Eurasian Journal of Economics and Finance, 5(1), 2017, 33-48
DOI: 10.15604/ejef.2017.05.01.003

EURASIAN JOURNAL OF ECONOMICS AND FINANCE

www.eurasianpublications.com

THE PROSPECT OF INFLATION TARGETING IN KAZAKHSTAN

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Abstract

Over the last two decades, there has been a significant increase in the number of countries that began to pursue an Inflation Targeting monetary policy framework. Since the collapse of the Soviet Union, each of the fifteen newly created independent countries started to develop and run their own autonomous monetary policies. Kazakhstan announced the implementation of an Inflation Targeting policy in August 2015. At the same time, a number of researches show that Inflation Targeting might not work as well for developing countries as it does for developed ones due to certain fundamental differences and preconditions that must be met before the implementation phase. Thus, this paper discusses the case of Kazakhstan as a typical emerging market economy example, examines its ability to respond to various external shocks and identifies the main transmission channels in order to contribute to the knowledge in this particular area. Identification assumptions generate contemporaneous monetary shocks on domestic inflation behavior, which also take into account various features of the small open economy as well as indicate different important transitory and persistent effects. The results show, based on the interpretation of impulse response functions, a positive interest rate shock has an uncertain inflationary impact, which raises questions about the effectiveness of interest rate manipulation in keeping inflation within the given band. In addition, a positive exchange rate shock leads to a stronger upward pressure in inflation rates. Finally, inflation inertia explains a substantial increase in future inflation rates.

Keywords: Monetary Policy, Inflation Targeting, Structural VAR

JEL Classification: E31, E47, E52

1. Introduction

Over the last two decades, there has been a significant increase in the number of countries that started to pursue an Inflation Targeting monetary policy framework. First experienced in New Zealand in 1990, the new monetary invention gained wide popularity among central banks of industrial as well as emerging economies. Following this policy rule, monetary authorities declare maintaining low inflation and commitment to price stability as their first and main priorities. Otherwise, there is an institutional approach that high inflationary pressures actually can damage long-run economic growth through different transmission channels (Mishkin and Schmidt-Hebbel, 2007). Currently, around sixty countries around the world have already adopted different forms of Inflation Targeting, and many more announced the move toward ”fully fledged” Inflation Targeting or plan to implement some other variations of this macroeconomic policy in the coming years.

Since the collapse of the Soviet Union, each of the fifteen newly created independent countries started to develop and run their own autonomous monetary policies. Having inherited not well-suited market monetary institutions, the collapse of the system led to the most severe economic downturn in those new states due to the destruction of traditionally established economic ties among them. As of today, they have undergone important changes in their monetary policies bringing various characteristics at each specific country level. Thus, some of them pursue fixed nominal exchange rate regimes (Uzbekistan, Tajikistan), others peg their currencies to a regional one (Belorussia), and some of them recently have started to realize an Inflation Targeting scenario (Kazakhstan, Georgia, Russia, Armenia). Since the fall 2014, the region's largest economy, Russia, declared its institutional obligation to preserve price stability, so formally announcing an Inflation Targeting rule for its macroeconomic management, and simultaneously free floated its national currency – ruble (CBRF, 2014). That was a sign of fundamental and long-term inroad of Inflation Targeting policy into the space of post-Soviet economies, now one of the integral groups of emerging market economies.

Following the case of Russia, a year later Kazakhstan also announced the implementation of Inflation Targeting policy in August 2015. The ability of Central Banks to alleviate the negative impacts of the crises has been critical and powerful, which demonstrated the advantages of flexible monetary policy in response to external shocks in most of the countries that adopted Inflation Targeting policy. Therefore, the aim of this paper is to combine theoretical approaches to discuss monetary theory in a case of a small open economy and practically assess the origins of its inflation dynamics. There is a growing literature on monetary theory, monetary policy, and macroeconomic management under Inflation Targeting, which primarily concentrates on a single target approach and subsequent possible policy outcomes. Particularly, number of researches show that Inflation Targeting might not work well for developing countries as it is for developed ones due to certain fundamental differences and preconditions that must be met before implementation phase. Thus, discussing the case of Kazakhstan as a classical emerging market economy example, examining its ability to respond on various external shocks and identifying main transmission channels would importantly contribute to the knowledge in this area. This article especially focuses to tackle the following questions: What are the particular building blocks of Inflation Targeting monetary policy framework? What causes the fundamental shift in macroeconomic governance in Kazakhstan? How does the Kazakhstani CPI respond to various monetary shocks?

The rest of the paper is organized in the following sections. The next part will present broad overview of Inflation Targeting, its theoretical background and academic justification. Then, we discuss some preconditions before the adoption, identify key steps of realization, and examine a small open economy case study of Kazakhstani economy, followed by key relationships between macroeconomic variables and the ability to respond to different kinds of shocks over the given period. Last section concludes with general thoughts on medium-term policy implications.

2. Key Theoretical Issues of Inflation Targeting Policy

Maintaining the price stability becomes the first and main responsibility of central banks around the world. Thus, Inflation Targeting is one of the formal monetary regimes, which is designed to preserve low and stable inflation rates. Post-soviet economies had a scarce choice to conduct their monetary policies, and thus, most of them selected fixed nominal exchange rate as their intermediate target to maintain price stability. Fixed exchange rate served as a visible anchor for monetary policy choice that was easily manageable, and hence, helped to gain central bank credibility. Secondly, stable exchange rate was essential to promote international trade and attract investments during early transition period. However, the practical inefficiency of exchange rate targeting includes loss of monetary autonomy, speculative attacks bringing banking crises, and real exchange rate mismatches leading to changes in domestic prices and a decline in output. As a result, inflation targeting emerges as a monetary policy only after specific preconditions have met in financial, fiscal, and monetary institutions of a country (Batini and Laxton, 2006).

