

SAMA Working Paper :

Exchange Rates Pass-Through in Saudi Arabia*

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Abstract

The paper analyzes the domestic price response in the Kingdom to the pass-through of changes in the Saudi riyal exchange rate, using a vector autoregression model to examine the relationship between the two variables. The findings of the study show that the pass-through is weak and incomplete. The most important factors behind this feeble response are explored, such as the change in the ratio of imports to non-oil GDP and breakdown of opened letters of credit for financing imports by currency. Indications show that one of the reasons behind the weak response of domestic prices to an increase in the riyal purchasing power is the possibility of incomplete competition in the domestic market.

Keywords: Inflation, Exchange rate pass-through, and Nominal Effective Exchange Rates.

JEL Classifications: E 30, E31, E50.

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Introduction

One of the most important exchange rate-related issues is the pass-through of local currency exchange rate movements to domestic prices. In the following sections, the reader will find an analysis of the relationship between changes in the Saudi riyal exchange rate against the currencies of the Kingdom's major trading partners¹ and the domestic price response to such changes during the past two years. It is expected that an increase in the Saudi riyal exchange rate against other currencies would lead, at least in part, to a decrease in the value of imported goods, thereby influencing the consumer price index.

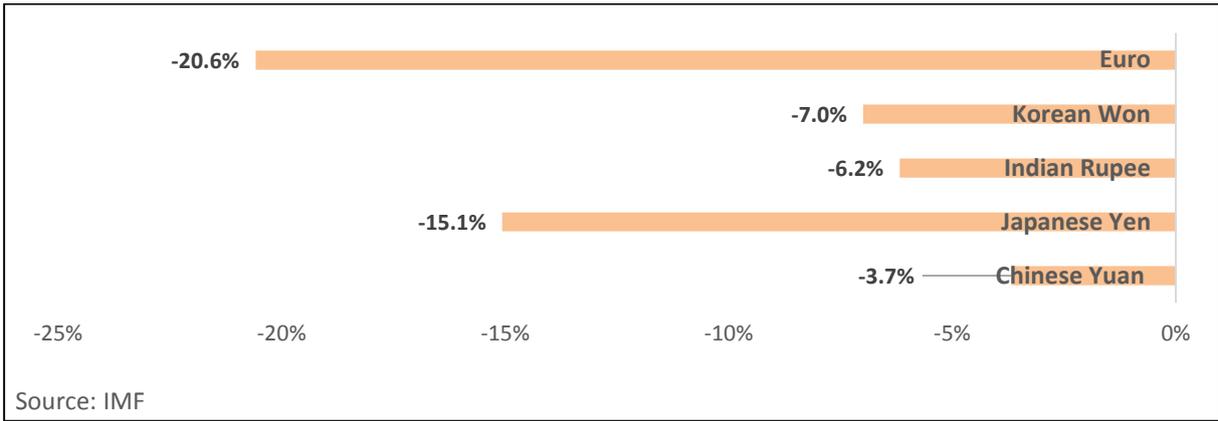
Riyal Movement against the Currencies of Major Trading Partners by Import Sources

Keeping in mind that traders need to adjust prices within a reasonable period, the stockpile of available currencies, and the usual periods of supply and contractual obligations governing international trade, the most recent two-year period (2014-2015) is selected for an initial analysis of the Saudi riyal exchange rate movements against currencies of its trading partners. It is evident that, due to the riyal-dollar peg and the strength of the dollar against major currencies, the riyal's average purchasing power has increased against other currencies during the selected period.

During the two years used in our comparison, the Chinese yuan fell 3.9 percent, the Japanese yen dropped by 14.6 percent, the Indian rupee declined by 5.9 percent, the South Korean won decreased by 6.3 percent, and the euro showed a decrease of 20.1 percent. Figure 1 illustrates these changes in the currencies' exchange rates against the riyal.

