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AN ANALYSIS OF EXCHANGE RATE PASS-THROUGH AND IMPACT ON DOMESTIC INFLATION IN SRI LANKA

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Abstract: Continuous depreciation of the Sri Lanka Rupee and huge inflation caused by skyrocketing of fuel and food prices Sri Lanka is now experiencing an external imbalance as well as instability in the domestic economy. Policy makers are confronting enormous challenges due to these external and domestic shocks that would hinder to effective policy implementation. Therefore, an analysis of external shocks and the exchange rate pass-through has now become timely area to understand the size and the degree and its real impact on the economy. Therefore, this paper examines the effectiveness of exchange rate pass-through to import price, producer price and consumer price and impact on the inflation in Sri Lanka. For this purpose, the analysis is based on a Vector Auto Regression (VAR) approach for the period of 2010Q1 -2021Q4.The findings of this study confirms that the pass-through effect of external shocks on exchange rate and exchange rate on import price, producer price and consumer price are incomplete. The impact of change in the exchange rate on the import price shows that the one percent depreciation of Sri Lanka rupee results man increase in the import price index by 0.31 percent in the first quarter and 0.42 percent in the second quarter. The pass-through effects of exchange rate on consumer price is also incomplete across all the periods. The consumer price increases by 0.22 percent when the domestic currency depreciates by one percent. However, in the fourth quarter, it shows a negative response confirming that consumer price decrease by 0.36 percent when the nominal effective exchange rate increases by one percent. The estimated results suggest that the pass-through effects of international oil price shocks and exchange rate shocks appear to be quite ambiguous and provides puzzling results for some periods.

INTRODUCTION

Most of the small open economies are highly vulnerable to the external shocks and vulnerabilities due to increasing interconnectedness and the openness of the global

economies. Spillover of these external shocks could have an adverse impact on the stability of the external sector as well as the domestic economy. The adverse effects of external shocks could also create much pressure on the exchange rate and ultimately domestic inflation Therefore, understanding the degree in which the domestic prices adjust to the changes in the exchange rate has become now paramount important to policy makers and economist to manage the exchange rate of the country to achieve a stable price level in the domestic economy. The exchange rate is considered as one of the key determinants of conducting monetary policy by the central banks because the degree to which domestic prices adjust to exchange rate movements is important to understand the dynamics of the inflation and guide the monetary policy (Jong *et al.,* 2019). Further, according to the Choudhry and Hakura (2001), degree of pass-through of exchange rate to domestic prices is a vital factor in debates when determining both optimal monetary and exchange rate policies

In Sri Lanka, under the monetary management of the Central Bank of Sri Lanka (CBSL), the final target of the price stability is achieved by taking into account of major factors of the economy including inflation, economic growth, balance of payments and other economic factors. The analysis of the effect of exchange rate variations on domestic prices is important in ensuring that central banks are conducting monetary and foreign exchange policy optimally (Ponomarev, 2014). According to the Wimalasuriya (2007), the degree of exchange rate pass-through affects the effectiveness of monetary policy mainly through expenditure switching effects, with low exchange rate pass-through that is favorable to monetary policy effectiveness.

At present the stability of the macroeconomy of the country has become more challenging phenomena due to the significant depreciation of the of the Sri Lanka Rupee (LKR) and the higher inflation. Therefore, analyzing the dynamic and the magnitude of the Exchange Rate Pass-Through is now a timely important economic are for policy makers, given the severity of its impact on inflation because the pass-through degree in exchange rate changes has put pressure on the domestic inflation that has been resulted in uncertainty of economic structures, especially monetary policy (Phiakeo, 2017). Further, the significance of exchange rate changes in macroeconomic adjustment is determined, to a large extent, by its influence on domestic prices and the speed of its transmission (Bada, 2016).

Generally, Exchange Rate Pass-Through is defined as the transmission of change of the exchange rate into the prices of import goods in the domestic market. That means it is the elasticity of prices of imports relevant to the domestic currency in respect to one percent changes in the exchange rate. The pass-through can occur in two ways namely complete pass-through and incomplete passthrough. Complete pass-through is the situation where the prices of the import of the domestic currency change in the same magnitude when the exchange rate changes by one percent whereas incomplete pass-through occurs when the magnitude of change is less than one percent.

According to the Kotil (2020), Exchange Rate Pass-Through is complete when most of the exchange rate movement is transferred to domestic prices. If the degree of pass-through is high, then the then the relative changes of the prices of imports in the domestic

currency is high casing pay higher price for imports goods due to the higher fluctuations in the Nominal Exchange Rate (NER). The higher prices of imports then lead to an increase the domestic inflation. This means, when the foreign exchange rate deprecates, prices of imports goods will go up thereby increasing the cost for import goods and decreasing the demand for imported goods. The decline in the demand for foreign goods leads to increase in demand for domestic good as it is relatively cheaper to consume. As a result, domestic aggregate demand would increase causing demand-driven inflation in the domestic economy. On the other hand, relative low cost of local products has demand from other countries and hence increase the exports of goods and services in the domestic economy. The movements in the nominal exchange rate have incited concerns regarding the pass-through of these fluctuations onto domestic prices due to the increased openness of most economies (Taylor, 2000) like Sri Lanka.

The main objective of this paper is to analyze the effectiveness of exchange rate pass-through to import price, producer price and consumer price and the impact on the inflation. In order to pursue this objective, the analysis examine the exchange rate pass-through of the Sri Lankan economy taking into account of the continuous depreciation of Sri Lanka rupee in the recent past. Further, the analysis extends to examine the long run relationship between the exchange rate and the domestic inflation. Accordingly, the first section of study begins with analysis of the impact of external shocks on the exchange rate. The second stage of this study analyze the effectiveness of the exchange rate pass-through to three prices impact on inflation and economic growth by employing the Vector Autoregression (VAR) model.

The continuous depreciation of the domestic currency further intensifies the situation of the prevailing ongoing twin crisis, namely economic and debt crisis in Sri Lanka. Even though, the current economic crisis starts to begin as pandemic-induced economic crisis, the country specific structural issues including prolonged political instability, high external debt burden, corruptions and poverty and inequality has created substantial impact on almost all the sectors of the economy, including monetary sector, fiscal sector, financial sector and external sector. Given the timely importance of analyzing the impact of depreciation of domestic currency and the relationship between the exchange rate and inflation has become now essential part for formulation and implementation of macroeconomic policies for the central banks in order to achieve the desired economic objectives. According to the Ito and Sato (2007), the variations in the exchange rate have major implications for the designing of macroeconomic policies. Further, Taylor (2000) also pointed out that understanding the degree of exchange rate pass-through has become vital when conducting monetary policy and adjusting inflation. Therefore, understanding the degree and the size of exchange rate pass-through have become paramount importance for policy makers when managing inflation to achieve the macroeconomic objectives.

The rest of the sections of this paper is organized as follows. The section two focuses on the literature review of the empirical and recent analysis of the impact of exchange rate

on domestic inflation. The section three is based on the theoretical aspects of the ERPT focusing the Sri Lankan economy. The next section discusses about the analytical framework including methodology, variables and date which will be used to estimate the results. The section five is focused on the discussion of the empirical results and final section describes the conclusion of the analysis.

2.   A REVIEW OF LITERATURE ON EMPIRICAL AND RECENT STUDIES

This section of the study provides a systematic review of the empirical and recent analysis of the exchange rate pass-through and its impact on inflation A growing number of research on ERPT has been produced to analyze the degree of the pass-through, magnitude of the pass-through, determinants of the pass-through and the relationship with the macroeconomic variables. Much of the early work in this area centers around the study of the pass-through effect of the exchange rate on domestic price level. This study is an the effectiveness of exchange rate pass-through to import price, producer price and consumer price and impact on the inflation.

McCarthy (2000) who analyzed the impact of exchange rates and import prices on domestic producer price and consumer price for some industrial countries. He employed VAR as an analytical tool to estimate the results while incorporating the distribution of the pricing chain. The estimated results suggested that exchange rate have modest effect on the domestic inflation though import have significant impact which is larger for the countries which have a larger share of import, persistent exchange rate and import prices.

Choudhri and Khan (2002) examined the exchange rate pass-through effect on consumer prices in the Pakistan economy using the Regression analysis. They employed the set of variables including Exchange Rate, Domestic Consumer Price Index and Foreign Consumer Price Index and estimate the effect of Exchange Rate on Consumer Price Index using the control variable of Foreign Consumer Price Index. Based on the results, they emphasized that the devaluation of rupee is not inflationary, and the analysis confirmed that there is no impact of rupee devaluation on inflation.