There are several different ways to define what Inflation Targeting policy is and how it runs. However, Mishkin (2000) gave one of the well-accepted operational descriptions, which were taken as a representative among other versions. Inflation targeting is a monetary policy regime, which includes the following five main elements. First of all, it involves a clear announcement of an inflation target by the central bank for a medium or long-term time horizon, which usually is a narrow range of annual inflation rates. Secondly, primary goal of monetary policy is a price stability, to which other goals are subordinated. Third, it is an information inclusive strategy, which includes different monetary variables to designate appropriate policy instruments. In addition, central banks commits for a greater transparency, publicly describing all decisions they undertake to fight inflation and openly explaining reasons if target has been missed. Finally, increased accountability of a central bank for achieving desired inflation purposes. In case of emerging market economies, "fully-fledged" Inflation Targeting policy requires institutional development in monetary, financial, and fiscal authorities to increase the power and independence of a central bank.

Kydland and Prescott (1977) first gave theoretical reasoning for the value of commitment to the announced targets and credibility in monetary policy. The theory of dynamic inconsistency states that monetary authorities formulate policies based on the assumption that future expectations are fixed. Therefore, this creates an incentive to maintain inflation rate at a higher level than socially optimal inflation. Important outcome of this concept is that individual agents rationally adapt their expectations in response to various changes in monetary policy, thus removing long-term impact on real variables. As options of incorrect response on short-term incentives to raise output or employment above long-run level are eliminated, then rules-based central banking is desirable, in which scope of discretion is limited. Such kind of policy rule can be represented as a loss-function, which expresses the trade-off between inflation and output variability:

$$L = 0.5(y-y^*)^2 + 0.5a(\pi-\pi^*)^2 \quad (1)$$

The aim of loss function to minimize the squared deviation from socially optimal inflation targets, where y* is a socially desirable output (assume $y<y^*$), π^* is a socially desirable level of inflation, a - is a relative weight to inflation (assume $a>0$).Tradition inflation-output tradeoff (Philipp's-curve type relationship):

$$Y = y' + b(\pi - \pi^*) \quad (2)$$

There is a potential short-run trade-off between inflation and output, which depends how expectations were adapting. But, we assume no long-run tradeoff, as long as expectations modify up to $\pi = \pi^*$.Solving our loss-function leads to the final expression:

$$\pi^e = \pi = \pi^* + b/a(y^*-y') \quad (3)$$

As a result, it means that as more weight is given to inflation (a goes to infinity), then inflation would tend to reach socially optimal level of inflation targets. Therefore, increasing independence of a central bank would reduce the possibility of raising output beyond its long-run potential. If all weight is put on inflation variable, then country pursues "strict" inflation targeting. Any weight given to output would be representation of a "flexible" inflation targeting (Svensson, 1997). Theoretical setting behind y'=y (natural level of output) is the assumption that in the long-run output will get to equilibrium point, which is referred as natural level of output.

According to Bernanke *et al.* (1999) usually in practice, central banks should be bounded by forward-looking fundamnetal objectives that would prevent them from actions with long-run negative effects. At the same time, they need some discretion to response on various moentary shocks and unanticipated calamities. As a result, target-rules sometimes might be broken, but taking into account increased degree of transparency and accountability. As it was mentioned earlier, central banks should publicly explain why they have missed assigned inflation target. That type of Inflation Targeting regime, which is not strictly rules-based and has

a room for output stabilization, mostly characterized as a policy of a constrained discretion. (Bernanke and Mishkin,1997) Overall, various macroeconomic shocks put a gap between theoretical background and practical implementation, so each country needs its own careful analysis.

One of the crucial compound parts of Inflation Targeting is that credibility and transparency would help to anchor inflation expectations. In other words, over the long-run time horizon inflation expectations should be driven only by economic agents' perception of monetary policy (Heintz and Ndikumana, 2010). Thus, based on clearly observable inflation targets people would be able to understand and evaluate the decision of a central bank better than under other monetary strategies. Subsequently, the concept is that all participants will believe them and adjust their expectations to the targets announced by the central bank. Finally, those expectations then should be incorporated into future wage agreements, pricing schemes and industry contracts. However, in countries that have adopted Inflation Targeting relatively recently, people are observing and learning at a constant term, so their expectation converge to particular distribution near long-term ration expectation equilibrium (Sargent, 1999).Overall, it can be argued that forward-looking nature of inflation expectations should closely tie inertial inflation factor from previous periods to current inflation target band. In contrast to other traditional monetary tools, this particular method would not contain real economic costs, and will bring inflation down at a lower cost. Especially, it would lessen the "sacrifice ratio" – the amount of output or employment that must be forgone to decrease the same level of inflation.

However, the results of empirical studies testing the effect of inflation targeting practice on the level and volatility of observed inflation are diverse. For instance, according to Ball and Sheridan (2003) and Epstein (2008), inflation-targeting countries in comparison with other countries' central banks do not demonstrate significant reduction in inflation in terms of forgone output. Corbo *et al.* (2001) claim that sacrifice ratios have declined in emerging market economies compared to their pretargeting period. In addition, output variability fell in both developing and developed countries after implementation of Inflation Targeting policy. Mishkin and Schmidt-Hebbel (2007) state that among developed countries inflation targeting experience brought steeper decline in both amount and variability of inflation than in the similar group of countries that did not implement inflation targeting. Goncalves and Salles (2008) extended the analysis for thrity six developing countries and found that they also have experienced greater falls in inflation and reductions in inflation volatility. In general, all these practical investigations are very sensitive to different variable controls that are used to capture the influence of adoption of inflation targeting. Thus, assessing pre- and post-targeting experience of one particular country might prove the change in monetary policy, but not the pure effect of inflation targeting on macroeconomic indicators. The same applies for comparisons between inflation targeters and countries that pursue different regulatory policies, where selection of control groups might result in subjective inferences. Overall, discussions wether Inflation Targeting reduces long-run real econoimc costs by lowering inflation expectations remain uncertain. Even if there is no clear evidence on decreased inflation expetations, practicing inflation targeting make central banks accountable and transparent for reaching aimed policy object. Taking into account relatively late adotion of Inflation Targeting in post-Soveit economies, conducting of equivalent researches on effects of Inflation Targeting in those countries is still limited.

