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The Analysis of the Relationship Between Money Supply, Budget Deficit and Inflation Rate in Azerbaijan

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Abstract: The most critical macroeconomic dynamics of economies include the supply of money, the budget deficit, and inflation. Moreover, inflation has a significant effect on the economy. Inflation is induced when monetary and fiscal policies are not used in a compatible and supportive manner. Because of this basis, it is interesting to examine the relationship between the money supply, the budget deficit, and inflation variables. Data was used from the Central Bank of Azerbaijan Republic annual report, World Bank, and Statista database. By applying the Granger method of causality this study aims to empirically define the relationships in the Azerbaijan economy between the supply of money, budget deficits, and inflation. The duration of 2009-2019 is being analyzed in the study and with quarterly results, the study is carried out. Budget deficits can cause inflation only if they are reflected in monetary aggregates, as inflation is a monetary phenomenon. When the central bank tries to accelerate monetary liquidity to cover or finance the budget deficit will promote inflation. The results suggest that there is one-way causality from the supply of money and the budget deficit to inflation. There is also a one-way causal link between the supply of money and the budget deficit.

Keywords: Budget Deficit, Inflation Rate, Money Supply, Monetary Policy, Fiscal Policy, Financial Methods, Granger Method, Nominal Effective Exchange Rate, Real Budgetary Capital Expenditure

1. Introduction

The key macroeconomic dynamics in economies are the money supply as well as the budget deficit and inflation indicators. This is why monetary and fiscal policies are so important. The variables can also have significant impacts on one another. To achieve macroeconomic goals, fiscal and monetary policy should be combined well and systematically. In other terms, fiscal policies should not have a negative impact on monetary and fiscal policy. It is essential to select the correct policies and carefully assess their effects on the economy. Practically, the use and promotion of expansionary fiscal policy by monetary policy instruments seem to have a very negative impact on price stability, especially in developing nations. This creates high inflation initially but then leads to significant economic uncertainty.

In principle, the mixed results of the studies should be available. Different authors are not able to reach an agreement on the effect the budget deficit has on the inflation rate [1]. The inflation rate and the impact of the budget deficit [2] were noted. It was concluded that ample evidence supports the hypothesis that the government deficit affects the inflation rate. Previous studies have shown that high inflation levels are associated with high budget deficits [3, 4, 5, 28].

The relationship between money supply, budget deficit, and the inflation rate was examined for Azerbaijan using quarterly data, 2009-2019. After previous research in this field, the Granger theory of causality has been used. These findings suggest that inflation and budget deficit are in a bidirectional relationship. A budget deficit is the main driver for money supply growth. A budget deficit is the principal growth driver of the money source. The central bank printing more money to make up for a budget shortfall results in an increase in the money supply. Because the aggregate supply of money is insufficient to satisfy the aggregate demand, prices and consumption rise. The budget deficit directly or indirectly increases inflation by increasing the amount of money. In an inflationary climate, the budget deficits

continue to rise because the real tax revenue drops. These studies indicate that inflationary impacts are created by changes in both the money supply and budget deficits.

The literature review will be presented in the following section. In section 3, we discussed the theoretical concepts for the money supply, budget deficit, as well as inflation. In section 4, data and methodology were discussed. The fifth section reveals the results. The sixth and final section discusses future policy implications and concludes with results.

2. Literature Review

2.1. The Effect of Money Supply on Inflation

This section will discuss recent studies that focus on the relationship between monetary policies and economic development. Because of its importance, many studies examine the relationship between money supply and budget deficit. Oomes [6] used the error correction model to examine the impact of money demand on inflation in Russia for monthly data from April 1996 through January 2004. These findings show that inflation is caused by an excess supply of effective wide money, while other excess money policies are not. They also found that effective broad money expansion has the strongest and longest-lasting effect on short-run inflation.

Several studies examine the effect of significant money demand on Bangladesh by using the Johansen cointegration test and error correction model. Empirical results indicate that there is a causal relationship between inflation and growth in the money supply.

Dilshad Ahmed [7] investigated the existence of a correlation between money supply and budget deficit in Pakistan. They used the Autoregressive Distribution Lag (ARDL), which measures money supply, inflation rate growth, and budget deficit. Data ranged from 1987 to 2018. These empirical results show that there is a statistically significant relationship between money availability and the inflation rate over time, which has positive effects on the budget deficit.

