled as in Townsend (1983).

The information structure consists of two steps:

• The CBI receives private signals on inflation and output and uses a forward-looking Taylor rule to determine the interest rate and a forward-looking rule for the inflation target (this target is announced to the public in the inflation targeting case).

• The representative private sector agent observes the interest rate and the inflation target (in the inflation targeting case) and revises her inflation and output expectations.

The CBI receives the following private signals about the autoregressive components of shocks to inflation and output at time *t*.

$$_{\pi t}\theta^{*}_{t} = \theta^{\pi}_{t+1} + u^{\pi}_{t} \qquad (4)$$

$$_{xt}\theta^{*}_{t} = \theta^{x}_{t+1} + u^{x}_{t} \qquad (5)$$

The private sector agent observes the interest rate and the inflation target (in the inflation targeting case) set by the CBI. The private sector agent is assumed to receive no signal on inflation and output. She then forms her own expectations about future inflation and output. The expectations of the representative investor are derived in section 2.2.

4.3 Monetary Policy Implementation of the CBI

After receiving the private signals mentioned above, the CBI uses a forward-looking Taylor rule to determine the interest rate and the CB also determines the inflation target using its private information and announces it to the public. The rule for the interest rate is specified as: $r_t = \lambda_1^r \{E(\pi_t \left| \Omega_t^{CBI} \right.) - \tilde{\pi}_t\} + \lambda_2^r E(x_t \left| \Omega_t^{CBI} \right.) + \lambda_3^R r_{t-1} + \varepsilon_t^r$ (6)

As in Gurkaynak, Sack, and Swanson (2003), the rule for the inflation target is specified as:

$$\lambda_t^{\tilde{\pi}} = \lambda_1^{\tilde{\pi}} \{E(\pi_t \left| \Omega_t^{CBI} \right.)\} + \lambda_2^{\tilde{\pi}} E(x_t \left| \Omega_t^{CBI} \right.) + \lambda_3^{\tilde{\pi}}\, \tilde{\pi}_{t-1} + \varepsilon_t^{\tilde{\pi}} \quad (7)$$

$\lambda_1^{\tilde{\pi}}$ and $\lambda_2^{\tilde{\pi}}$ determine the response of the inflation target to the inflation and output expectations of the CBI. $\varepsilon_t^{\tilde{\pi}}$ is the shock to the inflation target, which is normally distributed with mean zero and variance $\sigma_{\varepsilon_{\tilde{\pi}}}^2$ and is independent over time.

5. Expectation Dynamics

This section focuses on a highly stylized structure to illustrate the hierarchical information structure and the interplay of expectations across agents. We construct a learning model using a Kalman filter algorithm to model the information dynamics between the CBI and the private sector agent as suggested by Townsend (1983). The modeling structure and solution of the model is in line with Svensson and Woodford (2004) and Townsend (1983). The computation of the equilibrium involves three steps: the definition of an appropriate state space, the solution of the filtering problem for each agent, and the derivation of the expectations of the CBI and the private sector agent. The expectation dynamics of the CBI and the private sector are determined to investigate the credibility and reputation properties of the CBI.

5.1 Expectations of the Central Bank of Iraq

As shown in Faust and Svensson (2000) and Townsend (1983) the Kalman filter provides the optimal solution to the public learning problem. Thus, the equations for the CBI's expectations are found using a Kalman filtering algorithm.

The state vector $\begin{bmatrix} \varsigma_{t+1} \\ \theta_{t+1}^{\pi} \\ \theta_{t+1}^{x} \end{bmatrix}$, with corresponding state equation

$$\begin{bmatrix} \varsigma_{t+1} \\ \theta_{t+1}^{\pi} \\ \theta_{t+1}^{x} \end{bmatrix} = C \begin{bmatrix} \varsigma_t \\ \theta_t^{\pi} \\ \theta_t^{x} \end{bmatrix} + D \begin{bmatrix} \Upsilon_t \\ 0 \\ 0 \end{bmatrix} + v_{t+1} \quad (8)$$

Or $\Psi_{t+1} = C\Psi_t + D\Gamma_t + v_{t+1}$ (9)