Following the McCarthy (2000), Hahn (2003) who examined the pass-through of external shocks including oil price shocks, exchange rate shocks and non-oil import price shocks to import prices, producer prices and consumer prices in Euro Zone. Similar to the McCarthy, he used VAR methodology incorporating the distribution chain of pricing. According to his findings, pass-through of non-oil import price shock is larger as well as faster compared to the pass-through effect of exchange rate shock and the oil price shock. Further, he confirmed that the size and the speed of pass-through effect relevant to these shocks decreasing along the distribution chain

Berument, H., & Pasaogullari, M. (2003) conducted an analysis on effects of real exchange rate on output and inflation. They demonstrated that there is a negative correlation between output and real exchange rate. Further, they pointed out that there is a long run relationship between among the variables of exchange rate, inflation and output using the

VAR analysis. In addition, they showed that movements in the real exchange rate is key to the variability of economic output and there is a permanent negative output response after a real devaluation of the exchange rate. Finally, they pointed out that devaluation is inflationary.

Ito & Sato (2007) produced the comparative analysis on the ERPT and Inflation for East Asia and Latin America employing the SVAR. According to their findings, EXRP is higher in Latin America and Turkey though it is low for the South Asian countries except for Indonesia. Further, these findings confirm that there is a strong response of CPI to the exchange rate shocks and the estimated results confirmed that the supply of large amount base money has an impact on increasing domestic inflation in Indonesia compared to other countries. Also, they demonstrated that under the normal situation of the economy, the gradual real depreciation of the exchange rate leads to an increase the net export whereas the significant devaluation of the exchange rate causes to increase the prices of import goods in local currency and after that will transmit to the consumer prices.

Wimalasuriya (2007) examined the ERPT into prices in Sri Lanka and analyze the employing the two econometrics models including the Log Linear Regression model and the VAR model. The estimated results suggested that the one percent depreciation of the nominal effective exchange rate leads to change the import prices is 0.5 percent which is less than one percent confirming that exchange rate pass-through in Sri Lanka is incomplete based on the estimated results. Further, according to the estimated results for the pass-through into input prices, trade prices, wholesale producer prices and the retail consumer prices exchange rate pass-through to consumer prices is around thirty percent. However, pass-through into wholesale producer price was complete. Further, the estimated results for the VAR model suggested that exchange could pose significant impact for the trade balance in Sri Lankan economy.

A study on pass-through of exchange rate, oil price, and import price shocks to inflation in Sri Lanka conducted by Duma (2008) revealed that incomplete pass-through of external shocks to inflation in Sri Lanka. Further, he pointed out that the pass-through consumer prices increase from about 10 percent in the first month of the shocks. The pass-through effect of oil price shock on domestic prices is small and negative and the results of parallel model suggested that the pass-through effect of oil price shock is much larger on administered prices in comparison to the domestic consumer price in Sri Lanka.

Bada *et al.*, (2016) conducted an analysis of ERPT for the Nigeria using the VECM model for the period of 1995 Q1 to 2015Q1.The study is based on the pass-through effect at the aggregate level into import prices and consumer prices. The estimated results confirmed that the ERPT Consumer Price Index is incomplete. Pass-through elasticities for the long run were 0.24 and 0.30 and the pass-through effect on import prices is higher than the effect on consumer prices confirming that the ERPT effects decline along the pricing chain. In contrast to this result, Mohammed, and Bashir (2018), pointed out that opposite view of ERPT for Nigeria. According to their analysis on ERPT to import prices and consumer

prices using the Threshold Regression model, ERPT to import prices is substantial and complete. Also, pass-through from import prices to consumer prices is low and incomplete.

An analysis of impact of exchange rate pass-through on inflation and economic growth for Southeast Asian countries conducted by the Phiakeo (2017) confirmed that there is no direct impact of depreciation of the domestic currency on inflation and then economic growth. Further, the results suggested that the coefficient of interaction variable dollarization degree and the depreciation of the currency is significant as well as it is correlated with domestic inflation and economic growth. The estimated results of 0.72 to 0.9 evidenced that the pass-through coefficients are comparatively high for the selected dollarized economies

Another aspect of the effectiveness of exchange rate pass-through is that analyzing the relationship between Exchange Rate and the Inflation. Monfared & Akin (2017) conducted the study to examine the relationship between the set of macroeconomic variables and dynamics of the random shocks on the system of variables the using the quarterly and annual data with the application of VAR techniques and the Hendry General to specific Modeling method. The results obtained from the Hendry model confirmed that there is a direct relationship between inflation and Exchange Rate. This means when the exchange rate increases, inflation also increase. The estimated results according to the VAR after adding the money supply to the model, inflation is affected by both money supply and the exchange rate in the positive direction.

Helmy *et al.*, (2018) analyzed the ERPT in Egypt using a structural VAR for the period of 2003 to 2005 using the monthly data. The estimated results revealed that ERPT in Egypt is incomplete and slow in three price indices of Import Price Index, Producer Price Index and Consumer Price Index. Kotil (2020) examined the ERPT for the Turkish economy and found that the effect of change in exchange rate is higher for the Producer Price Index than the Consumer Price Index.

A recent analysis of Exchange rate pass-through into inflation in Vietnam was conducted for the period of 2008-2018 by the Pham (2019). He employed one exogenous variable and fine endogenous variables using the VAR model. He pointed out that the incomplete pass-through of exchange rate impact on inflation in Vietnam though the transmission of exchange rate shocks to inflation is significant. According to the estimated results the pass-through effect is less than one percent Further, he demonstrated that the exchange rate is an important macroeconomic variable when explaining the fluctuations of the domestic inflations. Finally, he concluded that the overall impact of exchange on inflation is significant for the Vietnam.

Although, extensive research has been carried out to analyze the exchange rate pass-through impact on other countries, there is a limited literature on the exchange rate pass-through effect on the Sri Lankan economy. In Sri Lanka, Wimalasuriya (2007) analyzed ERPT effect on domestic prices. Further, Duma (2008) conducted analysis to examine pass-through of oil price and exchange rate fluctuations to consumer inflation in Sri Lanka. The Sri Lankan economy has been experiencing a significant depreciation of Sri Lanka Rupee amongst a myriad of external challenges that could have significant influence on the

stability of domestic economy. Therefore, the analysis mainly focuses on the impact of exchange rate depreciation on the domestic inflation through price channel that would be beneficial for the policymakers to understand the pass-through dynamics of the exchange rate and its impact on inflation.

3.   THEORETICAL FRAMEWORK

This section of the study mainly discusses the most relevant theoretical concepts related to the ERPT and provides the background information and stylized facts related to the Sri Lankan economy.

3.1. Exchange Rate Pass-through

Generally, ERPT is defined as the transmission of change of the exchange rate into the prices of import goods in the domestic market. That means it is the elasticity of prices of imports relevant to the domestic currency in respect to the percent changes in the exchange rate. The pass-through can occur in two ways namely complete pass-through and incomplete passthrough. Complete pass-through is the situation where the prices of the import of the domestic currency change the same magnitude when the exchange rate exchange rate changes by one percent, whereas, incomplete pass-through is defined as the prices of the imports of the domestic currency change the lower rate when the exchange rate changes by one percent. According to the Menon (1996), one reason for the incomplete exchange rate pass-through is that the deviation of market structures from market competition.

In order to understand the impact of exchange rate pass-through on inflation, it is important to analyze these effects separately. Pass-through effect take place in two different stages. This is called direct effect of pass-through and the indirect effect of pass-through. In the first stage, exchange rate fluctuation affects to firstly prices of imported goods and this price effect in turn affects the prices of domestically produced goods and services and finally overall inflation of the domestic country. In the second stage, indirect effect occurs when the domestic producer input the imported raw material to produced final goods of the domestic market. Overall, The fluctuations in the exchange rate affect import prices, consumer prices and producer prices (Kardasz & Stollery 2001).

Theory of the Purchasing Power Parity (PPP) also can be used to understand the pass-through effect of the exchange rate on the domestic price level. PPP is a nominal exchange rate between two currencies relevant to home country and the foreign country that should be equal to the ratio of price levels relevant home country and the foreign country. According to the theory of PPP, any changes to the exchange rate cause a proportional change in the domestic inflation. Accordingly, a complete ERPT to domestic price level can be observe through the one-to-one relationship. That means one percent depreciation of nominal exchange rate leads to increase in the domestic inflation by one percent. The one-to-one relationship between the exchange rate and the inflation can be analyzed using the Law of one Price theory (LOP). LOP is an economic theory that can be explained as the prices of

identical goods that have similar characteristics that will sell in the different markets in the world at the same price given the transportation cost zero and the taxes of those market have no significant difference. The ERPT to domestic price level can be explained the according to the following equations.