Wun [8] found that there is a long-term relationship in China between money supply, inflation rate, and economic growth. However, in the short term, they discovered a co-directional causality in money supply and inflation rate. They also found that Granger economic growth can be caused by money supply and the inflation rate using the Vector Error Correction Model (VECM), error mode (ECM), Johansen Co-Integration Test, Granger causality, as well as variance decay from the first quarter of 1999 to the third quarter. Granger inflation rate and money supply are not caused by economic growth.

Prices are affected by the adjustment in the money supply. This effect assumes the economy is in full employment and the pace of money supply remains constant. The following money quantity equation was developed by Irving Fisher:

$$MV = PT \qquad (1)$$

Next, the following is the equation forming the principle of inflation:

$$P = MV/T \qquad (2)$$

These equations reveal that M is money supply, V money velocity, P is the price level, T is the number of goods and service transactions. It can be concluded that an increase in money supply is generally responsible for a price hike.

Long-Run Monetary Neutrality may also explain inflation. This view suggests that every economy will experience inflation, as the increase in the money supply is usually higher than the increase in national production. According to Trisdian [9], inflation is affected by the money supply.

2.2. The Effect of Budget Deficit on Inflation

According to the monetarist view, inflation is caused by an increase in the money supply. If monetary policy is accommodating to deficits in the budget, then the money supply tends to rise for a long period. This deficit funding leads to an increase in aggregate demand, which causes production to rise above its natural level. In turn, a rising labor demand results in higher wages, which contributes to a decline in aggregate supply. After a while, production returns to normal. This comes at the price of higher prices which cannot be reversed.

Several studies have examined the relationship between inflation and fiscal deficits using panel data. The data's time and cross-sectional dimensions are examined in these studies. Based on annual data for 32 countries, finds that budget deficits do not cause inflation and used the dynamic panel model in 47 countries from 1993 to 1996 [10]. Inflation in industrial and transition economies is affected by fiscal deficits, according to Sargent and Wallace [2], said that central banking could not maintain complete control over inflation in certain circumstances. While the tight monetary policy may reduce inflation temporarily, long-term inflation will continue to rise. Particularly, long-term financial finance would be more effective in preventing inflation from occurring if the government funds persistent domestic borrowing deficits. Because budget deficits are driven by borrowing and printing money, the monetary policy might be subject to their suppression of them [24].

Lin and Chu [11] developed the dynamic panel quantile analysis (DPQR), which examines the deficit/inflation relationship between 1960-2006 in 91 nations. The DPQR modifies the ARDL specification to adjust the complex budget deficit effect on the inflation rate at different inflation levels. The empirical findings show that inflation is strongly affected by high-inflation episodes, while it has a weak effect on low-inflation episodes.

Jayaraman & Chen [12] performed an empirical review to examine the relationship between the budget deficits of the four Pacific Island countries (PICs), using a panel econometric analysis. Multivariate structures are used to prevent bias caused by the absence of relevant variables. The Wester Lund error-corrected panel co-integration test

protocol is used to calculate a long-term relationship between budget deficits & inflation. The results of this study confirmed the existence in all four PICs of a strong and direct relationship between budget deficits, inflation [26].

2.3. The Effect of a Budget Deficit on the Money Supply

According to the monetarist theory, a rise in the budget deficit causes an increase in the money supply, and therefore inflation [13]. Monetarists believe that an increase in the money supply is the main driver of aggregate demand, which will lead to increased consumption, employment, inflation, and therefore, more spending. Friedman [30], states that inflation can be minimized by long-term money supply management.

Woodford [14], Sims [16, 17], and Canzoneri [18] all presented the Fiscal Theory of the Price Level (FTPL) as an additional theory to examine the causes of inflation. The FTPL methodology, also known as the financial approach is based on the idea that there are both continuous budget deficits and financial methods. Woodford [15] states that budget deficits are the main cause of macroeconomic uncertainty. It was said that money supply is not the key inflation-determining factor, but that the budget deficit also has a significant influence on inflation.

Monetarist strategies assume that the earnings of the young generation will finance budget deficits. This is called inflation tax. It would increase general prices and contribute to inflation. Inflation is a tax that helps finance government deficits most efficiently. This tax is levied upon individuals' money and reduces the real value of money continually. To achieve its goals, the government creates inflation that is not anticipated and gains wealth [27].