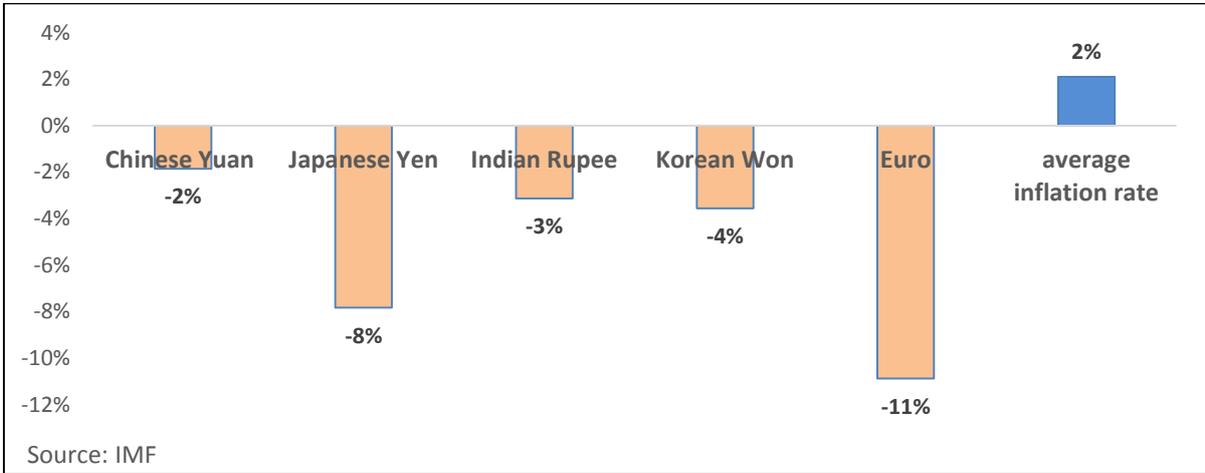
¹ Only the major exporters to Saudi Arabia were considered, since import prices were the focus of this analysis. The major exporters to the Kingdom include China, Japan, the European Union, South Korea and India. The United States is excluded due to the riyal-dollar peg.

Figure 1: Change in Exchange Rate of Currencies against the Saudi Riyal (CAGR) (Dec. 2013-Dec. 2015)



On average, the currencies of the Kingdom’s major trading partners fell against the riyal by 4.8 percent (at a compound annual growth rate). Figure 2 shows movements of the currencies of major trading partners against the riyal during the past two years (on average), as well as the average inflation rate during the same period. The slight decline of the Chinese yuan shown in the chart is a result of the recent actions taken by the Chinese government to address the rise of the US dollar and mitigate the potential impacts of the US interest rate hike. The Japanese yen fell the most, by 10.1 percent, while the Indian rupee dropped by an average of 4.4 percent, and the South Korean won by an average of 1.1 percent. As for the euro, it fell by a year-over-year average of 8 percent, while the domestic inflation rate rose by an average of 2.35 percent during the same period.

Figure 2 : Change in Exchange Rate of Currencies against the Saudi Riyal (Annual Change) (Dec. 2013-Dec. 2015)

