HOW MUCH DOES FISCAL POLICY CONTRIBUTE TO EXPLAINING INFLATION IN KYRGYZSTAN?

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ABSTRACT

Despite many reforms in the public finance sector and improvement of tax administration, the budget deficit in Kyrgyzstan remains chronic from the first year of getting independence. Kyrgyzstan has faced budget deficits almost in each year between 1990-2020. The annual average government budget balance to GDP was -3.44% for the period 1990-2020.

Along with the budget deficit, one of the most critical problems in Kyrgyzstan's market economy is inflation. The main factors as the collapse of the Soviet Union, the transition of the Kyrgyz economy from a socialist to a market economy, and the deep decline in the economy, led to hyperinflation. Not taking into account the transition period, the average annual inflation rate in Kyrgyzstan was 10.67% for 1995-2020.

Therefore, the analysis of the causal effect of the budget deficit on inflation seems to be urgent. I employ the autoregressive distributed lag (ARDL) model to empirically estimate the short-run and long-run causal effects of the budget deficit on the inflation rate in Kyrgyzstan using quarterly data over the period 2001:1-2020:4.

The analysis results show that the budget deficit positively affects the inflation rate both in the short-run and long-run periods. In the short run, a one percent increase in the budget deficit to GDP ratio increases the annual inflation rate by 0.245 percent. In the long run, a one percent increase in the budget deficit to GDP ratio raises the yearly inflation rate by 0.635 percent.

Keywords: *Kyrgyzstan, budget deficit, inflation, budget balance to GDP ratio*

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LIST OF ABBREVIATIONS

ADF	Augmented Dickey-Fuller (unit root test)
AIC	Akaike info criterion
ARDL	Autoregressive distributed lag
ECM	Error correction model
FTPL	Fiscal theory of the price level
GDP	Gross domestic product
GIP	Government Investment Program
KGS	Kyrgyzstani som (the currency of the Kyrgyz Republic)
KPSS	Kwiatkowski, Phillips, Schmidt and Shin (unit root test)
LM	Langrange multiplier (test)
NBKR	National Bank of the Kyrgyz Republic
NIA	National income account
NSCKR	National Statistical Committee of the Kyrgyz Republic
PP	Phillips-Perron (unit root test)
VAT	Value added tax

1. INTRODUCTION

The impact of fiscal policy on various economic indicators is a relevant area of research. Expansionary fiscal policies have a special place in discussions on the relationship between fiscal policy and price levels. Although the relationship between budget deficit and inflation is not always apparent, the fact that Kyrgyzstan has experienced budget deficits and high inflation rates since getting independence forms an interesting case to study if there is a causal relationship between the two primary indicators.

Inflation has remained one of the most critical problems in Kyrgyzstan's market economy. The main factors as the collapse of the Soviet Union, the transition of the Kyrgyz economy from a socialist to a market economy, and the deep decline in the economy, led to hyperinflation. According to the National Bank of the Kyrgyz Republic (NBKR) data, the annual inflation rate in 1992 reached 2032.73%. The average month-to-month inflation rate was 28.49% over 1992-1993. It means that, for example, if you could buy a loaf of bread for 1 KGS on January 1 in 1992, this loaf of bread cost almost 220 KGS on December 31 in 1993 that is 220 times more expensive than two years ago.

After implementing the national currency "Kyrgyzstani som" (KGS) in May 1993, it became possible for Kyrgyzstan to conduct its monetary policy. Thanks to policies undertaken by the NBKR, inflation has been reduced. Already in 1994, inflation fell to 62.12%, in 1995 – to 32.1%.

Reducing the inflation rate is one of the targets of the NBKR. However, if we do not consider the transition period, Kyrgyzstan's average annual inflation rate has been 10.67% for 1995-2020. During the current COVID-19 pandemic, prices in Kyrgyzstan have been rising, on average, by 0.83% every month since March 2020, when the coronavirus started to spread

worldwide. If we look at the annual inflation rate in March 2021, prices were 10.16% higher than the relevant month in 2020.

Along with the inflation, the budget deficit in Kyrgyzstan remains chronic from the first year of getting independence despite many reforms in the public finance sector and the improvement of tax administration. Financing the budget deficit by various sources increases the debt level of the government. By the end of 2020, the government debt was 4,928.67 million USD, out of which 4,220.31 million USD is borrowed from abroad and 708.36 million USD is domestic debt. There is a law stating that total public debt must not exceed the country's GDP in the Kyrgyz Republic, while the level of foreign debt must not be greater than 60% of GDP. In 2020, the share of total government debt in GDP was 68.08%, while foreign debt constituted 58.2% of GDP. There is a high risk of reaching this threshold when government continuously runs budget deficits. Kyrgyzstan has faced budget deficits almost every year between 1990 and 2020. The average ratio of government budget balance to GDP was -3.44% over the period 1990-2020, with the highest proportion of 0.83% in 2008 and the lowest one of -13.89% in 1992.

Therefore, the analysis of the causal effect of the budget deficit on inflation seems to be urgent. This paper empirically analyzes the short-run and long-run effects of the budget deficit on inflation in Kyrgyzstan. The relevance of the thesis lies in two gaps in academia. First, there is no academic work conducted on this topic for Kyrgyzstan. Second, the method of empirical analysis differs from existing literature using growth rates of selected variables instead of levels. Thus the thesis's primary purposes are to fill this gap in academia and guide policymakers in combating inflation during economically and politically hard times for Kyrgyzstan.

The rest of the paper is structured as follows. Chapter 2 discusses the theoretical approaches to the budget deficit-inflation nexus and reviews the existing literature on the topic. Chapter 3

gives an overview of Kyrgyzstan's budget deficit dynamics and inflation processes from 1990 to 2020. Chapter 4 builds the empirical model to investigate the short-run and long-run relationship between the budget deficit and inflation. Then, based on the developed model, the effect of the budget deficit on inflation is estimated, and findings are discussed. Chapter 5 provides a conclusion and gives some policy recommendations.

2. IMPACT OF THE BUDGET DEFICIT ON PRICE LEVEL: THEORETICAL EXPLANATION

This chapter discusses theoretical approaches to the relationship between the budget deficit and inflation, then reviews the work of others related to the field.

2.1. Financing the Budget Deficit and Its Impact on Price Level

The government budget deficit, or the excess of government spending over revenues, is quite common in the modern economy. To achieve a balanced budget, the government needs to either reduce public spending or increase revenues. It is often not possible to reduce budget expenditures due to socio-political reasons, and it is necessary to look for ways to increase revenues. However, in the face of the chronic budget deficit, conventional sources of government revenues such as taxes, domestic borrowing, and privatization are often unattainable.

The government can finance its expenditures in several ways. One of them is funding spendings through tax revenues, but this source of financing is limited. The reason can be explained as follows. Tax receipts are equal to $t \times TB$, where t is the average tax rate, TB is the tax base. According to this formula, tax revenues can increase by raising tax rates. However, tax revenues will not grow indefinitely with increased tax rates because the magnitude of the tax base depends on the tax rate. If the government increases tax rates, then the tax base might reduce. Indeed, for example, rising corporate tax rates can lead to a decrease in business activity, bankruptcy of some firms, the transition of other firms to the shadow sector. In other words, it can lead to a reduction in the amount of taxable profit in the economy. An increase in the tax rate above a particular value might cause a significant decrease in the tax base that tax revenues will begin to decline.

So, until the tax rate reaches a certain level, as indicated in figure 2.1 by *T**, an increase in tax rates raises tax revenues. However, a further increase in tax rates will no longer compensate for the decrease in the taxable base, which will lead to a decline in government tax revenues. This type of tax revenue dependence on the tax rate bears the name of the Laffer curve, named after the American economist Arthur Laffer, who first proposed this model in 1982.

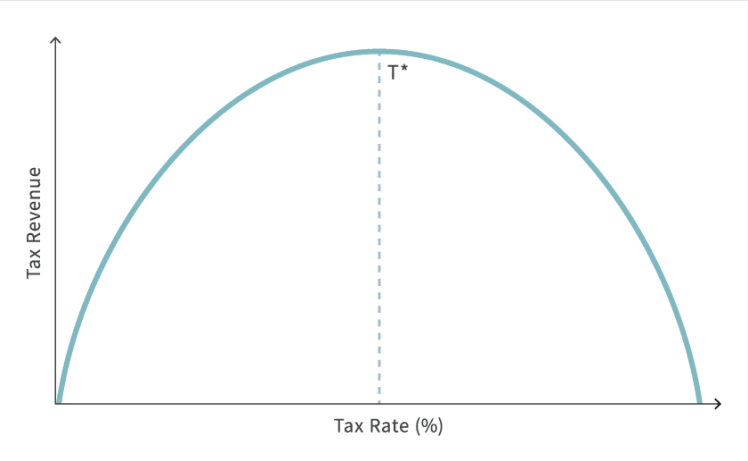

Figure 2.1. The Laffer curve (Smith, n.d.)

However, increasing taxes does not always help to reduce budget deficits. There are several ways to finance budget deficits beyond tax collections.

The government can borrow from citizens and firms. This financing method explains that the government issues securities (government bonds and treasury bills) and sells them to residents (households and firms). It uses revenues to finance expenditures. The advantages of this way of financing are several. First, since the money supply stays unchanged, it doesn't cause inflation. That's why it is a non-inflationary way in the short-run period. Secondly, it is a sufficiently efficient way as it is possible to provide quick issuance and sale of government securities. Because government securities are highly liquid (it is easy and fast to sell them, they are almost money), highly reliable (guaranteed by the government, which enjoys the confidence of the population), and profitable enough (interest is paid on them).

On the other hand, financing the budget deficit through domestic borrowing has disadvantages. First of all, debts have to be paid off with interest ultimately. The population doesn't purchase government securities if they are not profitable, i.e., if interest is not paid. The payment of principal and interest on government securities is called government debt servicing. The more outstanding government debt, the more money has to be spent on government debt servicing. Also, the payment of interest on government securities is a part of government expenditures. The larger the interest payments are, the greater the budget deficits. It turns out a vicious circle. The government issues securities to cover a budget deficit. However, the interest payment on them provokes an even greater deficit.

Furthermore, two American economists Thomas Sargent, who is the Nobel Prize winner, and Neil Walles (Sargent and Wallace, 1981), show that financing the budget deficit by borrowing can lead to even more significant inflation in the long run than the emissive way of financing. The point is that government builds a financial pyramid by financing a budget by domestic borrowing, i.e., it pays off previous debts by borrowing again, which have to be paid off in the future. In that way, government refinances its debt. Sargent and Wallace (1981) show that financing the budget deficit by domestic borrowing is non-inflationary only in the short-run period. But in the long run, it can induce sufficiently high inflation. However, to avoid high inflation, it is more rational not to refuse an emissive way of financing and use it in conjunction with borrowing one.