3. Economic Background

3.1. Money Supply

Economic evaluations show that the most important thing in choosing a fiscal strategy is whether it delivers faster and more efficient economic intervention [19]. In 2008's financial crisis, when relative price stability declined in relative importance, public spending was increased and fiscal incentives packages, including tax cuts, were implemented to reduce negative production and increase economic efficiency. According to the Central Bank of the Republic of Azerbaijan (CBAR), the money supply increased between the global crisis and the devaluation of the manat (AZN), which occurred in 2015-2016. To attract people's attention, banks increased interest rates in 2015-2016 to increase depositors' savings and decrease the manat on the local market. This would increase incentives to appreciate manat's value against the US dollar. The floating currency strategy led to an increase in the money supply in 2016, mainly due to the improvement of business areas and the acceleration in the non-oil sector in Azerbaijan.

Figure 1. Money Supply M2 (2009-2020).

The CBAR implemented an expansionary monetary strategy in 2008 after the global crisis. This was in response to the increase in global liquidity. A general expansionary monetary policy was also adopted; it has been shown. Depending on economic conditions, expansionary fiscal policies have been implemented at different times. A fiscal and monetary expansion strategy that takes into account both global and local economic conditions is being implemented by 2020. But, inflation rates have increased dramatically. There are significant concerns about the effect of fiscal and monetary policy on inflation after this economic situation has been evaluated. This study will empirically investigate the relationship between inflation, budget deficits, and money supply in Azerbaijan following the 2008 financial crisis.

3.2. Budget Deficit

Azerbaijan was in a state of constant high inflation, high public sector revenue-expenditure inequalities, fiscal domination, and big structural breaks before 2008. The funding of budget deficits due to an income-expenditure gap within the public sector through printing money was one of the main reasons for high inflation rates during this period. Budget deficits remained high throughout the term and financing was not improved. Second, interest rates were lowered due to an increase in money supply as a result of

money printing. This has resulted in more consumption and not investment. This has led to increased price volatility, but more chronic inflation over the years. Thus, while price volatility has increased, inflation has become chronic over time [20, 29]. As a result, public debt has further risen, and capital market resources have moved from the private sector to the public. This condition has deepened the financial

supremacy of the economy of Azerbaijan. Finally, public debt began to grow, and a strong inflationary economic trend accompanied the 2008 economic crisis. The 2008 economic crisis in Azerbaijan's economy, as mentioned above, was a turning point for the economic system. After 2013, there was a tremendous decline in the government's budget, and a budget surplus switched to a budget deficit.
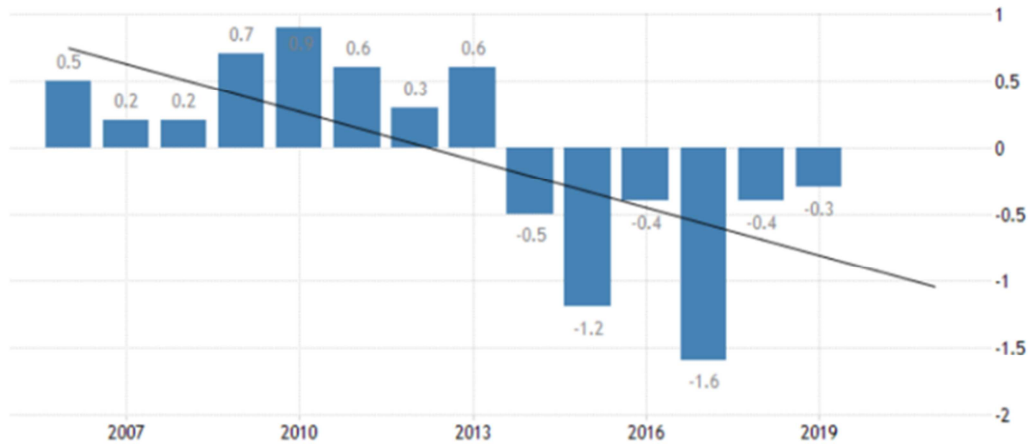