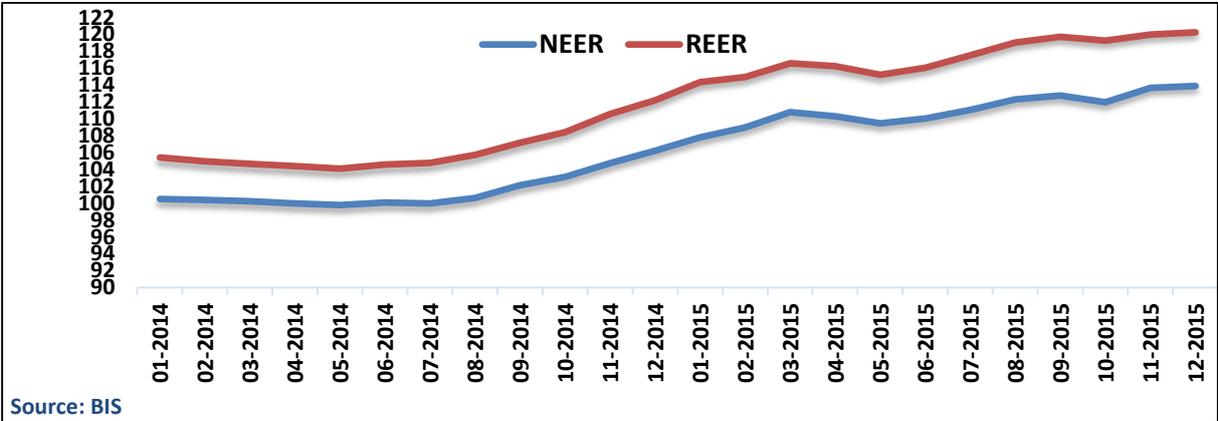


It was expected that the increase in the riyal’s value over the last two years would have acted to keep the inflation rate lower than it would otherwise have been. In other words, the prices of imported goods from our major trading partners would be lower than they would have been in the absence of the exchange rate changes.

Nominal Effective Exchange Rates

The nominal effective exchange rate (NEER) for Saudi Arabia is an index that is created by weighing the bilateral exchange rates of the Kingdom’s major trading partners’ currencies by their volume of trade.² The real effective exchange rate (REER) is the nominal rate adjusted for the relative price levels of the trading partners. Figure 3 shows the movements of the riyal NEER and REER from January 2014 to December 2015, where the nominal effective exchange rate rose by 11.4 percent and the real effective exchange rate by 13.1 percent during this period.

Figure 3: Riyal Effective Exchange Rate (January 2014-December 2015) (2010=100)



The Effective Exchange Rate and Inflation Rate in the Kingdom

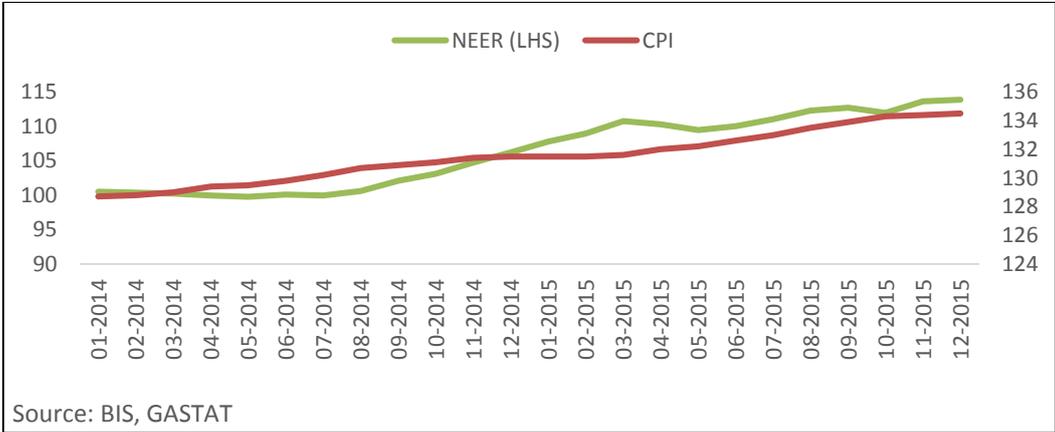
The comparison between the nominal effective exchange rate and the inflation rate is usually used to identify the exchange rate pass-through to domestic prices. Many studies have focused on the relationship between the exchange rate and inflation to determine

²BIS data were used for the nominal and real effective exchange rates of the riyal.

the pass-through to domestic prices due to changes in the exchange rate. These studies show that the relationship is usually high in emerging countries and low in advanced countries. However, some studies find that the relationship is high in countries that have a fixed exchange rate, such as Saudi Arabia. Figure 4 shows the trends in the nominal effective exchange rate and the consumer price index in the Kingdom from January 2014 to December 2015.

Figure 4 shows that both the SAR nominal effective exchange rate and the consumer price index have risen over the two year period. This does not necessarily mean that the SAR exchange rate pass-through is weak, nor does it mean that the prices of imported goods should necessarily be falling. All that it means is that both series rose over the two year period. Common sense tells us that the change in the price level of imported goods is less than would otherwise have been the case, if the riyal’s exchange rate had not strengthened over the period. In order to establish the actual relationship between the two, it is necessary to look at many more periods and apply more sophisticated methodology such as that used later in this paper.