The low of one price can be given mathematically according to the following equation given the Pt^D is the domestic price level and the Pt^F is the foreign price level and Et is the nominal exchange rate between currencies of home country and foreign country.

$$Pt^D = Et * Pt^F \tag{1}$$

Converting this equation into log form the equation 02 can be written as follows.

$$ln\ Pt^D = \gamma lnEt * \gamma lnPt^F \tag{2}$$

According to the LOP if the $\gamma = 1$, the ERPT is complete. If the $\gamma < 1$, then the ERPT is incomplete.

3.2. Exchange Rate Devaluation

Devaluation is simply defined as the lowering the value of exchange of a country's currency in terms of foreign currency unit. The rationale for devaluation is that to minimize the pressure on Balance of Payment in a domestic currency. Theoretically, devaluation of a domestic currency against the foreign currency would leads to lowering the prices of exports in domestic currency making the exports goods relatively cheaper for countries who export goods from the domestic country. The relative advantage of devaluation will depend on the size of the elasticity demand for exports and imports when change in the exchange rate. If the sum of demand elasticity for imports and exports is high, then then the export income for the domestic country will rise and import expenditure will decline causing to improved Balance of Payment (BOP) in that country. This relationship is explained by the Marshall-Lerner Condition which states that if the sum of demand elasticity is greater than one, then the currency devaluation will lead to improve the trade balance and finally an improved BOP.

3.3. The Exchange Rate regime in Sri Lanka

Countries around the world have different exchange rate regimes, namely, Fixed Exchange Rate Regime and the Floating Exchange Rate regime. The beginning of the Fixed Exchange Rate system goes back to the period of 1960. Under the Bretton Woods system around 1960 the exchange rate was fixed and pledged to Gold. With the collapsed of the Bretton Woods system in 1971 floating exchange rate began to play a role. However, under the floating exchange rate regimes, the global foreign exchange markets experienced considerable amount of variability (Menon, J., 1993). Sri Lanka also had Fixed exchange Rate regime in 1948 and the currency was pledged to the Indian Rupee. In 2001, the country moved to the independent floating exchange rate system. Under the floating exchange rate system, the exchange rate is determined by the market forces including demand and supply of the foreign exchange market in the country. Accordingly, on 23rd of January 2001, the

CBSL took actions to liberalize the foreign exchange market. However, the CBSL time to time intervenes the foreign exchange market to manage the excessive volatility in the exchange rate.

3.4. Sri Lanka Economy and the Stylized Facts

The Global integration, interconnectedness and interdependence of economies particularly small open economies are more vulnerable to the external sector shocks. These countries are constrained by some external shocks including imported inflationary pressures and exchange rate volatility due to high level of financially integration of these economies (Aron *et al.*, 2012). Sri Lanka is small open economy located in the South Asian region and categorized as a lower-middle income country with the population is about 21.9 million. The per-capita income of the country is stood around USD 3,682 and the year-on-year inflation measured by the National Consumer Price Index (NCPI) recorded as 21.5 in March 2022.

Sri Lanka also has been confronting unprecedented risk and a myriad of challenges after easter attack followed by the COVID-19 pandemic. After COVID-19, the country is experiencing the rising trade deficit, deteriorating fiscal position, debt crisis due to the huge amount of external debt, political turmoil due to the prolonged political instability and a BOP crisis. The external sector has now become one of the most vulnerable sectors of the economy due to the several reasons. One of the reasons is that the war between Ukraine and Russia caused an increase the commodity prices. Sri Lanka is highly depending on the imported commodities for the generation of electricity power, consumption, transportation, and manufacturing. Therefore, higher commodity price have a direct impact on imported prices in Sri Lanka and the economy is now experiencing large exchange rate volatility. The degree of the openness and the interdependencies resulted in become further vulnerable to external shocks. Another reason is that the lower external demand from the major trading partners due to the implications of COVID pandemic. Further, Sri Lanka has been experiencing persistent external current account deficits and the declining trend of Workers 'remittances (Annual Report of the CBSL, 2021). Further, high external debt position, lower tourism income and dropped in income from remittances significantly affected to further decline in the foreign reserves of the country. As a consequence of these imbalances, the exchange rate has been depreciating continuously.

At present, exports of goods and services as percentage of GDP in Sri Lanka is around 23 percent and it is a relatively small share of the total economy. The imports as a percentage of GDP are around 29.25 percent. Sri Lanka highly depends on import goods including consumer goods, intermediate goods and investment good, transmission impact of exchange rate fluctuation on domestic inflation occur through import price, producer price and consumer price. In the recent past, the exchange rate experienced continuous depreciation as shown in the figure 1. Further, given the low exports and higher imports, devaluation of
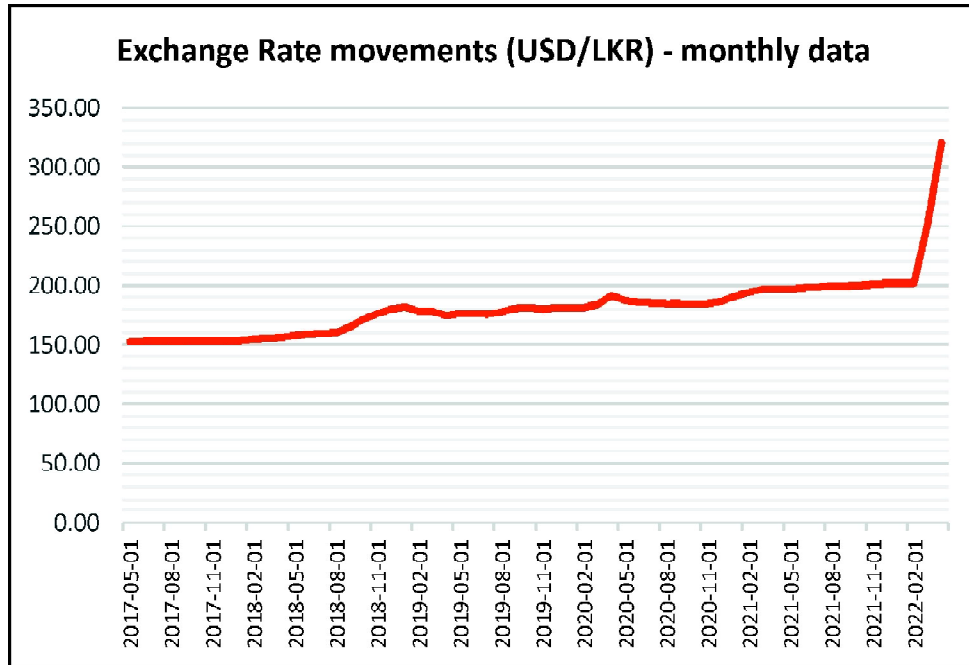
Figure 1: Exchange Rate movements (USD/LKR) for monthly data

Rupee may not have a favorable impact on the economy and always resulting too much pressure on the trade balance. As depicted in the figure 2, Sri Lanka has been experiencing trade deficit due to higher imports than the exports.
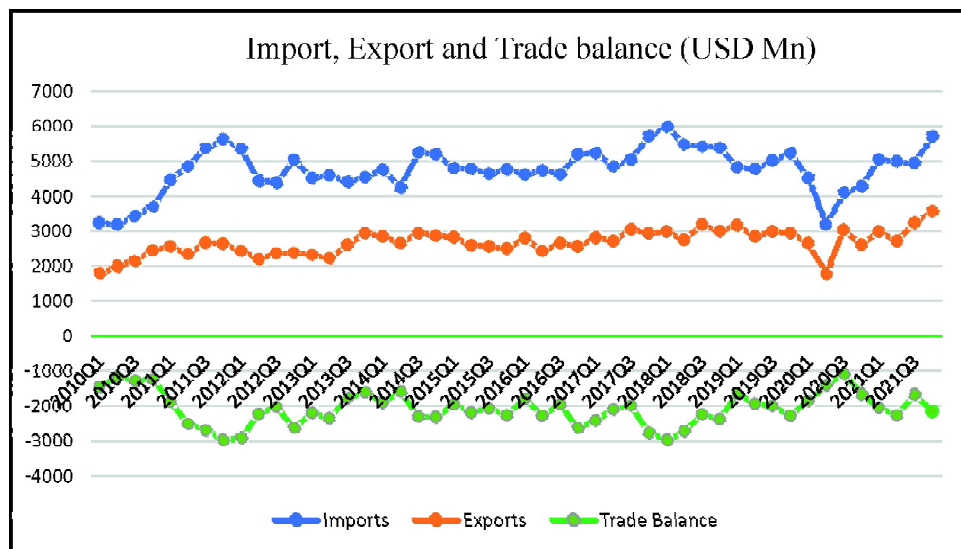

Figure 2: Imports, Exports and Trade balance (USD mn).