The CBI then observes private signals about autoregressive components of shocks to time t inflation and output at time t. So, the observation equation is

$$\begin{bmatrix} {}_{\pi}\theta_t^* \\ {}_{xt}\theta_t^* \end{bmatrix} = \begin{bmatrix} 0_{2\times 4} \vdots \begin{matrix} 1 & 0 \\ 0 & 1 \end{matrix} \end{bmatrix} \begin{bmatrix} \varsigma_t \\ \theta_t^{\pi} \\ \theta_t^{x} \end{bmatrix} + \begin{bmatrix} u_t^{\pi} \\ u_t^{x} \end{bmatrix} \tag{10}$$

Or $z_t = H\Psi_t + \omega_t$ (11)

The Kalman filtering algorithm indicates that when a system can be represented in a state-space representation from as above, the forecast equation is

$$E(\Psi_{t+1} | \Omega_{t+1}^{CBI}) = CE(\Psi_t | \Omega_t^{CBI}) + D\Gamma_t + K_t(z_t - H(CE(\Psi_t^{CBI} | \Omega_t^{CBI}) + D\Gamma_t))$$

Where K_t is the Kalman gain and can be expressed in H, C, D an K_t are presented in detail in the appendix.

Equations (9) and (11) form a state-space representation form as above, the forecast equation is

$$E(\Psi_{t+1} | \Omega_{t+1}^{CBI}) = (C - K_t HC)E(\Psi_t | \Omega_t^{CBI}) + (D - K_t HD)\Gamma_t + K_t(H\Psi_t + \omega_t) \tag{12}$$

Equation (12) indicates that the CBI's inflation, output, oil price, exchange rate, autoregressive components of shocks to inflation, and output expectations are linear combinations of expectations made in the previous period, current macroeconomic variables and components of shocks to inflation and output.

5.2 Expectations of the Private Sector

The results in section 5.1 provide the linear equations for the CBI's expectations. Using the result above, we now derive the expectations of the private sector agent. The private sector agent observes the Federal Funds rate and the inflation target of the CBI (for the inflation targeting case) which is determined by the CBI's private information about future inflation and output. Thus, the private sector agent sees a filtered version of the CBI's private information. Similarly, we can use a Kalman filter to obtain the private sector agent's expectation equations.

5.2.1 Expectation Dynamics with Inflation Targeting

The state space representation of the system faced by the private sector agent under inflation targeting is as follows:

State equation:

$$G\begin{bmatrix} \Psi_{t+1} \\ E(\Psi_{t+1} | \Omega_{t+1}^{CBI}) \\ r_t \\ \tilde{\pi}_t \end{bmatrix} = C^{PRI}\begin{bmatrix} \Psi_t \\ E(\Psi_t | \Omega_t^{CBI}) \\ r_{t-1} \\ \tilde{\pi}_{t-1} \end{bmatrix} + D^{PRI}\begin{bmatrix} E(\pi_t | \Omega_t^{CBI}) \\ E(x_t | \Omega_t^{CBI}) \end{bmatrix} + \begin{bmatrix} v_{t+1} \\ K\omega_t \\ \varepsilon_t^{r} \\ \varepsilon_t^{\pi} \end{bmatrix} \tag{13}$$

Or

$$G\Theta_{t+1} = C^{PRI}\Theta_t + D^{PRI}\Delta_t + \alpha_{t+1} \tag{14}$$

G , C^{PRI} , D^{PRI} and α_{t+1} are presented in detail in the appendix.

In the inflation targeting case, the private sector agent observes the interest rate and the inflation target, so the observation equation is

$$\begin{bmatrix} r_t \\ \tilde{\pi}_t \end{bmatrix} = H^{PRI}\Theta_t + \begin{bmatrix} \varepsilon_t^r \\ \varepsilon_t^\pi \end{bmatrix} \quad (15)$$

Or $p_t = H^{PRI}\Theta_t + \kappa_t$ (16)

Applying Kalman filter to the state space representation formed by equation 14 and equation 16 provide us with the optimal expectations of the private sector under inflation targeting.

$$\begin{aligned} &E(\Theta_{t+1}|\Omega_{t+1}^{PRO}) = (C_G^{PRI} - K_t^{PRI}H^{PRI}C_G^{PRI})E(\Theta_t|\Omega_t^{PRO}) \\ &+ D_G^{PRI} - K_t^{PRI}H^{PRI}C_G^{PRI})\Gamma_t + K_t^{PRI}p_t \end{aligned} \quad (17)$$

Equation 17 presents the relationship between the private sector agent's expectations and the actions of the CBI. The equation identifies another transmission mechanism for monetary policy. Besides having direct effects, the changes in the interest rate and the implementation of monetary policy affect the expectations of the private sector agent.