Figure 4: The Trends in NEER and CPI



It is important to remember that changes in exchange rates may affect prices of imported goods to a greater or lesser extent, depending on various factors affecting their relationship. In general, the influence of exchange rates depends on macroeconomic factors, such as the inflation target, the size of the economy, the geographic breadth of the country, the composition of imports and their ratio to non-oil GDP, as well as their ratio to the total basket of goods and services. It also depends on other economic factors, such as the price flexibility of imported goods, inflation rates in the exporting countries,

competitiveness, and labor markets. Moreover, it relies on the optimal estimate or the equilibrium exchange rate appropriate for growth. This means that the mechanism of transmission and its impact varies according to the circumstances of different countries and economic sectors. The exchange rate pass-through may take time to emerge.

Factors Affecting Pass-through in the Saudi Economy

Based on previous studies conducted in different countries around the world, the inflation response to changes in exchange rates of a currency relies on several factors as mentioned in the previous section. This section discusses the influence of these factors on the Saudi economy. Following are the main points regarding these factors:

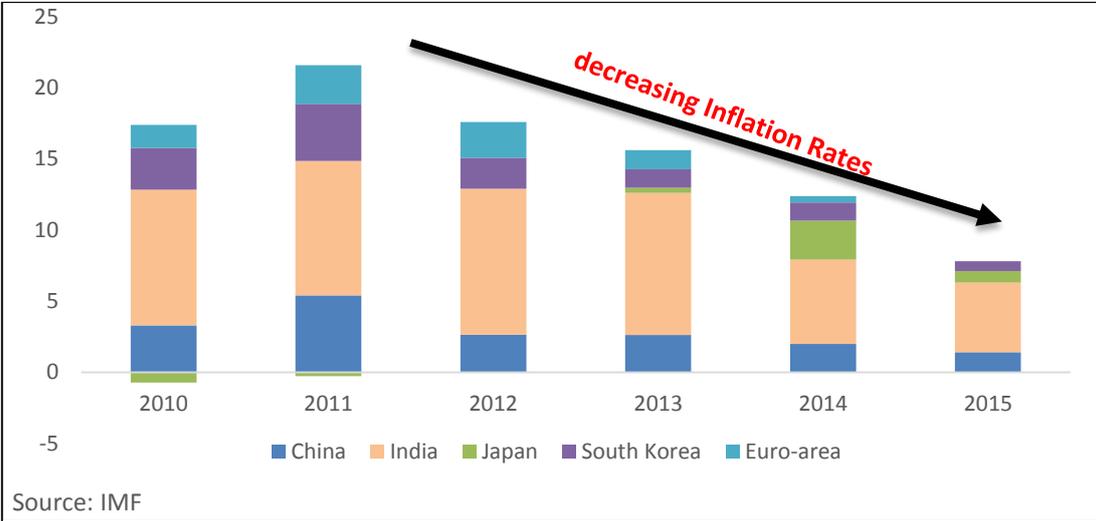
- There appear to be no structural reforms that could change the structure of the Saudi economy during the study period.
- One of the advantage of pegging the riyal to the dollar is that the government does not need to target inflation; instead, it aims are to strengthen monetary and financial stability and maintain the value of the Saudi riyal.
- Figure 5 shows that there is no change in the import ratio to GDP, and imports continued with the same momentum, as the ratio of imports to non-oil GDP amounted to an average of 40 percent during the past five years.

Figure 5: Ratio of Imports to Non-Oil GDP



- The Kingdom’s geographical breadth has an impact on prices, especially in the peripheral areas where transportation cost is usually added to the selling price, which is understandable as a market practice.
- The inflation rates in the Kingdom’s trading partners have been declining over the last five years. For example, the euro zone has recorded negative figures during recent months; and other countries have recorded low rates except for India. However, even India has witnessed a recent fall in inflation rates as compared to those registered in earlier years. Figure 6 shows the inflation rates in the Kingdom’s major trading partners (excluding the US).

