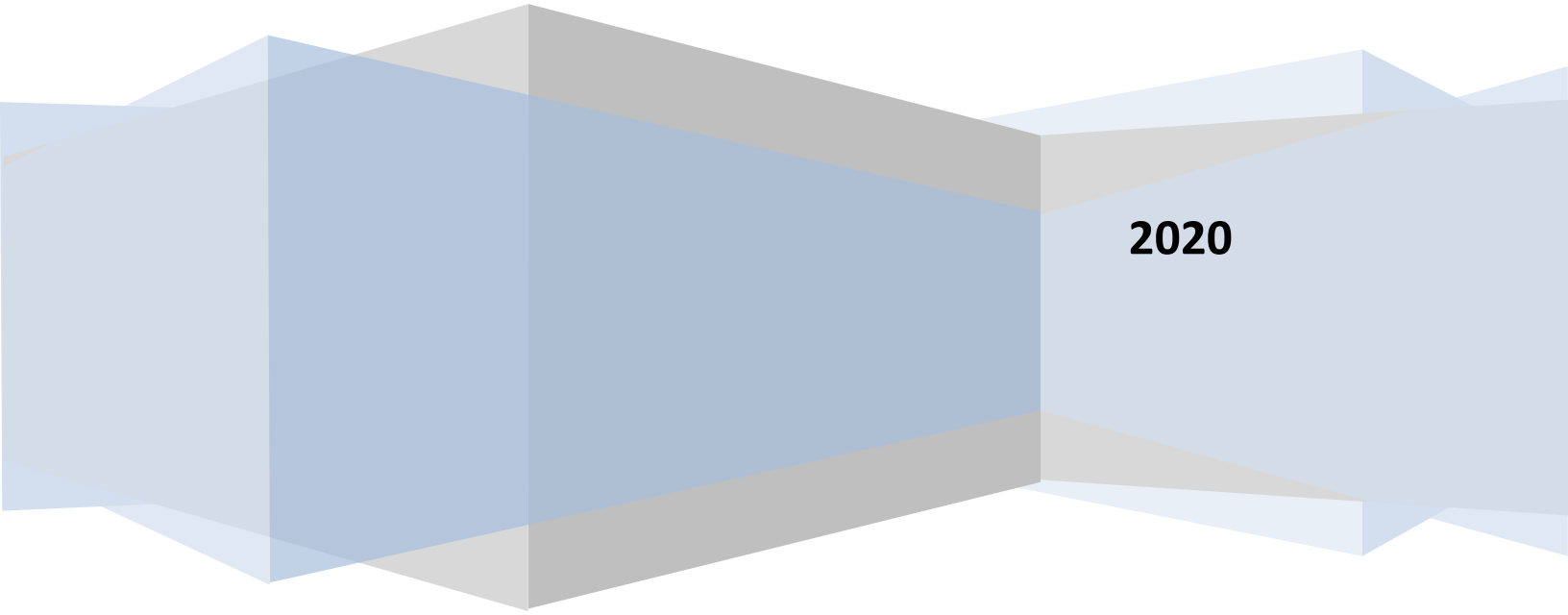
Da Afghanistan Bank
Monetary Policy Department
Research Unit

Exchange Rate Pass-through Effect on Inflation in Afghanistan

By: Iqbal Safi and, Naqibullah Mashal



2020

Acknowledgments:

Many thanks to Mr. Naib Khan Jamal, the Director General of the Monetary Policy Department and Mr. Khalid Miraj, the Deputy Director General of the Monetary Policy Department for their kind instructions and suggestions while conducting this study.

Table of Contents:

List of Figures

Figures **Page No.**

List of Tables

Tables **Page No.**

Abstract:

Afghanistan is an import-dependent country facing perpetual trade balance deficit for decades. The trade deficit causes higher outflow of foreign currencies out of the country. Therefore, the demand for foreign currencies, especially the U.S. dollars remains high in the foreign exchange markets in Afghanistan. Thus, the higher demand for the U.S. dollars depreciates the afghani exchange rate and with the depreciation of the domestic currency, the prices of imported products rise. An increase in the prices of imported products influences the prices of similar and substitute goods that are produced domestically and causes their prices to increase as well.

However, this paper studies the exchange rate pass-through effect on CPI inflation in Afghanistan. The paper finds that the exchange rate and inflation are correlated and the correlation between these two variables is equal to 73.79 percent. According to the regression analysis carried out in this paper, the exchange rate is statistically a significant variable for explaining the inflation variable and the coefficient of the exchange rate is equal to 0.44 in the estimated regression model. Besides, the pair-wise Granger Causality tests indicate that the exchange rate does cause inflation.

Introduction:

As it is well-known fact that countries with higher volume of imports and lower amounts of exports usually experience low level of foreign currencies inflow into the country and higher level of outflow of foreign currencies out of the country. The mentioned countries require more major foreign currencies for purchasing and importing goods from neighboring countries and international markets. This situation usually increases the demand for foreign currencies in the foreign exchange market inside the country. Higher demand for foreign currencies in the country will result the depreciation of the domestic currency. As the domestic currency loses its value, it will influence the prices of the imported products and will cause the prices of the mentioned products to rise. An increase in the prices of imported goods will also influence the prices of the similar and substitute goods and will cause the prices of the domestically produced goods to increase.

In other words, countries with large amounts of trade balance deficits usually experience depreciation of the domestic currency. The depreciation in the domestic currency in turn leads to higher prices for imported products. Higher prices for imported goods can influence the prices of the similar and substitute goods produced in the country and as a result the overall inflation rate increases in the country. The above mentioned impact of the exchange rate on the domestic prices can be known as the pass-through effect of the exchange rate on inflation.

The degree of the exchange rate pass-through effect on the domestic prices is related to the economic conditions and import orientation of a country. In case of imperfect competition in the market or existence of market monopoly, there is a higher chance of reflecting the exchange rate changes on the prices of the goods. In Addition, countries with low level of domestic production and higher amounts of imports usually experience higher degree of the exchange rate pass-through effect on inflation.

Afghanistan is an import dependent country and has been facing perpetual trade balance deficit for decades. According to the data from the external sector of the monetary policy department of Da Afghanistan Bank, the country's export of goods reached around USD 0.863 billion in 2019 while the import of goods of Afghanistan amounted USD 6.776 billion. The above figures indicate a large trade deficit in goods amounting USD 5.913 billion. Now-a-days, the international community is helping Afghanistan through aids and contributions. Therefore, sufficient amount of foreign currencies enters the country and the Central Bank of Afghanistan supplies adequate amounts of foreign currencies to the foreign exchange market in the form of regular currency auctions. The mentioned market intervention of the Central Bank has played an important role in the stabilization of the exchange rate in the country.

Despite the efforts of Central Bank, still there is always higher demand for foreign currencies, especially for the U.S. dollar in the foreign exchange markets in Afghanistan. Higher demand for the U.S. dollars causes the domestic currency to depreciate. The depreciation of afghani paves the way for higher inflation in the country since most of the goods which are consumed domestically are imported from neighboring countries and international markets.