5.2.2 Expectation Dynamics without Inflation Targeting

When the CBI is not exercising inflation targeting, there is still an inflation target for the CBI but it does not announce that to the public. Thus, the private sector agent needs to deduce the inflation target of the CBI from its policy actions — in other words the interest rate determined by the CBI. Compared to the model in 5.2.1 the state equation is the same but the observation equation only contains the interest rate.

When the CB does not follow an inflation target, it only determines the interest rate using its private information. The only signal that the private sector agent receives is the interest rate. Thus, the private agent's expectations are determined by the following equation after applying the Kalman filter.

State equation (equation 14):

$$G\Theta_{t+1} = C^{PRI}\Theta_t + D^{PRI}\Delta_t + \alpha_{t+1}$$

The private-sector agent only observes the interest rate, so the observation equation is:

$$[r_t] = I^{PRI}\Theta_t + [\varepsilon_t^r] \quad (18)$$

Or

$$p_t = I^{PRI}\Theta_t + \kappa_t \quad (19)$$

Applying Kalman filter to the state space representation formed by equations 14 and 19 provide us with the optimal expectations of the private sector without inflation targeting as in equation 17. The generic economic dynamics and the optimal expectations of the CBI and the private sector agent complete our model. In the next section we define reputation and credibility of the CBI in the context of our model.

6. Reputation and Credibility of the Central Bank of Iraq

Many studies like Cukierman and Meltzer (1986) and Faust and Svensson (2001) investigate the credibility and reputation of a central bank. These studies conclude that credibility and reputation of a central bank significantly affect the policy outcomes. Since the CBI will be newly established, its credibility is far more important than other older central banks. In this section we define reputation as credibility of the CBI, which we analyze in the context of our model.

6.1 Reputation

Faust and Svensson (2001) develop and solve a similar control-theoretic model for a central bank. They show that in equilibrium the private sector agent's best guess (optimal expectation) as to the CBI's output expectation summarizes everything the private sector agent has learned about the central bank preferences from economic outcomes. Thus, the private sector's output expectation summarizes the CBI's reputation at time. When comparing the reputation of the CBI under alternative regimes, we use the private sector's output expectation, as the reputation measure.

6.2 Credibility

As Blinder (1999) and Faust and Svensson (2001) emphasize, there are several different definitions of credibility. Cukierman and Meltzer (1986) and Faust and Svensson (2001) prefer and use the definition "average credibility of announcements". In other words, they use the difference between the inflation target of the central bank and the inflation expectation of the private sector agent. Cukierman and Meltzer (1986) and Faust and Svensson (2001) assume the inflation target to be zero. Since inflation targeting is one of the monetary policy regimes that we are investigating, we follow an approach closer to reality and remove this assumption. As in Faust and Svensson (2001), the credibility of the CBI is defined as

$$cre_t = \tilde{\pi} - E\left(\pi_t \middle| \Omega_t^{PRI}\right) \qquad (20)$$

7. Calibration of the Time Series Dynamics and Comparison of Alternative Regimes

In this section, we investigate the implications of the theoretical results by representing the economy in a vector autoregression (VAR) format. The VAR format allows us to use impulse response functions. We examine the response of the system from an initial steady state to a positive, one-unit increase in the specified variable's innovation at time t, i.e. the impulse response of the system to a specified shock. We analyze and compare the dynamics of macroeconomic variables like inflation and output and dynamics of reputation and credibility of the CBI under alternative monetary policy regimes which are explained in section 3 (inflation targeting, currency board and dollarization). The VAR representation of the whole economic dynamics is defined and calibrated under alternative regimes and impulse responses of these structural VARs are compared.

7.1 An Independent Central Bank with and without Inflation Targeting

Discretion and inflation targeting only differ in the transparency of the CBI — whether the CBI announces its inflation target to the public or not. Thus, the structural VAR representations of both systems are the same but the expectation equations differ as shown in Section 5. To save space and avoid unnecessary repetitions we represent the same VAR format for both systems with different companion matrices. Superscripts define the coefficient matrices for the non-inflation targeting case and the coefficient matrices for inflation targeting.

$$\left[T^{disc,target}\right]\begin{bmatrix}\Psi_{t+1}\\ E(\Theta_{t+1}|\Omega_{t+1}^{PRI})\\ E(\Theta_{t+1}|\Omega_{t+1}^{CBI})\\ p_t\end{bmatrix} = \left[A^{disc,target}\right]\begin{bmatrix}\Psi_t\\ E(\Theta_t|\Omega_t^{PRI})\\ E(\Theta_t|\Omega_t^{CBI})\\ p_{t-1}\end{bmatrix} + \left[error_{t+1}\right] \qquad (21)$$

The independent central bank also maintains a floating exchange rate compared to a pegged exchange rate which is analyzed below.