The second disadvantage of financing the budget deficit through domestic borrowing is the crowding-out effect. The economic meaning of this phenomenon is that an increase in the number of government securities in the financial market increases the demand for financial resources causing interest rates to rise. A part of the households' saving goes for purchasing government securities, which provides financing for the government budget deficit, i.e., for non-production

purposes, but not for buying firms' securities that the firms could use to expand production. It reduces the private sector's financial resources and consequently reduces investment. As a result, production volume declines.

There is another type of financing the budget deficit by borrowing – foreign borrowing. In this case, the budget deficit is financed by loans from other countries or international organizations like the International Monetary Fund, World Bank, London and Paris Clubs, etc. Advantages of such kind of method are the opportunity of borrowing in huge amounts and its non-inflationary nature. As the coin has two sides, this method also has disadvantages: it is essential to pay off debt and to service it, i.e., to pay the debt itself and interest on it; it is impossible to build a financial pyramid for payment of the foreign debt; it is necessary to divert sources from the economy for debt payment and its servicing, which leads to a decrease in the volume of domestic production and economic recession; in the presence of a deficit in the balance of payments may occur depletion of gold and foreign exchange reserves.

Another way of financing the budget deficit is by running budget arrears. It is also called forced borrowing, which means that the government just does not pay its obligations as a peculiar way of borrowing or violates the payment schedule unilaterally without the agreement of bondholders. This way can be used in the transition economy as a domestic borrowing to finance budget deficits. The purpose of such a way is to decline the excessive burden of debt servicing and debt payment.

Also, the government can sell the land and enterprises of the public sector (a process of privatization) to finance budget deficits. This financing method is rarely used since all public sector assets will be sold in the end.

The budget deficit can be financed using foreign exchange reserves. Fisher and Easterly (1990) argue that the government can avoid the inflationary effects of financing budget deficits by running down foreign exchange reserves. This policy appreciates the national currency and leads inflation to slow down. However, foreign exchange reserves have a clear limit. Suppose the private sector expects that the limit is going to be reached. In that case, it starts moving its capital and assets from the country since running out of reserves is related to currency depreciation. Thus, it has a substantial negative impact on the balance of payments. As a result, the price level rises.

Thus, if all the government budget deficit financing methods mentioned above are exhausted, the central bank can print money. A central bank increases the money supply, i.e., it issues extra money into circulation, purchasing government securities by which the government covers excess expenditures over income. This way has several advantages. First, the growth of the money supply is a factor in the increase in aggregate demand and, consequently, production output. An increase in money supply causes interest rates to fall (reduction of borrowing cost), which stimulates investments but deteriorates saving and provides growth of consumption and output. Secondly, this way can be conducted quickly. An increase in money supply occurs when the central bank buys government securities running extra money into circulation by paying bondholders (households and firms) the price of securities. The central bank can make such a purchase at any time and in the necessary volume.

The main disadvantage of financing the budget deficit by issuing money is an increase in money supply causes inflation in the long run, i.e., it is an inflationary way of financing. Rising prices reduce the purchasing power of money. As money loses its value, consumers suffer losses called inflation tax. The inflation tax is a change in the real money supply caused solely by a change in the price level.

Moreover, as inflation becomes high, households prefer to use foreign currency for transactions rather than domestic one. As a result, dollarization or euroization occurs depending on the geopolitical location of a country. Domestic currency depreciates as the demand for domestic currency decreases. Consequently, purchasing foreign goods and services becomes more expensive. It is not good for import-dependent economies.

2.2. Theoretical Approaches to the Link between the Budget Deficit and Inflation

Bordo and Levy (2020) argue that in the years of post-World War II, two approaches have dominated economists' ideas to the relation between budget deficits and inflation: simple Keynesian models and the simple quantity theory of money.

The post-Word War II Keynesian models' point of view on the budget deficit-inflation nexus is based on that any increase in the components of the aggregate demand (consumption, investment, government expenditures, and net exports) will cause the nominal income to increase. The rise in price level driven by expanded aggregate demand depends on the aggregate supply's shape. Advocates of the early Keynesian models affirm that monetary policies would not effectively influence the economy because the economy has fallen into a liquidity trap. Hence, fiscal policy remains the only tool to affect the economy. However, they do not explicitly discuss how to finance budget deficits other than collecting taxes. They argue that the supply curve is reverse L-shaped in which an increase in aggregate demand leads output to rise until the level of full employment is reached, which is a long-run supply curve when any rise in aggregate demand results in increases in the price level. However, the supply curve is upward sloping in the early Phillips curve framework so that increased aggregate demand leads prices and output to rise (Lipsey 1960). Therefore, in Keynesian models, fiscal policy is considered to be inflationary.

The simple quantity theory of money is based on the equation of $MV = PY$, where M is money supply, V is the velocity of money, P is price level, and Y is real national income. When the money velocity and output level are constant, the price level depends on the quantity of money in the economy. As Friedman (1956) argues, sustained inflation requires sustained growth in the money supply. Higher nominal interest rates, driven by the expected inflation rate, decrease the demand for money, amplifying the money velocity and raising the price level. As early monetarists argue, unless the budget deficit is money financed will not have an impact on the price level and nominal income.

In the late 1980s and early 1990s, there emerged an alternative view to the monetarist approach to the study of inflation, which is called the fiscal theory of the price level (FTPL). In the opinion of the advocates of this approach, the growth rate of price level significantly depends on the government's fiscal policy. In particular, the determinant of inflation is the volume of the budget deficit.

It is essential to distinguish the real and nominal public debt to understand the logic of the FTPL. The critical point is that real debt is secured by future tax revenues. The real public debt appears in the government's budget constraint taken into account by the fiscal authorities when developing economic policy measures. In contrast, nominal debt is just new volumes of the national currency needed to pay off bonds in the future.

If all government debt is nominal and the government can print money, then the budget constraint disappears. However, in this case, the fiscal authorities lose control over the price level, leading to high inflation.

In most work studying the interaction of fiscal and monetary authorities within the framework of FTPL, in general, the authors come to common conclusions. The growth rate of

price level depends on the interaction of fiscal and monetary authorities, as opposed to the monetarist approach, according to which inflation depends entirely on the actions of monetary authorities. Fiscal and monetary policies can operate in two modes, which are conventionally called active and passive. When fiscal authorities aim to stabilize or reduce public debt, fiscal policy corresponds to a passive policy, in other cases, to the active policy. In a situation in which the monetary authorities are forced to stabilize the public debt, monetary policy corresponds to a passive policy, but if their actions are aimed at sustaining the inflation rate at the targeted level, then monetary policy is active.

In the models built within the framework of FTPL, the price level is stable if one of the policies is active while the other is passive, as filed in table 2.1. When both fiscal and monetary policies are active, inflation can get out of control and be high. If both of them are passive, then the uncertainty of future price dynamics will arise. In an active monetary and passive fiscal policy, the dynamics of inflation coincide with the monetarist approach. If fiscal policy is active and monetary policy is passive, then inflationary dynamics correspond to the views of FTPL.

Table 2.1. The interplay of monetary and fiscal policies

Interaction scenarios		**Fiscal policy**	
		Active	*Passive*
Monetary policy	*Active*	high inflation	price stability
	Passive	FTPL	indeterminacy of the price level

Source: Based on Leeper (1991)

2.3. Literature Review

Current views on the causes of inflation can be grouped into two main groups. According to the first one, inflation has a monetary nature. Another point of view is that it has non-monetary or not only monetary sources.

According to the monetarist point of view, inflation is a purely monetary phenomenon. The dynamics of prices depend only on the change in the money supply, i.e., there is a strong causal relationship between price levels and growth in the money supply. These ideas are based on the quantitative theory of money, as discussed in the previous section. Critics of this approach argue that price levels are influenced not only by the rate of growth in the money supply but also by some other factors, including inflation expectations and changes in output level, and unemployment rates. The theoretical basis for these views is Okun's law, the Phillips curve, and the IS-LM model.

Alternative non-monetary approaches to the study of inflation, which argue that the main reasons for inflation are not related to the change in money supply, are adjacent to the neo-Keynesian approach and FTPL. Among the non-monetary reasons for inflation are cost-push inflation, liberalization of foreign trade for import-dependent countries, structural features of the economy, changes in the sectoral structure of demand, non-inflationary financing of the budget deficit, and inflation expectations.

Many economists, who believe that inflation is a fiscal phenomenon, have empirically investigated the relationship between budget deficit and inflation, which has yielded conflicting results.

Aghevli and Khan (1978) analyze the relationship between budget deficit and inflation in four developing countries, namely Columbia, Brazil, the Dominican Republic, and Thailand, over

the period 1961-1974 employing the three-stage least squares method. They find that the budget deficit plays an essential role in the inflationary process in all four countries.

In contrast, Dwyer (1982), using quarterly data over the period 1952-1978 to explain the positive correlation between budget deficits and inflation in the United States in the post-World War II period, finds no significant effect of expected budget deficits on future inflation.

Ahking and Miller (1985), employing quarterly data over the period 1947:1-1980:3 for the United States, run a trivariate extension of the bivariate autoregressive modeling method of Hsiao. They estimate the system of equations for three time periods to analyze if the relationship between the budget deficit, inflation, and money growth is stable over time: from 1947:1 to 1960:4, from 1961:1 to 1970:4, and from 1971:1 to 1980:3. They find that for the 1960s, both budget deficits and inflation are econometrically exogenous. But for the 1950s and 70s, they detect a causal relationship between budget deficits, growth in money supply, and inflation.

Hondroyiannis and Papapetrou (1987) empirically analyze the direct and indirect effects of the government budget deficit on inflation using annual data over 1957-1993 for Greece. The authors employ an error correction model (ECM) regressing the inflation rate on the budget deficit and money supply. They ascertain that there are indirect effects of government deficits on inflation (here, indirect means the effect of the budget deficit on inflation through money supply) while there is no direct effect of the budget deficit on inflation.

Abizahed and Yousefi (1988), using the model derived from a comprehensive IS-LM model, find no significant relationship between national income account (NIA) deficits, i.e., consolidated deficits and inflation rate. They use annual data from 1951 to 1986 for the United States. I argue that their results are spurious since they employ the ordinary least squares (OLS)

and maximum likelihood models to deal with multicollinearity issues, not checking for the stationarity of the variables. One cannot apply level variables if they are non-stationary at the level.