The degree of the exchange rate pass-through effect in Afghanistan is quite higher since Afghanistan is an import dependent country and is experiencing lower level of production due to

many reasons. One of the most important reason behind lower production is insufficient level of domestic and foreign investments inside the country due to political instability and lack of security across the country. As Afghanistan becomes more politically stable and if there is peace throughout the country, the level of domestic and foreign investments will increase remarkably which will enhance higher production of goods and services inside the country. Hence, the degree of import dependency of Afghanistan will decline and the exports of Afghanistan will also increase considerably because of higher domestic production. As a result, Afghanistan will experience stability in the exchange rate and in the domestic prices.

However, this paper studies the pass-through effect of exchange rate on inflation in Afghanistan. A correlation of nominal afghani exchange rate per U.S. dollar and inflation rate is observed and analyzed. Besides, a simple regression model with two variables which are the exchange rate and the inflation rate is estimated using the least square method. Moreover, a theoretical explanation of other factors that influence inflation in the country is also discussed.

Methodology and Data:

i. Methodology:

As mentioned earlier, this study is about the pass-through effect of the exchange rate on inflation in Afghanistan. This study is both qualitative and quantitative. First, correlation analysis of the nominal afghani exchange rate per U.S. dollar and the inflation rate (CPI inflation) is analyzed and discussed. Second, a simple regression model with two variables (the afghani exchange rate and inflation rate) is estimated using the least square method. In this model, the inflation rate is the dependent variable while the exchange rate is the independent variable.

The following is the formula of the regression model:

$$INF_{(t)} = \beta_1 + \beta_2 EXC_{(t)} + E_{(t)}$$

In the above mentioned formula, INF is the CPI inflation rate, β1 is the y intercept, β2 is the coefficient of the EXC variable, EXC is the nominal afghani exchange rate per U.S. dollar and the ϵt is the residual of this model.

After the estimation of the model, pair-wise Granger Causality tests are carried out for knowing whether the exchange rate causes inflation. The lag length criteria suggest taking two lags. The formulas of the pair-wise Granger Causality tests are as follows:

$$INF_{(t)} = \beta_1 \times EXC_{(t-i)} + \beta_2 \times INF_{(t-j)} + U_{1(t)}$$

$$EXC_{(t)} = \beta_3 \times EXC_{(t-i)} + \beta_4 \times INF_{(t-j)} + U_{2(t)}$$

The above mentioned formulas indicate pair-wise Granger Causality tests of the mentioned variables.

ii. Data:

Time series data is used for estimating the regression model and for carrying out correlation analysis. Monthly time series data is used for the above mention purpose from March, 2018 until March, 2020. It is worth mentioning that the data used in this research paper is received from various sections of the Monetary Policy Department of Da Afghanistan Bank. Many regression models were created for this study using monthly time series data of both variables and after comparing the models, the best model is chosen for this study which is the model created using the above mention data sample. The details of other estimated models are provided in the appendix section. It is worth mentioning that according to the Augmented Dickey-Fuller unit root test, both variables are non-stationary at level while after taking the first difference, the variables become stationary.

It is mentionable that there are tradable currencies which are exchanged in foreign exchange markets in Afghanistan on daily basis, but the U.S. dollar is widely recognized throughout the country. Traders and retailers usually consider the afghani exchange rate per U.S. dollar while determining the prices of the imported products. Therefore, in the regression model, only the afghani exchange rate per U.S. dollar is used to evaluate whether the exchange rate is a significant variable to explain the inflation variable.

In addition, the inflation variable considered in this model is CPI inflation. The Nominal Effective Exchange Rate (NEER) is not considered for creating the model due to lack of accurate and reliable data on trade volume because goods are smuggled into the country for avoiding custom duty. Besides, a considerable portion of imports are re-exported to other countries. Moreover, Afghanistan also produces and exports opium and the value of the exported opium is not reliable and it is not considered in the official exports of Afghanistan.

The Real Effective Exchange Rate (REER) is also not included in the estimated model due to above mentioned reasons. Add to that, availability of accurate and reliable data is also a major problem in this regard. For instance, neighboring countries are the major trade partner of Afghanistan, but these countries do not publish real and accurate data.

Lit-Review:

Razafimahefa Ivohasina F. 2012. The study examines the degree and speed of the exchange rate pass-through effect on inflation in sub-Saharan African countries. In the study, the sub-Saharan African countries are divided into two groups so that sufficient degree of freedom is acquired for the empirical analysis. These two groups of countries are categorized as the countries with fixed exchange rate regime and countries with the flexible exchange rate regime. Countries with independently floating and managed floating with no predetermined path for the exchange rate are included in the countries with flexible exchange rate regimes, while countries with other conventional fixed peg arrangement are included in the countries with fixed exchange rate regimes.

According to the study, as with changes in the exchange rate, the inflation rate was higher in the countries with fixed exchange rate regimes compared to the countries with the flexible exchange rate regime. A depreciation of over 40 percent in 1994 in fixed regime countries resulted in a sharp increase in prices while no similar large price changes were observed in the countries with flexible exchange rate regimes as changes occurred in the exchange rate.

Takhtamanova Yelena. 2008. The author explains the recent decline in the extent to which firms pass-through the exchange rate to prices. The paper focuses on the relationship between

inflation and exchange rate. The paper tries to explain the phenomenon by presenting empirical evidence of a structural break during 1990s in the relationship between the real exchange rate and the CPI inflation for a number of OECD countries. In the empirical approach, a sample of data for 14 OECD countries is received from the International Financial Statistics (IFS) database and an unrelated regression model is estimated which finds out a weakening relationship between real exchange rate and the CPI inflation. As a result, the empirical work confirms the decline in the exchange rate pass through during the 1990s.

The study also considers an open economy Philips curve by extending a standard sticky price model to an open economy. According to theoretical work carried out in the study, the degree of exchange rate pass-through effect on inflation is determined by four factors which are: the degree of openness of the economy, the fraction of flexible price firms in the economy, the credibility of the Central Bank and the degree of the exchange rate pass-through at the level of the firm.

Zorzi Michele Ca', Hahn Elke, and Sanchez Marcelo. 2007. The research is conducted on Exchange Rate Pass-through in Emerging Markets which examines the degree of the exchange rate pass-through effect on inflation for 12 emerging markets from Asia, Latin America, and Central and Eastern Europe. In this study, a vector auto-regressive model is estimated which is comprised of baseline case as variable output, the exchange rate, import and consumer prices, a short term interest rate and oil prices. Based on results from three alternative vector autoregressive models, the effect of exchange rate pass-through on both import and consumer prices is always higher in emerging markets compared to the developed countries.

According to the author, the effect of exchange rate pass-through on import and consumer prices is found to be low in emerging markets which are experiencing single digit inflation mostly the Asian countries which are not very dissimilar from the levels of developed countries. The paper also finds strong positive relationship between the exchange rate pass-through and inflation in line with Taylor's hypothesis once two outlier countries which are Argentina and Turkey are removed from analysis. The presence of a positive link between import openness and the exchange rate pass-through is noticed in this study as well while plausible theoretically finds only weak empirical support.

Yetman James, and Bevereux Michael B. 2002. The authors created a model of a small open economy and discussed it in the paper. In the model, the effect of exchange rate pass-through effect is set by the frequency of price changes of importing firms while this, in turn, is determined by the monetary policy rule of the Central Bank. According to the authors, expansionary monetary policy which leads to higher mean inflation rate and increased level of changes in exchange rate will result more frequent price changes and higher degree of the exchange rate pass-through.