7.2 Currency Board

Hanke and Sekerke (2003) explain the currency board as follows:

A currency board issues a domestic currency at a fixed exchange rate with a reserve currency such as the U.S. dollar or the euro. The domestic currency is convertible on demand into the reserve currency at the fixed exchange rate, and convertibility is guaranteed because the currency board maintains 100 percent reserve currency backing of the domestic monetary base.

As explained above, the currency board is a pegged exchange rate and very similar to dollarization. A currency board dictates the exchange rate to be constant. So, under a currency board regime the CBI has an exchange rate target and directly targets the exchange rate. The exchange rate target of the CBI is denoted as follows and is assumed to be constant over time.

$$ex_{t+1} = \overline{ex} \tag{22}$$

We solve and calibrate the model using the constant exchange under the currency board. The central bank is responsible for the constant exchange rate. To take into account this responsibility and constraint on the central bank, we modify the economic dynamics of the model and the interest rate rule of the CBI. We introduce the exchange rate into the policy rule of the CBI.

7.3 Dollarization

Many economists like Summers (2000) and Fischer (2001) proposed hard pegs for emerging economies. Dollarization — in the sense that the country should abandon its national currency and adopt an advanced nation's currency as legal tender (US Dollar for Ecuador) — has been implemented by many countries. Hanke and Sekerke (2003) argue that “two alternative monetary regimes that would work well to introduce sound money in postwar Iraq are a currency board regime and official “dollarization.”. Herrendorf (1999) investigates reputation and credibility under pegged exchange rates. He indicates that under pegging the exchange rate equals zero. The domestic money supply is endogenous and foreign inflation is imported. Thus, the inflation equation is different from the independent central bank case. Equation 23 below defines the inflation equation under dollarization.

$$\begin{aligned} ex_{t+1} &= 0 \\ \pi_{t+1} &= \pi^f_{t+1} \\ \pi^f_{t+1} &= \beta_f \pi^f_t + \varepsilon^f_{t+1} \end{aligned} \tag{23}$$

8. Impulse Response Functions

The VAR format shown above provides a convenient way of examining the response of the system from an initial steady state to a positive, one-standard-deviation impulse in specified economic shocks at date 1. Using impulse responses with calibrated coefficients we compare reputation and credibility under alternative regimes.

8.1 Credibility

The simulation results of credibility are shown in Figure 1. Credibility is calculated as defined in Section 6.2.

Higher values in the graph indicate that the private sector agent’s expectations are different from the CBI’s target. Thus, the simulation results show that the pegged exchange rate regime has the lowest credibility and the inflation targeting regime has the highest. This result is caused by the fact that the CBI cannot control inflation and imports inflation of the other countries.

8.2 Reputation

The simulation results of reputation are shown in Figure 2. Credibility is calculated as defined in Section 6.1.

The simulation results are inconclusive with regards to the CBI's reputation. But we can say that under a pegged regime the CBI is considered to have negative emphasis on the output.

9. Conclusion

We construct a detailed and realistic model of macroeconomic structure and expectation (learning) dynamics for post-war Iraq to investigate the optimal monetary policy regime for the country. We analyze and compare the theoretical implications of three alternative monetary policy regimes on inflation, growth, expectations, credibility and macroeconomic stability. The analyzed monetary policy alternatives are: an independent central bank with and without inflation targeting, a currency board and dollarization. The simulation results indicate that an independent central bank with inflation targeting achieves credibility and reputation. The model constructed in this paper can be used to investigate other oil producing open economies. Future research should include the effects of monetary policy on macroeconomic factors.

References

Aoki, Kosuke, 2000, Optimal Commitment Policy under Noisy Information, *Journal of Monetary Economics* 50, 501-523.