Choudhary and Parai (1991), using the rational expectations macro model of inflation, find that budget deficit and the growth in money supply significantly impact inflation in Peru. They employ quarterly data for the period 1973:1-1988:1.

Akcay et al. (1996) document the relationship between budget deficit and the general level of prices in Turkey using annual data between 1948 and 1994. They find a positive effect of budget deficits on inflation in Turkey.

Solomon and de Wet (2004) examine the relationship between budget deficit and inflation in Tanzania using cointegration analysis for 1967-2001. Their results show the causal link running from the budget deficit to inflation due to the monetization of the budget deficit.

Alavirad and Sanhita (2005) analyze the effect of the budget deficit on inflation in the Islamic Republic of Iran. Employing univariate cointegration tests like Phillips-Hansen estimation and the ARDL model on time series annual data between 1963 and 1999 estimate the long-run relationship between budget deficit and inflation. To study the model's short-run behavior, they use the ECM. They find a significant impact of the budget deficit and liquidity on the inflation rate.

Makochekanwa (2008) examines the deficit-inflation relationship in Zimbabwe, employing Johansen cointegration techniques for the period 1980-2005. He finds the causal link running from the budget deficit to the inflation rate due to the massive monetization of the budget deficit.

3. BUDGET DEFICIT AND PRICE LEVEL IN KYRGYZSTAN OVER 1990-2020

This chapter analyzes historical patterns of the budget deficit and inflation in Kyrgyzstan for the period 1990-2020.

3.1. Dynamics of Budget Deficits between 1990 and 2020

A budget deficit is the excess of expenditures of the government over its revenues. There is a budget surplus in case of excess revenue over expenses. Over the business cycle, i.e., the structural budget should ideally be balanced. However, due to various factors (economic, political, natural, etc.), budget revenues (tax and non-tax) do not cover all necessary expenses.

Economic factors, such as a downturn in the economy, force the government to increase social transfers to support the citizens. There can be political changes that push the government to spend more than planned. For example, during coups, many government entities are usually destroyed. The government has to spend additional money to recover them. The Kyrgyz Republic has experienced three coups since getting independence. Each time the government had to repair or rebuild the destroyed buildings. Moreover, there can be unexpected natural disasters. For example, when a strong earthquake or flood destroys people's houses, the government must build homes for them, increasing government expenditures. It was also the case in Kyrgyzstan.

In general, Kyrgyzstan has been experienced budget deficits since the day of becoming an independent country. Kyrgyzstan has faced budget deficits each year between 1990-2020, except for 2001, 2005, 2007, and 2008 as depicted in figure 3.1. The average ratio of government budget balance to GDP was -3.44% for the period 1990-2020, with the highest proportion of 0.83% in 2008 and the lowest one of -13.89% in 1992.

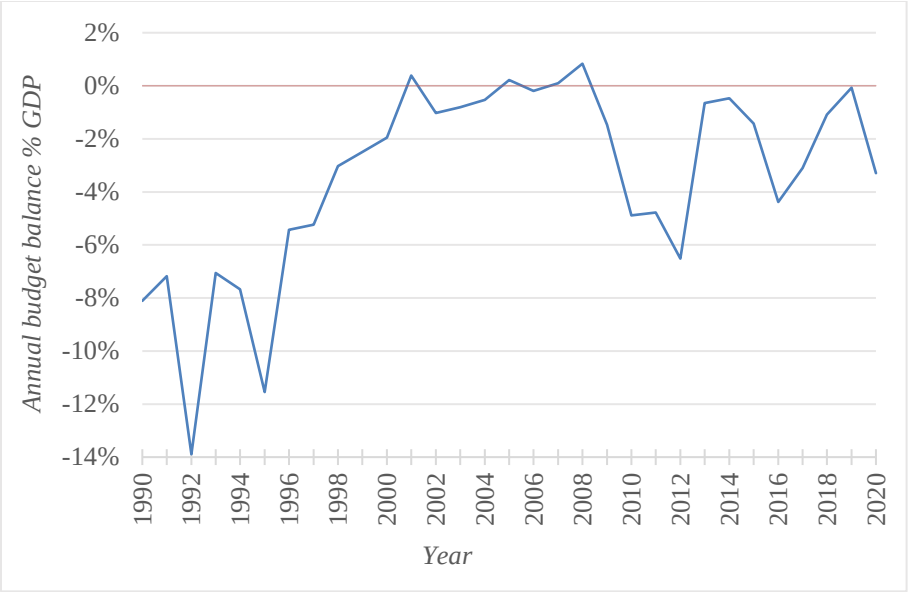

Figure 3.1. Budget balance to GDP ratio in Kyrgyzstan over the period 1990-2020 (based on the National Statistical Committee of the Kyrgyz Republic database)

In 1992, the budget deficit sharply increased by 1450.20%. At the same time, the nominal annual GDP growth was two times smaller than the budget deficit growth. Thus, the budget balance to deficit GDP ratio decreased from -7.14% in 1991 to -13.89% in 1992. However, the nominal GDP growth exceeded the budget deficit growth rate in 1993, increasing the budget balance to GDP ratio to -7.05%. But again, in 1995, the percentage increase in the budget deficit exceeded the nominal GDP growth rate by three times. From 1996 to 2008, on average, the nominal GDP growth was higher than growth in the budget deficit, explaining the increasing tendency in the budget balance to GDP ratio.

From figure 3.2, one can note the divergence between the government expenditures and revenues over the periods 2009-2012 and 2015-2017. In these years, the change in the budget deficit significantly exceeded nominal GDP growth deteriorating the budget balance to GDP ratio.

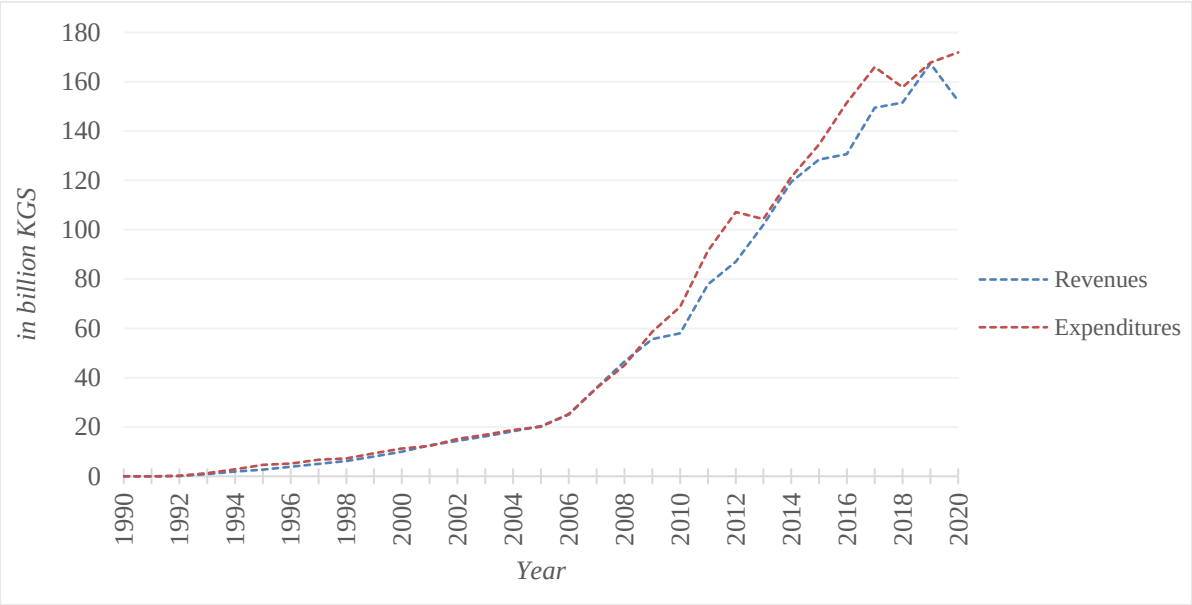

Figure 3.2. Dynamics of government revenues and expenditures in over 1990-2020 (based on the National Statistical Committee of the Kyrgyz Republic database)

The effects of the global financial crisis in 2008 were negatively reflected in the budget balance of Kyrgyzstan. In 2009, the government significantly raised grants to governments of foreign countries, international organizations, and government entities. The year 2010 was one of the most challenging years for Kyrgyzstan. In April 2010, Kyrgyzstan experienced a coup for the second time in its history, followed by ethnic clashes in the south of Kyrgyzstan in June 2010. Eighty-nine people were killed, some government entities and private properties were destroyed and burned down during the coup in April (Yefimov and Trilling 2011). The clashes in June killed at least 400 people, seriously injured about 2,000 people. Dozens of families became homeless. Their houses were destroyed and burned down. Most of the businesses were victims of looping (Sikorskaya 2015). In 2010-2012, the government significantly increased expenditures on

reconstructing destroyed buildings and houses, social payments to the families of killed people, and suffered citizens. In addition, government expenditures increased due to spending on Parliamentary and Presidential elections in October 2010 and October 2011, respectively. These cases increased government expenditures, consequently raised budget deficits worsening the budget balance to GDP ratio.

In 2015-2017, Kyrgyzstan experienced the next Parliamentary elections in 2015 and Presidential elections in 2017. During these years, the government increased expenditures on conducting elections. In addition, the significant increase in the expenditure side of the budget was caused by the rise in purchasing non-financial assets from 2013. The share of expenditures for acquisition of non-financial assets in government expenditures was 6.73% in 2012. This indicator reached 24.76% in 2017. In the light of the COVID-19, the government decided to postpone tax payments to help businesses during the lockdown and the epidemic situation. This resulted in a decline in the revenue part of the government. At the same time, the government increased spending on healthcare by 23.26% in 2020. Moreover, during the lockdown, the government had to spend additional money on purchasing facilities and adapting the education system to online learning. In 2020, expenditures on education increased by 11.23%. All cases mentioned above led to a higher government budget deficit.

If we look at the government revenue structure, Kyrgyzstan fills up its budget through tax revenues, received official transfers, and non-tax income. Besides, the government of the Kyrgyz Republic gets some money from receipts for social needs and sales of non-financial assets.

On average, 70.65% of the budget revenues of Kyrgyzstan consist of tax revenues. As depicted in figure 3.3, in 2019, a share of tax receipts in total government revenues was 72.59% (121,526 million KGS), and non-tax income constituted 19.30% of total government revenue (32,314 million KGS). Received official transfers from foreign countries and international organizations were 8.06% of government revenues (13,489 million KGS). In comparison, the share of received revenue from the selling of non-financial assets was 0.05% in 2019 (84 million KGS).

