NATIONAL BANK OF KAZAKHSTAN

Role of the Fiscal Policy in the Price (In) Stability in Kazakhstan: Empirical Assessment and Macroeconomic Equilibrating Mechanism

Monetary Policy Department
Economic Review No.2021-3

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NBRK – WP – 2021-3

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Abstract

An extended analysis of the existing theoretical and practical base suggests that, along with monetary factors, the policy of the fiscal authorities plays an equally important role in the formation of inflation. This is supported by the so-called fiscal theory of the price level. This theory assumes that the fiscal policy is not neutral in the long run, since the formation of inflation and inflation expectations of economic agents depends, among other things, on the state of such fiscal indicators as revenues and expenditures, the budget balance and public debt.

In this study, the compliance of the situation in Kazakhstan with the fiscal theory of the price level was verified by means of a retrospective analysis of the nature of fiscal policy, its relationship with monetary policy as well as by an empirical assessment of the impact of fiscal parameters on inflationary processes.

At the same time, the paper provides recommendations for creating conditions to ensure a balance between fiscal and monetary measures in Kazakhstan, which allows reducing the upward pressure of the fiscal policy on inflation stability as well as achieving sustainability of the fiscal balance and the business cycle.

Key Words: FAVAR, fiscal dominance, fiscal expansion, fiscal policy, fiscal theory of the price level, inflation, inflation targeting, monetary policy, price level, VECM,

JEL-Classification: C32, C52, E17, E62, E63

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Contents

1. Introduction

Inflationary processes represent one of the significant categories in the modern macroeconomic theory and practice, which is a complex mechanism of interaction and mutual influence of many factors. Thus, the exact segmentation of these factors and their differentiation according to the degree of impact on the final result in the form of changes in the general price level in the economy can be referred to a number of rather nontrivial tasks.

At the same time, in the practice of macroeconomic modeling and, accordingly, in implementation of the macroeconomic policy, it is accepted that a special and sometimes the final role of the only and fundamental factor of inflation is to endow monetary parameters in the economy – the amount of money supply, interest rate and liquidity ratios in the money market. In turn, such an explanation of the inflation nature had a significant impact on creation of the view that the monetary authorities as represented by central banks are able to completely control inflation and ensure its stability by influencing monetary parameters with their own measures.

However, as the results of a number of international studies over the past few decades show, in modern macroeconomic realities the amount of money supply and the process of its multiplication, which affect the change in aggregate demand, and hence the dynamics of inflation, depend not only on the policy of central banks. Thus, an additional significant effect on the dynamics and structure of monetary factors of inflation can also be exerted by the fiscal policy parameters, such as the budget balance and the public debt amount that are driven by impulses of government revenues and expenditures. With this in mind, a new research area has begun to develop in the macroeconomic science since 1980s that was later called the fiscal theory of the price level.

In broad terms, the fiscal theory of the price level forms an idea and tests the hypotheses about how the public debt balance and the budget deficit that depend on the amount of government revenues and expenditures are correlated with the stability of inflation rates. In other words, the fiscal theory of the price level explains that inflation is not only a monetary phenomenon but also a fiscal phenomenon. At the same time, it is important to point out that the focus and the degree of influence of the fiscal policy on inflationary processes depend on the nature of fiscal measures per se as well as on their interaction and consistency with the existing monetary policy regime. And, depending on this, the fiscal policy can either contribute to the monetary policy in achieving the price stability, increasing the efficiency of its transmission mechanism, or, conversely, can become a barrier reducing the effectiveness of the central bank's actions.

Given the above and taking account of the fact that at present a coordinated interaction of the monetary and fiscal policies as well as the assessment of effects exerted by the fiscal measures on inflation are very current, the following aspects have been presented in this paper:

1) a historical analysis of the fiscal policy in relation to the business cycle dynamics;

2) a retrospective assessment of the focus and the degree of a balance in the interaction of the fiscal and monetary policies;

3) a testing of the hypothesis that the observed processes of impact of the fiscal parameters on inflation in Kazakhstan may correspond to the fiscal theory of the price level.

For empirical assessments of the suggested hypotheses, the study uses such updated approaches of econometric modeling as a vector error correction model and a vector autoregression model expanded by the inclusion of unobservable factors. At the same time, a special attention in the study is paid to recommendations whereby it becomes possible to balance the monetary and fiscal policies in Kazakhstan and thereby provide conditions for long-term stability of inflation, the budget balance and the business cycle.

The paper consists of several parts. The second section provides a literature review describing the theoretical aspects of the fiscal theory of the price level as well as an analytical presentation of the existing combinations of relationships between the fiscal and monetary policies. The third section describes the methodology and the data used to test the key hypotheses in this paper. The fourth section presents the summary of modeling and economic analysis of the results of testing hypotheses. The fifth section provides conclusions and recommendations for record and implementation in the macroeconomic policy of Kazakhstan.

2. Literature Review

In the economic theory, there is a widely known thesis that inflation is anytime and everywhere a monetary phenomenon and is accompanied by the outstripping growth of the money supply over the output.

This statement was first formulated by Milton Friedman, an American economist, Nobel laureate in economics and the founder of the monetarist school, in the middle of the last century (Friedman M., 1963). From that moment on, the ideology began to actively develop that inflation is completely and exclusively under control of the monetary authorities represented by central banks and their monetary policy, whereby the amount of money supply and the cost of liquidity in the economy are determined.

However, later Friedman explained (Friedman M., 1989; Friedman M., 1996) that the primary generalization of relationship between inflation and the money supply cannot be regarded as an arithmetic and direct assumption or some kind of truism. Thus, according to Friedman, the relationship between inflation and money supply does not reflect a rigid relationship between the rate of price growth in the economy and the amount of money. Along with that, the rate of price growth against the existing rate of growth of the amount of money also depends on other, more structural and non-monetary factors, such as the past price behavior, current structures of the labor and commodity market as well as on the fiscal policy parameters.

And it was the last clarification regarding probable impact on inflation not only by monetary factors (hence, the monetary policy) but also by fiscal parameters (that is, fiscal policy) that subsequently led to the formation of new economic hypotheses, which were combined into the fiscal theory of the price level.

In a broader understanding, the fiscal theory of the price level forms an idea of how the public debt balance and the budget deficit driven by impulses of government revenues and expenditures are correlated with the stability of inflation rates. In other words, the fiscal theory of the price level explains that inflation is not only a monetary but also a fiscal phenomenon.

The first holistic attempts to do a systematic research of how the fiscal policy affects the price stability refer to the study of Sargent and Wallace (Sargent T., Wallace N., 1981). In particular, the authors concluded that inflation may experience upward pressure from the fiscal authorities when they finance the current budget deficit by increasing the government debt, which becomes a trigger for additional money issuance by the central bank.

In turn, Christopher Sims (Sims C., 1994), as part of the model assessment of the price level determinants and the relationship between the fiscal and monetary policies, came to the conclusion that in an economy with fiat money, the fiscal factor of inflation is more fundamental than monetary reasons. This, according to Sims, is associated with the fact that the volume and demand for fiat money always depend on public expectations regarding a future fiscal policy.

Another American macroeconomist Michael Woodford who specializes in the study of monetary policy and the fiscal theory of the price level, as a result of several studies concluded that effective ensuring of inflation stability should be based not only on the central bank's compliance with a certain rule on the reaction of monetary policy to price dynamics but also on a strictly regulated discipline and the behavior mechanism of the fiscal authorities in the form of adherence to the budget rule (Woodford M., 1994, 1995, 2001). Otherwise, the unstable expectations of economic agents regarding the likely growth of government spending reduce the effectiveness of the monetary policy measures impact on demand, and, respectively, on inflation. Thus, the growth of government spending may reflect an increase in the revenue side of the budget or require an increase in the budget deficit if the rise in revenues is limited.

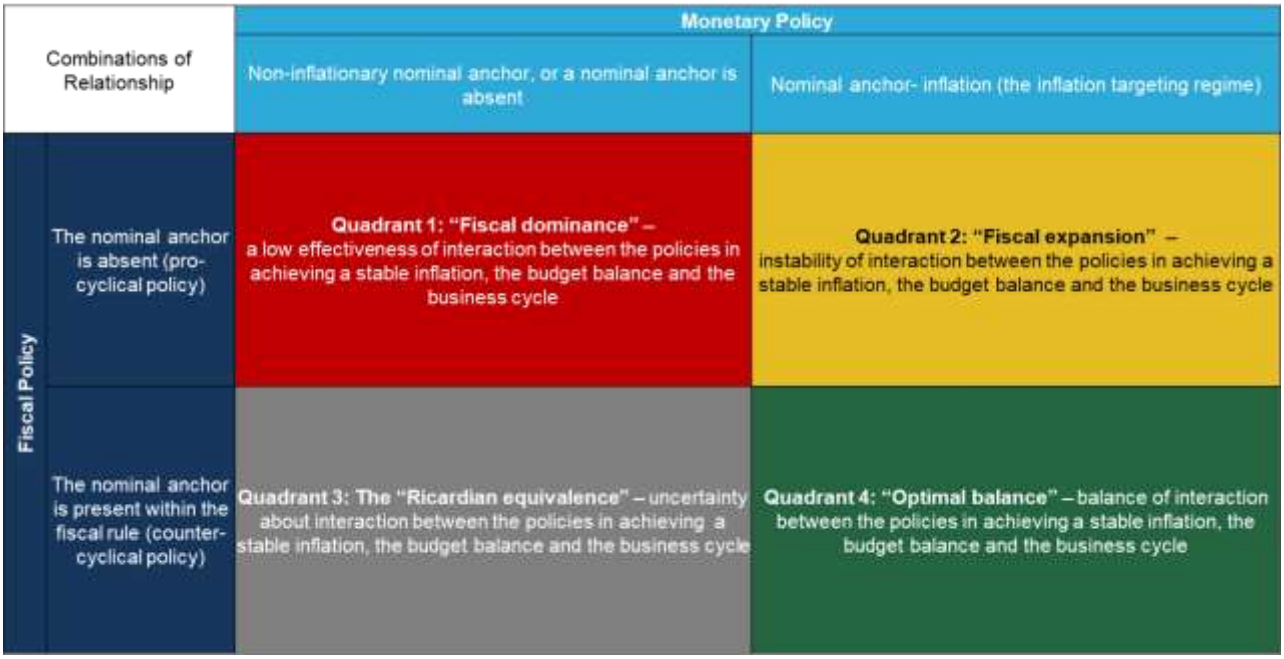
At the same time, an alternative view of the fiscal theory of the price level that describes the effect of the fiscal policy actions on inflation is presented in the study of Bruno and Fischer (Bruno M., Fischer S., 1990). The authors note that anchoring inflation expectations, which predetermine the degree of stabilization of inflation itself, depends, among other things, on the degree of the budget deficit financing through seigniorage and the issuance of government bonds. In these conditions, the equilibrium of inflationary expectations is achieved when the fiscal authorities establish a nominal anchor for their actions, that is, the budget rule.