One of the fundamental reasoning for Inflation Targeting, despite all other purposes, is that it specifies the role of a "*nominal anchor*" for the real economy. (Bernanke *et al.* 1999) If economic agents will not have sufficient information about the average price level and its most likely future dynamic patterns, there is a greater risk that they would missalocate resources due to incorrect observation of changes in relative prices. Thus, having well recognized and easily understandble anchor provides better communication with the public. In a system of fiat money, it is essential to put an additional constraint on monetary policy to limit the price level to a particular level at a specific period of time. For instance, there are traditional practices of designing some other forms of nominal anchors such as quantity and price constraints. Quantity limit option is considered as a control of the amount of paper-money that can be added into circulation. Whereas, price limit form is essentially fixing the value of paper money expressed in terms of other goods, i.e., the level of exchange rate. Thus, without any potential money

constrains, public would be vulnerable to fluctuations in inflation expectations driven by various set of factors. (Laurens *et al.* 2015) As a result, an instituional commitment to long-run price stability is also an effective way to launch a nominal anchor, and thus, Inflation Targeting stands as one of the potential choices. In addition, emerging market economies are often subject to disruptive effects of exchange rate fluctuations. (Mishkin, 2000) Too frequent and substantial interventions in the foreign exchange market might pose greater risks of switching the exchange rate into a nominal anchor. Therefore, it is very important to run a transparent moentary policy that would allow smoothing of a short-run exchange rate volatility, but also making possible for the exhange rate to reach its market determined equilibrium level.

Finally, a systematic understanding of the monetary policy transmission processes is a major precondition to successfully implement Inflation Targeting framework. According to Taylor (1995), monetary policy transmission mechanism is the scheme by which changes in monetary policy decisions affect the rate of economic activity and the rate of inflation. Prior academic liretature identifies various transmission channels, but most important ones are the interest rate channel, exchange rate channel, bank credit and asset price channels (Mishkin, 1996; Bernanke and Gertler, 1995; Tobin, 1969). Implementation of Inflation Targeting regime usually implies that manipulation of the short-term interest rate becomes the main monetary policy tool. Thus, transmission mechanisms claim that changes in policy rates lead to subsequent deviations in commercial bank lending and deposit rates. Secondly, movements in retail rates impact personal comsumption and investment levels, so aggregate demand. Finally, aggregate demand adjustements influence the real economic activity, which should bring the expected effect on domestic inflation rate. Thus, increase in the nominal interest rate theoretically causes appreciation in the value of domestic currency due to a large amount of short-term investment inflows, which in turn is called exchange rate channel (Cardero, 2008). Furthermore, the growth of stocks of short-term capital increases the risk of financial fragility. Generally, emerging market economies are characterized with underdeveloped financial markets, oligolistic nature of banking sector, and shocks to money supply coming mostly through external channel(Mukherjee and Bhattacharya, 2011). However, empirical studies on monetary policy effects in response to various monetary shocks are ambiguous, resulting in a number of anomalies (puzzles), which are broadly depicted in prior literuature (Kim and Roubini, 2000). Therefore, careful evaluation of the outcomes and relative significance of domestic and foreign shocks, and the possible capability of the consistent monetary authorities reactions is the key goal of the second part of the paper.

3. Inflation Targeting in Kazakhstan

In contrast to advanced economies, developing countries have some differences in implementation of Inflation Targeting strategy due to weak fiscal, financial and monetary institutions. Such kind of structural limitations make inflation and exchange rates less manageable for forecasting, and thus, can destabilize the real value of money within the country (Calvo and Vegh, 1996). To reach the most efficient macroeconomic outcomes under Inflation Targeting framework, emerging market economies should aim for a stronger institutional development. In addition, Stone (2003) argues that developing group of countries, which recently switched to Inflation Targeting, often adopted some form of transitional regime aiming for monetary policy stability while operational reformations are still continuously implementing. Thus, next section draws a number of systemic prerequisites that are preferred to be before the adoption.

Thus, first developing strong *fiscal* stability is necessary. The problem is that government uncoordinated fiscal policy would eventually put pressure on monetary authorities by generating additional money growth and higher inflation. Thus, large fiscal dominance is a serious constraint on the realization of any given monetary strategy. Kazakhstani figures on external debt and regular reports on balance of payments demonstrate that fiscal dominance is not a significant obstacle for the central bank's policy of discretion (NBK, 2016). Law improvements that make budgeting rules more transparent would greatly contribute to preclude future fiscal imbalances and efficient conduct of the monetary policy. Next major precondition is

to develop safe and sound *financial* system, so the central bank can reach the maximum potential of interest rate channel on monetary policy. In a state of weak and underdeveloped banking system, a central bank is unable to substantially raise interest rate, because this could possibly lead to a long-term downturn of the financial system and subsequent damage of the inflation control. Thus, once economic agents identify the weakness of the banking system, sudden capital outflows lead to the sharp depreciation of the exchange rate and upward pressure of inflation rate. Correspondingly, negative net worth of domestic firms, which primarily engage in the foreign currency liability management, eventually deteriorates balance sheets of banks and finally result in a decline of investements and economic activity. Thus, a high level of the financial dollarization also can become a main difficulty to promote flexible monetary program (Mishkin, 2000). National Bank of Kazakhstan constantly supervises and regulates commerical banks activities and regularly publishes analytic reports on standing of the banking industry. As of August 2016, the overall level of dollarization of private savings accounts in Kazakhstani banking institutions stands at about seventy percent (NBK, 2016). The overall impact of the financial dollarization on such core issues as credibility of the central bank and the future expectaions formations by economic agents should be a topic for further discussion. In addition to the fundamental notion of rising autonomy of the central bank, *monetary* preconditions also include inflation forecast capabilities and a comprehensive understanding of monetary transmission mechanisms by policymakers. Batini and Laxton (2006) state that a lot of emerging market economies have started with a liitle or no forecasting tools. However, since monetary policy actions impact target variables with various lags, forecasts are required for the more efficient realization of inflation targeting framework. National Bank of Kazakhstan has already developed its own forecasting method, which is normally explained in Quarterly Inflation Reports documents (NBK, 2016). While the NBK is already applying those tools, the practical effectiveness is limited due to different exogenous shocks, major exports price volatility, and incomplete structural reforms. Therefore, Kazakhstan have not met of all required preconditions before the adoption of Inflation Targeting strategy. In addition, relatively short time series reduces analytical part of the research. Overall, prior experience of emerging markets reveal that fulfilling of all the prerequisites is not critical for its succesful implementation (Batini and Laxton, 2006; Mishkin, 2000). Moreover, adoption of Inflation Targeting has been always accompanied with substantial improvements not only in fiscal and financial institutions, but also in data accessibility and inflation forecasting tools. Thus, proactive attitude by both the central bank and the government after implementation stage is important to effectively retrieve above disucessed preconditions.