Figure 2. *Azerbaijan Government Budget (2006 – 2019).*

3.3. Inflation

During the economic structuring process in many fields, radical arrangements were made. Within the context of the program called the transition to a strong economy, the central bank's independence was legally assured, the inflation-targeting monetary policy plan was put into effect, and the central bank aimed to ensure and sustain price stability. In addition, significant steps have been taken to minimize fiscal dominance and maintain fiscal discipline. It is forbidden for the central bank to finance the deficits of the treasury or other

public institutions. As far as fiscal policy is concerned, the focus has been given to introducing a balanced budget, thus structuring public borrowing. Thus, the inflation rate of up to two-digit figures in the Azerbaijan economy has dropped to single digits in the process. The chart proves that increasing public borrowing had an incentive and that the inflation rate reached a peak (20.78%) during the global economic crisis. After the manat's devaluation, the inflation rate reached a second peak (12.84%). Then the floating exchange rate strategy started, and the percentage declined tremendously. (Figure 3)
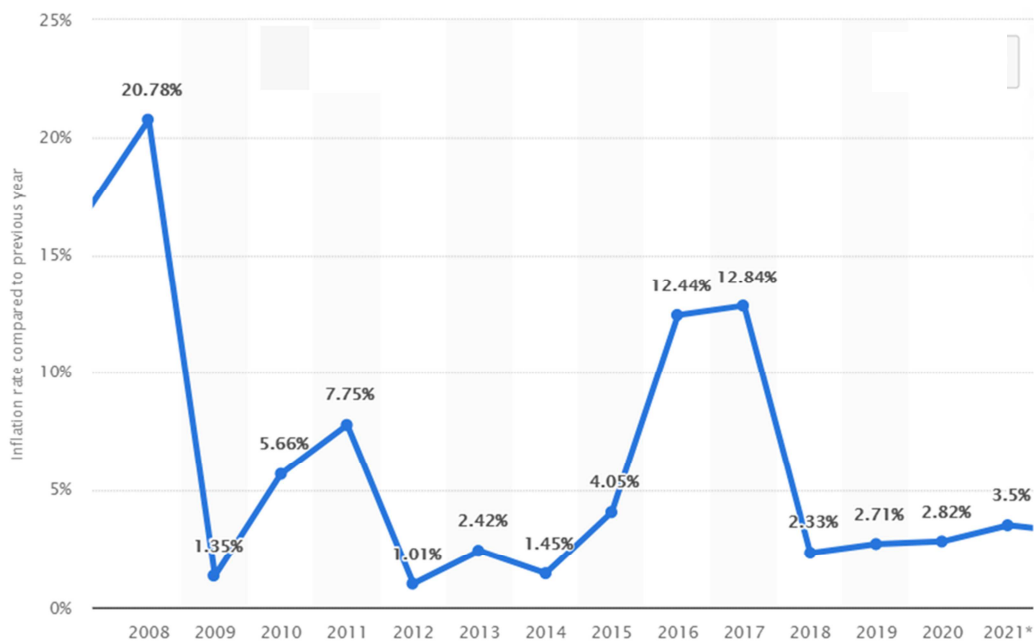

Figure 3. *Azerbaijan Inflation Rate (2008-2020).*

Domestic inflation is characterized as a function of its lagging values, nominal effective exchange rate, foreign inflation, real budgetary capital expenditure, budget deficit, supply of money, and a deviation from the long-term level of the real exchange rate:

$$\Delta p_t = \beta_{51}(L)\Delta p_t + \beta_{52}\Delta neer_t + \beta_{53}(L)\Delta p_t^*$$

$$+\beta_{54}(L)\Delta(i_t^G - p_t) + \beta_{55}(L)\Delta(yn_t - yn_t^*) + \beta_{56}(L)\Delta m_t + \beta_{57}(L)\mu_{\rho,t}$$

whereas usual, where β_{ij} (L) are lag polynomials and $\mu_{p,t}$ represents the deviation of the real exchange rate from its long-run level.

4. Data and Methodology

This study describes the model consisting of budget deficits and money supply as determinants of inflation as the existence and direction of the connection between budgetary deficits, money supply, and inflation.

$$\text{inf}_t = \alpha_0 + \alpha_1 \text{budget}_t + \alpha_2 m2_t + u_t$$

In the model, inf indicates the consumer price index; m2 indicates a broadly defined money supply; budget indicates budget deficit, and u indicates the error term. The α_1 and α_2 coefficients in the model are the parameters that show the relationship between budget deficit and money supply, and inflation, respectively.