Thus, the development of the fiscal theory of the price level that is described above resulted in the fact that in today's macroeconomic practice associated with modeling and specifying the determinants of the aggregate price level in the

economy, along with monetary factors, the measures and actions of the fiscal authorities have begun to be actively taken into account. So, the study of Leeper and Leith (Leeper E., Leith C., 2016) by using empirical assessments has determined that success in stabilization of inflationary processes lies in choosing a combination of interaction between types and regimes of the fiscal and monetary policies. According to the authors, the most optimal combination of the behavior of the two types of macroeconomic policies is the option when the monetary policy manifests itself "actively", that is, is aimed at ensuring the price stability without taking into account other macro-parameters in its actions, and the fiscal policy adheres to the so-called "passive" regime when it strictly focuses on constraints and goals related to the public debt or the budget deficit in the decision-making about the change in the amount of government spending or revenues. Similar points of view are also observed in other related studies (Davig T., Leeper E., 2011; Cevik E., Dibooglu S., and Kutan A., 2014).

In general, the mechanisms of interaction of various fiscal and monetary regimes that enable to choose the most preferable combination of fiscal and monetary policies ensuring effective stabilization of the overall inflation rate, the budget balance and the business cycle, can be summarized in the form of an analytical matrix (see. Figure 1), which is described below.

Figure 1. Matrix of Relationship between the Monetary and Fiscal Policies in the Context of Stability of the Total Price Level, the Budget Balance and the Business Cycle



Source: compiled by the authors.

Quadrant 1 defines the monetary policy without a nominal anchor. In turn, the fiscal policy is pursued without the fiscal rule constraints; therefore, this situation can

be characterized as **fiscal dominance**. In this combination, the interaction of such regimes of the monetary and fiscal policies is not aimed at smoothing the business cycle and stabilizing inflation and budgetary balance purposefully; consequently, in most cases, they depend on changes in exogenous factors, for example, the situation in the external sector.

Quadrant 2 in the matrix shows a situation when the fiscal policy actions are not limited by any nominal anchor and are not regulated strictly in accordance with the budget rule. The actions of the fiscal authorities are pro-cyclical, which stimulates budget imbalances and also prevents the fiscal policy measures from smoothing out fluctuations in the business cycle. In turn, in this case the monetary policy is focused on ensuring the price stability, including within the framework of the inflation targeting regime, and adheres to the Taylor rule or other similar rule in its policy. At the same time, the actions of the fiscal authorities that create **fiscal expansion** reduce the effectiveness of the monetary policy transmission mechanism, thereby hindering the central bank's sustainable achievement of the inflation target and stimulating unanchored inflationary expectations of economic agents.

Quadrant 3 – this is an option of combination of the counter-cyclical fiscal policy, which is based on the fiscal rule but does not have the monetary policy's nominal anchor in the form of inflation target. The latter reduces the likelihood of achieving equilibrium of inflation expectations of households and firms, and also limits the formation of rational expectations regarding the future dynamics of interest rates in the economy. As a result, the fiscal policy, even though it is counter-cyclical and operates according to the budget rule, is ineffective in influencing the business cycle fluctuations, namely, the aggregate demand. Therefore, in this case, a situation arises similar to that called the **Ricardian equivalence** in economic theory. So, in a short form, the Ricardian equivalence, or the Ricardo-Barro equivalence theorem, suggests that the fiscal policy does not have a significant impact on the current consumer spending, and, respectively, on the economic activity. (Buchanan. J., 1976).

Quadrant 4 describes the relationship of the fiscal policy that follows counter-cyclical measures within the framework of a strictly defined fiscal rule with a specific nominal anchor, and the policy of the monetary authorities adhering to an inflation targeting regime. In this case, all the necessary conditions for a balanced mutual influence of the fiscal and monetary policies arise, where their measures are coordinated in terms of ensuring the price stability and at the same time smoothing out fluctuations in the business cycle. This combination of relationship between the two policies can be treated as an "**optimal balance**", where the manifestation of features of the situation known as **"divine coincidence"** in the macroeconomic theory and practice is possible (Blanchard O., Galí J., 2007). Divine coincidence is a feature of the new Keynesian models, in which a central bank does not need to make a compromise between ensuring the sustainability of inflationary processes and stabilizing the output gap.

Thus, the existing macroeconomic theory and practice in determining the nature of inflation, along with monetary factors, also takes into account fiscal parameters,

being based on the development of the fiscal theory of the price level. At the same time, there is the most optimal combination of monetary and fiscal policies, which have opportunities not only to offset a negative effect of fiscal impulse on inflation but also to increase the effectiveness of fiscal measures themselves in terms of their impact on the dynamics of the business cycle, as well as ensuring a balanced budget. This combination of two macroeconomic policies requires that the central bank should focus on the price stability (the inflation targeting regime) and the government should comply with the fiscal rule and conduct the counter-cyclical fiscal policy.

At the same time, practical evidence of these theses is presented in the paper of the International Monetary Fund (Combes J.L., et. al., 2014), based on the use of data for 1990-2009 on 152 developed and developing countries. Thus, the results of the study demonstrate that the combined use of the fiscal rule and the inflation targeting increases the average annual figure of the primary budget balance and reduces the average annual inflation rate by 2.9 and 2.6 percentage points (pp), respectively.

3. Methodology and Data

3.1 The Study Methodology

As part of this study, taking into account the studied theoretical base, several key hypotheses are tested regarding the historical relationship between the monetary and fiscal policy in Kazakhstan, as well as the fiscal theory of the price level in the country.

For these purposes, first the nature of fiscal measures in respect of the business cycle (pro-cyclicity and counter-cyclicity) in Kazakhstan over a historical horizon is identified.

Second, combinations of relationship between the fiscal and monetary policy are considered.

Third, a hypothesis regarding the presence of a long-term influence of the fiscal policy on inflationary processes in the Kazakh economy is tested.

Fourth, a quantitative assessment of the contribution of fiscal measures to the dynamics of overall consumer price level in Kazakhstan is made.

Thus, to identify the pro-cyclical and counter-cyclical nature of the fiscal policy in Kazakhstan for the selected historical period, the coefficients of correlation between the costs of the national budget[4], including those that reflect a direct effect of a change in the budget revenues and the business cycle in the country were calculated. In turn, the business cycle dynamics were calculated via the output gap or GDP estimated with the use of Kalman filter and adjusted for dummy variables. So, for the periods of positive output gap, the dummy variable was assigned a singular value and zero was assigned for the remaining periods. At the same time, the dummy variable characterizing a negative output gap was equated to a single negative value for the periods when the economic activity was below the potential, and to zero for the remaining observations.

[4] As % of GDP

In testing the hypothesis about the long-term impact of fiscal policy expressed through the dynamics of budget revenues and expenditures on inflation in Kazakhstan, we used econometric tools from the class of vector error correction models (VECM).

To quantify the contribution of fiscal measures to inflationary processes, we used a model from the family of vector autoregressions augmented by the inclusion of unobservable factors (FAVAR – factor-augmented vector autoregression model).

A brief methodological description of these types of models (VECM, FAVAR) is presented below.

Vector Error Correction Model (VECM)

The VECM approach allows assessing a long-term correlation between two non-stationary time series that may be presented as follows:

$$y_t = \alpha * x_t + \varepsilon_t \quad (1)$$

where, y_t and x_t – non-stationary time series;
ε_t – random error.

It should be noted here that in building a model with the use of non-stationary variables the so-called "spurious regression"[5] may appear. That is, the creation and use of regression equations on the basis of non-stationary time series, other things being equal, may result in the biased estimates.

However, Engle and Granger (Engle R., Granger C., 1987) had demonstrated that a linear combination of two or more non-stationary variables may have a stationary form. And when such stationary linear combination is present, time series are co-integrated. In turn, a stationary linear combination is called a co-integration equation, which can be interpreted as the presence of a long-term dynamic relationship between indicators. At the same time, if co-integration is present in the time series, the most correct way is to use a model of the VECM class, which is a restricted VAR model (vector autoregression) in differences. The VECM specification, taking into account the short-term dynamics of endogenous variables, restricts their behavior so that they converge towards their long-term equilibrium. This process is conducted by including the error correction mechanism into the model. Thus, a VECM equation of a relevant VAR specification may be presented as follows:

$$\Delta y_t = \beta_0 + \sum_{i=1}^{p-1} \Gamma_i \, \Delta y_{t-i} + \Pi y_{t-1} + \; BX_t + u_t \quad (2)$$

[5] This is a type of regression that can produce misleading mathematical proofs of a linear relationship between independent non-stationary variables

where Πy_{t-1} – is an error correction term, in turn, a Π matrix of dimension k ×k (k – the number of endogenous variables) characterizes a long-term relationship of the system of variables;

y_t – vector of endogenous variables;

Γ_i – matrix of coefficients at lag i;

X_t – vector of exogenous variables;

u_t – random error;

B – matrix of coefficients at exogenous variables;

β_0 – vector of intercept terms;

t – observation period;

i – lag ordinal number;

p – number of lags.

Thus, from the point of view of economic logic, in the presence of co-integration in the analyzed indicators (for example, a long-term relationship between budget revenues and expenditures with inflation) the use of a model error correction approach, that is VECM, is the most correct approach.

Factor-Augmented Vector Autoregression Model (FAVAR)

In general, vector autoregressions (VAR) represent a system of equations in which the value of each endogenous variable is determined by the previous values of not only this variable but also other endogenous variables of the system. This approach also provides an opportunity to analyze causal relationships between indicators and obtain quantitative estimates of the impact of effects on the dependent variable.

Mathematically, vector autoregression models look as follows:

$$Y_t = \mathrm{A(L)} * \mathrm{Y}_{t-1} + \mathrm{B(L)} * \mathrm{Z}_t + \mathrm{U}_t \qquad (3)$$

where Y_t – vector of endogenous variables;

Z_t – vector of exogenous variables;

U_t – vector with random errors;

$\mathrm{A(L)}, \mathrm{B}(L)$ – matrices of lag operators.

In this study, VAR models were supplemented with unobservable variables or factors that transform the VAR model into FAVAR, in order to keep track of the maximum possible amount of information. (Bernanke B., Boivin J., Eliasz P. 2003).

When FAVAR model is used to calculate unobservable factors, the principal components method is employed, and the variables included in the assessment of factors are normalized by subtracting the mean from the fact and then dividing by the standard deviation. In the analysis, the FAVAR model allows taking into account various information, for example, data from the real, financial, price sectors, the labor market sector and the external sector, whereby the problem of missing variables

manifests itself to a lesser extent than when factors are not included into the specification.

In order to explain the specification of FAVAR model, at first the factor model needs to be looked at in a static form:

$$Y_t = \wedge F_t + D(L)Y_{t-1} + \nu_t \quad (4)$$

$$F_t = \Phi(L)F_{t-1} + G\eta_t \quad (5)$$

where $\wedge$ is a matrix of size $n \times f$,

f – the number of static factors, where the observed variables of a certain sector that have the unidirectional dynamics are consolidated in one factor.