Figure 6 : Inflation Rates in the Kingdom’s Major Trading Partners



- Market competition, as a principle, leaves its impact (either positive or negative) on inflation. However, in Saudi market, questions have been raised about the low degree of competitiveness in local markets, which might allow importers to set prices that do not necessarily reflect changes in exchange rates. In order to address this question, we can compare the prices of goods that are usually imported with the changes in the nominal effective exchange rate. Imported goods are concentrated in the food category, clothing, new cars (in the transport group) and household equipment items (in the group of home furnishings, equipment and maintenance). The prices of these goods should reflect a response to changes in the riyal exchange rate, as they are mostly imported goods. Figures 7,9,10 and 11 show the trends in the nominal effective exchange rate and the price indexes of food, clothing, cars (in the transportation group) and household

appliances items (furnishings, household equipment and maintenance group) respectively. Figure 8 illustrates the relationship between the global food index and Saudi food index.

Figure 7: Trends in the NEER and the Index for Food Group

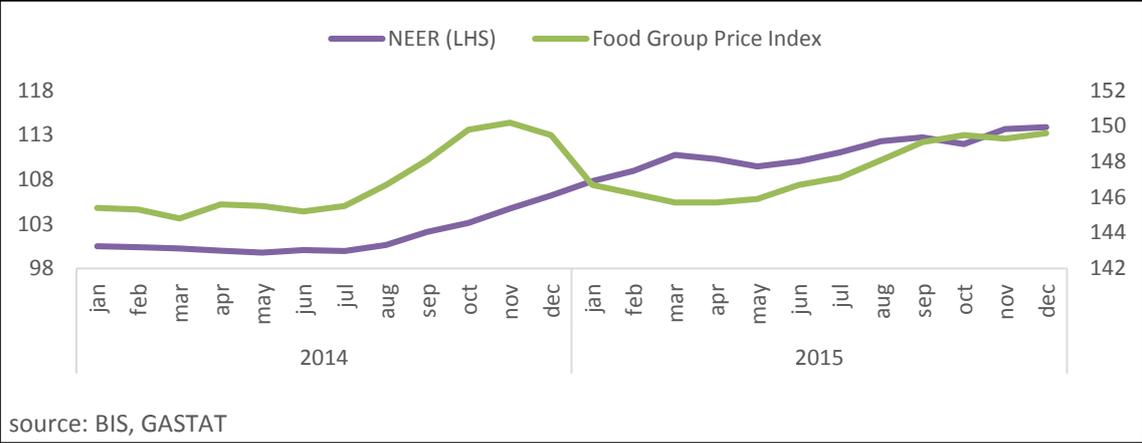


Figure 8: Trends in the Global Food Index and the Saudi Food Index

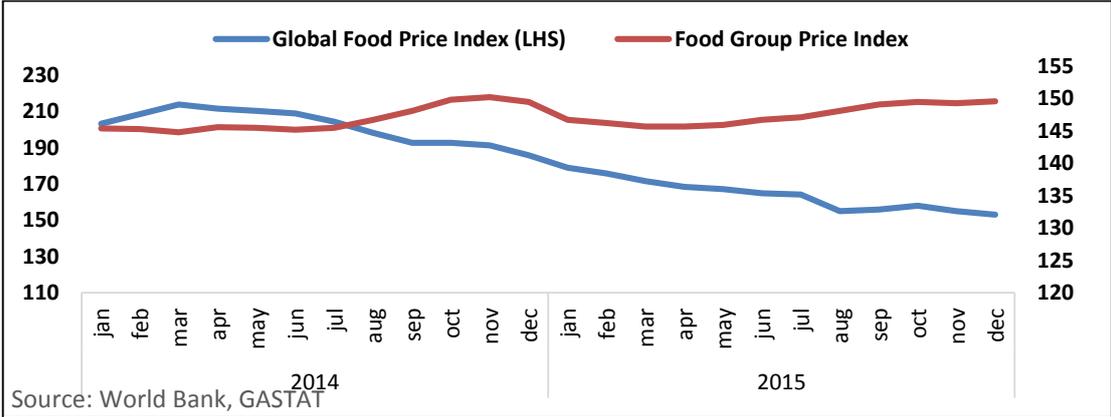


Figure 9 : Trends in the NEER and the Clothing Index

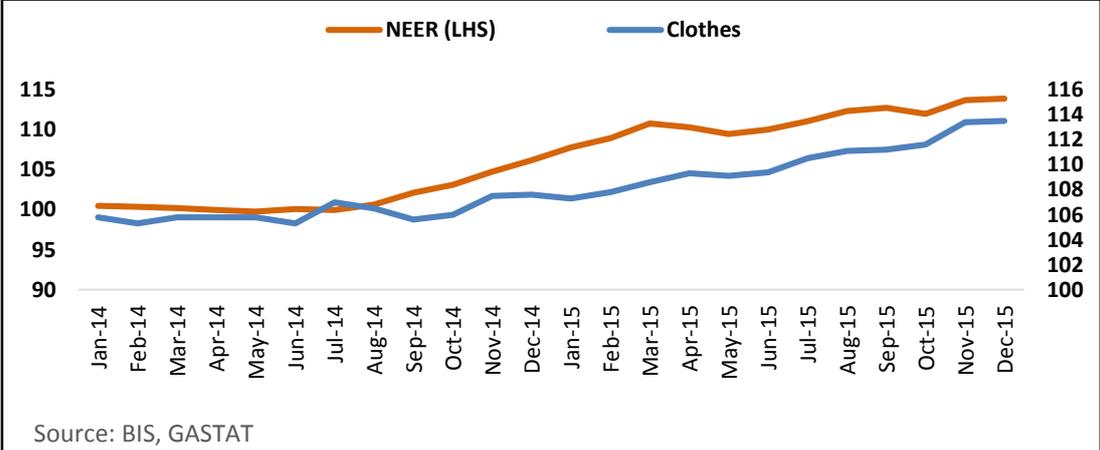


Figure 10 : Trends in the NEER and Cars Item Index

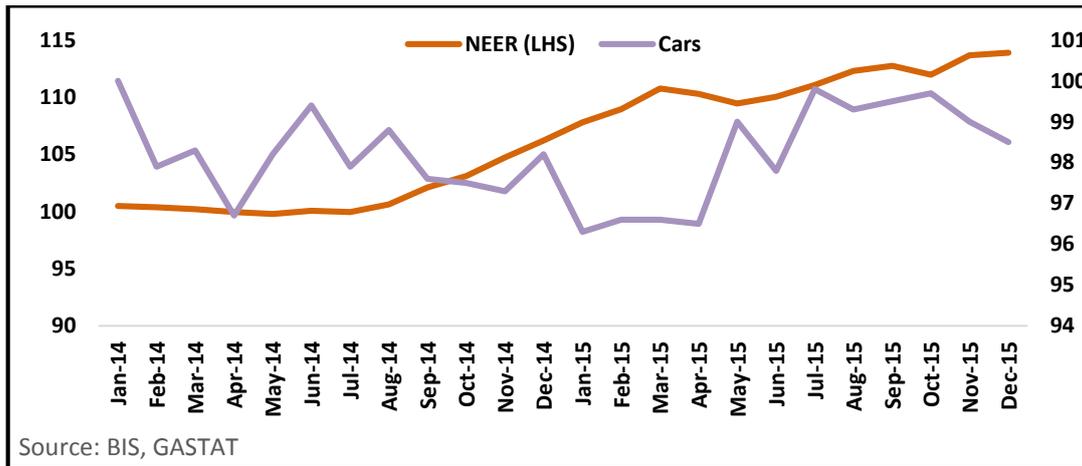
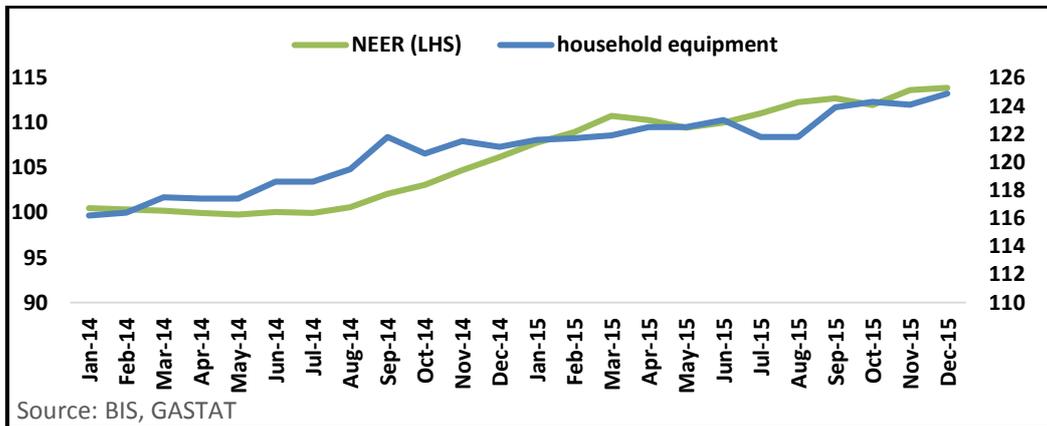