The model describes that there should be a non-leaner positive relationship between the pass-through and mean inflation and a positive relationship between pass-through and changes in exchange rate. The result is strongly supported by the data collected for a sample of 122 countries. The paper finds that low level effect of the exchange rate pass-through on inflation is partly due to short term rigidities in the prices.

Carranza, L., J. E. Galdn-SÆnchez and J. Gmez-Biscarri. 2004. The result qualifies common view that countries with higher dollarization exhibit higher inflation. The analysis of the study is cross country level which consist widest possible set of countries, the countries are heterogeneous in the level of dollarization, the dataset contains prices and exchange rate data of one hundred and twenty-four countries. The fully dollarized countries and countries with fixed exchange rate are eliminated for the period of 1996-2004. The result shows that the exchange rate pass-through is significantly higher in Highly Dollarized Economies and the empirical analysis of this study is consistent with the accepted view (Reinhart et al, 2003) as well. The result robustly supports that largely depreciations have negative effect on pass-through coefficient and this negative effect is higher in the high dollarized economy.

De Grauwe, P., & Schnabl, G. (2008). The estimations reveal a significant impact of exchange rate stability on low inflation as well as a highly significant positive impact of exchange stability on real growth. The period of the study is divided into two different periods high inflation period (1994-1997) and low inflation period (1998-2004). The finding of the study suggests that European Monetary Union have a positive impact on these countries growth rate as a result of (South) Eastern and Central European countries membership. To analyze how inflation and economic growth are affected by the exchange rate regime in Eastern and Central European countries, a panel of 18 countries for the period of (1994-2004) is used. The finding of the study

suggests that exchange rate stability variables do not show any significant effect on economic growth. Thus, not rejecting the hypothesis that exchange rate stability promotes economic growth in the (South) Eastern and Central European countries.

Wang, Y. (2013). The results of the effect of exchange rate pass-through on inflation show that there is a negative relationship between the nominal effective exchange rate and consumer price index, and the pass-through ratio has a hysteretic nature. The study analyzes the effect of Chinese exchange rate changes to domestic inflation by using the vector autoregressive (VAR) model for the period of (2005-2013). The traditional theoretical models that describe the relationship among variables indicate static relationships, not dynamic. Using the non-structural method can explain the dynamic relations. The result suggests that; first, the relationship between the Nominal Effective Exchange Rate (NEER) and CPI is negative. Second, the exchange rate pass-through is not completely, it has a lag period. Third, the NEER can explain a part of CPI changes.

Garcia, C., & Restrepo, J. (2001). The estimation result shows that exchange rate pass-through depends positively on economic activity (output gap) explaining why pass-through has been so low in recent years in Chile. In other words, a negative output gap has compensated the inflationary impact of exchange rate depreciation; ii) productivity reduces unit labor costs and inflation; iii) wages and foreign prices are positively related to inflation; iv) Finally, expected inflation acceleration is significant, confirming that expectations matter determining inflation. The estimation includes the first difference of the dependent variable following the literature on the estimation of linear quadratic adjustment cost (LQAC) models, the empirical result shows that that labor productivity reduces unit labor costs and expected inflation acceleration is significant, confirming that expectation matters for determining inflation. Wages and foreign prices are also positively related to inflation. It is obvious from the result that the pass-through will increase with the increase in aggregate demand unless monetary authorities take action.

Fetai, B., Koku, P. S., Caushi, A., & Fetai, A. (2016). The paper investigates the relationship between exchange rates and inflation in Western Balkan Countries (Albania, Serbia, and Macedonia) empirically. The result shows that the main source for the inflationary pressure in Balkan countries is still due to exchange rate and the policy makers need to consider relative cost and benefits associated with flexible exchange rate in small open economies as a result of higher

costs rather than benefits in such economies. The main objective is to look for playing significant role between fixed exchange rate and flexible exchange rate in inflationary performance in Western Balkans. In order to examine the nexus between inflation and exchange, Fixed and Random Effect Model and "Hausman-Taylor instrument variable IV" models are applied using panel quarterly data covering period (1996-2014). The result shows that exchange rate plays significant role in price stability as a result of liberalization capital accounts and membership of World Trade Organization. The results of this study are consistent with the findings of previous studies that held that the stability of the exchange rate plays a significant role in maintaining price stability in transition economies. Western Balkan countries have to join EU- and exchange rate is the main source of inflation- stabilization of the exchange rate would lower inflationary pressure and help to fulfill some of the criteria to enter the European Monetary Union (EMU).

Correlation Analysis of the Exchange Rate and the Inflation Rate in Afghanistan:

The exchange rate plays a vital role in the domestic price stability in Afghanistan because the domestic production is very low and most of the domestically consumed products are imported from other countries and international markets. For analyzing the relationship between the exchange rate and inflation rate in country, let's observe the graph of both variables.

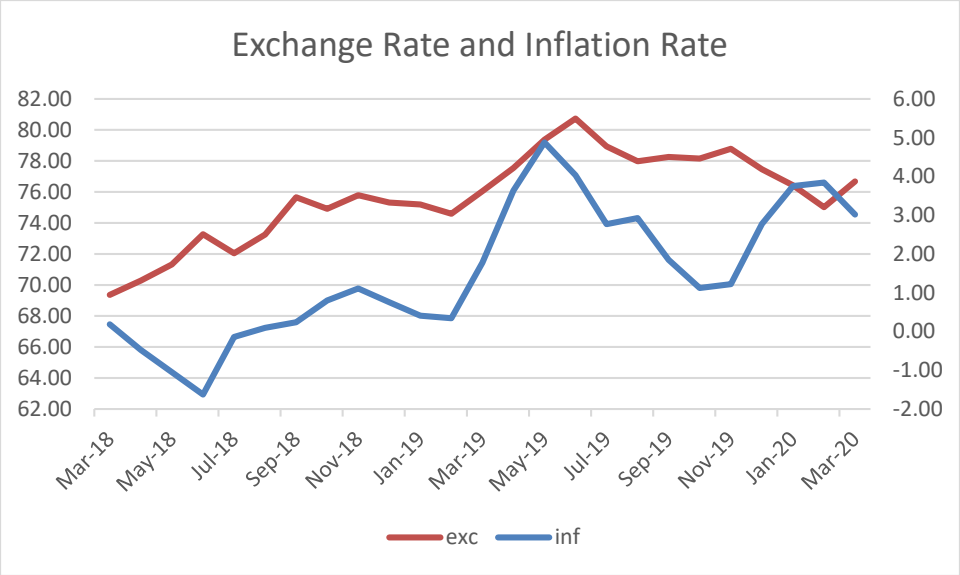


Figure 1: Exchange Rate and Inflation Rate from March, 2018 until March, 2020

The figure 1 shows the exchange rate and the inflation rate curves from March, 2018 until March, 2020. As it is obvious from the figure, the inflation curve is sloping downward in the second quarter of 2018 while the exchange rate curve moves upwards at a slower pace. In the second half of 2018, both curves move a little upwards with the exchange rate curve to be more volatile. In 2019, both curves follow the same trend to a higher degree. In the first quarter of 2020, both curves move the opposite directions. Therefore, it can be concluded that both variables seem to be correlated to some degree.