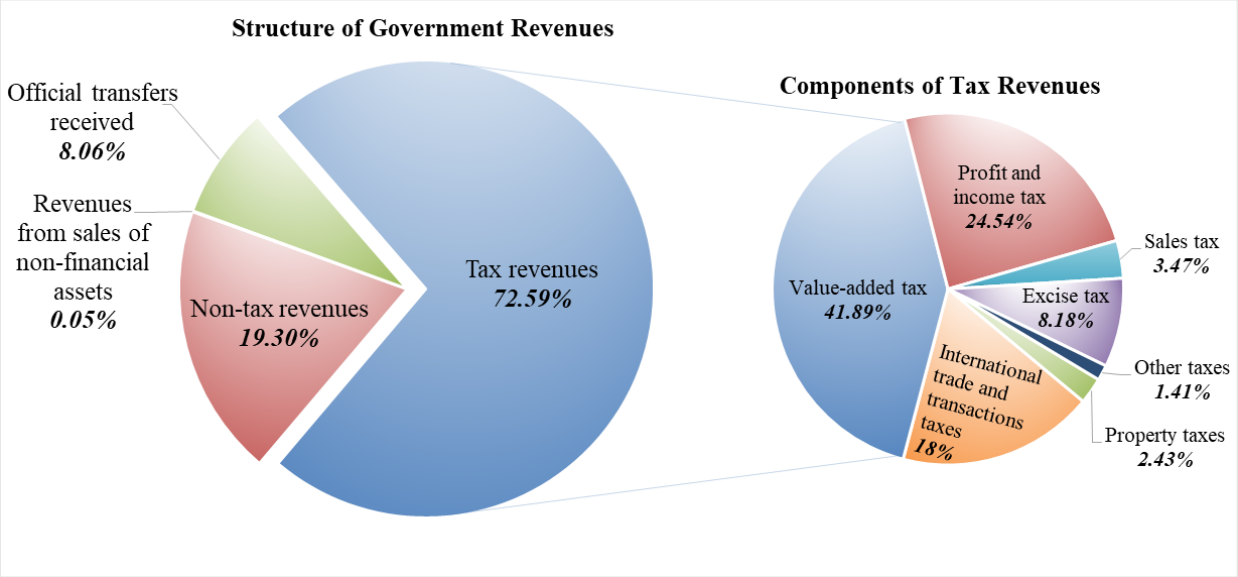

Figure 3.3. Structure of government revenues and tax revenues of Kyrgyzstan in 2019 (based on the National Statistical Committee of the Kyrgyz Republic database)

Government revenue from taxes consists of value-added tax, profit and income taxes, receipts from the gold-mining company "Kumtor" (on average, 7.15% of tax revenues or 26.34% of revenues from profit and income taxes), customs payments, excise tax, sales tax, taxes on property, and other taxes. Value-added tax is the primary source of tax receipts that is more than 40% of all taxes incoming to the budget. From non-tax income, dividends and receipts from rendering chargeable government services make a considerable contribution, constituting about 47% of all non-tax income.

If we look at the expenditure side of the budget, the government spends most of its wealth on education, social protection, and the purchasing of non-financial assets. As figure 3.4 reveals, in 2019, the government spent 21.38% of total expenditures on education (35,880 million KGS), 19.47% on social protection (32,672 million KGS), 18.9% on purchasing non-financial assets (31,726 million KGS), 12.23% on general public services (20,530 million KGS), 10.56% on public defense (17,729 million KGS), and 8.35% on healthcare (14,009 million KGS). In the light of the COVID-19 pandemic, spending on healthcare reached 10.04% of total government expenditures, constituting 17,268 million KGS in 2020.

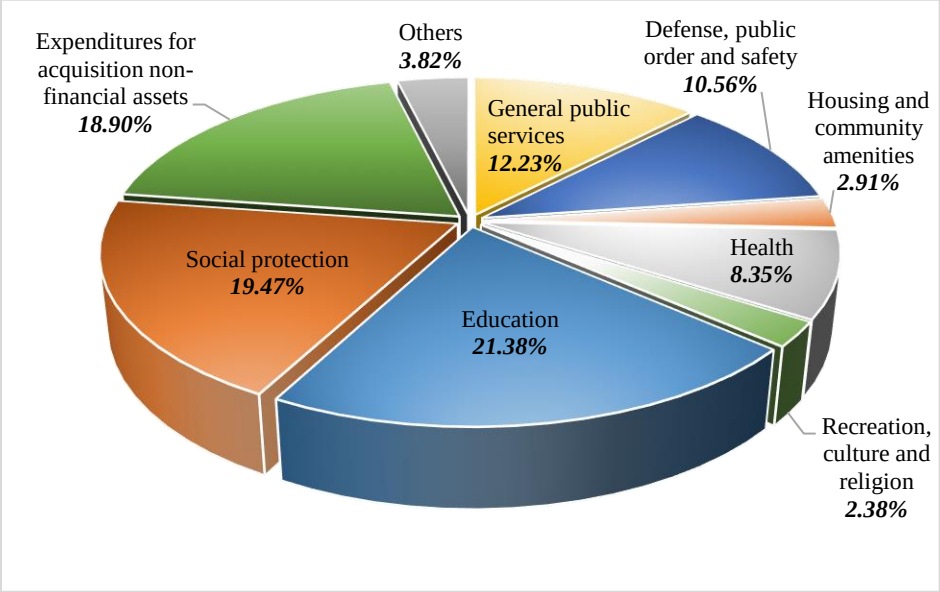

Figure 3.4. Government expenditures of Kyrgyzstan in 2019
(based on the National Statistical Committee of the Kyrgyz Republic)

If we classify government expenditures by economic activities, the largest share of spending falls to workers' compensation, i.e., to the salaries of employees who work at governmental entities. Its average share in total expenditures was 31.93% between 2007-2020. In 2019, it was 52,047 million KGS and constituted 31.01% of the total spending. It is worth mentioning the interest payments on government debt because, on average, it constituted 4.70%

of total expenditures in the last three years. In 2019, the Kyrgyz government spent 7,787 million KGS on interest payments. As I told earlier, financing a budget deficit by borrowing pushes the government to borrow again to cover expenses on debt servicing, i.e., on interest payment on loans.

3.2. Inflation Performance between 1992-2020

The most crucial problem in Kyrgyzstan's market economy is inflation, which is driven by a high increase in the prices of goods and services, a decrease in the purchasing power of the Kyrgyz currency and its depreciation, the emergence of a large amount of money supply in circulation not provided with goods and services.

This section analyzes inflation dynamics in Kyrgyzstan from 1992 to 2020. The dynamics of annual inflation rates from 1995 to 2020 are presented in figure 3.5, which does not include 1992, 1993, and 1994 as outliers.

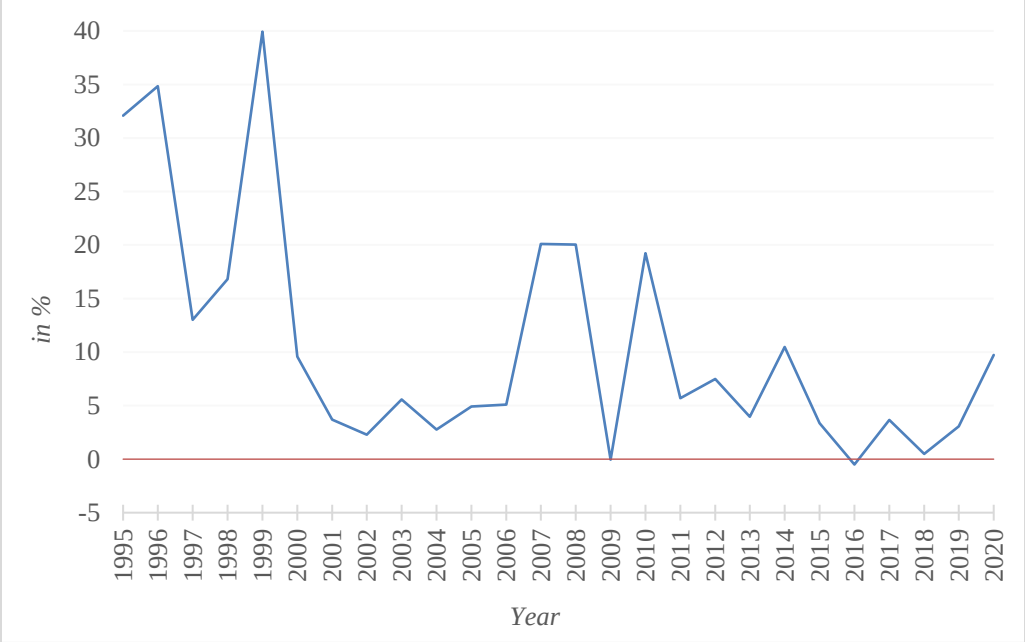

Figure 3.5. Inflation rate dynamics in Kyrgyzstan between 1995-2019 (based on the National Bank of the Kyrgyz Republic database)

After implementing the national currency in May 1993, it became possible for Kyrgyzstan to conduct its monetary policy. Thanks to policies undertaken by the NBKR, inflation has been reduced. Already in 1994, inflation fell to 62.12%, in 1995 – to 32.1%.

The end of 1998 was characterized by a deterioration in the socio-economic situation in the country. To a certain extent, difficulties were associated with the consequences of the global financial crisis, including the Russian and Asian ones, which affected all spheres of life and decreased economic growth. Internal factors also played a negative role. With the apparent stabilization in the country, there was an accumulation of the likelihood of a crisis. One of the reasons for the crisis was the lack of coordination in economic policies. The production level fell, economic growth significantly decreased, and imports increased. The crisis of 1998-1999 confirmed this. The inflation rate rose to a maximum of 35.94% in 1999 since the stabilization period, and the Kyrgyzstani som depreciated by about 2.5 times.

Since 1999, inflation had dropped sharply from 35.94% to 9.57% in 2000. Success in suppressing inflation was achieved thanks to implementing measures outlined in the anti-inflationary program, especially a strict monetary policy and import substitution policy. It was possible to strengthen public finances, and the government budget deficit was reduced to 1.96% of the GDP in 2000. It was also possible to enhance som and reduce the interest rate. The period 2000-2002 was characterized by deeper macroeconomic stabilization. In 2001, the budget balance was in surplus, constituting 0.39% of the GDP, and the annual inflation rate decreased to 3.69%.