On August 19, 2015 President Nazarbayev held a meeting with Government officials to address the issue of declining trends in global commodity markets and its' challenge for the economy of Kazakhstan. As a main result, President Nazarbayev mentioned a necessity to build competitive monetary policy, which implied a long-term shift to an Inflation Targeting policy (Witte, 2015). The following day, Kazakhstan announced free floating of its national currency, tenge. Subsequently, Kazakhstan stock exchange (KASE) became the only place, which sets the exchange rate through the free market's "invisible hand". On August 21, 2015 the National Bank released a statement N38, which says that "The National Bank is committed to ensuring price stability and will target the range of 6-8 percent annually (based on year-on-year headline consumer price inflation rate) and financial stability. By 2020, the National Bank will aim at targeting headline inflation in the range of 3-4 percent annually" (NBK, 2015, pr. 38). Since then, the nominal exchange rate has depreciated by around one hundred percent with adjustment period lasting approximately two months, when Daniyar Akishev was appointed as a new chairman of the Kazakhstan National Bank (central bank) by the decree of President Nazarbayev.

The primary measurement ratio of inflation rate, which National Bank of Kazakhstan uses to calculate inflation, is the CPI (Consumer Price Index) inflation rate. CPI observations are available on monthly basis starting January 1994. Since then, Kazakhstan once experienced hyperinflation period right after the collapse of the Soviet Union, which lasted up until the first quarter of 1996. Skyrocketed interest rate and money reserve tightening efficiently forced inflation to drop, even having periods with negative inflation numbers. Figure 1 depicts the

period between June 1996 and June 2016 with respect to inflation and interest rates.

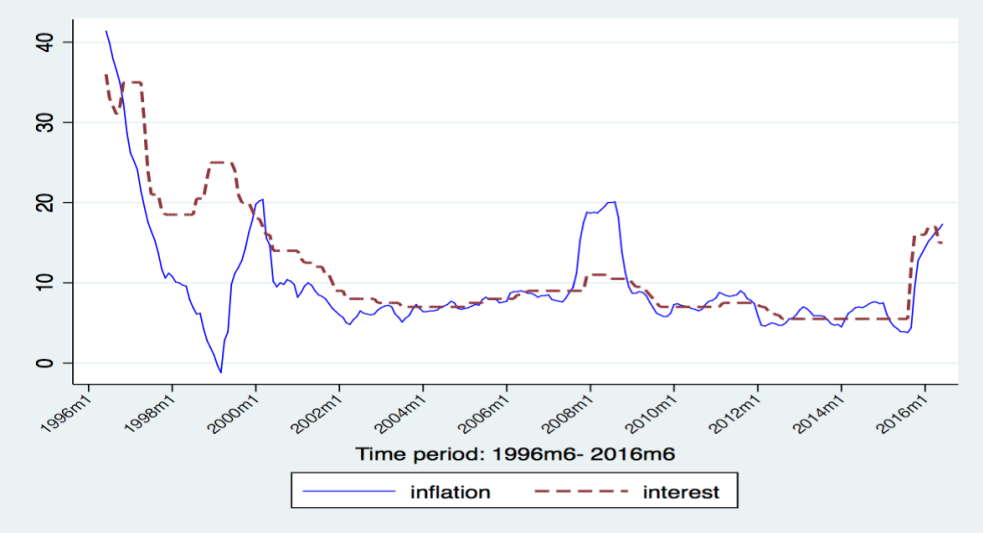

Figure 1. Annual Inflation/Interest rates, May 1996 – June 2016. (NBK, 2016)

From the graph, it can be clearly seen that interest rate generally follows the inflation dynamic in the past, and might be a good predictor for the future forecast instruments under Inflation Targeting framework. After 1996 inflation rates generally fluctuated around ten percent average before the adoption of Inflation Targeting policy. Furthermore, during past two-decade time window one can noticeably identify only one relatively high inflationary pressures period through 2008 world financial crises, which raised inflation up to twenty percent. At the same time, during that period exchange rate was fixed, which was one of the tools contributed for low inflation. Introduction of Inflation Targeting monetary policy coincided with the period when oil prices started to plunge rapidly, the main export commodity for Kazakhstan. Thus, in this paper, oil prices also are taken into account to test if inflationary dynamics are affected by supply side shocks, in addition to external price shocks, and nominal exchange rate fluctuations. After the adoption of Inflation Targeting, inflation rates virtually quadrupled, from 3.8 percent in August 2015 to 17.7 percent in June 2016. This might imply the presence of self-fulfilling inflation dynamics, in a sense that expectations of high inflation have already rooted due to currency mismatches in private sector and high degree of the financial dollarization on balance sheets of banks. Overall, there are different determinants that affect inflation dynamics from country to country. Therefore, in order to properly evaluate the effectiveness of Kazakhstani monetary policy, it is essential to explore the sources of inflationary pressures in the economy. To that purpose, the method of structural vector auto-regressions will be applied to the small open economy case of Kazakhstan.

4. Model Specification

Since the pioneering work of Sims (1980), vector auto-regression (VAR) models have been widely used for empirical tests of broad set of monetary policy issues. They are especially useful in assessing and forecasting the impact of monetary policy on real economic variables. An ordinary VAR model demonstrates the dynamic movement of endogenous variables by their own past values:

$$y_t = c + B_1 y_{t-1} + B_2 y_{t-2} + \ldots + B_p y_{t-p} + u_t, \quad (4)$$
$$y_t = c + B(L) y_t + u_t,$$

where*t* = 1, …., *T*, $y_t$is a (*n x 1*) vector of endogenous variables at a time *t*, c is a (*n x 1*) vector of constants, B's are (*n x n*) matrices of coefficients with lag-length i = 1, …, p, u_t~i.i.d, is a vector of disturbances with $E(u_t u_t')=\Sigma_u$, and L is the lag operator.