For better understanding the correlation between the mentioned variables and knowing whether the two variables are correlated or not, the correlation of the variables is calculated and shown in the following table:

	INF	EXC
INF	1.000000	0.737902
EXC	0.737902	1.000000

Table 1: Correlation between the Exchange Rate and Inflation Rate

According table 1, the correlation of the exchange rate and the inflation rate is equal to 0.737 meaning that both variables are 73.79 percent correlated. The calculated correction shows that the pass through effect of the exchange rate on inflation is 73.79 percent in Afghanistan.

Regression Results:

In this section, a single equation model is estimated and considered for the regression analysis. In the model the inflation rate is the dependent variable while the exchange rate is the independent variable.

Dependent Variable: INF
Method: Least Squares
Date: 07/05/20 Time: 11:16
Sample: 2018M03 2020M03
Included observations: 25

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-32.06140	6.410594	-5.001314	0.0000
EXC	0.443765	0.084632	5.243454	0.0000

R-squared	0.544499	Mean dependent var	1.528675
Adjusted R-squared	0.524694	S.D. dependent var	1.741356
S.E. of regression	1.200533	Akaike info criterion	3.280026
Sum squared resid	33.14942	Schwarz criterion	3.377537
Log likelihood	-39.00033	Hannan-Quinn criter.	3.307072
F-statistic	27.49381	Durbin-Watson stat	0.805648
Prob(F-statistic)	0.000026		

Table 2: Estimation Output of the Simple Regression Model

According to the above estimation output, the exchange rate is statistically a significant variable to explain the inflation variable. The coefficient of the exchange rate is equal to 0.44 which clearly shows that the exchange rate influences the inflation rate by 44 percent while the rest 56 percent relates to other variables that influence the inflation rate which are not included in this simple regression model.

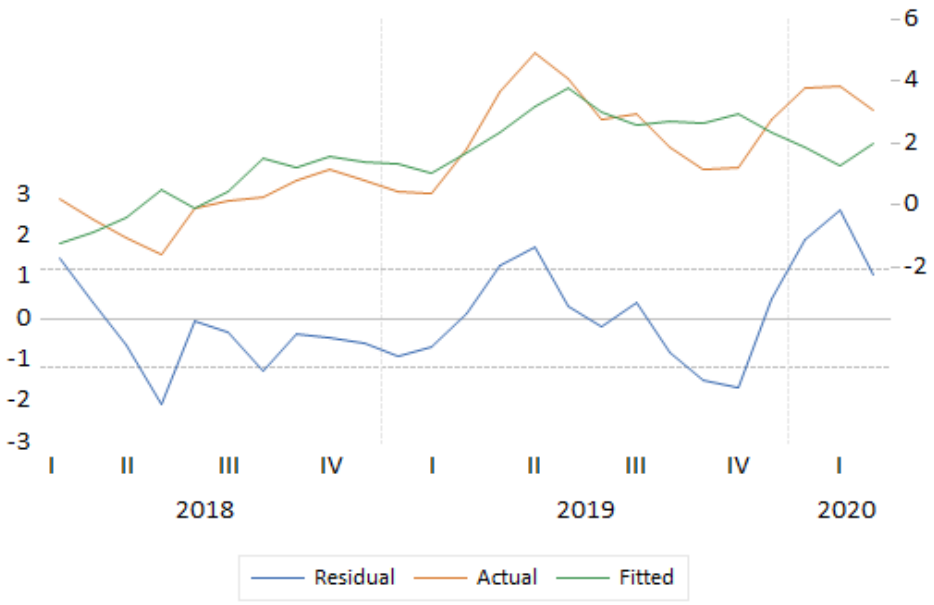


Figure 2: Actual, Fitted, and Residual Graph of the Estimated Regression Model

The figure 2 illustrates the actual, fitted and residual graph of the estimation output. As it is illustrated in table 2, the coefficient of determination (R-Squared) of the model is equal to 0.54 and as it is observed from the above graph, the model is poorly fitted. The residual graph also spikes upwards and downwards out of the set boundaries.

According to the Breusch-Godfrey Serial Correlation LM test, the residual of the model suffers from serial correlation and according to the Breusch-Pagan-Godfrey test, the residual of the model is not heteroskedastic. The following graph illustrates the histogram and normality test of the residual of the model:

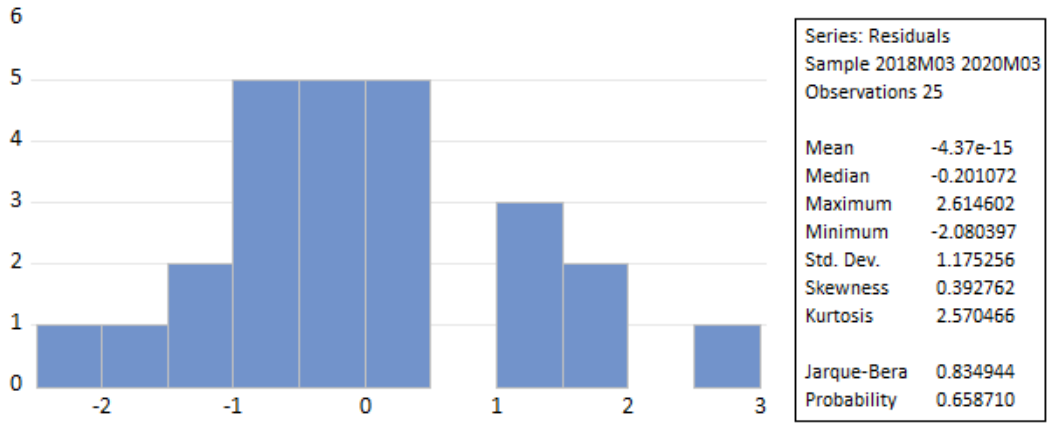


Figure 3: Residual Normality Test Output and Histogram of the Residual of the Regression Model

The figure 3 and the test results show that the residual of the model is normally distributed.

For testing the causal relationship of exchange rate and inflation rate, the pair-wise Granger Causality tests are carried out and the outcome of the tests is shown in the below table:

Pairwise Granger Causality Tests
Date: 07/05/20 Time: 11:47
Sample: 2018M03 2020M03
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EXC does not Granger Cause INF	25	4.92601	0.0182
INF does not Granger Cause EXC		1.32671	0.2877

Table 3: Pair-wise Granger Causality Test Output of Exchange Rate and Inflation Rate

The pair-wise Granger Causality tests indicate that the exchange rate does cause the inflation rate. Therefore, it can be concluded that the exchange rate has a significant influence on the inflation rate in Afghanistan.

Other Factors Affecting the Inflation:

As mentioned earlier, the exchange rate is a major factor that influences the inflation rate in countries with large amounts of exports such as Afghanistan. However, there are some other factors that influence the inflation rate which are mentioned briefly as follows:

- **Higher Demand for Goods and Services:** whenever the demand for goods or services increases while the supply remains unchanged or lessens due to some reasons, the inflation rate in the economy goes upwards. This type of inflation is called the demand-pull inflation. This type of inflation is usually observed during the economic boom when the economy experiences lower level unemployment with rising wages. This situation increases the confidence of the consumers which in turn leads to higher consumer spending. Thus, higher consumer spending causes the inflation rate to go up.