Due to its highly integrated and interdependent nature, the economy is highly vulnerable to the external shocks. Since the current monetary policy of the CBSL is in line with flexible inflation targeting with the objective of stable inflation to achieve the desired growth path of the economy, these shocks could hinder the achieve the expected targets of the CBSL. At present Sri Lanka is facing big challenge to maintain the inflation in single digit level. As show in the figure 3, the domestic inflation (year on year) is also increasing rapidly creating difficulties to policy makers to maintain a low level of inflation in the economy. Therefore, analyzing the exchange rate pass-through effects has become essential area for the implementation of effective policy measures for the economy to achieve stable inflation.
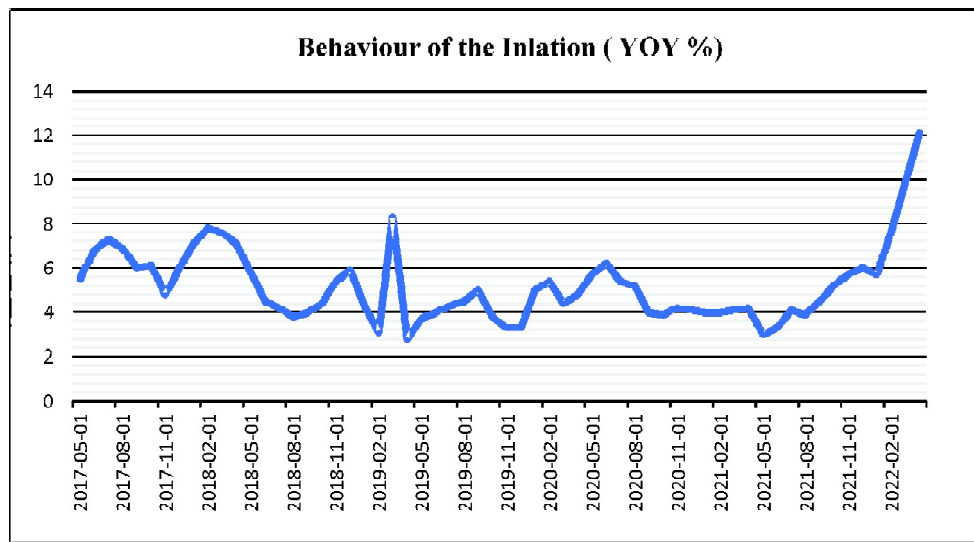

Figure 3: Behavior of the inflation (Year on Year %)

4. ANALYTICAL FRAMEWORK

The main objective of this research is to analyze the impact of exchange rate depreciation of inflation in Sri Lanka. In order to pursue this objective, the analysis mainly focus on the Exchange Rate Pass-through to import prices, producer prices and the consumer prices. There has been an increasing interest in the empirical literature in recent years analyzing the pass-through impact of external shocks mainly due to the adverse fluctuations in the exchange rate channel on using VAR as econometric model. Much of the current research has given attention to analyze the external shocks that affect the domestic inflation through the exchange rate channel given the uncertainty in the global economic situation and abnormal fluctuation in the exchange rates.

Many studies on ERPT mainly used Vector Auto Regression (VAR) model to analyze the size and the degree of ERPT. McCarthy (2000), Hahn (2003), Ito & Sato (2007), Wimalasuriya (2007), Mirala (2014), Borensztien & Heideken (2016), Helmy *et. al.*, (2018)

used VAR techniques to analyze the pass-through effect of exchange rate on inflation. McCarthy (2000) used the model of pricing along the distribution channel to examine effect of the exchange rate and the import prices of the pass-through into consumer and producer prices in the domestic economy. He employed the VAR with the Cholesky Decomposition to estimate the impact of each shock on domestic prices. Similarly, Hahn (2003) also applied the Cholesky Decomposition to identify the structural shocks of the model in the baseline model. Ito and Sato also applied five variable VAR model to estimate the impact of exchange rate and other macroeconomic shock on domestic prices. Following the model used by the empirical analysis and recent studies, this study employs VAR approach to provide the evidence-based analysis on effectiveness of exchange rate pass-through and the impact of depreciation of exchange rate on inflation in the Sri Lankan economy.

4.1. Data and the model

For the purpose of this study, the following key data were extracted from the IMF International Financial Statistics (IFS), Annual Reports of the CBSL and the Department of Census and Statistics (DCS). The analysis covers the period 2010 (Q1) to 20201(Q4). The model comprises six endogenous variables and one exogenous variable. The variables used in this model are Oil Price Index (P_t^{oil}), Output Gap (Y_t^{gap}), Nominal Effective Exchange Rate (E_t^{NEER}), Import Price Index (IMP_t), Wholesale Price Index (WPI_t), Consumer Price Index ($CCPI_t$), and Broad Money Supply ($M2B_t$).

- **Oil Price Index (P_t^{oil})** – In order to capture the international supply shocks, the oil price index is employed as a proxy to external supply shocks. For this purpose, UK Brent oil price index extracted from the United States Energy Information Administration.

- **Output Gap (Y_t^{gap})** - The demand shock is captured using the Output Gap (Y_t^{gap}). The output gap is produced using the Hodrick Prescott Filter (HPF). The Real GDP data was used to estimate the Output Gap.

- **Nominal Effective Exchange Rate (E_t^{NEER})** - E_t^{NEER} is employed to capture the exchange rate shocks and it is the weighted average of nominal exchange rates of the 24-trading partner and competitor countries. Weights are based on the trade shares reflecting the relative importance of each currency in the currency basket (Annual Report of the CBSL). The base year is 2017=100.

- **Import Price Index (P_t^{IMP}) -** P_t^{IMP} (2010=100) for consumer goods, intermediate goods and investment goods is used to capture the import price shock which is computed as Laspeyres.

- **Wholesale Price Index (Pt^{WPI})** – The Pt^{WPI} (1974=100) is used as a proxy for Producer Price Index (PPI) to capture the producer price shocks because the PPI is available from January 2014.

- **Consumer Price Index (P_t^{CCPI})** – The P_t^{CPI} is the Colombo Consumer Price Index (2013=100) which is based on Household Income and Expenditure Survey (HIES) conducted in 2012/13. The weights are based on the consumption pattern The Index is based on Household Income and Expenditure Survey (HIES) conducted in 2012/13 and the weights are based on the consumption pattern of the urban households within the Colombo district (Census and Statistics Department).

- **Broad Money Supply (M_t^{M2B})** - M_t^{M2B} is used to capture the monetary policy effects. $M2B_t$ comprises currency in circulation, demand deposits and the time and saving deposits of the domestic banking units and the offshore banking units of the licensed commercial banks operating in Sri Lanka.

For this analysis, the VAR model can be represented as follows:

$$X_t = A\, X_{t-1} + \varepsilon_t \tag{1}$$

$X_t =$ [Oil Price Index (P_t^{oil}), Output Gap (Y_t^{gap}), Nominal Effective Exchange Rate (E_t^{NEER}), Import Price Index (P_t^{IMP}), Wholesale Price Index (Pt^{WPI}), Consumer Price Index (P_t^{CCPI}), Broad Money Supply (M_t^{M2B})].

$\varepsilon_t =$ [Oil price shock (ε_t^{oil}), Demand shock (ε_t^{Ygap}), Exchange rate shock (ε_t^{neer}), Import Price shock (ε_t^{imp}) Wholesale Price shock (ε_t^{wpi}), Consumer Price shock (ε_t^{ccpi}), Liquidity shock (ε_t^{M2B})

X_t represents the vector of vector of 7 endogenous variables while A represents the order of n x n and contemporaneous relationship between the endogenous variables and $å_t$ is a vector of 7 x 1 of structural disturbances. Further, it is assumed that 7 exogenous shocks (which contemporaneously affected to the endogenous variables and structural disturbances are serially uncorrelated to each other. Further, åt is the exogenous shocks which represents an unexplained movement in endogenous variables**.**

In order to identify the structural shocks, the Cholesky decomposition is implemented. Accordingly, Cholesky Decomposition of the matrix (Ω) of the reduced form VAR residuals is employed to analyze the pass-through effect of the exchange rate on domestic inflation. The parametric restrictions on the matrix are imposed according to the Cholesky decomposition of the reduced form of lower triangular matrix. The number of restrictions is determined according to the n(n-1)/2 on the lower triangular matrix. The "n" denotes the number of variables. Therefore, the number of restrictions on the lower triangular matrix can be calculated 7(7-1)/2 = 21. The rational of imposing these restrictions on the below matrix is because the restricted variables do not have a contemporaneous impact from the structural shocks

Accordingly, the relationship between the reduced form VAR residuals (Ut) and Structural Disturbances (ε_t) is given in the equation (2).