In the analysis, using the Granger causality test, the relationship between the money supply, budget deficit, and inflation was analyzed in Azerbaijan. Dependent and independent variables are grouped separately in the Granger causality test and assessed simultaneously. First, the equations (3), (4), and (5) are calculated in this test with the correct lag length. The significance of the independent variable's lagged values is then checked in [21-23]

$$MS_t = \sum_{l=1}^{n} \partial_l MS_{t-l} + \sum_{i=1}^{n} \theta_i\, BD_{t-i} + \sum_{k=1}^{n} \rho_k\, \Delta INF_{t-k} + u_{2t} \tag{3}$$

$$BD_t = \sum_{l=1}^{n} \gamma_l MS_{t-l} + \sum_{i=1}^{n} \beta_i\, BD_{t-i} + \sum_{k=1}^{n} \alpha_k\, \Delta INF_{t-k} + u_{1t} \tag{4}$$

$$INF_t = \sum_{l=1}^{n} \delta_l MS_{t-l} + \sum_{i=1}^{n} \varphi_i\, BD_{t-i} + \sum_{k=1}^{n} \omega_k\, \Delta INF_{t-k} + u_{3t} \tag{5}$$

Until estimating the equations (3), (4), and (5), in which all variables are considered internal, optimum lag lengths are determined using the VAR technique. Criteria such as the Likelihood Ratio Test (LR), Final Prediction Error (FPE), Akaike Information Criterion (AIC), Schwarz Information Criteria (SIC), and Hannan-Quinn Information Criteria (HQ) have been used for this purpose [25]. After considering these parameters and reputation test results, the optimum lag period was defined as four.

5. Results

Numerous reliability tests related to the proposed VAR model have been conducted at the specified lag length. The proposed VAR model was tested for its applicability using stability and autocorrelation tests. The Autoregressive Unit Root was used to verify the model's stability. To determine if there was an autocorrelation issue within the model, the LM analysis first was performed. The test results are presented in Table 1. With a lag of 4, the 5-percent significance level indicates that there is no autocorrelation problem in the model.

Table 1. *Autocorrelation LM Test Results.*

Lag Length	LM Statistics	Probability
1	10.3050	0.3264
2	7.2209	0.6141
3	13.7907	0.1300
4	14.0245	0.1215

To determine whether the residual terms have an autocorrelation problem or not, the probability value in Table 1 takes values with a significance value greater than 5% until the 4th delay. It was discovered that there is no autocorrelation problem in the residual terms of the model estimated for all delays.
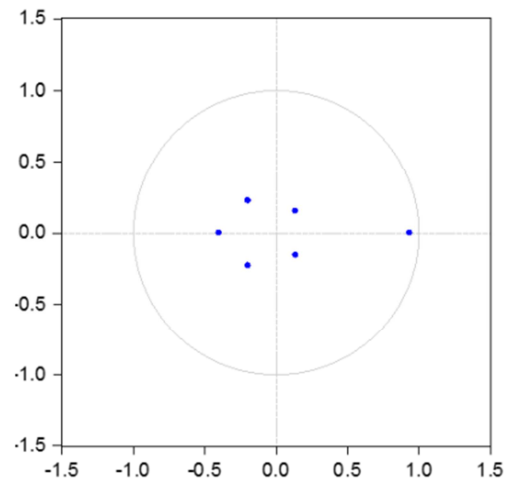

Figure 4. *Inverse Roots of AR Characteristic Polynomial.*

According to the autoregressive unit root test, the inverse roots of the AR characteristics polynomial of the model must take place within the unit circle, which is used to check the model's stability. As a result, if all AR inverse roots are within the unit circle, the system is either stable or steady; if at least one is on or outside the unit circle, the system is neither stable nor steady. Because all of the reverse roots in Figure 1 occur in the unit circle, the VAR model meets the stability criteria.

The model's appropriateness and stability have been tested, and the results show that the impulse response and variance decomposition analysis will be consistent.

These results indicate that every variable in the model has a direct or indirect relationship. According to statistics, inflation can be influenced by the money supply. Constant growth in the money supply will lead to inflation rising at the same time. A state that has a chronic budget deficit that is not resolvable will end up in indebtedness indefinitely. On the other hand, budget deficits have a two-way relationship with inflation. Inflation can increase the cost of government expenditures and decrease revenue. Budget deficits will therefore continue. Budget deficits will be a result of increased state indebtedness toward the central bank. Inflation is a result of an increasing budget deficit. This can be financed by printing more money. This creates a vicious circle in which inflation causes budget deficits and budget deficits encourage inflation.