- **Increase in Production Costs**: higher prices for the production factors such as raw material and wages, increases the costs of production of goods and services. As a result, the extra costs are passed to the consumer prices. Hence, the inflation rate increases in the country. This type of inflation is called the cost-push inflation. Generally, the cost-push inflation is observed when the prices for oil and metals rises since the mentioned materials are the major inputs for producing many goods in the economy. Moreover, whenever the economy is performing well and there is low level of unemployment, the wages usually rises which also increases the costs of production.

- **Expansionary Monetary Policy:** when the Central Bank implements expansionary monetary policy, it provides more liquidity to the economy. Hence, a lot of currency gets into the circulation and as a result, aggregate demand increases which paves the way for an increase in prices.

- **Expansionary Fiscal Policy:** expansionary fiscal policy also influences the aggregate demand positively. If the government decides to cut taxes, this will increase the purchasing power of firms and households which will result in higher aggregate demand. Besides, in case the government decides to spend more on development projects or

infrastructure project, this will also stimulate the economy and cause the aggregate demand to increase which results an increase in prices.

- **Market Monopoly:** another important reason behind an increase in the prices of goods and services is the existence of market monopoly. If the suppliers of a particular product or service are in tough competition and with the passage of time and lack of required regulatory framework and its proper implementation by the government, the competition ends in the market and market monopoly comes to existence. This situation usually leads to higher prices for goods and services.

- **Seasonality:** the prices of agricultural products such as fruits, and vegetables increase in case they are out season since the supply of these products is lower out of season while the demand for them remains unchanged (the demand may increase or slightly decrease in some scenarios). Thus, this situation leads to higher prices for the agricultural products which are out of season.

- **Speculation:** the purchase of large amounts goods and maintaining the goods to be sold later at a higher price for the purpose receiving more profit is called speculation. For instance, some traders purchase liquid gas in summer and maintain them until winter. Then in the winter, the liquid gas is supplied to the market and sold at a higher price. Speculation of goods for the purpose of maximizing profits results in the temporary increase in prices of goods in the market.

- **Shocks to the Economy:** if the economy is experiencing shocks, it may cause the inflation to rise. Shocks to the economy may be of various types such as economic shocks like supply shocks, demand shocks and other types of shocks due to non-economic reasons such as natural disasters floods that destroys arable lands, insects which destroys crops and so on.

- **Imported inflation:** countries with large amounts of imports such as Afghanistan may experience an increase in the prices of imported goods. For instance, if the prices of

goods increases in the countries form which goods are imported, the price of these imported goods increases in the domestic market automatically.

Conclusion:

Afghanistan is an import dependent country that faces perpetual trade balance deficit. Most of the goods particularly non-food items are imported from neighboring countries and international markets since Afghanistan is experiencing low level of production of goods compared to its needs. As it is well-known fact that for importing goods from other countries and international markets, foreign currencies are required and foreign currencies are usually received from exporting goods and services. According to the data from the external sector of the monetary policy department of Da Afghanistan Bank, the import of goods of Afghanistan reached USD 6.776 billion in 2019 while the amount of export of goods stood at USD 0.863 billion indicating a trade balance of USD 5.913 billion.

The above mentioned situation leads to higher demand for foreign currencies, especially the U.S. dollars in the foreign exchange markets in Afghanistan. Higher demand for the U.S. dollar levels the way for the depreciation of the domestic currency. The depreciation of the domestic currency causes the prices of the imported products to rise. This phenomenon which is known as the pass-through effect of the exchange rate on inflation is a one of the major factors that influences the prices of goods in the country.

The result qualifies common view that countries with higher dollarization exhibit higher inflation. The regression result of the study shows that exchange rate influences the inflation rate by 44 percent while the rest 56 percent relates to other variables that influence the inflation rate that are not included in this simple regression model which is consistent with (Carranza et all, 2004) indicating that the exchange rate pass-through is significantly higher in highly dollarized economies and the empirical analysis of this study is consistent with the accepted view (Reinhart et al, 2003) as well. The result robustly supports that high level depreciations have negative effect on pass-through coefficient and this negative effect is higher in the high dollarized economy.

A substantial literature covering many countries explains that the effect of changes in exchange rate is weaker on the domestic prices at consumer level. However, the case of Afghanistan is much different since Afghanistan is an import-dependent country and most of the goods which are consumed domestically are imported from neighboring countries and international markets. The correlation analysis of the data for both variables describes that the nominal exchange rate and inflation rate indicates a strong relationship of 73.79 percent. According to the estimated regression model, the exchange rate is a statistically significant variable for explaining the inflation variable. Moreover, the pair-wise Granger Causality tests indicate that the exchange rate causes inflation.

In addition, there are a number of other factors which can cause the prices to rise in the country as well. These other factors are as follows:

- Higher demand for goods and services
- Increase in the production costs
- Expansionary monetary and fiscal policies
- Market monopoly
- Seasonality
- Speculation
- Shocks to the economy
- Imported inflation

It is worth mentioning that the international community is helping Afghanistan generously these days and that's why sufficient foreign currencies enter the country. As a result, the Central Bank of Afghanistan is able to arrange adequate amounts of foreign currencies, particularly the U.S. dollars and supplies them to the foreign exchange market in the form of regular foreign currency auctions and because of the Central Bank's market intervention, the afghani exchange rate is stable and there is stability in inflation in the country. The efforts of the Central Bank can be considered a short term solution for the stability of the exchange rate and inflation in Afghanistan. For long term stabilization in the exchange rate and inflation in the country, higher investment level and higher industrial and agricultural production is essential. Therefore, efforts should be made by the government for increasing foreign and domestic investments in the country.

References:

1. Razafimahefa Ivohasina F (2012). Exchange Rate Pass-Through in Sub-Saharan African Economies and its Determinants, IMF Working Paper WP/12/141, International Monetary Fund
2. Takhtamanova Yelena (2008). Understanding Changes in Exchange Rate Pass-Through, Working Paper 2008-13, Federal Reserve Bank of San Francisco
3. Zorzi Michele Ca', Hahn Elke, and Sanchez Marcelo (2007). Exchange Rate Pass-Through in Emerging Markets, Working Paper Series No 739, European Central Bank
4. Yetman James, and Bevereux Michael B (2002). Price Setting and Exchange Rate Pass-through*: Theory and Evidence*, Hong Kong Institute for Monetary Research, and University of British Columbia
5. Achsani, N. A., Fauzi, A. J. F. A., & Abdullah, P. (2010). The relationship between inflation and real exchange rate: comparative study between Asean+ 3, the EU and North America. *European Journal of Economics, Finance and Administrative Sciences*, *18*, 1450-2275.
6. Buffie, E. F., Airaudo, M., & Zanna, F. (2018). Inflation targeting and exchange rate management in less developed countries. *Journal of International Money and Finance*, *81*, 159-184.
7. Carranza, L., J. E. Galdn-SÆnchez and J. Gmez-Biscarri. 2004. Exchange Rate and Inflation Dynamics in Dollarized Economies. University of Navarra. Mimeo.
8. De Grauwe, P., & Schnabl, G. (2008). Exchange rate stability, inflation, and growth in (South) Eastern and Central Europe. *Review of Development Economics*, *12*(3), 530-549.
9. Fetai, B., Koku, P. S., Caushi, A., & Fetai, A. (2016). The relationship between exchange rate and inflation: The case of Western Balkans Countries. *Journal of Business, Economics and Finance*, *5*(4), 360-364.
10. Gregorio, J. D., Tokman, A., & Valdés, R. (2005). Flexible exchange rate with inflation targeting in Chile: Experience and issues.
11. Monfared, S. S., & Akın, F. (2017). The relationship between exchange rates and inflation: The case of Iran. *European Journal of Sustainable Development*, *6*(4), 329-329.
12. Wang, Y. (2013). Impact of exchange rate changes on inflation: case of China.