$$
\begin{pmatrix}
eP_t^{oil} \\
eY_t^{gap} \\
eE_t^{Neer} \\
eP_t^{IMP} \\
eP_t^{PPI} \\
eP_t^{CPI} \\
eM_t^{M2B}
\end{pmatrix}
=
\begin{pmatrix}
a11 & 0 & 0 & 0 & 0 & 0 & 0 \\
a21 & a22 & 0 & 0 & 0 & 0 & 0 \\
a31 & a32 & a33 & 0 & 0 & 0 & 0 \\
a41 & a42 & a43 & a44 & 0 & 0 & 0 \\
a51 & a52 & a53 & a54 & a55 & 0 & 0 \\
a61 & a62 & a63 & a64 & a65 & a66 & 0 \\
a71 & a72 & a73 & a74 & a75 & a76 & a77
\end{pmatrix}
\begin{pmatrix}
\varepsilon P_t^{oil} \\
\varepsilon Y_t^{gap} \\
\varepsilon E_t^{Neer} \\
\varepsilon P_t^{IMP} \\
\varepsilon P_t^{PPI} \\
\varepsilon P_t^{CPI} \\
\varepsilon M_t^{M2B}
\end{pmatrix}
\tag{2}
$$

The ordering of the exogenous variable is very important to correctly identify the structural shocks. According to Mirdala (2014) ordering of endogenous variables exhibits the expected particular economy structure following general economic theory assumptions. According to the ordering of the Cholesky Decomposition, the following assumptions need to be defined.

Oil price Index variable is ordered first because the reduced form of residuals of oil prices are not likely to be affected contemporaneously by any other shocks of Demand shock (ε_t^{Ygap}), Exchange rate shock (ε_t^{neer}), Import Price shock (ε_t^{imp}) Wholesale Price shock (ε_t^{wpi}), Consumer Price shock (ε_t^{ccpi}), Liquidity shock (ε_t^{M2B}) from the endogenous variables of the model and can be affected by oil price shock itself (Ragoobur and Chicooree 2013) and it may take some period of time for these variables to impact the oil price. Therefore, it is assumed that these shocks of exogenous variables have no contemporaneous effect on oil price. However, all other variables in the system can be affected by the oil prices contemporaneously. Second, the output gap is ordered prior to the exchange rate, which allows the exchange rate to respond contemporaneously to demand shocks ($å_t^{Ygap}$) (Hahn, 2003). Next, the exchange rate is placed because, exchange rate variable which accounts for both demand and supply shocks is ordered before the price variables as exchange rate is found to be more exogenous (Helmy *et al.*, 2018). After the exchange rate, import price index can be ordered as the import price is immediately affected by the exchange rate. According to the pricing chain producer price index is ordered after the import price index and next consumer price index is placed in the equation. Finally, Broad money supply (M2B) is entered to the model to capture the effects of the changes in monetary policy on exchange rate and inflation.

5.   AN ANALYSIS OF EMPIRICAL RESULTS.

This section of analysis mainly discusses initial diagnosis test for the model specification and the estimated results generated through the VAR model.

5.1. Diagnosis Test for the model specification

For this analysis, this section firstly covers the basic econometrics test including Unit-root test to determine the status of the stationary in time series data, lag length selection criteria

test to determine the number of lags to be included in the VAR, residuals test which confirm the no outliers and the normality test which confirm the data is normally distributed. Secondly the impulse reposes are employed to analyze the responses of import prices, producer prices and the consumer prices. Variance Decomposition determines importance of exogenous shocks in explaining the forecast error variance of the domestic prices. Thirdly, the exchange rate pass-through is calculated using the Impulse Response results to determine the elasticity of price variables for the one percent change in the exchange rate. Finally, robustness test is conducted to confirm the estimated results are robust across the different models.

- **Unit Root Test Results**

Augmented Dickey Fuller (ADF) test is one of the major tests used widely to test whether the time series data in the model are stationary or non-stationary. According to the T- Statistics and P-values given in the table 1, rejected the null-hypothesis: each variable (DLPOIL, DYGAP, DLNEER, PIMP, DLPWPI, DLPCPI & DLM2B) has unit root, and confirmed that import price index is stationary at level 0 and all other variables are stationary at first difference.

Table 1: Summary of the Unit root test results

Variable	Code	T-Statistics	P-Value	Stationary
Oil Price Index (P_t^{oil})	DLPOIL	-6.230833	0.0037	I (1)
Output Gap (Y_t^{gap})	DYGAP	-22.69788	0.0000	I(1)
Nominal Effective Exchange Rate (E_t^{NEER})	DLNEER	-5.488515	0.0002	I(1)
Import Price Index (P_t^{IMP})	PIMP	-4.600848	0.0005	I(0)
Wholesale Price Index (Pt^{WPI})	DLPWPI	-6.07676	0.0000	I(1)
Consumer Price Index (P_t^{CPI})	DLPCPI	-6.575006	0.0000	I(1)
Broad Money Supply (M_t^{M2B})	DLM2B	-7.770914	0.0000	I(1)

Further, VAR residuals test given in the figure 4 confirmed that variables fluctuate within the boundaries and no outlier as shown.

- **Lag Length Selection Criteria Test**

The lag length selection Criteria test is performed to specify the correct lags to be included to the VAR model. The test results given in the table 1 suggested that Schwarz Information Criteria SC and Hannam- Quinn Information Criteria (HQ) suggest that 0 lag to be included for the model specification. However, Sequential Modified LR test Statistics (LR), Financial Prediction error and the most widely accepted criteria Akaike information Criteria (AIC) select the 3 lags of the VAR. Accordingly the selected lag length for the VAR analysis is 3.
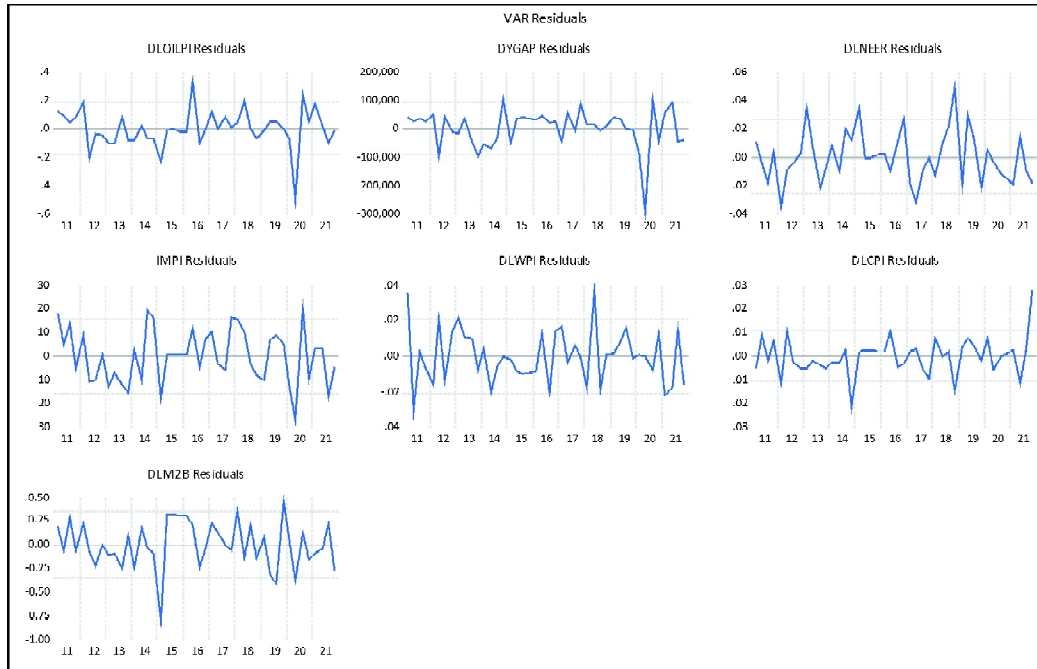
Figure 4: VAR Residuals Test

Table 2 : Lag Length Selection Criteria

Sample: 2010Q1 2021Q4
Included observations: 44

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-450.5866	NA	2.545449	20.79939	21.08324*	20.90466*
1	-413.2391	61.11419	4.448325	21.32905	23.59984	22.17117
2	-341.6579	94.35698	1.889773	20.30263	24.56036	21.88160
3	-265.3266	76.33128*	0.891766*	19.06030*	25.30497	21.37612

* indicates lag order selected by the criterion
LR: sequential modified LR test statistic (each test at 5% level)
FPE: Final prediction error
AIC: Akaike information criterion
SC: Schwarz information criterion
HQ: Hannan-Quinn information criterion

The test results given in the Appendix Table 3: VAR Residual Serial Correlation LM confirmed there is that no evidence of serial correlation. Accordingly, all the test performed for the model specification suggest that the correct model is selected for the analysis.