6. Discussion

This analysis is intended to empirically determine the relationship between the money supply, budget deficits, and inflation in the Azerbaijan economy for the period 2009-2019. During the research process, the Granger causality test was used. The consequences of the study indicate that there is one-way causality from the supply of money and the budget deficit to inflation. In addition, there is also a one-way causal link between the supply of money and the budget deficit. According to the Granger causality test, budget deficits and money supply in Azerbaijan are causally linked. This implies that fiscal deficits in the government trigger economic growth. In Azerbaijan, the result also shows that a money deficit increases the money supply.

These tests show that the money supply can influence the budget deficit. A country such as Azerbaijan has a budget deficit. This is a positive and essential way to increase economic and monetary growth. It should be noted that budget deficits are essential for a well-executed and effective monetary strategy. This means that government spending in productive sectors of the economy must be increased. A budget deficit should also be used to implement government regulations regarding legal constraints like price checks and rationing. Fiscal policy and monetary policies should be combitor to prevent financial scarcity from affecting either the public or private sector and to limit inflation.

During the 2008 economic crisis, the central bank was not allowed to directly fund public spending. The public financed its expenses by borrowing, but the central bank was not allowed to directly fund them during 2008. When the first result is taken into account, the central bank's increase in money supply impacts inflation and budget deficits. This can lead to a significant deviation from price stability, which is the central bank's primary goal.

Finally, the finding that the money supply influences inflation is in line with our predictions, given that price stability is the ultimate objective of the central bank. According to global macro models and analyst forecasts of the CBAR, money supply M2 in Azerbaijan is forecast to be 14500.00 AZN Million by the end of this year. Looking ahead, money supply M2 in Azerbaijan is expected to be 14500.00 in 12 months. According to our econometric models, the Azerbaijan money supply M2 is expected to trend towards 14500.00 AZN Million in 2022 in the long term.
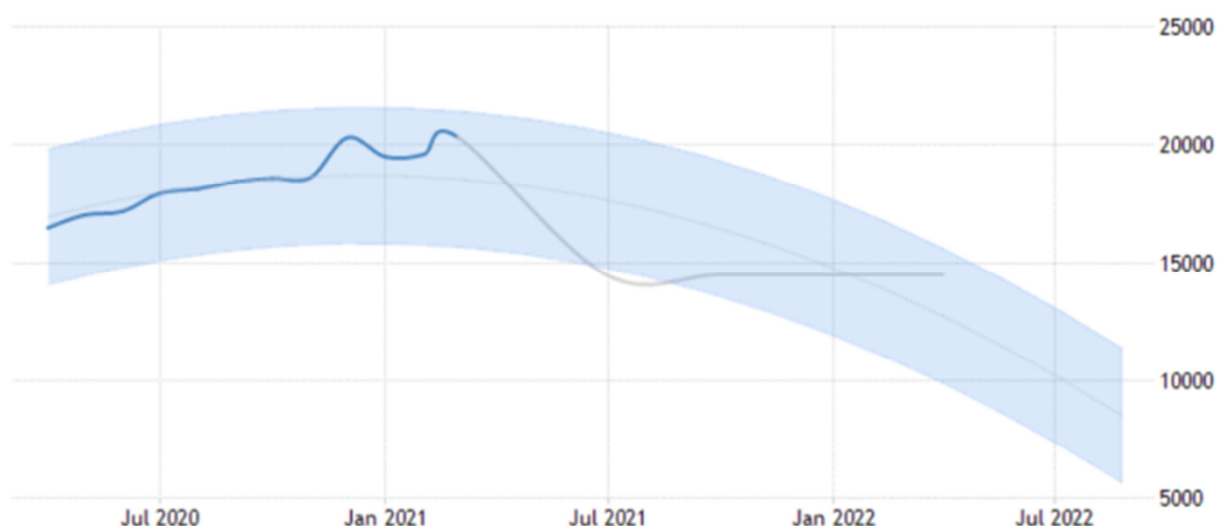