G – is a matrix of size $f \times q$,

F_t – factors vector,

$D(L)$, $\Phi(L)$ – matrices of coefficients at lags.

The equation (4) is a measurement model, equality (5) – equation of state. Expressions (4) and (5) represent a "static" form of the Dynamic Factor Model (DFM), since F_t in the equation of state is used in the static form. Based on the abovementioned, there is a possibility to present the Dynamic Factor Model in the form of a VAR by replacing equations (4) and (5) with the following expressions:

$$\begin{bmatrix} F_t \\ Y_t \end{bmatrix} = \begin{bmatrix} \Phi(L) & 0 \\ \wedge\,\Phi(L) & D(L) \end{bmatrix} \begin{bmatrix} F_{t-1} \\ Y_{t-1} \end{bmatrix} + \begin{bmatrix} \varepsilon_{F_t} \\ \varepsilon_{Y_t} \end{bmatrix} \quad (6)$$

$$\begin{bmatrix} \varepsilon_{F_t} \\ \varepsilon_{Y_t} \end{bmatrix} = \begin{bmatrix} I \\ \wedge \end{bmatrix} G\eta_t + \begin{bmatrix} 0 \\ \nu_t \end{bmatrix} \quad (7)$$

where $\varepsilon_{F_t}, \varepsilon_{X_t}$ – structural shocks.

Generally, within the framework of the FAVAR approach, impulse responses of the dependent indicator to the shock of the explanatory variable serve as the source of analytical information and quantitative assessment of relationship between the modeled indicators. In this case, the required impulse responses are calculated as the ratio of the cumulative impulse response of the dependent indicator to the shock of the explanatory variable to the cumulative impulse response of the explanatory indicator to its shock for standard deviation according to Cholesky (Mironchik N., Profatilov S., 2015). Ultimately, this characterizes the elasticity of the dynamics of a dependent variable to a change in the explanatory indicator.

3.2 Data

In the economic relationships and models assessed in this study, the observation period for 2008-2020 was applied, since the macro indicators used have a continuous and complete sample character specifically in this historical time period.

To build the VECM required to assess the nature of a long-term relationship between the budget parameters (revenues and expenditures) and inflation in Kazakhstan, a quarterly frequency of indicators was used. The reason for using the quarterly rather than monthly or annual data is the need to find a balance between the number of observations, respectively, the degrees of freedom in the model equations[6] and high volatility[7] of monthly indicators of budget revenues and expenditures. All variables in the vector error correction model are seasonally adjusted by the X-12-ARIMA method and are presented in logarithms multiplied by 100. The price level is expressed as an index to the base period of the fourth quarter of 2007 (the last observation period before the estimated sample).

In turn, in the FAVAR model, a monthly data frequency is used, which enables to estimate the most frequent contribution of the explanatory variable in the form of the national budget parameter to the inflation dynamics in Kazakhstan. At the same time, the variables included in the FAVAR model are expressed in the format of annual growth rates, namely, month to the corresponding month of the previous year. Also, when constructing the FAVAR model, many variables were generated for different sectors of the economy. As part of the calculation of the real sector factor, 28 variables were used, the price factor - 9, the financial variable factor - 19, the external sector factor (exogenous factor) - 12, and the labor market - 6. Subsequently, individual variables with a low degree of correlation, or an incorrect sign for correlation coefficient with inflation were excluded. Also, the FAVAR model included the exchange rate of the US dollar against the tenge, a short-term economic indicator (a proxy indicator of the economic activity in a monthly frequency) and a fiscal parameter, as endogenous variables.

A more detailed description of the data used in the models, the mechanism for model evaluations (codes for the EViews statistical package) as well as the results of correlation analysis and modeling are presented in Appendices 1-5.

4. Discussion of Outcomes

4.1 Determining the Historical Stance of the Fiscal and Monetary Policies and the Nature of their Relationship in Kazakhstan

In performing a correlation analysis (see Attachment 1) of relationship between the fiscal policy and the business cycle, due to some specifics of budget processes in

[6] The annual data applied for this period suggests using 16 observations only

[7] In some months, there is a significant excess of the budget spending over monthly intra-year figures and over average historical figures

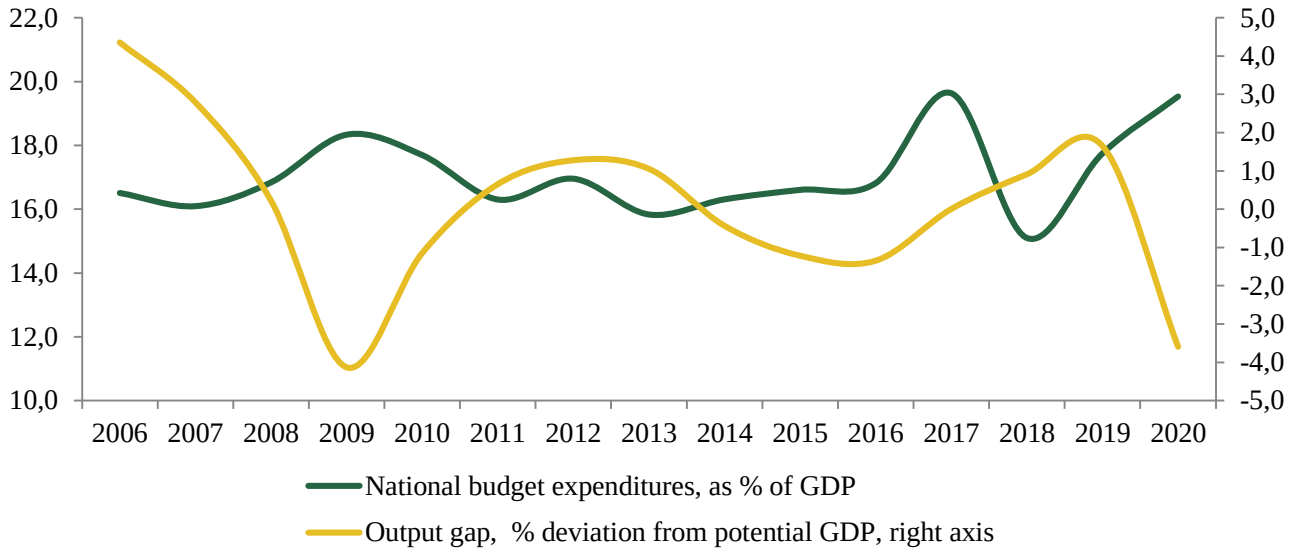
Kazakhstan it is not the budget balance or the amount of government debt but the national budget spending that was used as an indicator of fiscal measures (see Box 1).

In doing so, it was found out that over the last 15 years in the periods when the economy in Kazakhstan was above its potential level, i.e. there was a positive business cycle (economy was overheating), the fiscal policy in the country has been pro-cyclical (Figure 2). In other words, during the economic boom, the average expenditures of the national budget were actively increased. This is due to the fact that periods of significant economic growth in Kazakhstan are associated with the ramp-up of the budget revenues (both oil revenues and non-oil revenues) given the rising oil prices as well due to expansion of the taxable base against a high growth in nominal GDP. In addition, the volumes of receipts to the National Fund of Kazakhstan ("the NoF") are increasing because of higher oil prices. As a result, an increased level of the revenue side of the budget system enables the Government to raise the amount of government spending, thereby increasing the overheating of the economy and, accordingly, creating additional pro-inflationary pressure (Figure 3).

At the same time, the analysis points to the counter-cyclical nature of the fiscal policy in Kazakhstan during the periods of economic downturn or cooling of the economy, which is characterized by a negative output gap. It means that during the periods of economic crisis, the fiscal policy in Kazakhstan is aimed at reducing the influence of factors that have a negative impact on the dynamics of economic activity. This happens via an additional increase in the budget spending due to the expansion of its revenue side, associated with an increase in withdrawals from the NoF. As a result, in such conditions, the fiscal measures help smooth out the negative dynamics of the business cycle and bring the output gap from the negative zone to zero.

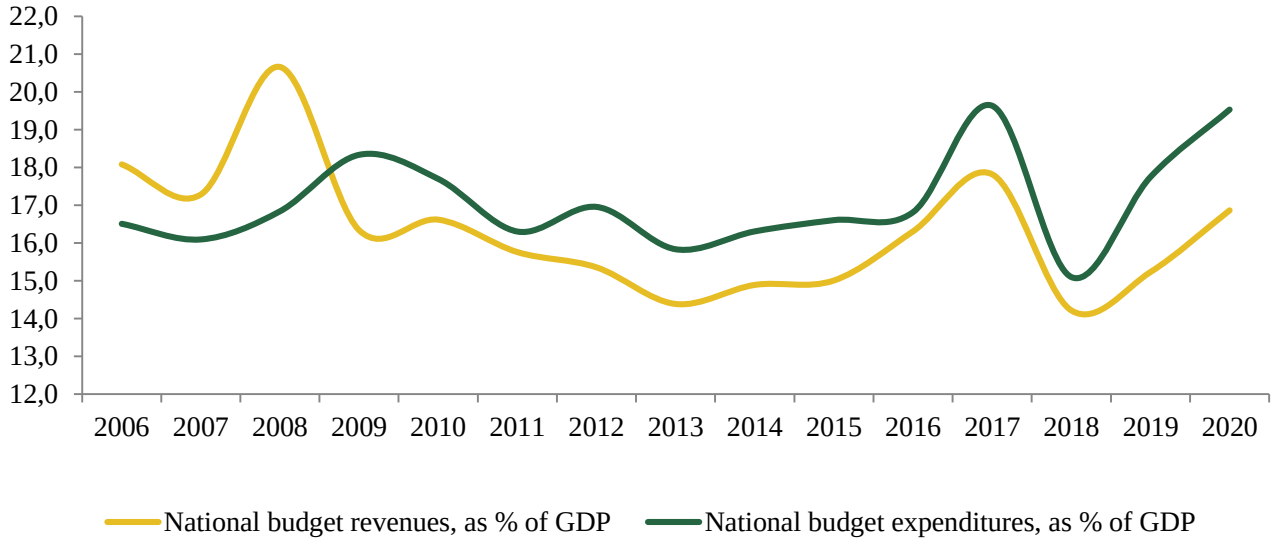
Therefore, taking into account the abovementioned correlation analysis, the fiscal policy in Kazakhstan can be characterized as pro-cyclical during the periods of economic boom and can be defined as counter-cyclical to a certain extent during the times of economic downturn. However, it is important to note that the counter-cyclical nature of the fiscal policy amid the economic slump is manifested not in accordance with a strict fiscal rule but largely by inertia as the continuation of those measures and actions that were implemented during the periods of a positive business cycle.