5.2. An analysis of Impulse Response

The impulse response analysis is most important analytical method to explain the dynamic impact of system of shocks. Firstly, the analysis focuses response of exchange rate (NEER) to external shocks (oil price shock). In the second stage, the responses of import price, producer price and consumer price to exchange rate exchange rate shock is analyzed to investigate the impact of exchange rate depreciation on domestic prices. The impulse response results were estimated to one standard deviation shock and the confidence intervals were computed +/-2SE confidence bands.

- **Response of exchange rate (NEER) to external shocks (Oil price shock)**

The figure 6 given in the below shows the impulse response of exchange rate to the Cholesky positive one standard deviation of oil price shock. The estimated results show that a one standard deviation of oil price shock on the nominal effective exchange rate during the first three quarters has an impact between quarter one to quarter three though this effect is gradually converging to neutral after quarter five.
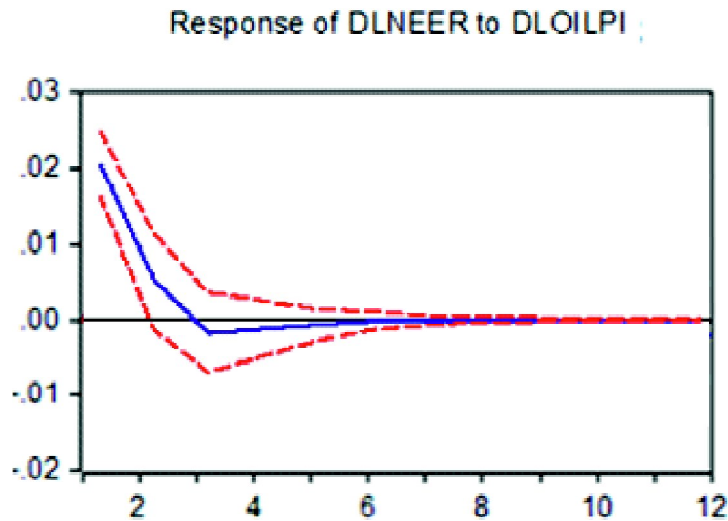

Figure 6: Response of Exchange rate to positive oil price shock

- **Response of Import price, Wholesale price and Consumer price on positive Exchange rate shock**

The response of import price to nominal effective exchange rate given in figure 7 suggests that a positive exchange rate shock (depreciation of domestic currency) on the import price-

does not show a significant response between the first and second quarter though there is a positive impact after the second quarter and it remains until the third quarter. Further, this positive impact is decreasing gradually after the third quarter. However, after the fourth quarter, the impact of exchange rate on import price shows a negative and this remains until quarter six. When a one standard deviation positive shock is given on the nominal effective exchange rate, the response of the producer price, a positive impact can be seen during the second and third quarter.

As shown in the figure 7 shows that a positive exchange rate shock has an immediate impact on consumer price in the third quarter. This means, the depreciation of the Sri Lankan Rupee results in an increase in consumer price in the third quarter. After the third quarter response of consumer price to the nominal effective exchange rate is decreasing gradually until quarter five. However, the response of consumer price to exchange rate shock converges to zero after quarter five. Overall, the response of import price, producer price and consumer price show some ambiguous results in some periods.
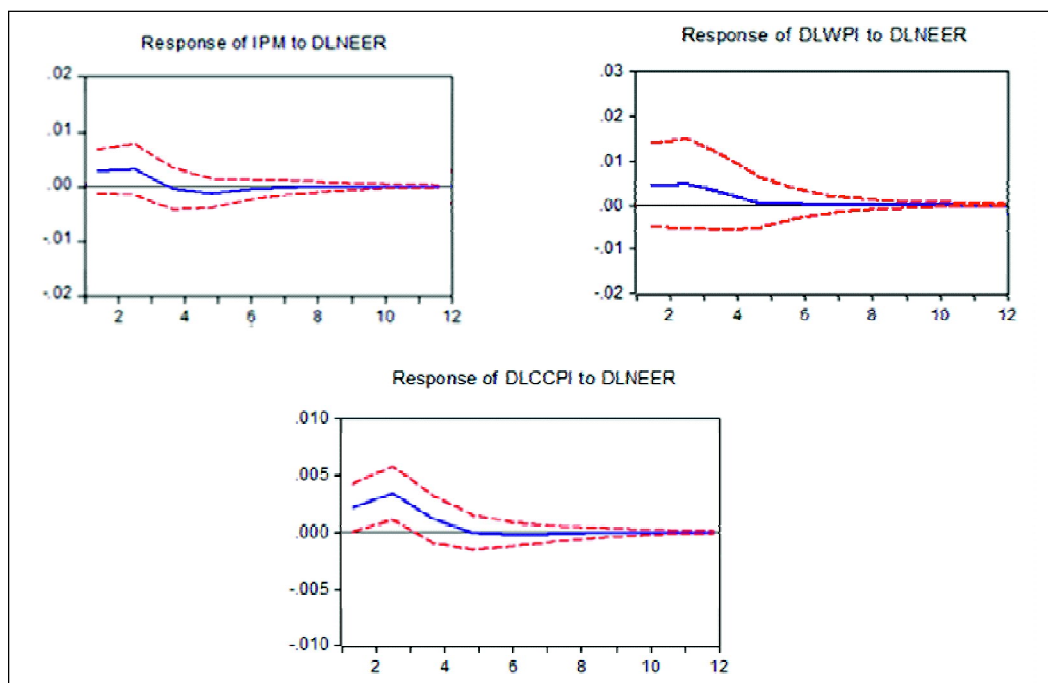

Figure 7: Response of Import price, Wholesale price and Consumer price on positive Exchange rate shock

5.3. Exchange Rate pass-through elasticities for import price, producer price and consumer price

The dynamic elasticities of the exchange rate pass-through on import price, producer price and consumer price are calculated using the following formula.

The pass-through elasticity at a time = $\dfrac{\text{Percentage change in price at time t}}{\text{Percentage change in the exchange rate at time 0}}$

    The pass-through elasticity values given in the table 4 were calculated by dividing the cumulative response of the above prices at time t by the exchange rate shocks at time t-1.

Table 4 : Exchange Rate pass-through Elasticities

Period	Elasticity of IMP	Elasticity of WPI	Elasticity of CCPI
T1	0.31	0.29	0.22
T2	0.42	0.48	0.20
T3	0.18	-0.30	0.17
T4	-0.23	0.10	-0.39
T5	-0.32	-0.50	0.23
T6	-0.20	-0.30	0.25
T7	-0.42	-0.21	0.13
T8	-0.63	-0.11	0.41

    The estimated results for exchange rate pass-through elasticity values given in the table 4 suggests that the exchange rate pass-through is incomplete in the three prices of import price, producer price and the consumer price. The impact of change in the exchange rate on the import price shows that the one percent depreciation of Sri Lanka Rupee results to increase the import price index by 0.31 percent in the first quarter and 0.42 percent in the second quarter. In contrast, the pass-through effect of exchange rate on import price shows negative impact from period four to period eight suggesting that the pass-through effect of exchange rate for import price is insignificant from period four to period eight. The pass-through effect of exchange rate on producer price confirms that a one percent depreciation of Sri Lanka Rupee increases the producer price by 0.29 and 0.48 percent in the first and second quarter respectively. The pass-through effects of exchange rate on consumer price is also incomplete across all the periods. The consumer price increase by 0.22 percent when the nominal effective exchange rate increase by one percent. However, in the fourth quarter, it shows negative response confirming that consumer price decrease by 0.39 percent when there is appreciation of the Sri Lanka Rupee by one percent.

    It is observed that the pass-through effects of international oil price and exchange rate appear to be quite ambiguous and provides puzzling results for some periods. Even though, the exchange rate should respond to the external shocks (oil price shock), the pass-through mechanism appears to be ineffective because exchange rate should react to the changes in the international oil price shocks.

5.4. The Variance Decomposition

The estimated results of variance decomposition indicates that the relative importance of the random shocks in explaning the variations in the given variable in the VAR model. The

below table summarizes the foreast error decompostion for the import price, producer price and the consumer price. According to the summary results given in the below table 5 (appendix 3).The import price to its own price shock explains the much of variation which is around 68 percent in the first quarter and decreasing over the time. The exchange rate also explain the significant variation in the import price when compared to the other shocks.The importance of the the exchage rate shocks in explaining the variance in the import price is increasing over the time indicating that the impact of exchange rate on import price is increaesing over the time. The variance decompostion of producer price shows that exchage rate shocks, import price shocks and consumer price shocks are relatively important variables in explaining the variations in the producer price and the relative importance of the these shocks are increasing over the time.