Figure 5. *Money Supply M2 Forecast (2021-2022) [31].*

As can be shown, there will also be some adjustments in the inflation rate despite increasing budget spending. While the Azerbaijani government is predicting higher inflation next year, the official inflation rate is still a single digit. At the same time, Azerbaijan expects double-digit inflation in the 2020-2022 period, according to CBAR inflation forecasts [33]. The demand for more services for the consumer market will also grow as government spending rises and the social package grows. At the same time, import dependence in the coming years will continue to safeguard the effects of import inflation.
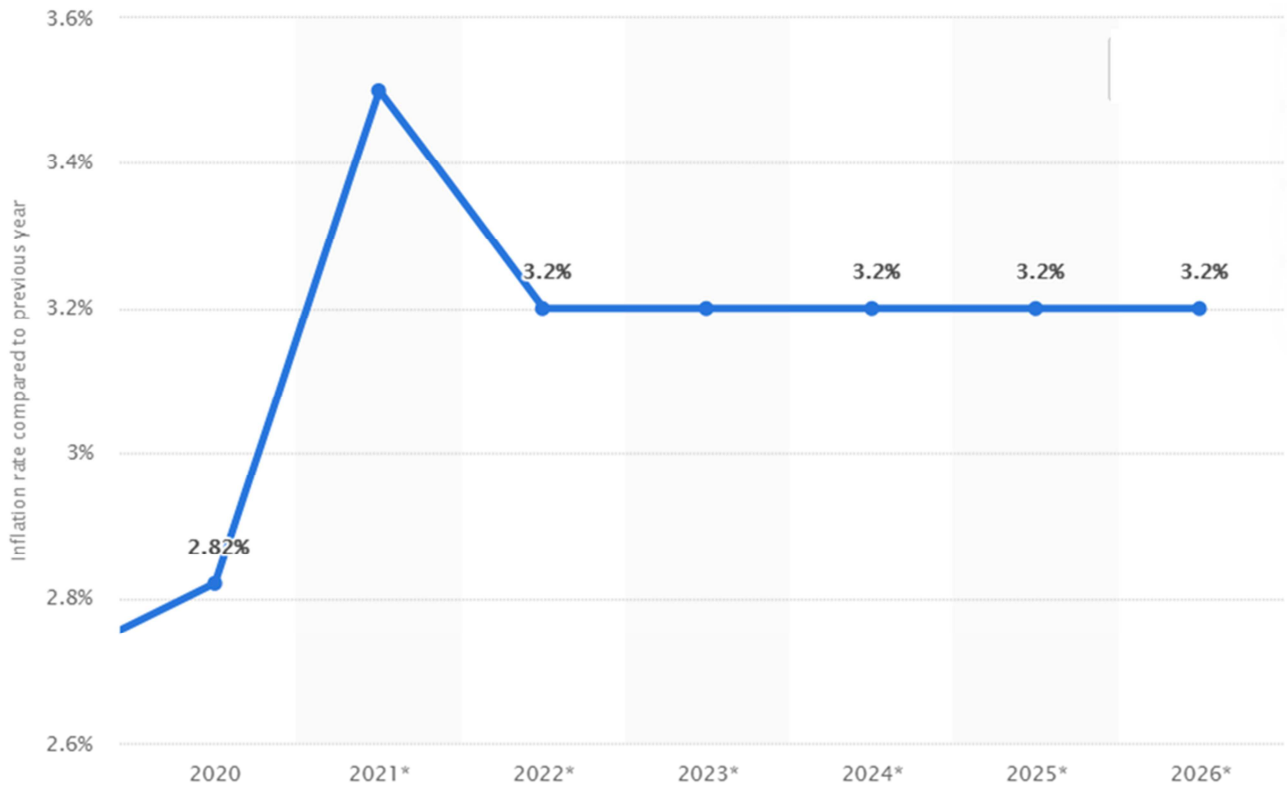
Figure 6. *Inflation Rate Forecast (2021-2026) [32].*

The study's results on the relationship between money supply-budget deficit and budget deficit-inflation suggest that the expansionary fiscal policy initially implemented would adversely affect price stability. Policymakers need to be alert, therefore. One of the most appropriate ways to close budget deficits is to raise tax collections in the second phase. The rise in tax revenues, however, is not accomplished exclusively by tax increases. The implementation of optimum tax rates is relevant in this context. The findings of the research provide qualitatively relevant clues. However, using analytical approaches that can produce more quantitative and straightforward results will be useful.