Figure 2. Retrospective Dynamics of the National Budget Expenditures and the Output Gap



Source: calculations made by the authors

Figure 3. Retrospective Dynamics of the National Budget Revenues and Expenditures



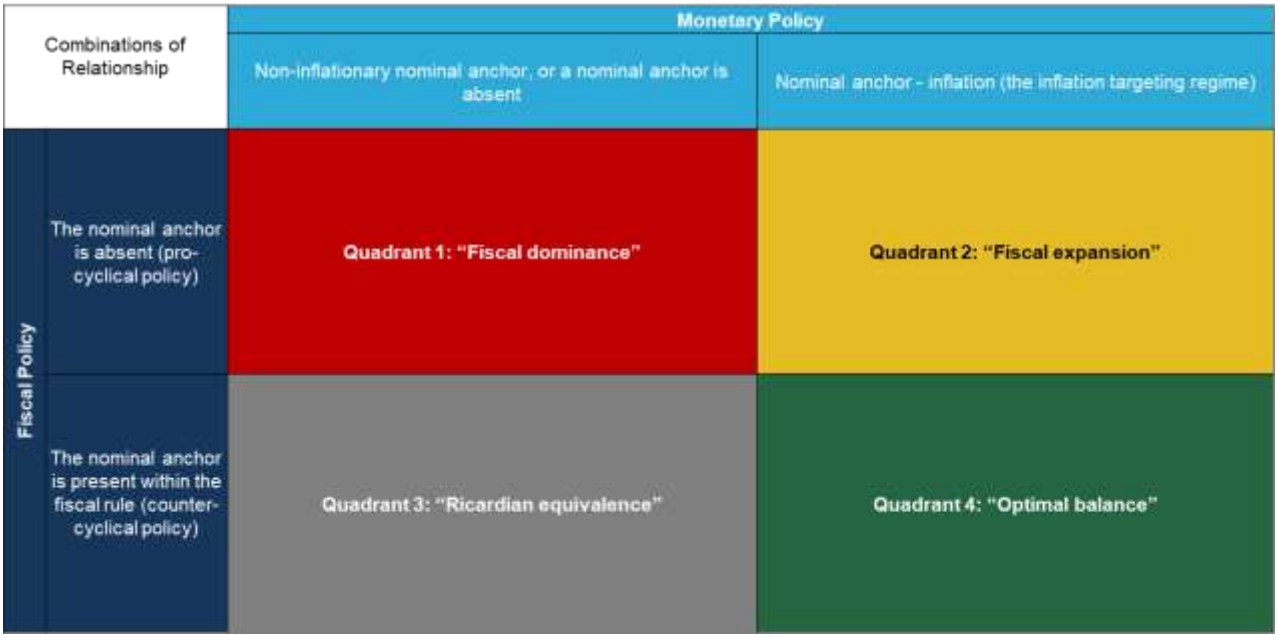
Source: calculations made by the authors

As for the monetary policy in Kazakhstan, it was characterized by non-existence of the nominal anchor in the form of inflation target before the inflation targeting was introduced in August 2015. Along with that, up to that moment, stimulative monetary conditions were prevailing in the country's economy along with negative real interest rates.

Given that fact and due to non-existence of a nominal anchor in the fiscal policy, in the context of analytical matrix of relationship between the two macroeconomic policies (see Figure 4) the interaction of monetary and fiscal

measures in Kazakhstan before 2015 may be referred to as the “fiscal dominance” with the instants of certain prevalence of the “Ricardian equivalence” features when the budget expenditures were expanding by inertia in response to the cooling of economic activity, that is, they were counter-cyclical.

Figure 4. Matrix of Relationship between the Monetary and Fiscal Policies in Kazakhstan from 2006 through 2020



Source: compiled by the authors

After the introduction of inflation targeting, the target inflation rate became the nominal anchor of the monetary policy. As part of implementation of the new regime, the National Bank began to apply the Taylor rule in order to actively respond to inflation deviations from the target level and deviations of the output gap from its potential value (Chernyavskiy D., 2017).

In this regard, taking into account the change in the monetary policy regime and the setting of inflation target as its nominal anchor in the absence of a fiscal rule, the combination of relationship of the monetary and fiscal policy in Kazakhstan changed from “fiscal dominance” mainly to “fiscal expansion” (see. Figure 3). At the same time, as a result of the periodic inertial manifestation of the counter-cyclical nature of the fiscal policy, the nature of relationship between the two policies was unstable and temporarily shifted (in 2016, 2018 and 2020) into a situation of the optimal balance.

Thus, as a result of analysis of the historical relationship between the fiscal and monetary policies, it was determined that there are prerequisites for identification of the fiscal theory of the price level in Kazakhstan, that is, a noticeable impact of fiscal measures on inflation.

4.2 Empirical Assessment of the Fiscal Theory of the Price Level in Kazakhstan

As noted above, in order to test the long-term impact of fiscal indicators on inflation in Kazakhstan, the VECM modeling approach was applied in this study, whose results are presented in Attachments 2 and 3. As part of this approach, the hypothesis about the existence of a long-term relationship between fiscal parameters (budget revenues and expenditures) and the price level dynamics was tested.

Given that the monetary policy before and after the inflation targeting had different combinations of relationship with the fiscal policy, it was decided to make estimates using the VECM for two periods:

1) from the first quarter of 2008 through the second quarter of 2015;

2) from the fourth quarter of 2015 through the fourth quarter of 2020[8].

The initial stage of the assessment had been the testing for the presence of co-integration (long-term relationship) between the studied variables: budget revenues, spending and the price level in Kazakhstan. As a result, the test showed the presence of a long-term and positive relationship between the price level and budget parameters for the two reviewed periods that is eventually proved by the fiscal theory of the price level in Kazakhstan. At the same time, before the new monetary policy regime was implemented, a long-term impact of the fiscal policy on the price level was higher compared to the period with the presence of a nominal anchor – the inflation target.

So, in accordance with the co-integration equation, the long-term elasticity coefficient of the price level from 1% of the change in budget revenues before the introduction of inflation targeting is **0.05%**, while after the transition to the new regime the elasticity decreased and accounted for **0.03%** (see Attachment 2, Tables 1, 2).

However, long-term elasticities of the price level from 1% of the change in budget spending for the same periods equaled **0.06%** and **0.04%,** respectively (see Attachment 2, Tables 3, 4).

A higher long-term relationship between the positive nature of budget expenditures and the dynamics of the price level in comparison with revenues is explained by the systematic persistence of the budget deficit in the historical period, that is, the excess of expenditures over revenues.

Therefore, a conclusion can be made that the fiscal policy exerts a long-term upward effect on inflation in Kazakhstan, both before the introduction of the inflation targeting regime and after its implementation.

After finding a long-term relationship between the price level and budget parameters, the degree of impact (contribution) of the fiscal policy to inflation should be assessed. It is important to note here that for a quantitative assessment of direct contribution of the budgetary policy to changes in the price level it is practicable to

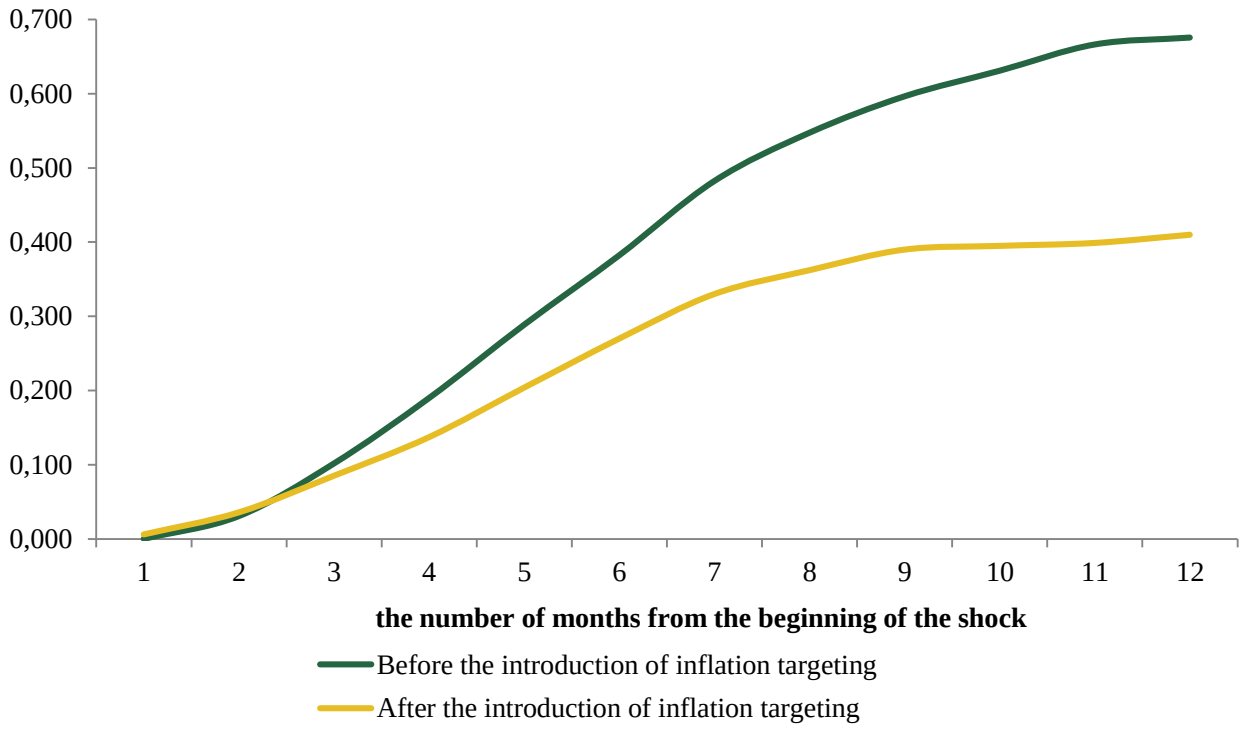
[8]Since the official date of transition to the inflation targeting regime was August 20, 2015, which is approximately the middle of the quarter, this quarter was not included either in the period before the introduction of inflation targeting or in the period after the introduction of the new regime.

use budget expenditures, since they have a final impact on the aggregate demand parameters, and, consequently, on inflation. As noted above, the FAVAR models were used for these purposes.

According to the results of the estimates obtained, before the implementation of inflation targeting, a 10% increase in the national budget spending in Kazakhstan led to an accumulated buildup in inflation of **0.68 percentage points** during 12 months. At the same time, after the introduction of inflation targeting, a similar increase (by 10%) in the national budget spending leads to a smaller but still significant accumulated acceleration of inflation – by **0.41 percentage points** during 12 months (Figure 5, Attachments 4, 5).

Given the result obtained, the computation can be made that the upward revision of the national budget spending in 2021 by **1.3 trillion tenge**, or by 9.1% compared to the initially approved version of the budget, can make an additional contribution to acceleration of the annual inflation rate in Kazakhstan of **0.37 percentage points**.