This is a general VAR(p) model representation of a reduced form, which requires no restriction on the form of B(L). In other words, there are no constraints imposed on dynamic relationship among control variables. Therefore, in order to analyze and adequately interpret policy shocks and their effect on monetary aggregates, some "structural" restrictions need to be imposed in the general VAR model. As a result, this paper exploits Structural VAR model (SVAR) for a small open economy case, which subsequently is subject to a number of exogenous variables that theoretically might have an influence to the dynamics of endogenous policy variables. A general structural VAR can be expressed as:

$$A_0 y(t)= c + B(L)y_{t-1} + \varepsilon_t \quad (5)$$

where the structure of the simultaneous determination in the economy is now expressed on A_0. Thus, each equation now is assumed to characterize specific monetary relations, and the innovation in ε represents an exogenous shock in it. Thus, our model inspects various monetary policy shocks to Kazakhstani case of a small open economy and primarily examines the dynamic responses of CPI inflation over time. Also, since our assumption that ε's are exogenous, and then they are orthogonal to each other, so the variance matrix D is a diagonal matrix. Consistently, to derive the representation back to the reduced form, both sides of SVAR must be pre-multiplied by A_0^{-1}, so finally will get the general reduced form:

$$A_0(L)y(t) = \varepsilon(t) \quad (6)$$

where $A_0(L)$ is an m*m matrix polynomial in the lag operator L, y(t) is m*1 vector of observation, and ε(t) is m*1 vector of structural disturbances with $A_0u(t)= \varepsilon(t)$, and $A_0^{-1}D\ (A_0^{-1})'=\Sigma(u)$.

Variables selection process is presented with seven variables SVAR model to comprehensively analyze all feasible arrangements among nonpolicy and policy factors. The data run monthly from 1994 up to the second quarter of 2016. However, our estimation avoids period of unprecedented hyperinflation, and thus actual observation starts from January 1996. For the domestic variables, the model includes CPI annual inflation growth rate, the nominal exchange rate (expressed in 1 US dollar price, so increase means depreciation of the domestic currency), the real GDP growth, the money supply (M2), and the short-term interest rate. Since, there is no monthly GDP data, we interpolated the series using Chow and Lin (1971) approach from the annual GDP data series (Statistics, 2016). Interest rate variables are averages of the given monthly period. Of the seven variables included in the model, two of them are of foreign block, which is represented by monthly Oil Price and the US Federal Funds Rate.

$$\begin{bmatrix} eMS \\ eMD \\ eExch \\ eGDP \\ eOIL \\ eFFR \\ eCPI \end{bmatrix} = \begin{bmatrix} 1 & a12 & a13 & 0 & a15 & 0 & 0 \\ a21 & 1 & a23 & 24 & 0 & 0 & 0 \\ 0 & 0 & 1 & a34 & a35 & 0 & 0 \\ 0 & 0 & 0 & 1 & a45 & 0 & 0 \\ 0 & 0 & 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 0 & 0 & 1 & 0 \\ a71 & a72 & a73 & a74 & a75 & a76 & 1 \end{bmatrix} \begin{bmatrix} uMS \\ uMD \\ uExch \\ uGDP \\ uOIL \\ uFFR \\ uCPI \end{bmatrix} \quad (7)$$

As it mentioned earlier, foreign block variables are important in our SVAR system to adequately signify the model of a small open economy. The foreign block is assumed to be exogenous in the current model set-up, so domestic variables block do not enter the foreign variables equation, either with a lag or instantaneously. All the variables are transformed into logarithm except the domestic short-term interest rate, US federal funds rate and inflation growth rates expressed in percentages. Additional details on the data and the sources of extraction are in the Data Appendix.

For the restrictions on the contemporaneous structural parameters A_0, we follow the general approach developed by Cushman and Zha (1997)and Kim and Roubini (2000), but also adapting the model to be able to successfully inspect the direct effects of monetary shocks particularly on inflation. Thus, the following system of equations express the identification scheme based on $A_0u(t)= \varepsilon(t)$,where eMS, eMD, eEXCH, eGDP, eOIL, eUSR, eCPI are the structural disturbances, so they are money supply shock, money demand shock, exchange rate shock, GDP shock, Oil price shock, US FFR shock and CPI shock, respectively, and uR, uM, uEXCH, uGDP, uOIL, uUSR, and uCPI are the residuals in the reduced form equations, which expresses unexpected path of each variable.

First of all, it is important to stress that the above relations are contemporaneous restrictions and do not comprise any lagged structural parameters. Based on that crucial specification, our money supply equation represents the reaction function of the central bank institution, which decides the present setting of interest rate after absorbing the information about the current value of money supply (M2), the exchange rate and the world price of oil. However, it does not include information on current level of output and price level, since the model assumes “information delays within the month period”. Central bank might not know all the related information at the time of setting the monetary response policy. In addition, leaving out the US FFR in our equation can be justified by the belief that there must be a substantial lag before local authorities formulate any policy reaction in response to change in the US Federal Funds Rate. In addition, the idea is that central bank is more concerned with the movements in exchange rate, and interest rate fluctuations would likely to respond to that type of shocks first. Secondly, the demand for real money relationship is predominantly relies on real income and the nominal interest rate. Therefore, our money demand equation excludes simultaneous effects of the oil price level, the exchange rate, and the US interest rate. For the real economic output equation we assume that all other variables shocks come with one period lag. However, inclusion of Oil Prices implies that oil influences output decision contemporaneously, since the model supposes that output decisions would not change within one-month window period, but rather responds to their price setting rules, among which oil price is the crucial one. Our block exogeneity assumption, including the oil price and the US federal funds rate imply the idea that domestic variables do not enter the equation of foreign originated shocks, but the reverse relations do hold. Also, there is an understanding that the US federal funds rate would increase interest rate due to oil price shocks that might feed inflation. Lastly, inflation equation represents forward-looking asset price level, thus the assumption is that all variables have contemporaneous effects on the inflation dynamics in that given equation. Overall, given structural shocks are believed to design proper money market equilibrium, domestic goods market equilibrium, exogenous shocks from the world economy, and inflation dynamics due to corresponding unexpected movements in policy variables.