The variance decomposition of consumer price given in the table 7 (appendix 4) confirms that the import price shocks, and producer price shocks are more important in explaining the variations in consumer price that the exchange rate shocks. It is also observed that the shock of consumer price on its own variable is significantly decreasing.

5.5. Robustness Test Results

The empirical studies have used different approaches to check whether the estimated results are robust across the different models. One common method relevant to impact of different shocks VAR model analysis is that change the ordering of the variables depending on the impact of shocks. Considering the Cholesky ordering according to the identification of the structural shocks, the following two models were estimated.

Original Model   : (dloilpi, dygap, dlneer, imp, dlwpi, dlccpi, dlm2b)

Model 1   : (dloilpi, **dlneer,** dygap, imp, dlwpi, dlccpi, dlm2b)

Model 2   : (dloilpi, **dlm2b,** dygap, dlneer, imp, dlwpi, dlccpi,)

The summary of the estimated results for the above three models given in the table 7 confirms that the estimated pass-through elasticities are almost similar. Therefore, it can be concluded that the estimated results are robust.

Table 8 : Price-through elasticities for Original Model, Model 1 and Model 2

Period	Original Model			Model 1			Model 2		
	IMP	*WPI*	*CCPI*	*IMP*	*WPI*	*CCPI*	*IMP*	*WPI*	*CCPI*
1	0.31	0.29	0.22	0.33	0.25	0.24	0.36	0.24	0.26
2	0.42	0.48	0.20	0.45	0.47	0.23	0.39	0.43	0.24
3	0.18	0.30	0.17	0.21	0.31	0.16	0.20	0.33	0.16
4	-0.23	0.10	-0.39	-0.26	0.12	-0.40	-0.26	0.13	-0.37
5	-0.32	-0.50	0.23	-0.34	-0.54	0.26	-0.34	-0.53	0.26
6	-0.20	-0.30	0.25	-0.20	-0.33	0.26	-0.19	-0.33	0.24
7	-0.42	-0.21	0.13	-0.44	-0.21	0.15	-0.44	-0.24	0.16
8	-0.63	-0.11	0.43	-0.60	-0.12	0.44	-0.66	-0.09	0.41

6. CONCLUSION

This study examines the effectiveness of the exchange rate pass-through to import price, producer price and consumer price and impact on the inflation in Sri Lanka by employing the VAR econometric model. This analysis was conducted under two main stages including the effectiveness of pass-through of oil price shocks to exchange rate and the effectiveness of exchange pass-through to import price, producer price and consumer price.

The findings of this study confirm the exchange rate pass-through is incomplete in the three prices of import price, producer price and the consumer price. The impact of change in the exchange rate on the import price shows that the one percent depreciation of Sri Lankan Rupee results in an increase the import price index by 0.31 percent in the first quarter and 0.42 percent in the second quarter. In contrast, the pass-through effect of exchange rate on import price shows a negative impact from period four to period eight suggesting that the pass-through effect of exchange rate for import price is insignificant from period four to period eight. The pass-through effect of the exchange rate on producer price confirms that a one percent depreciation of Sri Lanka Rupee increases the producer price by 0.29 and 0.48 percent in the first and second quarter respectively. The pass-through effects of exchange rate on consumer price also incomplete across all the periods. The consumer price increases by 0.22 percent when the domestic currency depreciates by one percent. However, in the fourth quarter, it shows negative response confirming that consumer price decrease by 0.36 percent when there is an appreciation of Sri Lanka Rupee by one percent.

The estimated results suggests that the pass-through effects of international oil price shocks and exchange rate shocks appear to be quite ambiguous and provides puzzling results for some periods. Even though, the exchange rate should respond to the external shocks (oil price shock), the pass-through mechanism appears to be ineffective because exchange rate should react to the changes in the international oil price shocks. The less volatility of the exchange rate could be due to the Central Bank's interventions to the foreign exchange domestic market to maintain the stability of the exchange rate After 2001, as a policy change, CBSL moved to the independent floating exchange rate system in which the exchange rate is determined by the market forces. However, to curb the excess volatility in the exchange rate, CBSL has been intervening in the foreign exchange domestic market to manage the excess/deficit of liquidity in the market.

The incomplete exchange rate pass-through effect on three processes could be due to several reasons. As stated before, Sri Lanka highly depends on imports goods. More specially, Sri Lanka totally relies on imported fuel for power generation and the transportation given that no alternative arrangement has been made within the country. Therefore, the changes in the oil price and the exchange rate should have an impact on the domestic prices. One reason for the incomplete pass-through could be the government involvement through the fuel subsidies to control the oil prices. The fuel subsidies are given to Ceylon Petroleum Corporation (CPC) and Lanka Indian Oil Company (LIOC) to minimize the fluctuations in

international oil prices. Another reason could be the unavailability of formula to calculate the oil prices in accordance with the international changes. Further, different response of pass-through effects could be due to unexpected tax levy on crude oil imports and the sudden decision of the government to change fuel prices during the election period in the country. Given these administrative arrangements within the country, an incomplete pass-through effect of oil price and the exchange rate on the import price, produce price and consumer price is acceptable

Overall, the estimated resulted provides evidence on ineffectiveness of the exchange rate channel to the monetary policy transmission mechanism. This means, pass-through of exchange rate fluctuations and external shocks to domestic inflation is insignificant. Therefore, policy makers need to consider more an domestic shocks than the external shocks when they implement policies to achieve stable inflation to achieve the macroeconomic stability in Sri Lanka.

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Appendix 1: Results of Unit Root Test

Null Hypothesis: D(YGAP) has a unit root
Exogenous: Constant
Lag Length: 2 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-22.98729	0.0001
Test critical values:	1% level	-3.588509	
	5% level	-2.929734	
	10% level	-2.603064	

Null Hypothesis: D(LOILPI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

|		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.295690	0.0000
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

Null Hypothesis: IMPI has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-4.448549	0.0008
Test critical values:	1% level	-3.577723	
	5% level	-2.925169	
	10% level	-2.600658	

Null Hypothesis: D(LNEER) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.572146	0.0000
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

Null Hypothesis: D(LWPI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-6.084695	0.0000
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

Null Hypothesis: D(LM2B) has a unit root
Exogenous: Constant
Lag Length: 1 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-7.864941	0.0000
Test critical values:	1% level	-3.584743	
	5% level	-2.928142	
	10% level	-2.602225	

Null Hypothesis: D(LCCPI) has a unit root
Exogenous: Constant
Lag Length: 0 (Automatic - based on SIC, maxlag=9)

		t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic		-5.572146	0.0000
Test critical values:	1% level	-3.581152	
	5% level	-2.926622	
	10% level	-2.601424	

Appendix 2 : Stationary Test

Inverse Roots of AR Characteristic Polynomial
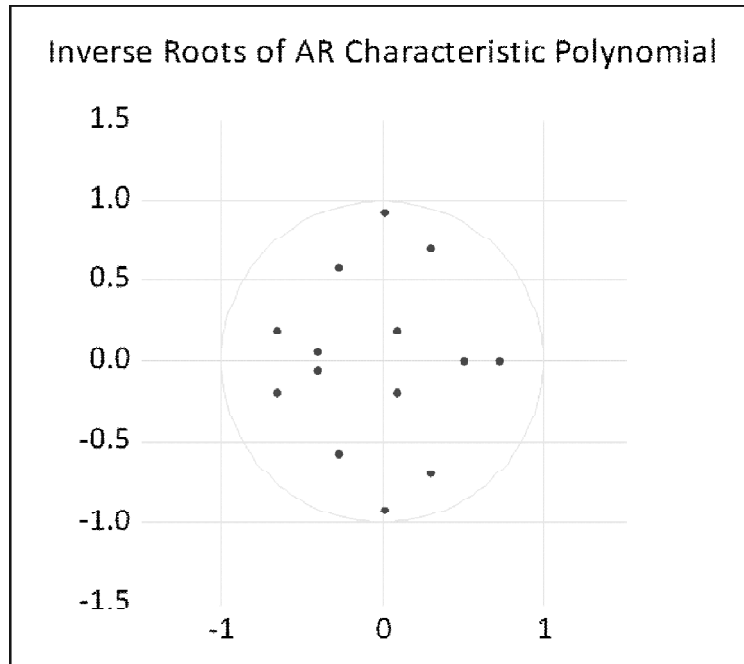
Figure 5: Lag Structure – AR Roots Graph

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Table 3: VAR Residual Serial Correlation LM