Figure 5. Accumulated Response of the Annual Inflation to a 10% Growth in the National Budget Spending in Kazakhstan



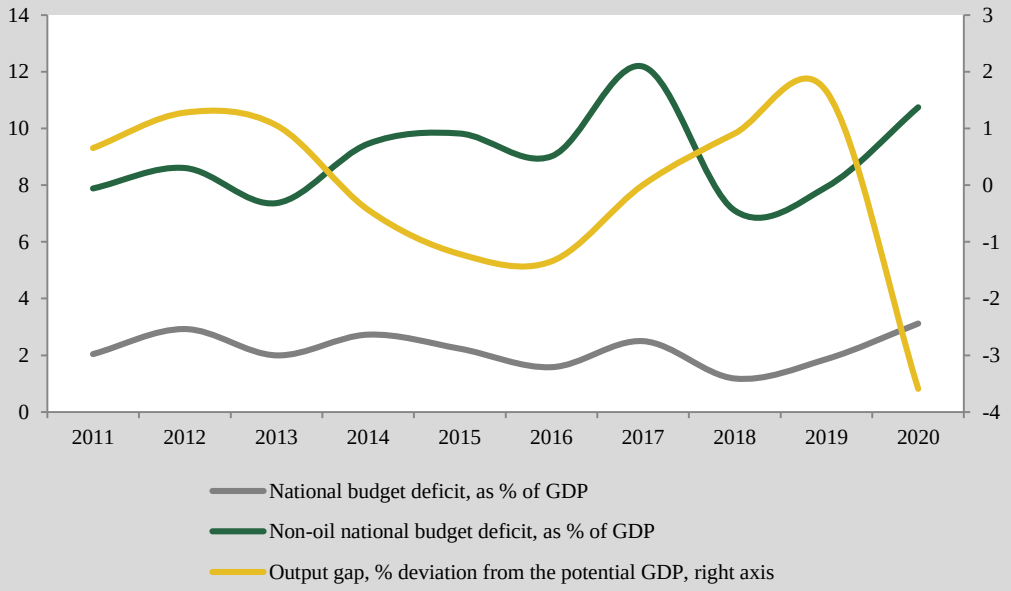
Source: calculations made by the authors

Box 1. Choosing a Key Fiscal Policy Macro Indicator in Kazakhstan

In assessing the relationship between the fiscal policy and the business cycle, the best option would be to use the budget deficit as a fiscal indicator since the budget deficit characterizes the fiscal focus or the fiscal stance to the maximum extent. However, in Kazakhstan's environment, the overall budget deficit has low volatility and weak dependence on both a positive and negative business cycle. This is explained by the allocation of transfers from the NoF to the budget that act as a stabilizer for the budget deficit, not allowing a strong buildup in the Government's debt. Thus, in the absence of transfers from the NoF, the Government's debt and the associated costs of its servicing would take higher figures. In particular, the total volume of withdrawals from the NoF for 11 years (from 2010 through 2020) exceeded the total volume of the Government's debt as of the beginning of 2021 by more than 1.6 times (by 63.9%). In addition, the total volume of guaranteed and earmarked transfers to the national budget from the NoF for the same 11 years amounted to 27.4 trillion tenge, which is almost equivalent to the amount of the NoF's resources as of January 1, 2021 (27.5 trillion tenge).

In addition to the overall budget deficit, another indicator that could serve as an indicator of the fiscal policy's impact on the business cycle in Kazakhstan is the amount of non-oil deficit. Thus, in contrast to the overall deficit, the dynamics of non-oil deficit reflects the impact of cycles of economic activity on fiscal indicators and the counter-cyclical nature of fiscal policy to a greater extent (see Figure 1). For example, during the period from 2010 to 2020, the average deviation of the output gap and the non-oil budget deficit take the same values and equal 1.5%, while the standard deviation of the overall deficit is 0.6%. Besides, over the same period, the negative relationship between the non-oil budget deficit and the output gap expressed through the correlation coefficient takes on a higher value in absolute terms (-0.55) than the correlation between the overall deficit and the output gap (-0.43).

Figure 1. Historical Dynamics of the Overall Deficit, Non-Oil Deficit and the Output Gap



Source: calculations made by the authors

This implies that the non-oil deficit compared to the overall deficit is a better indicator reflecting the counter-cyclical or pro-cyclical nature of the fiscal policy. At the same time, statistics on the indicator of "Export customs duties on crude oil", which are included in the calculation of the non-oil budget deficit of Kazakhstan, became available only in December 2010, thus significantly reducing the number of historical observations required for a qualitative assessment of the relationship.

Thus, given that the overall budget deficit does not fully reflect the economic nature of the fiscal policy in Kazakhstan, and the indicator of non-oil deficit has a limited number of observations, the budget expenditures were chosen as the main fiscal policy macro-indicator affecting the business cycle. So, within the expenditure side of the budget, the main fiscal impulse is transmitted to the economic activity and the price level in Kazakhstan, including through an increase in wages in the budget and social sectors, transfers to individuals (retirement benefits, scholarships and allowances), current expenses for the purchase of goods and services and capital expenditures. At the same time, the formation of budget revenues, including those involved in the calculation of the overall and non-oil deficits, serves the purpose of fulfilling the fiscal authorities' plan on the expenditure side.

5. Summary and Recommendations

There is a common thesis in the economic theory that inflation is a monetary phenomenon accompanied by the outstripping growth of money supply over the output. However, an extended analysis of the available theoretical and practical base suggests that, along with monetary factors, the policy of the fiscal authorities plays an equally important role in the buildup of inflation. This is supported by the so-called fiscal theory of the price level. This theory assumes that the fiscal policy is not neutral in relation to the price level in the long run since the formation of inflation and inflation expectations of economic agents depends, among other things, on the state of such fiscal indicators as revenues, expenditures, budget balance and public debt. At the same time, the price stability, sustainability of the economic growth and budget parameters are determined by the effective and balanced interaction of the fiscal policy with monetary measures.

The results of analysis of the historical fiscal policy stance suggest that the policy of fiscal authorities in Kazakhstan can be characterized as pro-cyclical during the periods of economic boom and counter-cyclical during the periods of economic downturn. However, the counter-cyclical nature of the fiscal policy during the periods of economic downturn manifests itself not in accordance with a strict fiscal rule but largely by inertia as the strengthening of those measures and actions that were implemented during the periods of a positive business cycle. At the same time, the monetary policy in Kazakhstan before the introduction of inflation targeting in 2015 was characterized by the absence of a nominal anchor in the form of inflation target and the prevalence of stimulating monetary conditions. Therefore, in the absence of a nominal anchor of the fiscal policy, the relationship between the monetary and fiscal measures in Kazakhstan until 2015 can be classified as “fiscal dominance” with some predominance of the “Ricardian equivalence” features (see Figure 3).

After the change of the monetary policy regime to inflation targeting and given that the previous nature of fiscal measures was retained, the relationship between the two policies in Kazakhstan changed from the “fiscal dominance” mainly to the “fiscal expansion”. At the same time, in certain periods of the fiscal counter-cyclicity, which retained its inertial nature, the combination of the fiscal and monetary policies is unstable and it temporarily transformed into the situation of optimal balance. This situation corresponds to the consistency of relationship between the two policies in achieving the inflation stability, sustainability of fiscal parameters and the business cycle.

Based on the analysis of theoretical and practical foundations of the fiscal theory of the price level, the hypothesis about the presence of a long-term influence of the fiscal policy on inflation in Kazakhstan was tested in the course of study with the use of VECM and FAVAR, followed by the identification of quantitative characteristics of the studied dependence before and after the inflation targeting. The results of the assessments proved that the fiscal policy (budget revenues and expenditures) has a long-term upward effect on inflation in Kazakhstan both before and after the implementation of the new monetary policy regime.

The calculations, which take into account the transmission of fiscal measures to the price level dynamics, showed that before the inflation targeting was implemented, a 10% growth in the national budget spending in Kazakhstan led to an accumulated increase in inflation of **0.68 percentage points** during 12 months. However, after the introduction of inflation targeting, a similar increase in the budget spending leads to a smaller, but still significant, accumulated acceleration of inflation of **0.41 percentage points** during 12 months.

Based on the analysis performed and the estimates obtained, now it is necessary to reduce the pro-inflationary impact of the fiscal policy on pricing processes and to improve the efficiency of fiscal measures in smoothing out fluctuations in the business cycle. To solve these problems, it is necessary that the two policies should interact in the combination of "optimal balance". In other words, given the National Bank's commitment to the inflation targeting regime, the Government needs to move to the implementation of a full-fledged counter-cyclical fiscal policy within a strictly enforced budget rule.

The solution to this problem in Kazakhstan should be ensured by implementing the mechanism of counter-cyclical budget rules jointly developed by the National Bank and the Government, from 2023. The following requirements to the fiscal parameters are established in accordance with such mechanism:

1) in allocating the guaranteed transfer from the NoF to the national budget, the growth rate of government spending will be limited by the desired long-term economic growth, increased by the long-term inflation target;

2) the guaranteed transfer will be determined in an amount not exceeding the volume of receipts to the NoF at the established cut-off price of oil;

3) the volume of government spending will be limited by non-oil budget revenues and the guaranteed transfer projected at the cut-off price for oil, by the targeted transfer as well as by the overall deficit.

The introduction and commitment to this mechanism of counter-cyclical budget rules will create conditions for interaction between the monetary and fiscal policy in Kazakhstan in accordance with the situation of "optimal balance", whereby it is expected to achieve the stability of inflation, sustainability of the budget balance and the business cycle.