Appendix:

Data Sample: From Jan-2015 to Mar-2020

Dependent Variable: INF
Method: Least Squares
Date: 08/11/20 Time: 13:17
Sample: 2015M01 2020M03
Included observations: 63

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-2.841235	3.905126	-0.727566	0.4697
EXC	0.074889	0.055701	1.344488	0.1838

R-squared	0.028781	Mean dependent var	2.391180
Adjusted R-squared	0.012859	S.D. dependent var	2.579693
S.E. of regression	2.563053	Akaike info criterion	4.751507
Sum squared resid	400.7238	Schwarz criterion	4.819543
Log likelihood	-147.6725	Hannan-Quinn criter.	4.778266
F-statistic	1.807649	Durbin-Watson stat	0.175463
Prob(F-statistic)	0.183769		

Table 1: Estimation Output

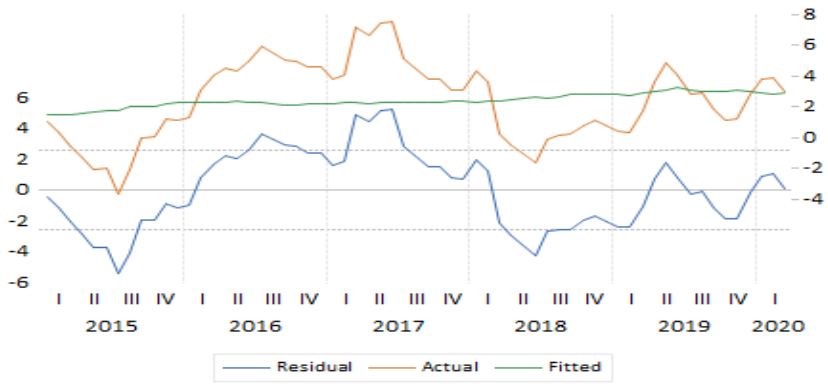


Figure 1: Actual, Fitted, Residual Graph

Pairwise Granger Causality Tests
Date: 08/11/20 Time: 13:15
Sample: 2015M01 2020M03
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EXC does not Granger Cause INF	63	1.08741	0.3439
INF does not Granger Cause EXC		2.76557	0.0713

Table 2: Pair-wise Granger Causality Tests

	INF	EXC
INF	1.000000	0.169649
EXC	0.169649	1.000000

Table 3: Correlation between Variables

Data Sample: From Jan-2010 to Mar-2020

Dependent Variable: INF
Method: Least Squares
Date: 08/11/20 Time: 13:40
Sample: 2010M01 2020M03
Included observations: 123

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	14.12488	2.112553	6.686165	0.0000
EXC	-0.161069	0.034179	-4.712557	0.0000

R-squared	0.155076	Mean dependent var	4.316658
Adjusted R-squared	0.148093	S.D. dependent var	4.350550
S.E. of regression	4.015505	Akaike info criterion	5.634330
Sum squared resid	1951.038	Schwarz criterion	5.680056
Log likelihood	-344.5113	Hannan-Quinn criter.	5.652904
F-statistic	22.20819	Durbin-Watson stat	0.102047
Prob(F-statistic)	0.000007		

Table 4: Estimation Output

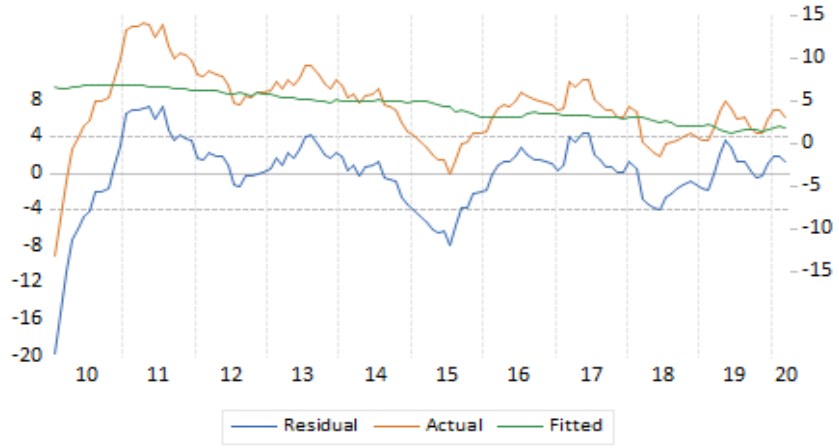


Figure 2: Actual, Fitted, Residual Graph

Pairwise Granger Causality Tests
Date: 08/11/20 Time: 13:45
Sample: 2010M01 2020M03
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EXC does not Granger Cause INF	123	4.21474	0.0171
INF does not Granger Cause EXC		0.55661	0.5746

Table 5: Pair-wise Granger Causality Tests

	INF	EXC
INF	1.000000	-0.393797
EXC	-0.393797	1.000000

Table 6: Correlation between Variables

Data Sample: From Mar-2005 to Mar-2020

Dependent Variable: INF
Method: Least Squares
Date: 08/11/20 Time: 13:50
Sample: 2005M03 2020M03
Included observations: 181

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	20.75876	4.072945	5.096744	0.0000
EXC	-0.251605	0.069868	-3.601152	0.0004

R-squared	0.067554	Mean dependent var	6.313708
Adjusted R-squared	0.062345	S.D. dependent var	9.813609
S.E. of regression	9.502770	Akaike info criterion	7.352032
Sum squared resid	16164.17	Schwarz criterion	7.387375
Log likelihood	-663.3589	Hannan-Quinn criter.	7.366361
F-statistic	12.96829	Durbin-Watson stat	0.075590
Prob(F-statistic)	0.000410		

Table 7: Estimation Output

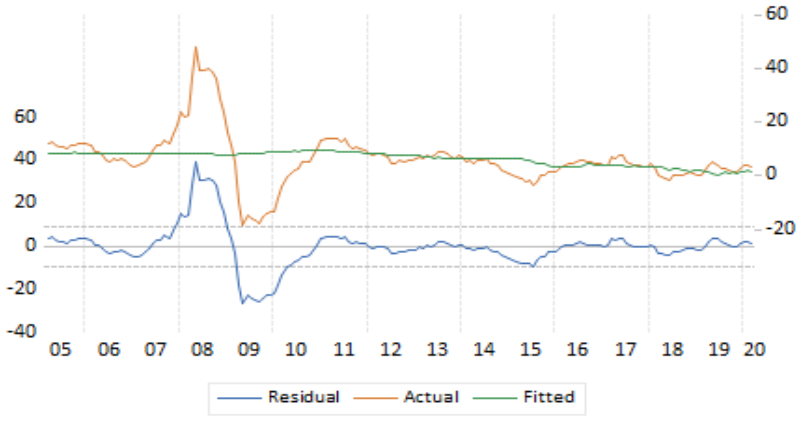


Figure 3: Actual, Fitted, Residual Graph

Pairwise Granger Causality Tests
Date: 08/11/20 Time: 13:54
Sample: 2005M03 2020M03
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
EXC does not Granger Cause INF	179	1.85667	0.1593
INF does not Granger Cause EXC		0.28349	0.7535