5. Estimation and Results

We perform Augmented Dickey-Fuller (ADF) unit root test to confirm that estimated time-series data are stationary. For this test we also assume that there is on autocorrelation among the error terms in a series to test for the unit root. The test approves that all variables do not contain unit roots after transforming them into log differences. Results of the ADF test are in Data Appendix. Therefore, we have taken log differences of the real GDP, the money supply, the exchange rate, and the oil prices. The CPI inflation rate variable remains in levels, because it is already in growth rate form. Also both domestic and the US federal funds rates are expressed in monthly percentage averages. Our SVAR model implicitly allows cointegration relationship in data. Based on Schwarz’s Bayesian information criterion and Akaike information criterion (AIC) lag-selection test, we have selected 4^{th} lag for each variable. Data Appendix reports all the estimated coefficients of our identification matrix. In the next section, we interpret the estimated impulse response functions, which were constructed to describe path of inflation in response to various domestic and foreign monetary policy shocks within the SVAR system.

The estimated impulse responses are presented over a 10-month period and with structural one-standard-deviation monetary policy shocks. In each graph, two dashed lines

represent the 95% confidence band. In a set of the following graphs, we present IRFs of inflation in response to various endogenous and exogenous monetary shocks as well as to its own past values. A positive interest rate shock explaining monetary innovations in monetary policy leads to unclear inflation patterns in a medium-run term, and a very insignificant and gradual rise over the longer time horizon. At the same time, money supply shock causes transitory increase in inflation rates, but the effects is not long living and eventually close to disappear over the longer span. Next, an exchange rate shock originates substantial surge in inflation over the medium term but vanishes in a year-long time frame. Given relatively large amplitude of the rise with narrow and consistent confidence intervals suggest us that the exchange rate shock is one of the main contributors to a potential increases in inflation. Next, a real GDP shock led to persistent increase in inflation, but it is difficult to conclude about the causality of the relationship, because the dynamics can be coming from both directions, and thus, require a more deliberate analysis of substantially longer series, which can be done in future. Generally, we cannot draw a bold conclusion based on the description of output shock. Now, analyzing exogenous block variables, it is important to note that oil price shocks do have a certain inflationary push on domestic inflation, even considering its transitory nature. Initial upward inflation pressures spread out in a decent ten-month time frame. Insignificant and theoretically contradictory results we have obtained from the US federal funds rate simulation. From our IRF results, we can conclude that one time policy shock causes persistence downturn in domestic inflation. One possible explanation could be that an increase in the US interest rates would induce domestic economy to increase its own interest rate, which theoretically leads to the appreciation of the national currency and subsequent downturn in inflation based on conventional transmission mechanisms scheme. Evidently, one period past inflation also contributed for the short-term increase of inflation, however slowly losing its impact, which can be explained by accounting adjustments of annual inflation. Nevertheless, I conclude that inflation inertia explains initial upward dynamics of inflation rates. Next, Figures 2-8 report the impulse response functions generated by our model and corresponding to various policy shocks.