Bayoumi, Tamim and Barry Eichengreen, 1994, One Money or Many? Analyzing the Prospects for Monetary Unification in Various Parts of the World, *Princeton Studies in International Finance* 76

Blinder, Alan S., 1999, Central Bank Credibility: Why Do We Care? How Do We Build It? NBER Working Paper No. W7161.

Clarida, Richard, Jordi Gali and Mark Gertler, 1999, The Science of Monetary Policy - A New Keynesian Perspective, *The Journal of Economic Literature* 37 (4) pp. 1661-1707.

Cukierman, Alex, and Allan H. Meltzer, 1986b, "A Theory of Ambiguity, Credibility, and Ination under Discretion and Asymmetric Information", *Econometrica* 54, 1099-1128.

Edwards, Sebastian, and I. Igal Magendzo, 2003, Dollarization and Economic Performance: What do we really know? *International Journal of Finance and Economics* 8, 351-363.

Faust, Jon and Lars Svensson, 2001, Transparency and Credibility: Monetary Policy with Unobservable Goals, *International Economic Review* 42, 369-397

Fischer, Stanley, 2001, Exchange Rate Regimes: Is the Bipolar View Correct? *Finance and Development* 38(2): 18-21.

Frankel, Jeffrey, 2005, Contractionary Currency Crashes in Developing Countries, NBER Working Paper No. 11508.

Frankel,Jeffrey and Ayako Saiki, 2002, A Proposal to Anchor Monetary Policy by the Price of the Export Commodity, *Journal of Economic Integration* 17, 417- 448.

Goodfriend, Marvin, 1991, Interest Rates and the Conduct of Monetary Policy, Carnegie-Rochester Conference Series on Public Policy 34, 7-30.

Gurkaynak, Refet S., Brian Sack, and Eric Swanson, 2005, The Excess Sensitivity of Long-term Interest Rates: Evidence and Implications for Macroeconomic Model, *American Economic Review* 95(1): 425-36.

Hamilton, James D., 1994, Time Series Analysis, Princeton: Princeton University Press.

Hanke, Steve H. and Matt Sekerke, 2003, Monetary Options for Postwar Iraq, Foreign Policy Briefing No. 80.

Herrendorf, Berthold, 1999, Transparency, Reputation and Credibility under Floating and Pegged Exchange Rates, *Journal of International Economics* 49, 31-50.

Joseph E. Gagnon and Jane Ihrig, 2004, Monetary Policy and Exchange Rate Pass-through, *International Journal of Finance & Economic* 9, 315-338.

Rautava, Jouko, 2004, The Role of Oil Prices and the Real Exchange Rate in Russia's Economy: A Cointegration Approach, *Journal of Comparative Economics* 32(2):315-327.

Romer, Christina D. and David H. Romer, 2000, Federal Reserve Private Information and the Behavior of Interest Rates, *American Economic Review* 90, 429-457.

Roubini, Nouriel and Brad Setser, 2003, Should Iraq Dollarize, Adopt a Currency Board or Let its Currency Float? A Policy Analysis, unpublished manuscript.

Rudebusch, Glenn D., 1995, Federal Reserve Interest Rate Targeting, Rational Expectations, and the Term Structure, *Journal of Monetary Economics* 35, 245-274.

Taş, Bedri K. O., 2008a, An Explanation for the Price Puzzle: Asymmetric Information, unpublished manuscript.

Taş, Bedri K. O., 2008b, Asymmetric Information, Stock Returns and Monetary Policy, unpublished manuscript.

Townsend, Robert M., 1983, Forecasting the Forecasts of Others, *The Journal of Political Economy* 91, 546-588.

Sack, Brian, 1997, Uncertainty and Gradual Monetary Policy, Board of Governors of the Federal Reserve System, mimeo.

Setser, Brad, 2007, The Case for Exchange Rate Flexibility in Oil-exporting Economies, Peterson Institute for International Economics Policy Brief, No: PB07-8.

Summers L.H., 2000. International Financial Crises: Causes, Prevention, and Cures. *American Economic Review* 90(2): 1-16.

Svensson, Lars, E. O. and Michael Woodford, 2004, Indicator Variables for Optimal Policy under Asymmetric Information, *Journal of Economic Dynamics and Control* 28, 661-690.