VAR Residual Serial Correlation LM Tests

Null Hypothesis: no serial correlation at lag order h

Date: 05/26/22 Time: 10:44

Sample: 2010Q1 2021Q4

Included observations: 43

Lags	LM-Stat	Prob
1	41.95667	0.2284
2	30.60166	0.7229

3	34.70514	0.5301
4	48.24086	0.0835

Appendix 3 : Variance Decomposition results

Table 4 : Variance Decomposition of Import Prices

Period	DLNEER	IPM	DLWPI	DLCCPI
t=1	2.632407	68.18904	0.000000	0.000000
t=3	7.820997	53.97805	3.720120	0.438071
t=6	14.56321	46.56871	6.558617	0.693743
t=9	15.80835	44.58437	6.435442	2.171814
t=12	15.57618	42.71283	6.494965	4.791346

Table 5 : Variance Decomposition of producer Prices

Period	DLNEER	IPM	DLWPI	DLCCPI
t=1	0.319377	5.649476	90.32560	0.000000
t=3	9.071395	14.94174	67.98545	2.725570
t=6	14.10167	16.75806	46.01271	15.91630
t=9	14.00732	15.18246	39.52246	17.86495
t=12	13.60515	16.62867	37.35987	17.15622

Table 6 : Variance Decomposition of Consumer Prices

Period	DLNEER	IPM	DLWPI	DLCCPI
t=1	2.232498	1.372725	1.462223	93.95334
t=3	4.101732	4.417288	4.039639	83.66034
t=6	8.661122	10.86265	3.705681	65.33513
t=9	4.696178	8.095577	11.74103	62.12757
t=12	4.730849	8.991897	13.29641	59.39105

Appendix 4 : Table 9 : Summary of the empirical studies

Author & Year	Country	Objective	Data	Econometric model	Area	Analytical Outcome
Taylor (2000)	US	Decline in pass-through or pricing power is due to the low inflation environment that has recently been achieved in many countries	1988-1998	Microeconomic model of price	Low Inflation, Pass-Through, and the Pricing Power of Firms	Inflation is positively correlated with persistence of inflation, suggesting that the low inflation itself has caused the low pass-through. An economywide model consistent with the micro model is then presented to illustrate how such changes in pricing power affect output and inflation dynamics in favorable ways but can disappear quickly if monetary policy and expectations change.
McCarthy (2000)	Industrial Economies	Examines the impact of exchange rates and import prices on the domestic PPI and CPI in selected industrialized economies	1976:1 - 1998:4	The Vector Auto Regression	Pass-Through of Exchange Rates and Import Prices to Domestic Inflation in Some Industrialized Economies	exchange rates have a modest effect on domestic price inflation while import prices have a stronger effect. Passthrough is larger in countries with a larger import share and more persistent exchange rates and import prices
Hanhn (2003)	European Countries	Examines the pass-through of external shocks, i.e. oil price shocks, exchange rate shocks, and non-oil import price shocks to euro area inflation at different stages of distribution (import prices, producer prices and consumer prices)	1970(2) to 2002(2)	The Vector Auto Regression	Pass-Through of external shocks to Euro area inflation	the pass-through is largest and fastest for non-oil import price shocks, followed by exchange rate shocks and oil price shocks. The size and the speed of the pass-through of these shocks decline along the distribution chain.
Choudhri & Khan (2002)	Pakistan	Examine whether inflation is systematically related to changes in the exchange rate	1982-2001	Regression Model	The Exchange Rate and Consumer Prices in Pakistan: Is Rupee Devaluation Inflationary	No association between rupee devaluations and inflation in Pakistan. It appears, therefore, that concerns about the inflationary consequences of rupee devaluation are unsupported by the fact

Berument & Pasaogullari (2003)	Turkey	Assessing the effects of real depreciation on economic performance of Turkey	1987 - 2001	The Vector Auto Regression	Investigated negative relationship between real exchange rate and output
Ito & Sato (2007)	East Asia & Latin America	The degree of domestic price responses to the exchange rate changes in crisis-hit countries in East Asian and Latina American countries and Turkey in order to reveal why the post-crisis inflation performance was very different across countries.	1991-2006 Monthly	The structural vector autoregression	The degree of exchange rate pass-through is found to be higher in Latin American countries and Turkey than in East Asian countries with a notable exception of Indonesia. Excessive supply of base money played an important role in increasing the domestic inflation rate in Indonesia, while such effect is not observed in other countries
Wimalasuriya (2007)	Sri Lanka	Establish how much and how fast domestic prices change in response to a change in the exchange rate, in Sri Lanka, examine the impact of a change in the exchange rate on factor input prices, trade prices, wholesale producer prices and consumer prices, and ascertain changes, if any, in exchange rate pass-through in Sri Lanka.	2000-2005	The Vector Auto Regression	exchange rate pass-through into import prices is around fifty per cent, that is, import prices increase by about 0.5 per cent as a result of a 1 per cent depreciation of the nominal effective exchange rate. Further, exchange rate pass-through into consumer prices is about thirty per cent.
Duma (2008)	Sri Lanka	Investigates pass-through of external shocks (exchange rate, oil price, and import price shocks) to inflation in Sri Lanka	2003 M1 –2007M7	Vector Auto Regression	low and incomplete pass-through of external shocks to consumer inflation, reflecting a combination of factors including the existence of administered prices, high content of food in the consumption basket, and low persistence and volatility of the exchange rate

Author (year)	Country	Objective	Period	Methodology	Title	Findings
2013	Mauritius	Investigating the extent and degree of exchange rate pass through to prices at different distribution levels, namely from import prices to producer prices up to consumer prices, for the small island economy of Mauritius which is highly dependent on the external markets	1999-2010 Quarterly	Structural Vector Autoregressive model	Exchange Rate Pass Through to Domestic Prices: Evidence from Mauritius	exchange rate pass through to consumer prices is the highest; followed by producer prices while exchange rate passthrough to import prices is the lowest
Mirdala (2014)	European Transition Economies	Responsiveness of exchange rate to the exogenous price shock to examine the dynamics (volatility) in the exchange rate leading path followed by the unexpected oil price shock and effect of the unexpected exchange rate shift to consumer prices to examine its distribution to the internal pricing chain	2000M1-2007M12	The Vector Auto Regression Model	Exchange Rate Pass-Through to Consumer Prices in the European Transition Economies	expected lower vulnerability of exchange rates in countries with nominal exchange rate anchoring ("peggers") to the external price shocks (this effect was even strengthened during the crisis period). Reduced exchange rate responsiveness to the external price shocks increased the transmission of the price effect to the domestic prices.
Sansone\ & Justel (2016)	Chile	Determine the size and speed of pass-through to different price indices in Chile.	1986-2013	Vector Autoregression Model	Exchange Rate Pass-through to Prices: VAR evidence for Chile	Fuel prices respond one-to-one the exchange rate after a few months. ERPT to CPI reaches 0.13 after twelve months and stabilizes at 0.2 after two years. ERPT to food prices it is not significantly different from zero

Author	Country	Objective	Period	Methodology	Title	Findings
Hyeongwoo & Ying (2018)	US	Downward trend in the rate of ERPT to the Consumer Price Index (CPI)	Pre-1973: II-1989: IVPost – 1990: I-2017:IV	The Vector Auto Regression	Exchange Rate Pass-Through to Consumer Prices and the Role of Energy Price	very weak evidence of ERPT during the pre-1990 era. On the other hand, we observe statistically significant evidence of ERPT during the post-1990 era,
Helmy (2018)	Egypt	Investigate the underlying relationship between the exchange rate and prices known as the exchange rate pass-through	2003-2015	Structural Vector Auto Regression	Exchange rate pass-through to inflation in Egypt: a structural VAR approach	exchange rate pass-through in Egypt is substantial but incomplete and slow in the three price indices [IMP, producer price index and consumer price index (CPI)]. However, the impact is more prominent for consumer prices than for any other price index
Pham (2019)	Vietnam	Analyze the exchange rate pass-through into inflation (ERPT) in Vietnam	2008-2018	The Structural Vector Autoregression	Exchange rate pass-through into inflation in Vietnam: evidence from VAR model	the transmission of exchange rate shocks to inflation is significant in Vietnam, and this is incomplete exchange rate pass-through.
Kotil (2020)	Turkey	Effect of exchange rate changes on the producer and consumer prices in Turkey	2005-2019	Vector Auto The Regression	Exchange Rate Pass-through for Turkish Economy	The effect of change in the exchange rate was found to be higher in the PPI compared to the CPI
Khyareh (2021)	Iran	Effects of exchange rate fluctuations on price indices and other macroeconomic variables	2004 Q1 to 2018 Q4	The Recursive Vector Auto Regression	Exchange Rate Pass-through to prices in Iran	Transfer of exchange rate changes to price indices is imperfect, such that the exchange rate path through to consumer, producer, and import prices is from 14.68%, 15.55% and 18.22% in the first period increase to 51.78%, 53.15% and 88.14% in the 13th period. exchange rate path-through decreases along the distribution chain, with the highest exchange rate passing through the import prices, producer prices and consumer prices, respectively