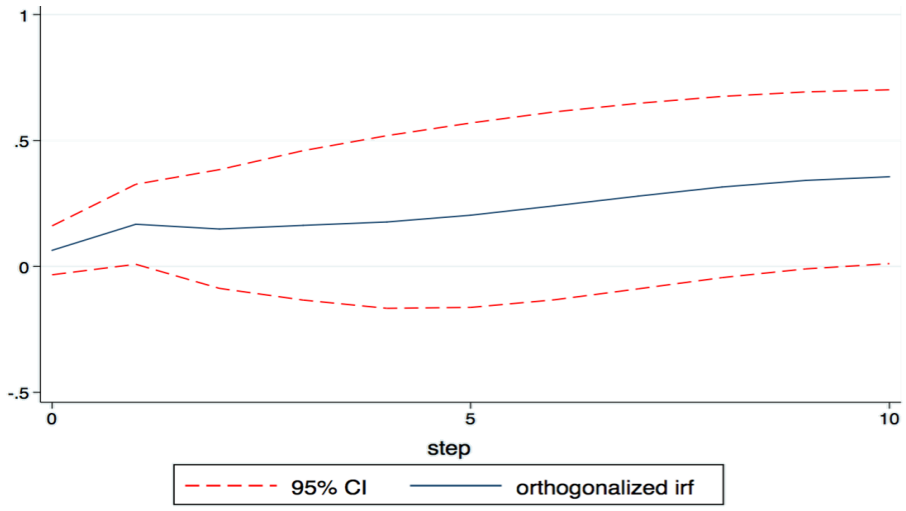

Figure 2. Interest rate shock to Inflation

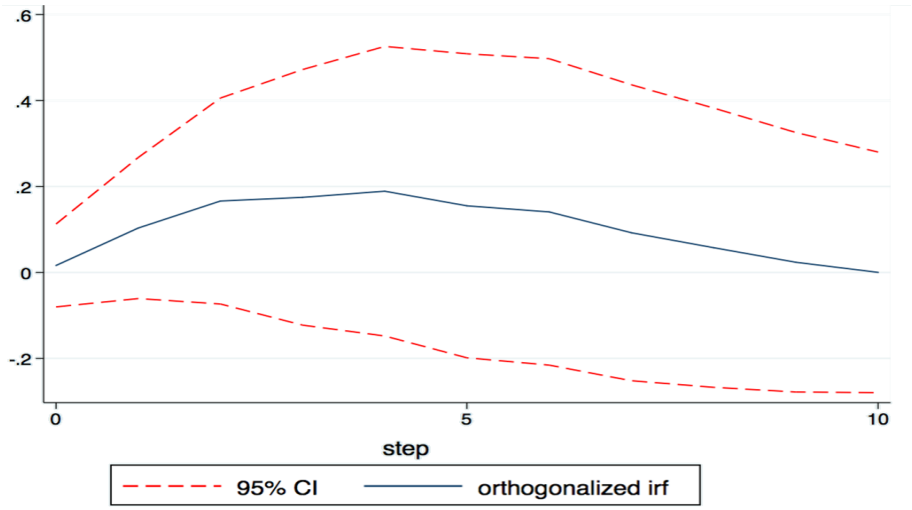

Figure 3. Money supply shock to Inflation

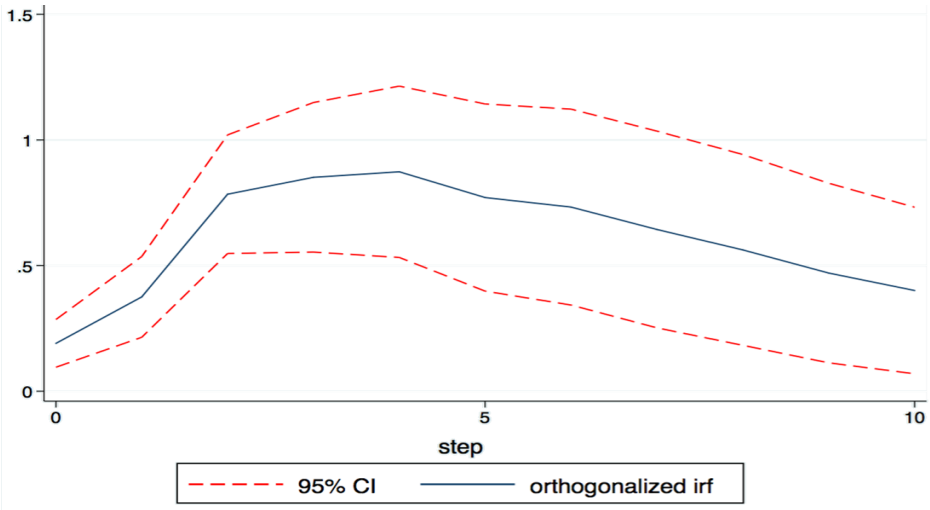

Figure 4. Exchange rate shock to Inflation

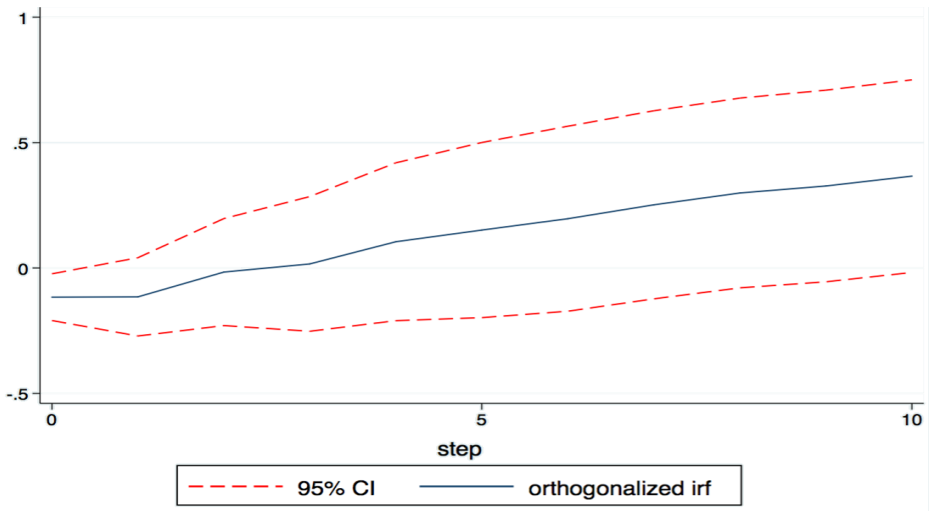

Figure 5. Real GDP shock to Inflation

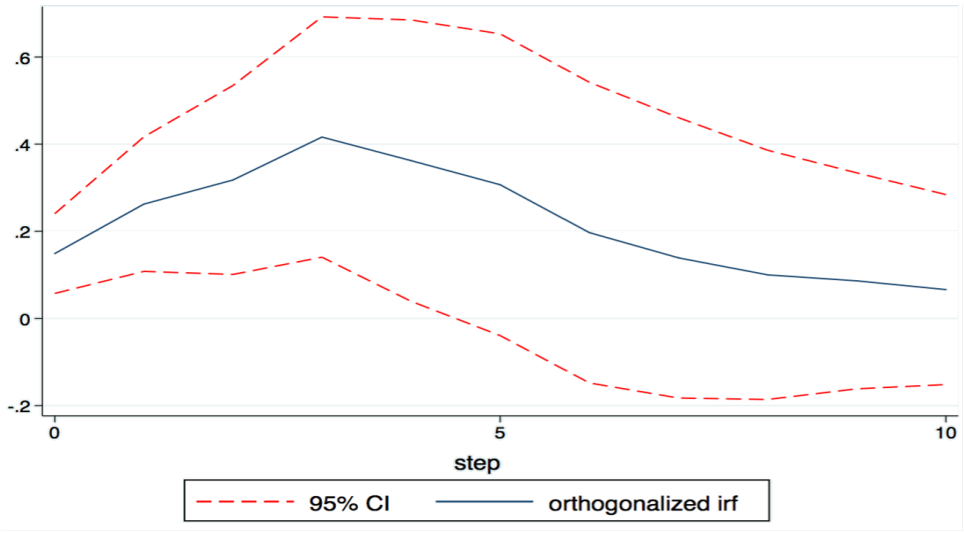

Figure 6. Oil price shock to Inflation

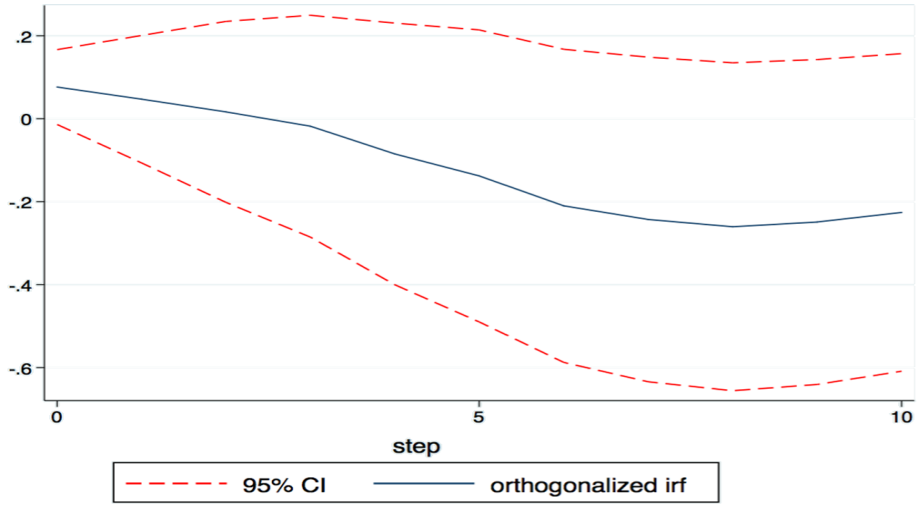

Figure 7. US FFR shock to Inflation

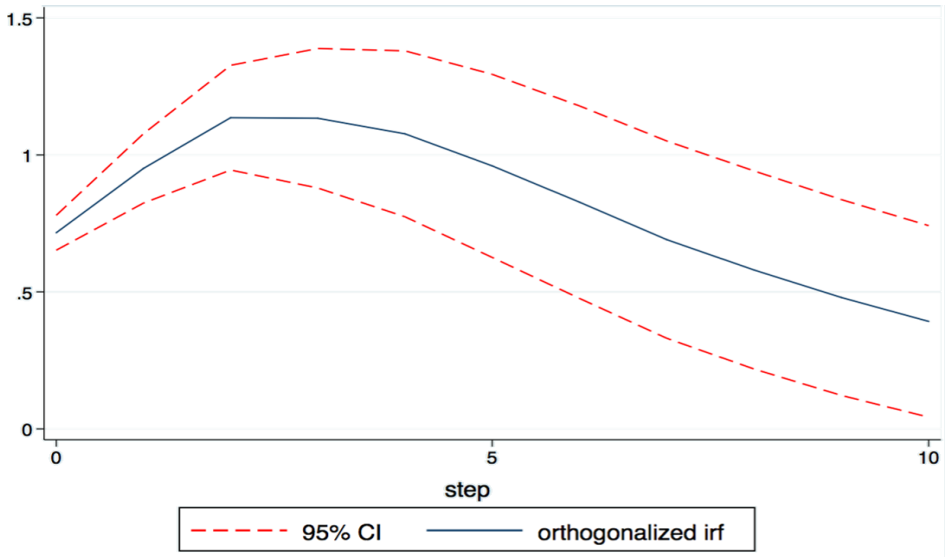

Figure 8. Past period inflation shock to Inflation

Robustness checks come from the implementation of Cholesky decomposition method, a special case of exactly identified model. Cholesky decomposition prevents simultaneous relationships between model variables. We perform that particular recursive approach with different orderings, essentially restricting the contemporaneous matrix A_0 to be lower triangle with our traditional orderings. Finally, running recursive VAR approach with the following ordering: Oil, USR, GDP, EXCH M2, Interest rate, and CPI will generate impulse response function analysis qualitatively consistent with previous results, and thus support the original identification restriction assumptions. In addition, using various proxy variables instead of our original ones and traditional exogenous set of variables do not substantially affect the general behavior of our initial impulse response functions, and produce outcomes compatible with the main conclusions of our study.

6. Conclusion

Using Kazakhstan as a small open economy case provides additional evidences to identify the effects of unpredicted policy disturbances to the inflation dynamics in an emerging market economy example. Contemporaneous identification restrictions create practical monetary policy shocks, which also take into account different features of world economy originating disturbances as well as indicate important transitory and persistent effects. Therefore, we treat the oil price and the US federal funds rate as exogenous relative to domestic policy variables. The assumption of block exogeneity in the presence of the contemporaneous structural restrictions is economically reasonable and provides a great source to pinpoint the effect of foreign shocks from the perspective of a small open economy.