Table 8: Pair-wise Granger Causality Tests

	INF	EXC
INF	1.000000	-0.259912
EXC	-0.259912	1.000000

Table 9: Correlation between Variables

Data Sample: From Apr-2005 to Mar-2020 (After taking first difference of both variables), also includes dummy variable

Dependent Variable: DINF
Method: Least Squares
Date: 08/13/20 Time: 10:07
Sample (adjusted): 2005M04 2020M03
Included observations: 180 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.067929	0.231526	-0.293395	0.7696
DEXC	-0.025419	0.246583	-0.103083	0.9180
DUM	0.094799	0.466435	0.203242	0.8392

R-squared	0.000350	Mean dependent var	-0.049190
Adjusted R-squared	-0.010946	S.D. dependent var	2.606889
S.E. of regression	2.621117	Akaike info criterion	4.781605
Sum squared resid	1216.035	Schwarz criterion	4.834821
Log likelihood	-427.3444	Hannan-Quinn criter.	4.803182
F-statistic	0.030981	Durbin-Watson stat	1.140269
Prob(F-statistic)	0.969500		

Table 10: Estimation Output

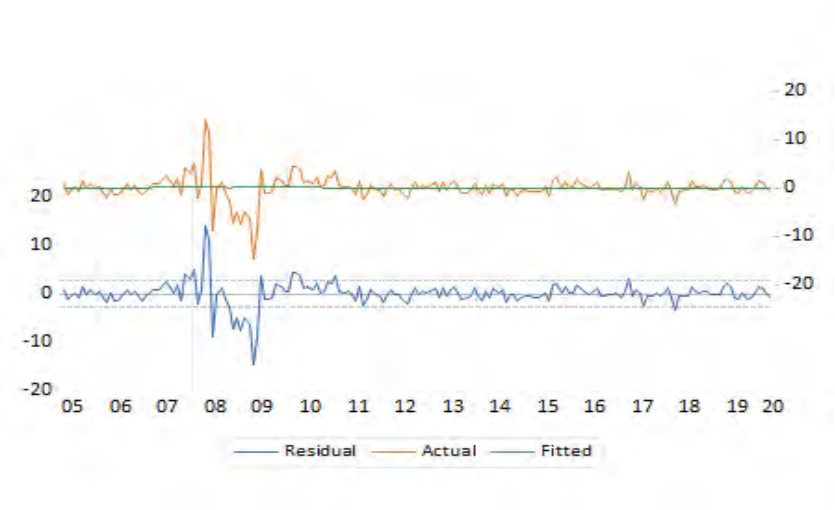


Figure 4: Actual, Fitted, Residual Graph

Pairwise Granger Causality Tests
Date: 08/13/20 Time: 10:13
Sample: 2005M03 2020M03
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DEXC does not Granger Cause DINF	178	1.32837	0.2676
DINF does not Granger Cause DEXC		0.60277	0.5484

Table 11: Pair-wise Granger Causality Tests

	DINF	DEXC
DINF	1.000000	-0.010800
DEXC	-0.010800	1.000000

Table 12: Correlation between Variables

Data Sample: From Jan-2010 to Mar-2020 (After taking first difference of both variables), also includes dummy variable

Dependent Variable: DINF
Method: Least Squares
Date: 08/13/20 Time: 10:17
Sample: 2010M01 2020M03
Included observations: 123

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.002513	0.113550	0.022130	0.9824
DEXC	-0.067994	0.116671	-0.582786	0.5611
DUM	2.038629	0.409774	4.975007	0.0000

R-squared	0.184543	Mean dependent var	0.136133
Adjusted R-squared	0.170952	S.D. dependent var	1.276365
S.E. of regression	1.162157	Akaike info criterion	3.162520
Sum squared resid	162.0730	Schwarz criterion	3.231110
Log likelihood	-191.4950	Hannan-Quinn criter.	3.190381
F-statistic	13.57839	Durbin-Watson stat	1.512268
Prob(F-statistic)	0.000005		

Table 13: Estimation Output

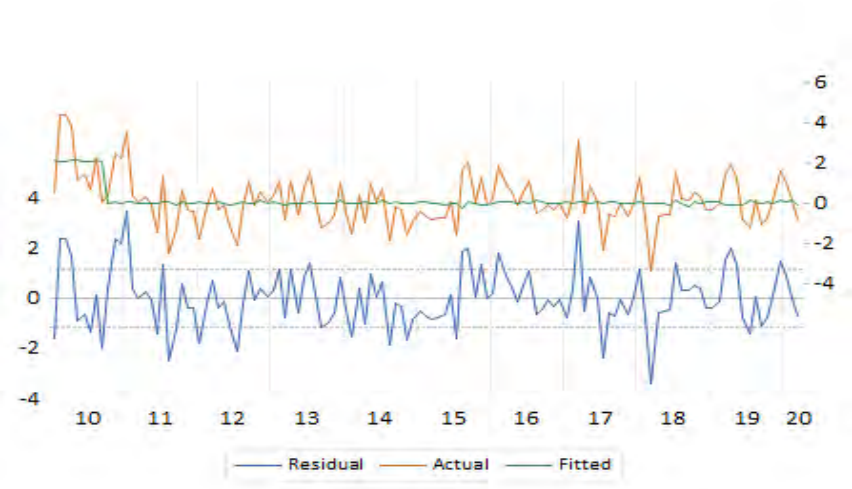


Figure 5: Actual, Fitted, Residual Graph

Pairwise Granger Causality Tests
Date: 08/13/20 Time: 10:25
Sample: 2010M01 2020M03
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DEXC does not Granger Cause DINF	123	0.69177	0.5027
DINF does not Granger Cause DEXC		0.58108	0.5609

Table 14: Pair-wise Granger Causality Tests

	DINF	DEXC
DINF	1.000000	-0.127869
DEXC	-0.127869	1.000000

Table 15: Correlation between Variables

Data Sample: From Apr-2005 to Mar-2020 (After taking first difference of both variables)

Dependent Variable: DINF
Method: Least Squares
Date: 08/15/20 Time: 09:29
Sample (adjusted): 2005M04 2020M03
Included observations: 180 after adjustments

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-0.043838	0.198348	-0.221017	0.8253
DEXC	-0.034810	0.241561	-0.144105	0.8856

R-squared	0.000117	Mean dependent var	-0.049190
Adjusted R-squared	-0.005501	S.D. dependent var	2.606889
S.E. of regression	2.614049	Akaike info criterion	4.770727
Sum squared resid	1216.319	Schwarz criterion	4.806204
Log likelihood	-427.3654	Hannan-Quinn criter.	4.785111
F-statistic	0.020766	Durbin-Watson stat	1.139628
Prob(F-statistic)	0.885581		