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Appendix 1

Table 1

Correlation Analysis between the Budget Expenditures as Percent of GDP and Dummy Variables of a Positive and Negative Output Gap

Variables	Budget Expenditures	A Dummy Variable of a Positive Output Gap	A Dummy Variable of a Negative Output Gap
Budget costs	1.00	0.18	0.21
A dummy variable of a positive output gap	0.18	1.00	-1.00
A dummy variable of a negative output gap	0.21	-1.00	1.00

Source: calculations by the authors

Appendix 2

Table 1

Results of the Error Correction Model on a Long-Term Dependence between the Price Level and Budget Revenues before the Introduction of Inflation Targeting

Vector Error Correction Estimates		
Sample (adjusted): 2008Q1 2015Q2		
Included observations: 30 after adjustments		
Cointegrating Eq:	CointEq1	
LN_PRICE_LEVEL_SA(-1)	1.000000	
LN_BUD_REV_SA(-1)	-0.04927	
t - statistic	[-11.2147]	
C	2.453846	
Error Correction:	D(PRICE_LEVEL_SA)	D(LN_BUD_REV_SA)
CointEq1	0.023915	1.798727
t - statistic	[1.55461]	[5.38533]
C	0.016389	0.037020
t - statistic	[12.9859]	[1.35101]

Source: calculations by the authors

LN_PRICE_LEVEL_SA – a logarithm of deseasonalized price level to the basis period of the 4th quarter of 2007
LN_BUD_ REV _SA – a logarithm of deseasonalized budget revenues

Table 2

Results of the Error Correction Model on a Long-Term Dependence between the Price Level and Budget Revenues after the Introduction of Inflation Targeting

Vector Error Correction Estimates		
Sample (adjusted): 2015Q4 2020Q4		
Included observations: 21 after adjustments		
Cointegrating Eq:	CointEq1	
LN_PRICE_LEVEL_SA(-1)	1.000000	
LN_BUD_REV_SA(-1)	-0.03388	
t - statistic	[-10.9295]	
C	6.034913	
Error Correction:	D(PRICE_LEVEL_SA)	D(LN_BUD_REV_SA)
CointEq1	0.066397	1.299998
t - statistic	[3.37784]	[5.77131]
C	0.020026	0.062099
t - statistic	[7.43348]	[2.01155]

Source: calculations by the authors

LN_PRICE_LEVEL_SA – a logarithm of deseasonalized price level to the basis period of the 4th quarter of 2007
LN_BUD_ REV _SA – a logarithm of deseasonalized budget revenues

Table 3

Results of the Error Correction Model on a Long-Term Dependence between the Price Level and the Budget Spending before the Introduction of Inflation Targeting

Vector Error Correction Estimates		
Sample (adjusted): 2008Q1 2015Q2		
Included observations: 30 after adjustments		
Cointegrating Eq:	CointEq1	
LN_PRICE_LEVEL_SA(-1)	1.000000	
LN_BUD_EXP_SA(-1)	-0.05677	
t - statistic	[-6.88194]	
C	-54.58535	
Error Correction:	D(PRICE_LEVEL_SA)	D(BUD_EXP_SAL_SA)
CointEq1	0.020335	173.3844
t - statistic	[0.90518]	[2.93549]
C	4.231856	2074.464
t - statistic	[11.4035]	[2.12612]

Source: calculations by the authors

LN_PRICE_LEVEL_SA – a logarithm of deseasonalized price level to the basis period of the 4th quarter of 2007
LN_BUD_EXP_SA – a logarithm of deseasonalized budget expenditures

Table 4

Results of the Error Correction Model on a Long-Term Dependence between the Price Level and the Budget Spending after the Introduction of Inflation Targeting

Vector Error Correction Estimates		
Sample (adjusted): 2015Q4 2020Q4		
Included observations: 21 after adjustments		
Cointegrating Eq:	CointEq1	
LN_PRICE_LEVEL_SA(-1)	1.000000	
LN_BUD_EXP_SA(-1)	-0.04388	
t - statistic	[-3.49134]	
C	-104.1651	
Error Correction:	D(PRICE_LEVEL_SA)	D(BUD_EXP_SAL_SA)
CointEq1	0.023525	50.24745
t - statistic	[1.30224]	[1.83247]
C	6.185693	2681.089
t - statistic	[9.87416]	[2.81955]

Source: calculations by the authors

LN_PRICE_LEVEL_SA – a logarithm of deseasonalized price level to the basis period of the 4th quarter of 2007
LN_BUD_EXP_SA – a logarithm of deseasonalized budget expenditures

Appendix 3

EViews Code for Building and Estimating the VECM that Assesses a Long-Term Relationship between the Budget Revenues and Expenditures with the Price Level Dynamics for the Period from the 1st Quarter of 2008 through the 2nd Quarter of 2015

```
'setup path
'cd "C:\Users\Desktop\VECM\... "

'bud_rev – budget revenues in nominal terms. Source: MOF RK
'bud_exp – budget expenditures in nominal terms. Source: MOF RK
'price_level – the price level in Kazakhstan to the basis period of the 4th quarter of 2007. Source: BNS ASPR

import C:\Users\Desktop\VECM\data.xlsx range=data colhead=1 na="#N/A" @freq Q 2008Q1 @smpl @all

'Seasonal adjustment
bud_exp.x12
price_level.x12
bud_rev.x12

'take logarithm
series ln_bud_rev_sa = log(bud_rev_sa)
series ln_bud_exp_sa = log(bud_exp_sa)
series ln_price_level_sa = log(price_level_sa)

smpl 2008q1 2015q2
var var0.ls 1 8 ln_price_level_sa ln_bud_exp_sa 'Estimate a VAR(0).
var0.laglen(8, vname=l1)  'Perform information criteria analysis on the estimated VAR(0)

'show v1
!pvar=l1(1) 'lag chosen by Schwarz

var0.ec(c,1) 0 0 ln_price_level_sa ln_bud_exp_sa

var var1.ls 1 8 ln_price_level_sa ln_bud_rev_sa 'Estimate a VAR(0).
var1.laglen(8, vname=l2)  'Perform information criteria analysis on the estimated VAR(0)

'show v1
!pvar=l2(1) 'lag chosen by Schwarz

var1.ec(c,1) 0 0 ln_price_level_sa ln_bud_rev_sa
```

EViews Code for Building and Estimating the VECM that Assesses a Long-Term Relationship between the Budget Revenues and Expenditures with the Price Level Dynamics for the Period from the 4th Quarter of 2015 through the 4th Quarter of 2020

```
'setup path
'cd "C:\Users\Desktop\VECM\... "

'bud_rev – budget revenues in nominal terms. Source: MOF RK
'bud_exp – budget expenditures in nominal terms. Source: MOF RK
'price_level – price level in Kazakhstan to the basis period of the 4th quarter of 2007. Source: BNS ASPR


import C:\Users\Desktop\VECM\data.xlsx range=data colhead=1 na="#N/A" @freq Q 2008Q1 @smpl @all

'Seasonal adjustment
bud_rev.x12
bud_exp.x12
price_level.x12

'take logarithm
series ln_bud_rev_sa = log(bud_rev_sa)
series ln_bud_exp_sa = log(bud_exp_sa)
series ln_price_level_sa = log(price_level_sa)

smpl 2015q4 2020q4
var var0.ls 1 8 ln_price_level_sa ln_bud_exp_sa 'Estimate a VAR(0).
var0.laglen(8, vname=l1)  'Perform information criteria analysis on the estimated VAR(0)

'show v1
!pvar=l1(1) 'lag chosen by Schwarz

var0.ec(c,1) 0 0 ln_price_level_sa ln_bud_exp_sa

var var1.ls 1 8 ln_price_level_sa ln_bud_rev_sa 'Estimate a VAR(0).
var1.laglen(8, vname=l2)  'Perform information criteria analysis on the estimated VAR(0)

'show v1
!pvar=l2(1) 'lag chosen by Schwarz

var1.ec(c,1) 0 0 ln_price_level_sa ln_bud_rev_sa
```

Appendix 4

Table 1

Accumulated Impulse Responses of Inflation in Kazakhstan to 1% Shock of Budget Expenditures Obtained by Using the FAVAR Model for the Period from January 2008 through July 2015, as Percentage Points

Period	Cumulative Response of the National Budget Expenditures to the Shock of the National Budget Expenditures	Cumulative Response of Inflation to the Shock of the National Budget Expenditures	Inflation Elasticity to the National Budget Expenditures
1	11.062	0.000	0.000
2	11.073	0.034	0.003
3	11.384	0.116	0.010
4	11.729	0.223	0.019
5	11.960	0.346	0.029
6	12.252	0.468	0.038
7	12.563	0.606	0.048
8	12.827	0.702	0.055
9	13.055	0.778	0.060
10	13.253	0.836	0.063
11	13.433	0.895	0.067
12	13.607	0.920	0.068
13	13.783	0.944	0.069
14	13.966	0.969	0.069
15	14.156	0.995	0.070
16	14.356	1.024	0.071
17	14.563	1.051	0.072
18	14.775	1.080	0.073
19	14.990	1.111	0.074
20	15.206	1.140	0.075
21	15.420	1.161	0.075
22	15.631	1.180	0.076
23	15.837	1.200	0.076
24	16.039	1.219	**0.076**

Source: calculations by the authors

Table 2

Accumulated Impulse Responses of Inflation in Kazakhstan to 1% Shock of Budget Expenditures Obtained by Using the FAVAR Model for the Period from September 2015 through December 2020, as Percentage Points

Period	Cumulative Response of the National Budget Expenditures to the Shock of the National Budget Expenditures	Cumulative Response of Inflation to the Shock of the National Budget Expenditures	Inflation Elasticity to the National Budget Expenditures
1	40.242	0.025	0.001
2	39.088	0.140	0.004
3	39.754	0.339	0.009
4	41.635	0.571	0.014
5	41.961	0.856	0.020
6	42.266	1.141	0.027
7	42.592	1.406	0.033
8	42.975	1.557	0.036
9	43.408	1.693	0.039
10	43.836	1.732	0.040
11	44.268	1.766	0.040
12	44.708	1.833	0.041
13	45.152	1.883	0.042
14	45.597	1.929	0.042
15	46.041	1.967	0.043
16	46.478	2.006	0.043
17	46.904	2.045	0.044
18	47.314	2.083	0.044
19	47.704	2.121	0.044
20	48.071	2.158	0.045
21	48.414	2.183	0.045
22	48.732	2.217	0.046
23	49.022	2.245	0.046
24	49.286	2.269	**0.046**