The most crucial factor that led to such results was the strict monetary and fiscal policy. To a large extent, the need for such a strict policy was dictated by the situation with public external debt, which increased sharply (to almost 95% of GDP in 2001) as a result of extensive borrowing to cover the current budget deficit and finance the Government Investment Program (GIP), as well

as the above-mentioned devaluation of som. Reducing the state budget deficit, which played a central role in the ongoing stabilization, was carried out mainly by lowering the expenditure part of the current budget and GIP. Therefore, in 2001 there was a noticeable decrease in both public consumption (including education and health services) and investment in fixed assets, an essential element of which was public investment within the GIP framework. Thus, macroeconomic stabilization has been achieved at the cost of somewhat slowing GDP growth by reducing these components.

Inflation pressure decreased significantly. While in 2000-2001, the average annual inflation was 6.63%, then in 2002-2005 it fell to 3.89%, the national currency strengthened. The stabilization of its value was mainly due to the weakening of the position of the US dollar in the world financial markets, an increase in foreign currency inflows in the form of remittances, deposits, and exports of goods and services.

In 2007-2008, Kyrgyzstan recorded the highest inflation rate of slightly above 20% since 2000. The reason for this was the world crisis. Its consequences for Kyrgyzstan were expressed by a sharp increase in prices for imported products, raw materials, energy carriers, as well as dollar inflation (a gradual devaluation of the dollar in world markets stimulating an increase in world prices for oil and raw materials), and a decrease in foreign capital inflows. However, in 2009, the inflation rate was low, with a value of -0.03%. In 2010, there was another significant increase in inflation over the past 12 years.

According to the NSCKR, the most significant influence on the dynamics of inflationary processes in the republic is the change in prices for food products and soft drinks. Thus, the decline in prices for food products and soft drinks by 6.5%, which was noted in 2016 compared to the previous year, determined the minimum annual inflation rate of -0.5% for 1992-2020. And a

significant increase in their prices by 3.9% in 2015 compared to the previous year caused a maximum rise in consumer prices and tariffs by 3.35% at the republican level. This means that no matter how much the cost of non-food goods grows, it does not significantly affect the rate of inflation.

Over the past five years, the largest increase in prices was recorded for leisure products - by 54.8%, thermal energy – by 47.9%, shoes – by 33.2%, glass products, cutlery, and household utensils – by 32.1%, clothing – by 27.5%. At the same time, in 2019 compared to 2014 prices fell for electric bulbs – by 24.9%, bricks – by 20.3%, cement – 13.7%, lumber – 10.4%, car tires – 8.6%, petrol – 4.3%, and gas – 3.1%.

It can be concluded that the highest inflation rate in Kyrgyzstan is observed during periods of crisis, then there is a gradual recovery of the economy for several years. There has a more stable situation associated with implementing a high-quality anti-inflationary policy by the government and the NBKR. However, during the current COVID-19 pandemic, prices in Kyrgyzstan have been rising, on average, by 0.83% every month since March 2020, when the coronavirus started to spread worldwide. If we look at the annual inflation rate in March 2021, prices were 10.16% higher than the relevant month in 2020.

4. METHODOLOGY, DATA, AND ANALYSIS

Reviewing the analysis of well-known publications on the impact of budget deficits on inflation, one can note the lack of a unified approach to solving this problem. Thus, the paper aims to show a relationship between inflation and budget deficits by employing econometric methods.

4.1. The Empirical Model

To investigate the causal effect of budget deficits on price levels, I adopt a model explained by Solomon and de Wet (2004). They start from the long-run government budget constraint to estimate the effect of budget deficits on price levels:

$$\frac{B_{t-1}}{P_t} = \sum \frac{1}{r_k} [\, T_{t+k} - G_{t+k} + (M_{t+k} - \frac{M_{t-1-k}}{P_{t+k}})] \tag{4.1}$$

where $\frac{B_{t-1}}{P_t}$ is real government debt, r_k is a discount rate, T_{t+k} is a government revenue from taxes, G_{t+k} is government expenditure, M_t is a broad money supply.

If we consider that the budget deficit is not financed by borrowing, meaning that the government debt level does not grow, the budget deficit is ultimately funded by printing money. As we impose this restriction, we obtain the short-run budget constraint:

$$\frac{B_{t-1}(t)}{P_t} = T_t - G_t + (\frac{M_t - M_{t-1}}{P_t}) \tag{4.2}$$

where *B(t)* is a government debt that matures at time *t* and has to be paid off and not rolled over. We can rewrite the equation (4.2) as follows:

$$\frac{B_{t-1}(t)}{P_t} - T_t + G_t = (\frac{M_t - M_{t-1}}{P_t}) \tag{4.3}$$

The left-hand side of the equation (4.3) represents the budget deficit composed of two components: the primary deficit and government debt repayment with maturity at time *t*. The right-

hand side of equation (4.3) represents the seigniorage. The revenue from printing money, *S*, can be expressed as a function of real money supply, $\frac{M}{P}$, and inflation rate, π:

$$S = f(\pi_t, \frac{M_t}{P_t}) \tag{4.4}$$

If we consider that revenue from printing money increases with the inflation rate and combine the equations (4.3) and (4.4), we get the equation calculated by Catao and Terrones (2001) where the budget deficit and money supply explain inflation rate:

$$\pi_t = \frac{\beta d_t P_t}{M_t} \tag{4.5}$$

where β is the inverse linear multiplier, d_t is the budget deficit expressed by the equation $d_t = G_t - T_t - B_{t-1}$, M_t/P_t is the real money supply. We get a relation between the ratio of budget deficit *(D)* to GDP and the level of inflation by dividing the equation (4.5) by nominal GDP *(Y)*:

$$\pi_t = \frac{D_t/Y_t}{M_t/Y_t} \tag{4.6}$$

I take the inflation rate as an outcome variable (dependent variable) and the budget balance to GDP ratio as a causal variable (independent variable) to develop a model for our analysis. Since I use observational data, regressing the causal variable on the outcome variable would give spurious results. Hence I have to identify potential common cause confounders (endogenous sources of variation in budget balance) that affect both the independent and dependent variable, mechanisms of reverse causality running from the dependent variable to the independent variable, and unwanted mechanism confounders. These three types of variables are called confounders.

Figure 4.1 helps us to visualize and identify potential confounders. As discussed earlier, the budget deficit driven by increased government expenditures improves aggregate demand and increases total output. An increase in production raises the price level for the same level of the money supply. Here GDP serves as a mechanism variable. Bekes and Kezdi (2021) call such a mechanism variable that *x* affects *y* as a bad conditioner and suggest not to condition on it. However, there is another path through which GDP affects both the budget deficit and inflation. When the economy in a boom, unemployment decreases, living standards of the vulnerable and the poor are more likely to improve. Consequently, the government's social expenditure, for example, on unemployment benefits, supporting the vulnerable and the poor is expected to decrease. It is positively reflected in the government budget balance. In this case, GDP serves as a common cause confounder, and we have to control for it.

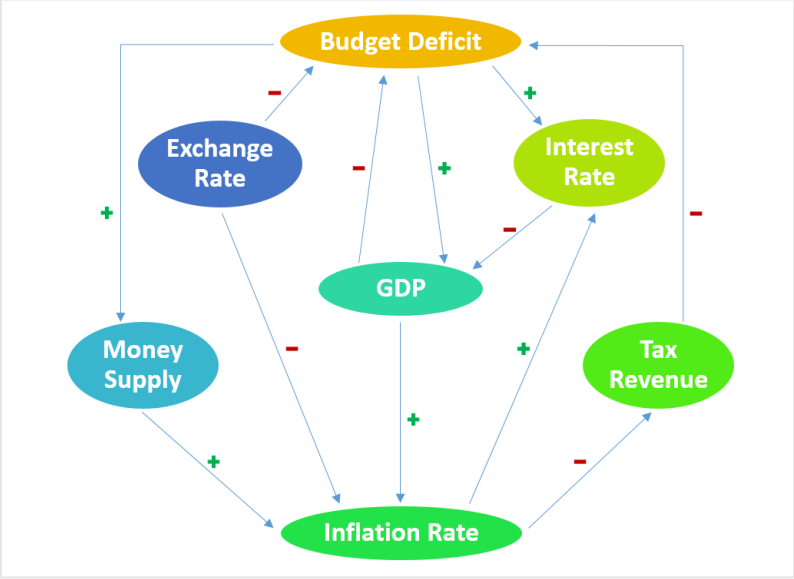

Figure 4.1. Causal map for the effect of the budget deficit on the inflation rate (by the author)

In the case of Kyrgyzstan, the next common cause confounder is the foreign exchange rate. When the Kyrgyz government borrows abroad, it takes loans in foreign currency and pays back the debt with interest in foreign currency. When the exchange rate of Kyrgyzstani som in relation

to foreign currency is low, the government has to spend more on debt servicing, increasing the budget deficit. As Kyrgyzstan is an import-dependent country, the prices of most consumption and production goods and services are defined by the exchange rate. The stronger the national currency, the lower the inflation rate. Thus, I include the exchange rate variable in the model.

Alavirad and Sanhita (2005) and Ahking and Miller (1985) control for money supply when estimating the effect of the budget deficit on the price level. The money supply is an instrumental (mechanism) variable through which the budget deficit affects the inflation rate. When the government finances its budget deficit by printing money or borrowing abroad, the monetary base increases in the economy. A higher money supply for the same level of output causes higher inflation. As I mentioned earlier, we do not condition on the mechanism variable. That's why I do not include the money supply variable in our model.

Barnhart and Darrat (1988) estimated the model conditioning on the interest rate as well. I consider the interest rate as an instrumental variable. When the government covers its budget deficit by domestic borrowing, it increases the demand for financial resources, rising interest rates, availability of resources to firms and households decreases (crowding-out effect). As a result, investment decreases, the level of output decreases affecting the price level. We do not control for mechanism variables. Moreover, the inflation rate directly affects the nominal interest rate. Here the interest rate is considered as a collider (common effect) variable. Collider means that both the budget deficit and inflation affect the interest rate. Cunningham (2021) argues that conditioning on a collider variable gives spurious results. Therefore I do not control for the interest rate in my model.

The final confounder variable is tax revenue. The Olivera-Tanzi effect (Anusic and Svaljek 1996) explains that the inflation rate decreases real government revenues from tax collection,

deteriorating the budget deficit. Here tax revenue is considered as a mechanism of reverse causality. However, tax revenue is a part of the government revenue and directly affects the budget balance. Hence, I do not include tax revenue in the model to avoid multicollinearity issues.