The results show, based on the interpretation of impulse response functions, a positive interest rate shock has uncertain inflationary impact over the long run, which raises questions about the effectiveness of interest rate manipulation to keep inflation within the given band. In addition, a positive exchange rate shock, i.e. sharp depreciation, leads to a stronger increase in inflation rates. Also, inflation inertia explains a substantial increase in short-term period inflation rates. Moreover, our results imply that a money supply and a real GDP shocks did not demonstrate theoretically large influence on dynamic path of the future inflation. At the same time, the oil price shock generates small transitory upward inflationary pressures after a substantial lag, whereas the effect from the US interest rate shock rather conveys a vaguely disinflationary pattern. Overall, obtained SVAR model is useful to obtain theoretical picture about Kazakhstan's monetary policy development. Further sophistication of the financial

markets that will allow public to engage with alternative saving tools, structural development of monetary institutions to increase the credibility of the central bank, and its active cooperation with government branches will certainly lead to the transformation of Inflation Targeting as an efficient and strong monetary policy in Kazakhstan.

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Data Appendix

The monthly data from January 1994 to second quarter of 2016 is used in this paper. They basically extracted from the National Bank of Kazakhstan website, Committee of Statistics (2016) and international agencies for exogenous variables block. Thus, identification of each variable is represented in the following table.

Interest rate	NBK	IR, monthly average
Money Supply	NBK	M2, log difference
Exchange rate	NBK	Exch, log difference
Real GDP	Committee of Statistics	GDP, log difference
World Oil price	International Energy Association	Oil, log difference
US FFR	Federal Reserve	USR, monthly average
CPI inflation rate	NBK	CPI, annual growth rate

Lag selection: ADF & SBIC

Lag	LL	LR	Df	p-value	AIC	HQIC	SBIC
0	-63.3108				0.583492	0.624271	0.68471
1	1751.46	3629.5	49	0.000	-14.0702	-13.744	-13.2605
2	1923.8	344.68	49	0.000	-15.0938	-14.4821	-13.5755
3	1969.99	92.383	49	0.000	-15.0705	-14.1733	-12.8437
4	2036.23	132.48	49	0.000	-15.213	-13.8461*	-12.2782*
5	2097.35	122.25	49	0.000	-15.3141	-13.8461*	-11.6703
6	2165.11	135.52	49	0.000	-15.4698*	-13.7163	-11.1174
7	2205.43	80.637*	49	0.003	-15.3978	-13.3588	-10.3369

Note: Selection-order criteria; Sample: 1996m3 - 2016m3, Number of observations = 241

Contemporaneous coefficients matrix

1	1.8302 (0.0197)	0.9631 (0.0405)	0	-7.6560 (0.2301)	0	0
1.112075 (0.0085)	1	5.8974 (0.1364)	-0.5733 (0.0878)	0	0	0
0	0	1	0.6677 (0.0644)	0.0764 (0.0652)	0	0
0	0	0	1	0.1610 (0.0644)	0	0
0	0	0	0	1		
0	0	0	0	0	1	0
-0.9679 (0.0801)	-0.7587 (0.0992)	2.0841 (2.8001)	8.0436 (0.3292)	-7.1227 (0.5686)	0.6560 (0.0688)	1