Table 16: Estimation Output

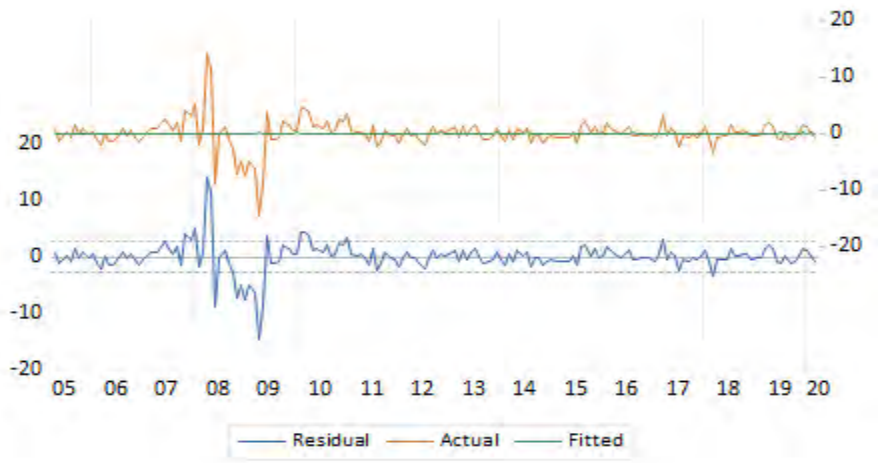


Figure 6: Actual, Fitted, Residual Graph

Pairwise Granger Causality Tests
Date: 08/15/20 Time: 09:34
Sample: 2005M03 2020M03
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DEXC does not Granger Cause DINF	178	1.32837	0.2676
DINF does not Granger Cause DEXC		0.60277	0.5484

Table 17: Pair-wise Granger Causality Tests

	DINF	DEXC
DINF	1.000000	-0.010800
DEXC	-0.010800	1.000000

Table 18: Correlation between Variables

Data Sample: From Jan-2010 to Mar-2020 (After taking first difference of both variables)

Dependent Variable: DINF
Method: Least Squares
Date: 08/15/20 Time: 09:36
Sample: 2010M01 2020M03
Included observations: 123

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.176769	0.118139	1.496276	0.1372
DEXC	-0.177712	0.125308	-1.418204	0.1587

R-squared	0.016351	Mean dependent var	0.136133
Adjusted R-squared	0.008221	S.D. dependent var	1.276365
S.E. of regression	1.271108	Akaike info criterion	3.333781
Sum squared resid	195.5015	Schwarz criterion	3.379508
Log likelihood	-203.0276	Hannan-Quinn criter.	3.352355
F-statistic	2.011302	Durbin-Watson stat	1.220902
Prob(F-statistic)	0.158702		

Table 19: Estimation Output

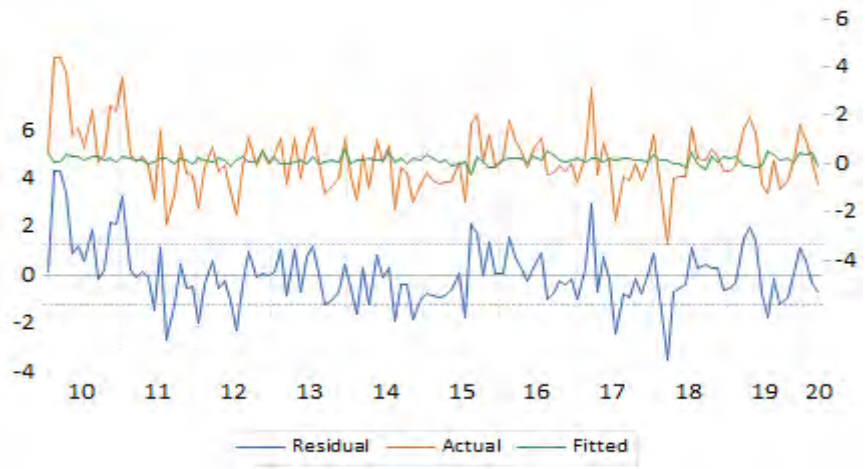


Figure 7: Actual, Fitted, Residual Graph

Pairwise Granger Causality Tests
Date: 08/15/20 Time: 09:39
Sample: 2010M01 2020M03
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DEXC does not Granger Cause DINF	123	0.69177	0.5027
DINF does not Granger Cause DEXC		0.58108	0.5609

Table 20: Pair-wise Granger Causality Tests

	DINF	DEXC
DINF	1.000000	-0.127869
DEXC	-0.127869	1.000000

Table 21: Correlation between Variables

Data Sample: From Jan-2015 to Mar-2020 (After taking first difference of both variables)

Dependent Variable: DINF
Method: Least Squares
Date: 08/13/20 Time: 10:28
Sample: 2015M01 2020M03
Included observations: 63

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.018143	0.140388	0.129233	0.8976
DEXC	0.025187	0.129544	0.194429	0.8465

R-squared	0.000619	Mean dependent var	0.025481
Adjusted R-squared	-0.015764	S.D. dependent var	1.064910
S.E. of regression	1.073271	Akaike info criterion	3.010530
Sum squared resid	70.26654	Schwarz criterion	3.078566
Log likelihood	-92.83170	Hannan-Quinn criter.	3.037289
F-statistic	0.037803	Durbin-Watson stat	1.510496
Prob(F-statistic)	0.846486		

Table 22: Estimation Output

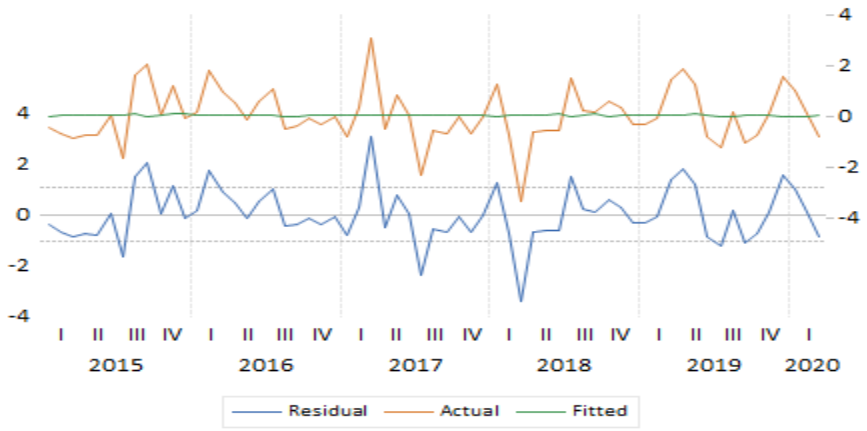


Figure 8: Actual, Fitted, Residual Graph

Pairwise Granger Causality Tests
Date: 08/13/20 Time: 10:32
Sample: 2015M01 2020M03
Lags: 2

Null Hypothesis:	Obs	F-Statistic	Prob.
DEXC does not Granger Cause DINF	63	1.46074	0.2405
DINF does not Granger Cause DEXC		0.48984	0.6152

Table 23: Pair-wise Granger Causality Tests

	DINF	DEXC
DINF	1.000000	0.024886
DEXC	0.024886	1.000000

Table 24: Correlation between Variables