Source: calculations by the authors

Appendix 5

EViews Code for Building and Estimating the FAVAR Model for the Period from January 2008 through July 2015

```
'setup path
'cd "C:\Users\Desktop\FAVAR\... "

'import data
import C:\Users\Desktop\FAVAR\data.xlsx range=Sheet1=1 namepos=first na="#N/A" @freq M 2008M01 @smpl @all

pageselect Data_pca

'Create groups
group g_rs rs1 rs2 rs3 rs4 rs5 rs6 rs7 rs8 rs9 rs10 rs11 rs12 rs13 rs14 rs15 rs16 rs17 rs18 rs19 rs20 rs21 rs22 rs23 rs24
rs25 rs26 rs27 rs28
group g_ps ps1 ps2 ps3 ps4 ps5 ps6 ps7 ps8 ps9
group g_fs fs1 fs2 fs3 fs4 fs5 fs6 fs7 fs8 fs9 fs10 fs11 fs12 fs13 fs14 fs15 fs16 fs17 fs18 fs19
group g_es es1 es2 es3 es4 es5 es6 es7 es8 es9 es10 es11 es12
group g_ls ls1  ls2 ls3 ls4 ls5 ls6

'============================================================
' rs1 - the growth rates of the industry, YoY. Source: BNS ASPR
' rs2 - the growth rates of the mining industry, YoY. Source: BNS ASPR
' rs3 - growth rates of the manufacturing industry, YoY. Source: BNS ASPR
' rs4 – the growth rates of electricity supply and water supply, YoY. Source: BNS ASPR
' rs5 - the growth rates of crude oil and natural gas production, YoY. Source: BNS ASPR
' rs6 - the growth rates of metal ores production, YoY. Source: BNS ASPR
' rs7 - the growth rates of ferrous ores production, YoY. Source: BNS ASPR
' rs8 - the growth rates of non-ferrous metals production, YoY. Source: BNS ASPR
' rs9 - the growth rates of production of chemical products, YoY. Source: BNS ASPR
' rs10 - the growth rates of metallurgical production , YoY. Source: BNS ASPR
' rs11 - the growth rates of production of coke and petrochemicals, YoY. Source: BNS ASPR
' rs12 - the growth rates of the food industry, YoY. Source: BNS ASPR
' rs13 - the growth rates of engineering, YoY. Source: BNS ASPR
' rs14 - the growth rates of the construction sector, YoY. Source: BNS ASPR
' rs15 - the growth rates of agriculture, YoY. Source: BNS ASPR
' rs16 - the growth rates of retail trade, YoY. Source: BNS ASPR
' rs17 - the growth rates of commissioning of residential buildings, YoY. Source: BNS ASPR
' rs18 - the growth rates of fixed capital investments, YoY. Source: BNS ASPR
' rs19 - the growth rates of freight turnover, YoY. Source: BNS ASPR
' rs20 - the growth rates of freight transportation by all modes of transport, YoY. Source: BNS ASPR
' rs21 - the growth rates of rail freight turnover, YoY. Source: BNS ASPR
' rs22 - the growth rates of road freight turnover, YoY. Source: BNS ASPR
' rs23 - the growth rates of pipeline freight turnover, YoY. Source: BNS ASPR
' rs24 - the growth rates of passenger turnover, YoY. Source: BNS ASPR
' rs25 - the growth rates of information and communication, YoY. Source: BNS ASPR
' rs26 - the growth rates of nominal government spending on capital expenditures, YoY. Source: MOF
' rs27 - the growth rates of nominal government spending on purchases of goods and services, YoY. Source: MOF
' rs28 - the growth rates of nominal state budget revenues, YoY. Source: MOF
' ps1 - the growth rates of the consumer price index, YoY. Source: BNS ASPR
' ps2 - the growth rates of the food consumer price index, YoY. Source: BNS ASPR
' ps3 - the growth rates of the non-food consumer price index, YoY. Source: BNS ASPR
' ps4 - the growth rates of the consumer price index of paid services, YoY. Source: BNS ASPR
' ps5 - the growth rates of the producer price index, YoY. Source: BNS ASPR
' ps6 - the growth rates of the agriculture price index, YoY. Source: BNS ASPR
' ps7 - the growth rates of the construction price index, YoY. Source: BNS ASPR
' ps8 - the growth rates of the commodity rate index, YoY. Source: BNS ASPR
' ps9 - the growth rates of the import price index, YoY. Source: BNS ASPR
' fs1 - the growth rates of the index of nominal effective exchange rate of the tenge against foreign currencies, YoY.
Source: NBRK
' fs2 - the growth rates of the index of real effective exchange rate of the tenge against foreign currencies, YoY. Source:
NBRK
' fs3 - the growth rates of Kazakhstan’s international reserves (Gold and foreign exchange reserves + NoF), YoY.
Source: NBRK
' fs4 - the growth rates of the reserve money, YoY. Source: NBRK
' fs5 - the growth rates of cash in circulation, YoY. Source: NBRK
```

```
' fs6 - the growth rates of money supply(M3), YoY. Source: NBRK
' fs7 - the growth rates of broad money in the tenge, YoY. Source: NBRK
' fs8 - the growth rates of retail deposits, YoY. Source: NBRK
' fs9 - the growth rates of corporate deposits, YoY. Source: NBRK
' fs10 - the growth rates of interest rates on corporate deposits in the tenge, YoY. Source: NBRK
' fs11 - the growth rates of interest rates on corporate deposits in foreign currency, YoY. Source: NBRK
' fs12 - the growth rates of interest rates on retail deposits in the tenge, YoY. Source: NBRK
' fs13 - the growth rates of interest rate on retail deposits in foreign currency, YoY. Source: NBRK
' fs14 - the growth rates of interest rates on corporate loans in the tenge, YoY. Source: NBRK
' fs15 - the growth rates of interest rates on corporate loans in foreign currency, YoY. Source: NBRK
' fs16 - the growth rates of interest rates on retail loans in the tenge, YoY. Source: NBRK
' fs17 - the growth rates of interest rates on retail loans in foreign currency, YoY. Source: NBRK
' fs18 - the growth rates of retail loans , YoY. Source: NBRK
' fs19 - the growth rates of corporate loans , YoY. Source: NBRK
' es1 - the growth rates of exports, YoY. Source: BNS ASPR
' es2 - the growth rates of imports, YoY. Source: BNS ASPR
' es3 - the growth rates of Brent oil prices, YoY. Source: www.eia.gov
' es4 - the growth rates of China's industrial production index, YoY. Source: data.stats.gov.cn
' es5 - the growth rates of Russia's industrial production index, YoY. Source: www.gks.ru
' es6 - the growth rates of the EU's industrial production index, YoY. Source: appsso.eurostat.ec.europa.eu
' es7 - the growth rates of copper prices, YoY. Source: www.indexmundi.com
' es8 - the growth rates of aluminum prices, YoY. Source: www.indexmundi.com
' es9 - the growth rates of zinc prices, YoY. Source: www.indexmundi.com
' es10 - the growth rates of lead prices, YoY. Source: www.indexmundi.com
' es11 - the growth rates of ferrous ore prices, YoY. Source: www.indexmundi.com
' es12 - the growth rates of wheat prices, YoY. Source: www.indexmundi.com
' is1 - the growth rates of the economically active population, YoY. Source: BNS ASPR
' is2 - the growth rates of nominal wages, YoY. Source: BNS ASPR
' is3 - the growth rates of real wages, YoY. Source: BNS ASPR
' is4 - the growth rates of nominal income, YoY. Source: BNS ASPR
' is5 - the growth rates of real income, YoY. Source: BNS ASPR
' is6 - the growth rates of the employed population, YoY. Source: BNS ASPR
' exp_g - the growth rates of the budget spending, YoY. Source: MOF
' er - the growth rates of the exchange rate, YoY. Source: MOF

'============================================================
'Create targeted group
group gt_rs rs1 rs2 rs3 rs4 rs7 rs9 rs11 rs12 rs13 rs14 rs16 rs17 rs18 rs19 rs20 rs21 rs22 rs24 rs25
group gt_ps ps1 ps3 ps5 ps8 ps9
group gt_fs fs3 fs4 fs5 fs6 fs7 fs8 fs9 fs18 fs19
group gt_es es1 es2 es3 es4 es5 es6 es7 es8 es9 es10 es11 es12
group gt_ls ls1 ls2 ls3 ls4 ls5 ls6

'Creating scalar with number of series in groups
scalar RSnum=gt_rs.@Count
scalar PSnum=gt_ps.@Count
scalar FSnum=gt_fs.@Count
scalar ESnum=gt_es.@Count
scalar LSnum=gt_ls.@Count

'Standartising the data  in real sector group
For !i=1 to RSnum
%Series=gt_rs.@Seriesname(!i)
smpl @all
!Std=@StDev({%Series})
!Mean=@Mean({%Series})
smpl @all
{%Series}=({%Series}-!Mean)/!Std
Next

'Standartising the data  in price sector group
For !i=1 to PSnum
%Series=gt_ps.@Seriesname(!i)
smpl @all
!Std=@StDev({%Series})
!Mean=@Mean({%Series})
smpl @all
{%Series}=({%Series}-!Mean)/!Std
Next
```

```
'Standartising the data  in financial sector group
For !i=1 to FSnum
%Series=gt_fs.@Seriesname(!i)
smpl @all
!Std=@StDev({%Series})
!Mean=@Mean({%Series})
smpl @all
{%Series}=({%Series}-!Mean)/!Std
Next

'Standartising the data in external sector group
For !i=1 to ESnum
%Series=gt_es.@Seriesname(!i)
smpl @all
!Std=@StDev({%Series})
!Mean=@Mean({%Series})
smpl @all
{%Series}=({%Series}-!Mean)/!Std
Next

'Standartising the data in labor group
For !i=1 to LSnum
%Series=gt_ls.@Seriesname(!i)
smpl @all
!Std=@StDev({%Series})
!Mean=@Mean({%Series})
smpl @all
{%Series}=({%Series}-!Mean)/!Std
Next


'Construction principal components
delete(noerr) kzfull
sample kzfull @first @last

gt_rs.makepcomp pc_rs
gt_ps.makepcomp pc_ps
gt_fs.makepcomp pc_fs
gt_es.makepcomp pc_es
gt_ls.makepcomp pc_ls

'Create models
smpl 2008m01 2015m07
var var0.ls 1 12 exp_g er cpi kei 'Estimate a VAR(5).
var0.laglen(12, vname=l1)  'Perform information criteria analysis on the estimated VAR(6)
' V1 contains: sequential modified LR test (row 1), final prediction error (row 2), Akaike information criterion (row 3),
Schwarz information criterion (row 4), Hannan-Quinn information criterion (row 5).
'show v1
!pvar=l1(4) 'lag chosen by Schwarz

'AR1 models for each variable
'equation ar_exp_g.ls(arma=cls, optmethod=bfgs) exp_g ar(1) c
'equation ar_cpi.ls(arma=cls, optmethod=bfgs) cpi ar(1) c
equation ar_kei.ls(arma=cls, optmethod=bfgs) kei kei(-1) c

'VAR
var var_full.ls 1 !pvar exp_g er cpi kei 'Estimate a VAR(pvar)


delete l1 var0 'clean workspace

'FAVAR
var favar0.ls 1 12 exp_g cpi kei pc_rs pc_ps pc_fs @ c pc_es(-2)  'Estimate a VAR(12).
favar0.laglen(12, vname=l1) 'Perform information criteria analysis on the estimated VAR(6)

!pfavar=2
'!pfavar=l1(4) 'lag chosen by Schwarz
var favar_full.ls 1 !pfavar exp_g cpi kei pc_rs pc_ps pc_fs @ c pc_es(-2) 'Estimate a VAR(pvar)
```

```
delete l1 favar0
'show favaranfull_us
```