As a result of Azerbaijan's budget and payment balance deficits, it is possible to conclude that inflation occurs not just as a result of rises in the supply of money, but also due to budget deficits. The key factors of inflation are thought to have been an increase in the supply of money affected by increased budget deficits and a rise in exchange rates. As a result, to tackle cost stagflation, relevant policy proposals for reducing the budget deficit and maintaining low exchange rates should be made. If the fight is for demand, the policies advocated should be aimed at keeping the supply of money low. The results indicate that the Azerbaijan economy follows the FTPL and the monetarist approach; therefore, a rise in the budget deficit and money supply could cause inflation.

7. Conclusion

From the late 1980s to the crisis of 2008, the Azerbaijani economy recorded a large budget deficit. Central bank funds were used to cover these deficits. This situation caused high inflation. After the 2008 economic crisis, some legal precautions were taken to prevent this cycle. After the 2008 global economic crisis, a wide range of fiscal and monetary policies were implemented, taking into account both the global framework and regional economic conditions. In the economic situation where this policy design is maintained, relatively high inflation rates have been recorded from 2018 to 2019. The March 2020 epidemic of COVID 19 has further expanded the scope of economic policies implemented to prevent possible economic negatives. Clarifying the link between the money supply, budget deficits and inflation in these economic conditions provides important clues for policymakers.

The results of a study on the relationship between the money supply-budget deficit and budget deficit-inflation show that the initial expansion fiscal policy has a negative impact on price stability. Therefore, politicians need to be careful. In the second stage, one of the most appropriate ways to eliminate the budget deficit is to increase tax revenue. However, the increase in tax revenue is not limited to tax increases. In this context, it is important to apply the optimal tax rate. The results of the study provide qualitatively important information. However, it is useful to use empirical methods that produce more quantitative and clear results.

8. Future Policy Implications

Based on the above evaluations, the government should

keep its loose monetary policy in place for the time being. Simultaneously, a balanced strategy should be favored, encompassing policies at both the central bank and the overall government level. First and foremost, the government should focus on reducing dependence on oil revenues and thus budget elasticity and expanding the non-oil sector through more tradable products and services. At the same time, more efficient planning should be realized through the implementation of a permanent oil income model with a fair and equitable distribution of incomes between current and future generations. The government budget should be planned for the long term to anticipate all risks, and appropriate measures are taken to mitigate any negative consequences. Of course, as the budget is more reliant on oil, the budget will be less likely to be designed for an extended period. As a result, reducing the economy's reliance on oil should be a top priority. That could be accomplished by boosting long-term growth in labor-intensive sectors such as agriculture, which employs 40% of the country's workforce but only accounts for 1% of total employment.

After that, the central bank should maintain its efforts to increase bank liquidity. From its reserves, the central bank lends to commercial banks at a discount rate. The government should increase mortgage credit and stimulate construction companies, insurance companies, and appraisal companies, as well as people's purchasing power for new apartments.

Another important consideration is to avoid increasing the money supply in circulation without increasing overall GDP; thus, the money supply should be steadily expanded under the condition that the national currency rate remains stable, and inflation does not quite rise. As there is currently no risk of higher inflation, the bank can postpone returning to its tighter liquidity position in the long term to meet inflation targets.

Another suggestion of particular importance is that commercial bank credits be secured so that credit losses and interest rates are reduced, allowing people to obtain credit from banks easily. The problem with such an alternative is that the insurance industry is not sufficiently established, so creditors must insure their credits through commercial markets. The government should keep up its policy of increasing the number of deposits that can be insured. If the economy improves, this scheme can be expanded to cover the protection of larger deposit amounts to boost economic growth.

List of Abbreviations

VECM   Vector Error Correction Model
ECM   Error Correction Mode
FTPL   Fiscal Theory of the Price Level
LR   Likelihood Ratio Test
FPE   Final Prediction Error
LM   Lagrange Multiplier Test
AIC   Akaike Information Criterion
SIC   Schwarz Information Criteria
HQ   Hannan-Quinn Information Criteria

CBAR   Central Bank of the Republic of Azerbaijan
ARDL   Autoregressive Distribution Lag
DPQR   Dynamic Panel Quartile Regression
VAR   Vector Autoregressive
PICs   Pacific Island countries

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