Figure 1: Central Bank of Iran's Credibility

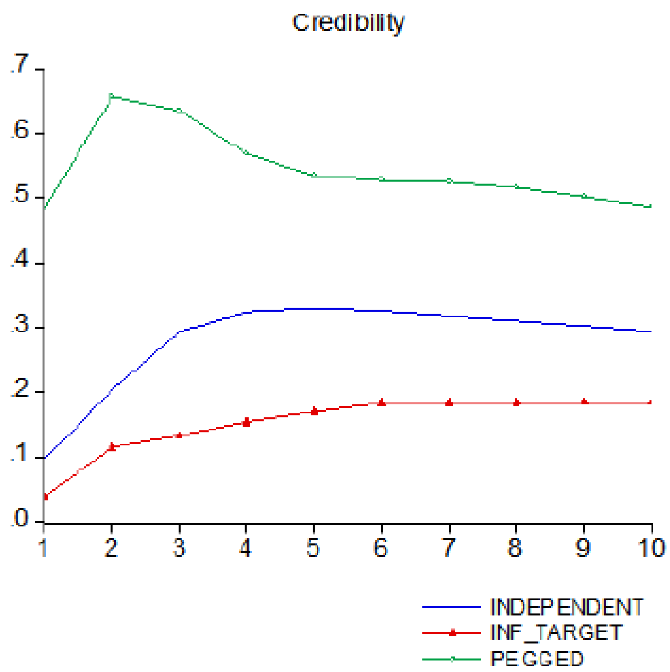
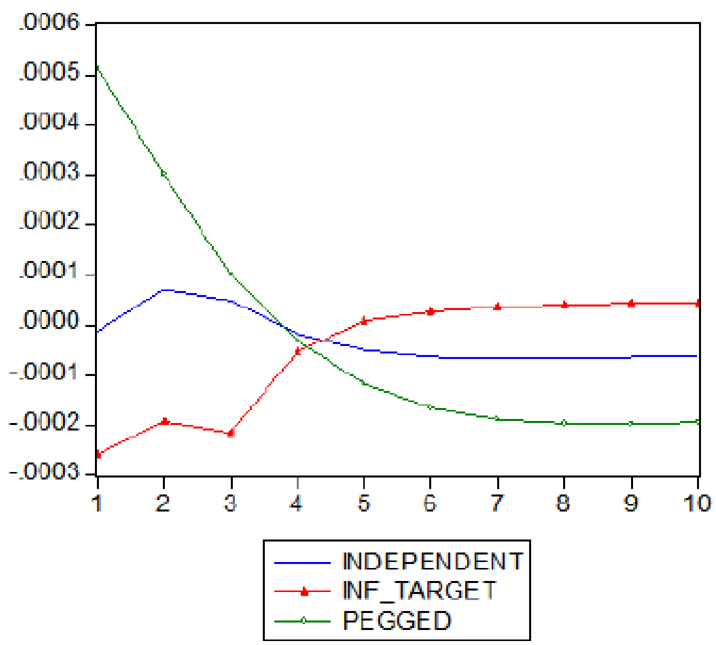


Figure 2: Central Bank of Iran's Reputation:



Appendix

A Detailed Display of Functions

$$C = \begin{bmatrix} \beta_{11} & \beta_{12} & \beta_{15} & \beta_{17} & \rho^{\pi} & 0 \\ \beta_{21} & \beta_{22} & \beta_{25} & \beta_{27} & 0 & \rho^{x} \\ 0 & 0 & \beta_{35} & 0 & 0 & 0 \\ 0 & 0 & 0 & \beta_{47} & 0 & 0 \\ 0 & 0 & 0 & 0 & \rho^{\pi} & 0 \\ 0 & 0 & 0 & 0 & 0 & \rho^{x} \end{bmatrix}$$

$$D = \begin{bmatrix} \beta_{13} & \beta_{14} & 0 & 0 & 0 \\ \beta_{23} & \beta_{24} & \beta_{26} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & \beta_{46} & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 \end{bmatrix}$$

$$K = (CP_{t-1}C' + Q)H'(HP_{t-1}H' + R)^{-1}$$

$$P_t = E\left[(\Psi_t - E\{\Psi_t \middle| \Omega_t^{PRI}\})(\Psi_t - E\{\Psi_t \middle| \Omega_t^{PRI}\})'\right]$$

$$C^{PRI} = \begin{bmatrix} C & O_{6\times 6} \\ KH & (C - KHC) \end{bmatrix}$$

$$D^{PRI} = \begin{bmatrix} D \\ (D - KHD) \end{bmatrix}$$