EViews Code for Building and Estimating the FAVAR Model for the Period from September 2015 through December 2020

```
'setup path
'cd "C:\Users\Desktop\FAVAR\... "

'import data
import C:\Users\Desktop\FAVAR\data.xlsx range=BASE_monthly_yy colhead=1 namepos=first na="#N/A" @freq M
2008M01 @smpl @all

pageselect Data_pca

'Create groups
group g_rs rs1 rs2 rs3 rs4 rs5 rs6 rs7 rs8 rs9 rs10 rs11 rs12 rs13 rs14 rs15 rs16 rs17 rs18 rs19 rs20 rs21 rs22 rs23 rs24
rs25 rs26 rs27 rs28
group g_ps ps1 ps2 ps3 ps4 ps5 ps6 ps7 ps8 ps9
group g_fs fs1 fs2 fs3 fs4 fs5 fs6 fs7 fs8 fs9 fs10 fs11 fs12 fs13 fs14 fs15 fs16 fs17 fs18 fs19
group g_es es1 es2 es3 es4 es5 es6 es7 es8 es9 es10 es11 es12
group g_ls ls1  ls2 ls3 ls4 ls5 ls6

'============================================================
' rs1 - the growth rates of the industry, YoY. Source: BNS ASPR
' rs2 - the growth rates of the mining industry, YoY. Source: BNS ASPR
' rs3 - the growth rates of the manufacturing industry, YoY. Source: BNS ASPR
' rs4 - the growth rates of electricity supply and water supply, YoY. Source: BNS ASPR
' rs5 - the growth rates of crude oil and natural gas production, YoY. Source: BNS ASPR
' rs6 - the growth rates metal ores production, YoY. Source: BNS ASPR
' rs7 - the growth rates ferrous ores production, YoY. Source: BNS ASPR
' rs8 - the growth rates non-ferrous metals production, YoY. Source: BNS ASPR
' rs9 - the growth rates of production of chemical products, YoY. Source: BNS ASPR
' rs10 - the growth rates of metallurgical production , YoY. Source: BNS ASPR
' rs11 - the growth rates of production of coke and petrochemicals, YoY. Source: BNS ASPR
' rs12 - the growth rates of the food industry, YoY. Source: BNS ASPR
' rs13 - the growth rates of engineering, YoY. Source: BNS ASPR
' rs14 - the growth rates of the construction sector, YoY. Source: BNS ASPR
' rs15 - the growth rates of agriculture, YoY. Source: BNS ASPR
' rs16 - the growth rates of retail trade, YoY. Source: BNS ASPR
' rs17 - the growth rates of commissioning of residential buildings, YoY. Source: BNS ASPR
' rs18 - the growth rates of fixed capital investments, YoY. Source: BNS ASPR
' rs19 - the growth rates of freight turnover, YoY. Source: BNS ASPR
' rs20 - the growth rates of freight transportation by all modes of transport, YoY. Source: BNS ASPR
' rs21 - the growth rates of rail freight turnover, YoY. Source: BNS ASPR
' rs22 - the growth rates of road freight turnover, YoY. Source: BNS ASPR
' rs23 - the growth rates of pipeline freight turnover, YoY. Source: BNS ASPR
' rs24 - the growth rates of passenger turnover, YoY. Source: BNS ASPR
' rs25 - the growth rates of information and communication, YoY. Source: BNS ASPR
' rs26 - the growth rates of nominal government spending on capital expenditures, YoY. Source: MOF
' rs27 - the growth rates of nominal government spending on purchases of goods and services, YoY. Source: MOF
' rs28 - the growth rates of nominal state budget revenues, YoY. Source: MOF
' ps1 - the growth rates of the consumer price index, YoY. Source: BNS ASPR
' ps2 - the growth rates of the food consumer price index, YoY. Source: BNS ASPR
' ps3 - the growth rates of the non-food consumer price index, YoY. Source: BNS ASPR
' ps4 - the growth rates of the consumer price index of paid services, YoY. Source: BNS ASPR
' ps5 - the growth rates of the producer price index, YoY. Source: BNS ASPR
' ps6 - the growth rates of agriculture price index, YoY. Source: BNS ASPR
' ps7 - the growth rates of construction price index, YoY. Source: BNS ASPR
' ps8 - the growth rates of commodity rate index, YoY. Source: BNS ASPR
' ps9 - the growth rates of import price index, YoY. Source: BNS ASPR
' fs1 - the growth rates of the index of nominal effective exchange rate of the tenge against foreign currencies, YoY.
Source: NBRK
' fs2 - the growth rates of the index of real effective exchange rate of the tenge against foreign currencies, YoY. Source:
NBRK
' fs3 - the growth rates of Kazakhstan’s international reserves (Gold and foreign exchange reserves+NoF), YoY. Source:
NBRK
' fs4 - the growth rates of the reserve money, YoY. Source: NBRK
```

```
' fs5 - the growth rates of cash in circulation, YoY. Source: NBRK
' fs6 - the growth rates of money supply(M3), YoY. Source: NBRK
' fs7 - the growth rates of broad money in the tenge, YoY. Source: NBRK
' fs8 - the growth rates of retail deposits, YoY. Source: NBRK
' fs9 - the growth rates of corporate deposits, YoY. Source: NBRK
' fs10 - the growth rates of interest rates on corporate deposits in the tenge, YoY. Source: NBRK
' fs11 - the growth rates of interest rate on corporate deposits in foreign currency, YoY. Source: NBRK
' fs12 - the growth rates of interest rates on retail deposits in the tenge, YoY. Source: NBRK
' fs13 - the growth rates of interest rate on retail deposits in foreign currency, YoY. Source: NBRK
' fs14 - the growth rates of interest rates on corporate loans in the tenge, YoY. Source: NBRK
' fs15 - the growth rates of interest rates on corporate loans in foreign currency, YoY. Source: NBRK
' fs16 - the growth rates of interest rates on retail loans in the tenge, YoY. Source: NBRK
' fs17 - the growth rates of interest rates on retail loans in foreign currency, YoY. Source: NBRK
' fs18 - the growth rates of retail loans , YoY. Source: NBRK
' fs19 - the growth rates of corporate loans , YoY. Source: NBRK
' es1 - the growth rates of exports, YoY. Source: BNS ASPR
' es2 - the growth rates of imports, YoY. Source: BNS ASPR
' es3 - the growth rates of Brent oil prices, YoY. Source: www.eia.gov
' es4 - the growth rates of China's industrial production index, YoY. Source: data.stats.gov.cn
' es5 - the growth rates of Russia's industrial production index, YoY. Source: www.gks.ru
' es6 - the growth rates of the EU's industrial production index, YoY. Source: appsso.eurostat.ec.europa.eu
' es7 - the growth rates of copper prices, YoY. Source: www.indexmundi.com
' es8 - the growth rates of aluminum prices, YoY. Source: www.indexmundi.com
' es9 - the growth rates of zinc prices, YoY. Source: www.indexmundi.com
' es10 - the growth rates of lead prices, YoY. Source: www.indexmundi.com
' es11 - the growth rates of ferrous ore prices, YoY. Source: www.indexmundi.com
' es12 - the growth rates of wheat prices, YoY. Source: www.indexmundi.com
' is1 - the growth rates of the economically active population, YoY. Source: BNS ASPR
' is2 - the growth rates of nominal wages, YoY. Source: BNS ASPR
' is3 - the growth rates of real wages, YoY. Source: BNS ASPR
' is4 - the growth rates of nominal income, YoY. Source: BNS ASPR
' is5 - the growth rates of real income, YoY. Source: BNS ASPR
' is6 - the growth rates of the employed population, YoY. Source: BNS ASPR
' exp_g - the growth rates of the budget spending, YoY. Source: MOF
' er - the growth rates of the exchange rate, YoY. Source: MOF

'============================================================
'Create targeted group
group gt_rs rs1 rs2 rs3 rs4 rs7 rs9 rs11 rs12 rs13 rs14 rs16 rs17 rs18 rs19 rs20 rs21 rs22 rs24 rs25
group gt_ps ps1 ps3 ps5 ps8 ps9
group gt_fs fs3 fs4 fs5 fs6 fs7 fs8 fs9 fs18 fs19
group gt_es es1 es2 es3 es4 es5 es6 es7 es8 es9 es10 es11 es12
group gt_ls ls1 ls2 ls3 ls4 ls5 ls6

'Creating scalar with number of series in groups
scalar RSnum=gt_rs.@Count
scalar PSnum=gt_ps.@Count
scalar FSnum=gt_fs.@Count
scalar ESnum=gt_es.@Count
scalar LSnum=gt_ls.@Count

'Standartising the data  in real sector group
For !i=1 to RSnum
%Series=gt_rs.@Seriesname(!i)
smpl @all
!Std=@StDev({%Series})
!Mean=@Mean({%Series})
smpl @all
{%Series}=({%Series}-!Mean)/!Std
Next

'Standartising the data  in price sector group
For !i=1 to PSnum
%Series=gt_ps.@Seriesname(!i)
smpl @all
!Std=@StDev({%Series})
!Mean=@Mean({%Series})
smpl @all
{%Series}=({%Series}-!Mean)/!Std
```

```
Next

'Standartising the data  in financial sector group
For !i=1 to FSnum
%Series=gt_fs.@Seriesname(!i)
smpl @all
!Std=@StDev({%Series})
!Mean=@Mean({%Series})
smpl @all
{%Series}=({%Series}-!Mean)/!Std
Next

'Standartising the data in external sector group
For !i=1 to ESnum
%Series=gt_es.@Seriesname(!i)
smpl @all
!Std=@StDev({%Series})
!Mean=@Mean({%Series})
smpl @all
{%Series}=({%Series}-!Mean)/!Std
Next

'Standartising the data in labor group
For !i=1 to LSnum
%Series=gt_ls.@Seriesname(!i)
smpl @all
!Std=@StDev({%Series})
!Mean=@Mean({%Series})
smpl @all
{%Series}=({%Series}-!Mean)/!Std
Next


'Construction principal components
delete(noerr) kzfull
sample kzfull @first @last

gt_rs.makepcomp pc_rs
gt_ps.makepcomp pc_ps
gt_fs.makepcomp pc_fs
gt_es.makepcomp pc_es
gt_ls.makepcomp pc_ls

'Create models
smpl 2015m09 2020m12
var var0.ls 1 12 exp_g er cpi kei 'Estimate a VAR(5).
var0.laglen(12, vname=l1)  'Perform information criteria analysis on the estimated VAR(6)
' V1 contains: sequential modified LR test (row 1), final prediction error (row 2), Akaike information criterion (row 3),
Schwarz information criterion (row 4), Hannan-Quinn information criterion (row 5).
'show v1
!pvar=l1(4) 'lag chosen by Schwarz

'AR1 models for each variable
'equation ar_exp_g.ls(arma=cls, optmethod=bfgs) exp_g ar(1) c
'equation ar_cpi.ls(arma=cls, optmethod=bfgs) cpi ar(1) c
equation ar_kei.ls(arma=cls, optmethod=bfgs) kei kei(-1) c

'VAR
var var_full.ls 1 !pvar exp_g er cpi kei 'Estimate a VAR(pvar)


delete l1 var0 'clean workspace

'FAVAR
var favar0.ls 1 12 exp_g cpi kei pc_rs pc_ps pc_fs @ c pc_es(-2)  'Estimate a VAR(12).
favar0.laglen(12, vname=l1) 'Perform information criteria analysis on the estimated VAR(6)

!pfavar=2
'!pfavar=l1(4) 'lag chosen by Schwarz
```

```
var favar_full.ls 1 !pfavar exp_g cpi kei pc_rs pc_ps pc_fs @ c pc_es(-2) 'Estimate a VAR(pvar)
delete l1 favar0
'show favaranfull_us
```