The functional form of my model to uncover the budget deficit-inflation nexus is:

$$inflation = f(budget\ deficit, GDP, exchange\ rate) \tag{4.7}$$

My model is in line with the models presented by Solomon and de Wet (2004) and Makochekanwa (2008), but they use levels of variables regressing the logarithm of CPI on the budget deficit, logarithms of GDP and exchange rate. I employ growth rates of GDP and exchange rate and take annual inflation rate. Hence, my econometric model is:

$$INF_t = \beta_0 + \beta_1 \times BBGDP_t + \beta_2 \times GDP\_GR_t + \beta_3 \times FX\_GR_t + u_t \tag{4.8}$$

where INF_t – inflation rate at time t with respect to the relevant quarter of the previous year;

$BBGDP_t$ – government budget balance to GDP ratio at time t ;

GDP_GR_t – nominal GDP growth at time t with respect to the relevant quarter of the previous year;

FX_GR_t – nominal foreign exchange rate growth at time t with respect to the relevant quarter of the previous year;

u_t – value of unobserved common cause variables at time t affecting both budget deficit and inflation rate.

4.2. Data Description

For the analysis, I use quarterly data for the period 2000:1-2020:4 covering 84 quarters obtained from the National Bank of the Kyrgyz Republic and the National Statistical Committee of the Kyrgyz Republic database. The inflation rate calculated from CPI expressed in percent to

the relevant quarter of the previous year is used as a proxy for *INF* in equation (4.8). For *BBGDP*, I take the level of government budget balance to GDP ratio. *GDP_GR* is taken as the nominal GDP growth rate compared to the relevant quarter of the previous year. The average exchange rate for the quarter is calculated from the average monthly official nominal exchange rate of Kyrgyzstani som against USD. Then, *FX_GR* is estimated as a growth rate of the foreign exchange rate with respect to the relevant quarter of the previous year. It is worthwhile to mention that an increase in the value of *FX_GR* means depreciation of the som.

All variables are expressed in terms of percentage change from the relevant quarter of the previous year except for budget balance to GDP ratio. If I also take growth rates of *BBGDP*, it would contain huge fluctuations reaching 850% growth rate and would lead to erroneous results.

I have to drop observations for the first year (first four quarters) to calculate the growth rates. For econometric analysis, there are left 80 observations covering the period 2001:1-2020:4.

Since the variables, except for *BBGDP*, are calculated as growth rates with respect to the relevant quarter of the previous year, they do not contain seasonal patterns (see figure A.1 in appendicies). However, there is a seasonality in *BBGDP* as it is expressed in level. It is usual for quarterly intervals. So I have to employ a seasonally adjusted variable by removing seasonal factors from it. Since data on *BBGDP* contain negative values, I deal with seasonality using the Tramo/Seats method.

Time series variables are often found to be non-stationary, containing a unit root. Variables included in the model should be stationary. For this reason, I have to check the stationarity of the variables using various methods. First, I use the most common method to test the unit root – the Augmented Dickey-Fuller (ADF) test. This test can tell us whether the particular variable has a

unit root or not. It has three basic shapes: with constant, with constant and trend, without constant and trend. It states null and alternative hypotheses as follows:

H_0: The variable has a unit root

H_1: The variable is stationary

Table 4.1 gives the results of the ADF tests. Based on it, *INF* has a unit root at the level, but it has no unit root at first difference. On the other hand, *BBGDP* and *GDP_GR* are stationary at the level. *FX_GR* has a unit root at the level when trend and constant are included, but it has no unit root at the level without constant and trend. However, it is stationary at first difference. No variable is integrated of the second order.

Table 4.1. Augmented Dickey-Fuller unit root test results

Variables	**p-value**					
	Intercept		**Trend and intercept**		**None**	
	level	*first difference*	*level*	*first difference*	*level*	*first difference*
INF	0.233	0.000	0.477	0.000	0.240	0.000
BBGDP	0.000		0.000		0.014	
GDP_GR	0.001		0.005		0.016	
FX_GR	0.103	0.002	0.176	0.013	0.020	0.000

Source: By the author using EViews estimates

I employ Phillips-Perron (PP) test as an alternative to the ADF test. Compared to the ADF test, under the null hypothesis, the form of serial correlation is not specified, making the PP test a non-parametric test. Therefore, the procedure of estimation p-values becomes different in the PP test. Moreover, it takes into account issues of autocorrelation and heteroskedasticity, correcting the statistics. Similar to the ADF test, PP test has three shapes. Also, the statement of the null and alternative hypotheses is identical to of ADF test.

The results of the PP test are given in table 4.2. According to the PP test, *INF* has a unit root at the level only when both constant and trend are included. It is stationary at first difference. Again, *BBGDP* and *GDP_GR* are stationary at level. The results on *FX_GR* are similar to the ADF test results. All variables are integrated of a mixed order (at the level and first difference).

Table 4.2. Phillips-Perron unit root test results

Variables	**p-value**					
	Intercept		**Trend and intercept**		**None**	
	level	*first difference*	*level*	*first difference*	*level*	*first difference*
INF	0.033	0.000	0.123	0.000	0.032	0.000
BBGDP	0.000		0.000		0.000	
GDP_GR	0.004		0.019		0.017	
FX_GR	0.137	0.000	0.146	0.000	0.026	0.000

Source: By the author using EViews estimates

Another method alternative to classical tests is Kwiatkowski, Phillips, Schmidt and Shin (KPSS) test results of which are filed in table 4.3. Unlike the previous methods, it has two shapes: with constant, with constant and trend. While the first two methods accept the null hypothesis if the variable is non-stationary, in KPSS test statement of the null hypothesis is different:

H_0: The variable is stationary

H_1: The variable is not stationary

Table 4.3. Kwiatkowski, Phillips, Schmidt and Shin unit root test results

Variables	**LM test statistic**			
	Intercept		**Trend and intercept**	
	at 1% level: 0.739 at 5% level: 0.463 at 10% level: 0.347		at 1% level: 0.216 at 5% level: 0.146 at 10% level: 0.119	
	level	*first difference*	*level*	*first difference*
INF	0.213	0.029	0.162	0.030
BBGDP	0.439		0.090	
GDP_GR	0.291	0.075	0.173	0.077
FX_GR	0.419		0.073	

Source: By the author using EViews estimates

In KPSS, we compare LM test statistic to the critical values at a five percent significance level. The KPSS test shows similar results on *INF* and *BBGDP* to the previous two methods. *INF* is found to be stationary when the constant term is included, but it is non-stationary at the five percent level when both constant and trend are included. However, it is stationary at first difference. *BBGDP* is stationary at a level. The KPSS test gives conflicting results on *GDP_GR* and *FX_GR* comparing to the previous unit root test methods: *NGDP_GR* is not stationary at level, but stationary at the first difference; *FX_GR* is stationary at level. All variables are I(0) or I(1).

To sum up, I present the unit root test results of all methods in table 4.4. All methods show that *INF* is stationary at the first difference and *BBGDP* is stationary at the level. However, the results on *GDP_GR* and *FX_GR* are conflicting with each other. Two out of three methods show that *GDP_GR* is stationary at level, while *FX_GR* is stationary at the first difference. I can conclude the order of integration based on the majority rule, as shown in table 4.4. No variable is found to be I(2).

Table 4.4. Overall results of unit root tests

Variables	ADF	PP	KPSS	Overall
INF	I(1)	I(1)	I(1)	I(1)
BBGDP	I(0)	I(0)	I(0)	I(0)
GDP_GR	I(0)	I(0)	I(1)	I(0)
FX_GR	I(1)	I(1)	I(0)	I(1)

Source: By the author using EViews estimates

4.3. The Empirical Analysis and Findings

This section empirically estimates the short-run and long-run effects of the budget deficit on the inflation rate applying the model developed in section 4.1. In the last section, I prepared data for the analysis, making them stationary.

According to ADF, PP, and KPSS test results, variables are I(0) or I(1). Thus, I cannot conduct an error correction model to uncover the long-run and short-run relationships between dependent and independent variables when they are integrated of a different order. Instead, one can employ the autoregressive distributed lag (ARDL) model when variables are I(0) or I(1), but not when a variable is I(2). Fortunately, my data does not include a variable integrated of order two. Therefore, I apply the ARDL model to capture both the long-run and short-run effects of *BBGDP* on *INF*.

I regress *INF* on *BBGDP*, *GDP_GR*, and *FX_GR* as presented in equation (4.8). The ARDL model is run in EViews with constant as a fixed regressor. I let the software select the optimal lag length automatically based on the Akaike info criterion (AIC), including a maximum of four lags for dependent and independent variables. Five hundred models are evaluated, and the ARDL (3, 0, 0, 2) model was selected based on AIC.

Table 4.5. Short-run estimates of the ARDL model (inflation as dependent variable)

Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
Inflation$_{t-1}$	1.113	0.122	9.109	0.000
Inflation$_{t-2}$	-0.307	0.169	-1.816	0.074
Inflation$_{t-3}$	-0.192	0.108	-1.774	0.081
Budget balance to GDP ratio	-0.245	0.098	-2.505	0.015
GDP growth	0.134	0.051	2.647	0.010
Foreign exchange rate growth	-0.014	0.083	-0.168	0.867
(Foreign exchange rate growth)$_{t-1}$	0.257	0.110	2.327	0.023
(Foreign exchange rate growth)$_{t-2}$	-0.262	0.080	-3.285	0.002
Constant	0.006	0.006	1.006	0.318
Number of observations	77	Prob(F-statistic)		0.000
Adjusted R-squared	0.845	Durbin-Watson stat		1.773

Source: By author using EViews estimates

The results of the short-run relationship are presented in table 4.5 (original EViews output can be found in figure A.2). The adjusted R-squared is quite high: the model explains 84.5 percent of variations in *INF*. Durbin-Watson statistics is close to two, meaning low autocorrelation in the

residuals from the regression (a plot of residuals is depicted in figure A.3). The probability of F-statistic is below the five percent level, indicating the significance of the model.

The coefficient on budget balance to GDP ratio is statistically significant at a ninety-five percent confidence level, and it is negative. We can interpret that a one percent increase in budget balance to GDP ratio slowdowns the annual inflation rate by 0.245 percent in the short run. Or, we can formulate this coefficient in terms of the budget deficit. In the short run, a one percent increase in the budget deficit to GDP ratio increases the annual inflation rate by 0.245 percent.

In addition, the coefficient on the GDP growth is also statistically significant. It shows that a one percent increase in nominal GDP growth increases the inflation rate by 0.134 percent in the short run. The foreign exchange rate is found statistically significant only at one and two lags. The net effect of the exchange rate can be found by summing up the statistically significant coefficients: 0.267 + (-0.262) = 0.005. In the short run, a one percent increase in the foreign exchange rate growth (depreciation of the Kyrgyzstani som) increases the annual inflation rate by 0.005 percent.

I run the ARDL model bounds test to find if the variables are cointegrated, i.e., whether they have a long-run relationship. The null hypothesis is that the variables are not cointegrated. The bounds test results are presented in figure A.4. The value of the F-statistic is above the upper bound at a five percent significance level so that we can reject the null hypothesis. There exists a long-run relationship between the variables in the model.

The long-run form of the ARDL model is presented in table 4.6. There is a statistically significant long-run effect of budget balance to GDP ratio and nominal GDP growth on the inflation rate. One percent increase in budget balance to GDP ratio decreases the annual inflation rate by 0.635 percent in the long run. Suppose we interpret it in terms of the long-run effect of the budget deficit on inflation. In that case, a one percent increase in the budget deficit to GDP ratio increases the inflation rate by 0.635 percent. When nominal GDP growth increases by one percent, the annual inflation rate increases by 0.346 percent. There is no long-run effect of foreign exchange rate growth on the inflation rate.

Table 4.6. Long-run estimates of the ARDL model (inflation as dependent variable)

Variable	**Coefficient**	**Std. error**	**t-statistic**	**Prob.**
Budget balance to GDP ratio	-0.635	0.283	-2.245	0.028
GDP growth	0.346	0.097	3.587	0.001
Foreign exchange rate growth	-0.048	0.114	-0.424	0.673
Constant	0.015	0.015	0.993	0.324

Source: By the author using EViews software estimates

Next, I perform residual diagnostics tests for ARDL estimates. The normality test indicates that residuals are distributed normally. The null hypothesis of the Lagrange multiplier test is accepted that there is no serial correlation in the residuals. To test heteroscedasticity in the residuals, I conduct White's test where the null hypothesis states no heteroskedasticity. We reject the null hypothesis at a five percent significance level that there is no heteroscedasticity in the residuals. All residual diagnostics are tested in EViews, and the results are presented in figures A.5-7. Then, I perform the stability test to examine if the parameters of my model are stable over different subsamples of data. Employing the CUSUM test, I find that the model is stable. The EViews output of the stability test is depicted in figure A.8.

After testing the residuals and stability of the model, I can conclude that my model is valid. However, there might be other factors that affect the internal validity of the results. One of the

issues is omitting variable bias. I might not control for variables that affect both *BBGDP* and *INF*. There might be unobserved factors affecting both the dependent variable and the causal variable. Another issue is that I might not correctly choose variables as proxies for inflation, budget deficit, GDP growth, and exchange rate growth.

5. CONCLUDING REMARKS AND POLICY RECOMMENDATIONS

The impact of fiscal policy on various economic indicators is a relevant area of research. This paper study the short-run and long-run relationships between the budget deficit and inflation in Kyrgyzstan. Quarterly data for Kyrgyzstan is used over the period 2001Q1:2020Q4, covering 80 observations. The inflation rate with respect to the relevant quarter of the previous year is taken as a dependent variable. The level of budget balance to GDP ratio is used as a proxy for the budget deficit. To find the causal effect of budget deficit on inflation, I control for common cause variables such as GDP and foreign exchange rates. For this reason, a yearly growth rate of nominal GDP and the annual growth rate of the official nominal exchange rate of KGS against USD is calculated.

The short-run and long-run relationships between the budget balance to GDP ratio and inflation rate are found employing the ARDL model. Thus, our study is in line with studies of other researchers discussed in Section 2.3, who find the relationship between the budget deficit and inflation in developing countries. The used variables differ from most previous work on the topic. In the short run, a one percent increase in budget balance to GDP ratio decreases the annual inflation rate by 0.245 percent, while in the long run, the effect is higher, reducing the yearly inflation rate by 0.635 percent. If we interpret the results in terms of the budget deficit, a one percent increase in the budget deficit to GDP ratio increases the inflation rate by 0.245 in the short run. If we are interested in the long-run effect, a one percent increase in the budget deficit to GDP ratio raises the annual inflation rate by 0.635 percent.

The short-run and long-run positive relationships are found between the nominal GDP growth and the inflation rate. There is only a short-run effect of the foreign exchange rate growth on the inflation rate.

The results show a significant effect of the budget deficit on the inflation rate. I can conclude that budget deficits increase the inflation rate. Therefore, the government budget balance should be improved to reduce the inflation rate in the country. Several actions and policies should be undertaken to achieve a lower inflation rate.

Even though the government of the Kyrgyz Republic takes foreign loans with the very favorable condition and receive external grants, unless those funds will not be invested in production, the current problem of budget deficits cannot be solved. Currently received foreign funds to cover deficits are being spent for temporary uses and leaving our economy in short periods. Instead, those funds should be used effectively that the government could repay the loans with interest payments.

Given that no substantial additional financing sources are expected to inflow, the focus should be on developing a program to limit the size of the budget deficit itself, namely, methods to increase government revenues and ways to reduce government expenditures. Among many necessary measures, two seem particularly important.

First, in fiscal policy, it seems necessary to expand the tax base and increase the efficiency of tax collection. The recent amendments to the Tax Code of the Kyrgyz Republic adopted by the Parliament of the Kyrgyz Republic go in the opposite direction that reduces tax receipts. For example, entrepreneurs exporting agricultural products to Kazakhstan and other countries are exempt from VAT, sales tax, income, and property taxes. The government should revise the costs and benefits of such exemptions from taxes.

Second, it is fundamentally vital to limit social spending in terms of budget expenditures, especially pension expenses. It is necessary to raise the retirement age and abolish preferential

conditions for early retirement of many categories of workers. Without such radical measures, it will not be possible to balance the budget.

In addition, in world practice, countries attract foreign capital to the economy to reduce the budget deficit. Consequently, several tasks can be solved at once, not only the fiscal issues but also economic problems. Budget expenditures on financing capital investments can decrease, narrowing the gap between revenue and expenditure of the government. Moreover, the production of goods and services expands; thus, new taxpayers appear to increase government revenues.

To improve the effectiveness of anti-inflationary policies, Kyrgyzstan needs to ensure a significant recovery of the real economy, which would give a growing mass of a wide variety of goods that can fill the domestic market and enter foreign markets in increasing volumes. The growing effective and competitive Kyrgyz economy will reliably protect against the rising of the price level. Kyrgyzstan has excellent opportunities to raise its economy to a modern high level, develop production to such extent as filling the domestic market mainly with its domestic goods, and significantly expand the supply of goods for export. The agricultural and industrial sectors, the mining industry, and tourism can give a lot to boost exports. In this way, our economy can avoid import dependency, which plays a significant role in determining the price level in the domestic market.

In conclusion, it should be noted that without a profound reform of the tax system and government expenditures, it will not be possible to reduce the government budget deficit. Its further financing by domestic borrowing and loans from abroad, international organizations, will not be achieved the planned inflation rate in the coming years.

APPENDICIES

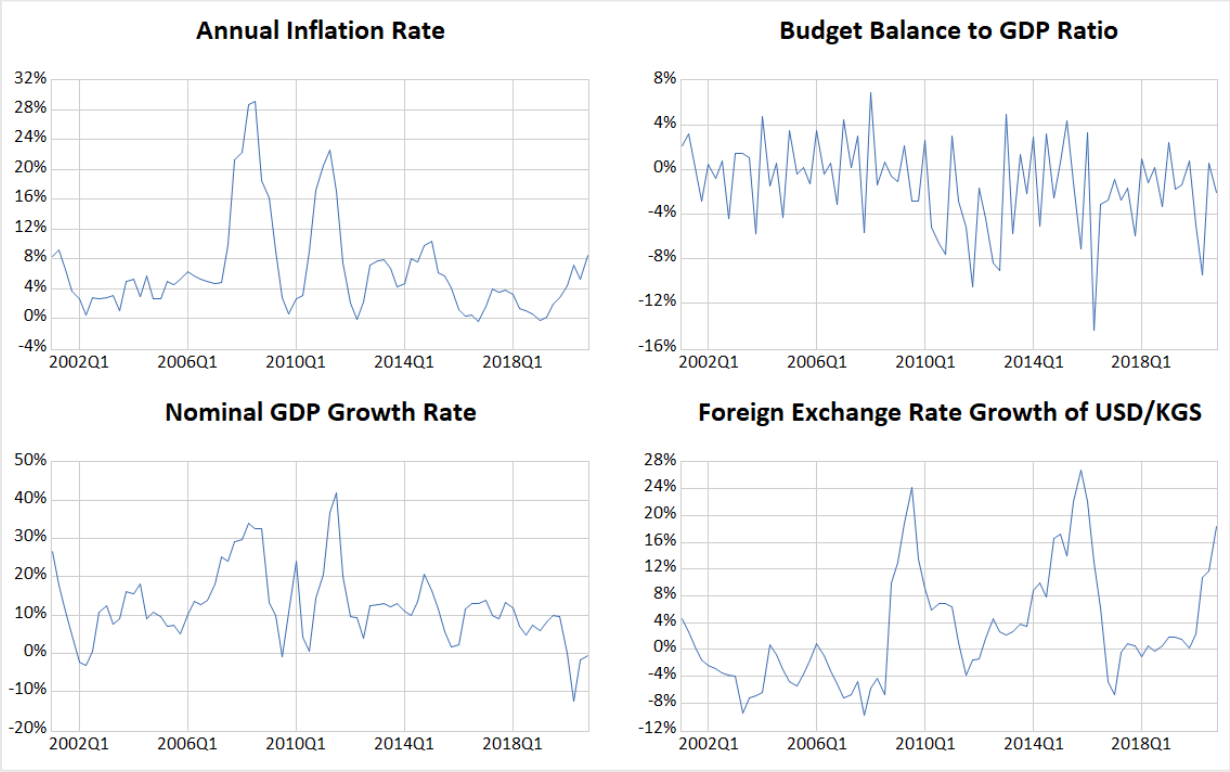

Figure A.1. Graphical plots of incorporated variables (EViews output)

Dependent Variable: INF
Method: ARDL
Date: 06/02/21 Time: 01:03
Sample (adjusted): 2001Q4 2020Q4
Included observations: 77 after adjustments
Maximum dependent lags: 4 (Automatic selection)
Model selection method: Akaike info criterion (AIC)
Dynamic regressors (4 lags, automatic): BBGDP GDP_GR FX_GR
Fixed regressors: C
Number of models evalulated: 500
Selected Model: ARDL(3, 0, 0, 2)
Note: final equation sample is larger than selection sample

Variable	Coefficient	Std. Error	t-Statistic	Prob.*
INF(-1)	1.112709	0.122156	9.108932	0.0000
INF(-2)	-0.306982	0.169081	-1.815592	0.0738
INF(-3)	-0.192012	0.108211	-1.774425	0.0805
BBGDP	-0.245409	0.097983	-2.504605	0.0147
GDP_GR	0.133819	0.050549	2.647309	0.0101
FX_GR	-0.013950	0.082967	-0.168142	0.8670
FX_GR(-1)	0.257086	0.110461	2.327396	0.0229
FX_GR(-2)	-0.261788	0.079702	-3.284589	0.0016
C	0.005788	0.005754	1.005933	0.3180

R-squared	0.861018	Mean dependent var	0.063957
Adjusted R-squared	0.844667	S.D. dependent var	0.065666
S.E. of regression	0.025881	Akaike info criterion	-4.361182
Sum squared resid	0.045547	Schwarz criterion	-4.087230
Log likelihood	176.9055	Hannan-Quinn criter.	-4.251603
F-statistic	52.65881	Durbin-Watson stat	1.773146
Prob(F-statistic)	0.000000		

*Note: p-values and any subsequent tests do not account for model selection.

Figure A.2. Short-run estimates of the ARDL model (EViews output)

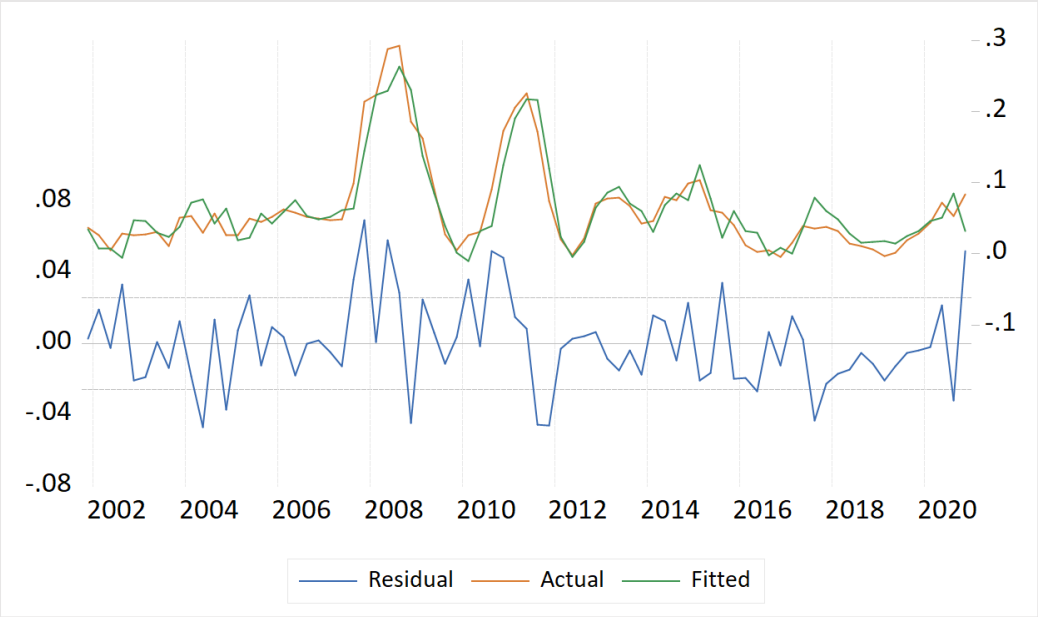

Figure A.3. The residuals plot of the ARDL model (EViews output)

F-Bounds Test		Null Hypothesis: No levels relationship		
Test Statistic	Value	Signif.	I(0)	I(1)
			Asymptotic: n=1000	
F-statistic	7.376444	10%	2.37	3.2
k	3	5%	2.79	3.67
		2.5%	3.15	4.08
		1%	3.65	4.66
Actual Sample Size	77		Finite Sample: n=80	
		10%	2.474	3.312
		5%	2.92	3.838
		1%	3.908	5.044
			Finite Sample: n=75	
		10%	2.482	3.334
		5%	2.946	3.862
		1%	4.048	5.092

Figure A.4. The ARDL bounds test results (EViews output)

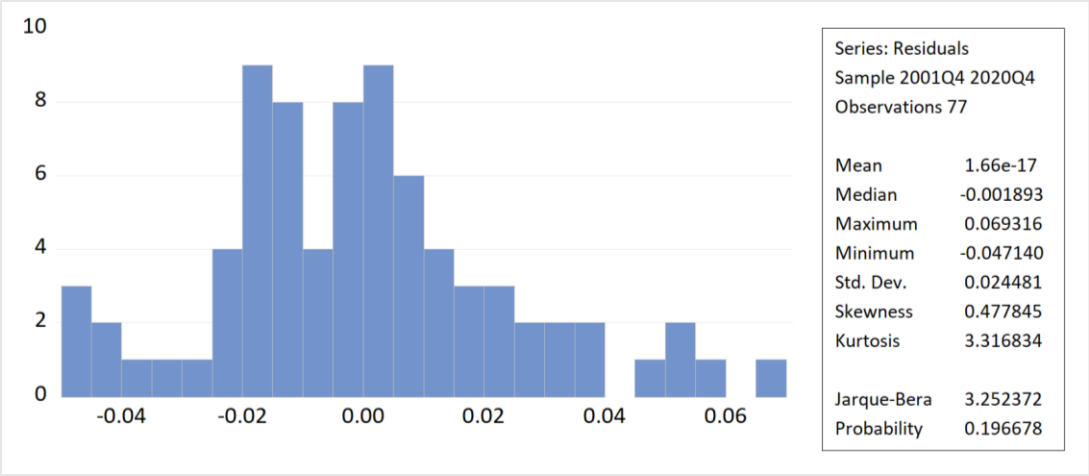

Figure A.5. Normality test results for residuals (EViews output)

Breusch-Godfrey Serial Correlation LM Test:			
Null hypothesis: No serial correlation at up to 2 lags			
F-statistic	1.342605	Prob. F(2,66)	0.2682
Obs*R-squared	3.010273	Prob. Chi-Square(2)	0.2220

Test Equation:
Dependent Variable: RESID
Method: ARDL
Date: 06/02/21 Time: 02:03
Sample: 2001Q4 2020Q4
Included observations: 77
Presample missing value lagged residuals set to zero.

Variable	Coefficient	Std. Error	t-Statistic	Prob.
INF(-1)	-0.225701	0.243952	-0.925187	0.3582
INF(-2)	0.189738	0.365560	0.519032	0.6055
INF(-3)	-0.024687	0.199075	-0.124009	0.9017
BBGDP	0.005444	0.098752	0.055124	0.9562
GDP GR	0.011356	0.051086	0.222299	0.8248
FX GR	-0.015204	0.083274	-0.182579	0.8557
FX GR(-1)	0.005753	0.111553	0.051575	0.9590
FX GR(-2)	-0.001941	0.079426	-0.024439	0.9806
C	0.003059	0.006091	0.502182	0.6172
RESID(-1)	0.288371	0.272527	1.058136	0.2939
RESID(-2)	0.160538	0.210996	0.760860	0.4495

R-squared	0.039094	Mean dependent var	1.66E-17
Adjusted R-squared	-0.106497	S.D. dependent var	0.024481
S.E. of regression	0.025751	Akaike info criterion	-4.349113
Sum squared resid	0.043766	Schwarz criterion	-4.014283
Log likelihood	178.4408	Hannan-Quinn criter.	-4.215184
F-statistic	0.268521	Durbin-Watson stat	2.016758
Prob(F-statistic)	0.985968		

Figure A.6. Serial correlation test results for residuals (EViews output)

Heteroskedasticity Test: White Null hypothesis: Homoskedasticity			
F-statistic	2.585642	Prob. F(44,32)	0.0031
Obs*R-squared	60.09645	Prob. Chi-Square(44)	0.0535
Scaled explained SS	54.29379	Prob. Chi-Square(44)	0.1375

Figure A.7. Heteroskedasticity test results for residuals (EViews output)

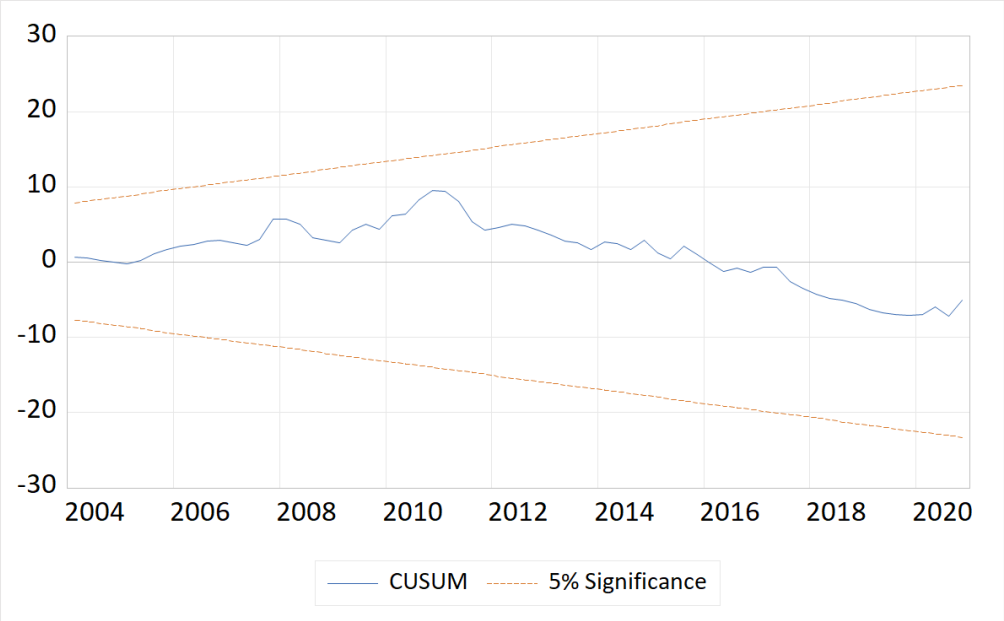

Figure A.8. Model stability test results (EViews output)

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