Figure 11 : Trends in the NEER and the Household Equipment Index



In general, the Figures suggest that the domestic prices response to change in the nominal effective exchange rate might not be as strong as it should be, highlighting the need to reconsider competition in the domestic market and its effects on prices. This weakness may be attributable to concentrations in the Saudi market exacerbated by the dependence on exclusive agents (WAKALAT), allowing the formation of a less competitive market for a number of goods in the domestic market. There are single local agents for many imported goods, which enables them to avoid adjusting prices with exchange rate movements, especially when the value of the riyal increases, resulting in a decline in costs. This is particularly noticeable in Figure 8, which shows a continued increase in the food index in the Kingdom compared to a decrease in the global food index.

Figure 12 demonstrates trends in the consumer price index (CPI), wholesale price index (WPI) and the nominal effective exchange rate (NEER). It shows that there was almost no increase in the WPI, which suggests that the increasing NEER may have had a greater effect on wholesale prices than it had on consumer prices. This suggests that the domestic consumer prices may have been influenced in part by a lower degree of competition at the retail level.

Figure 12 : Trends in the Price Indexes and the NEER

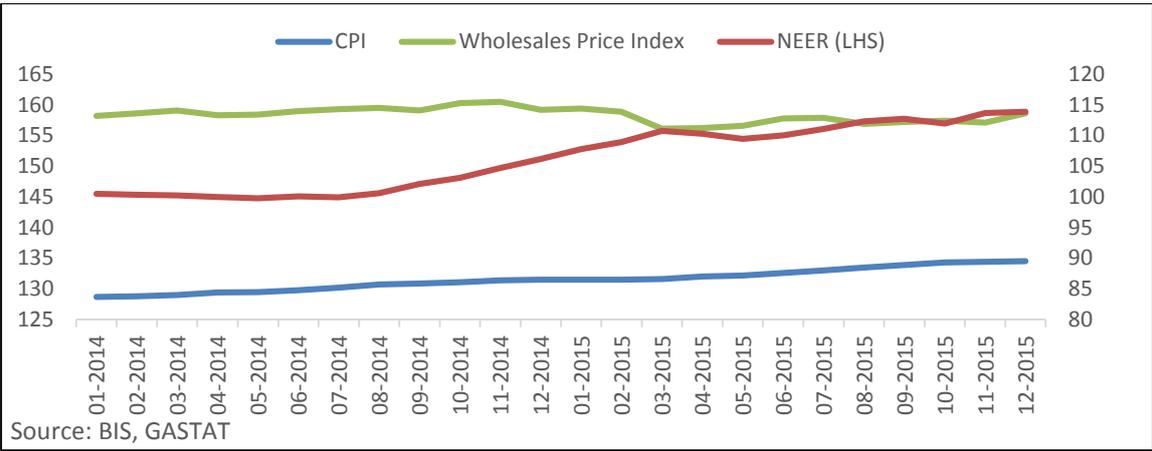
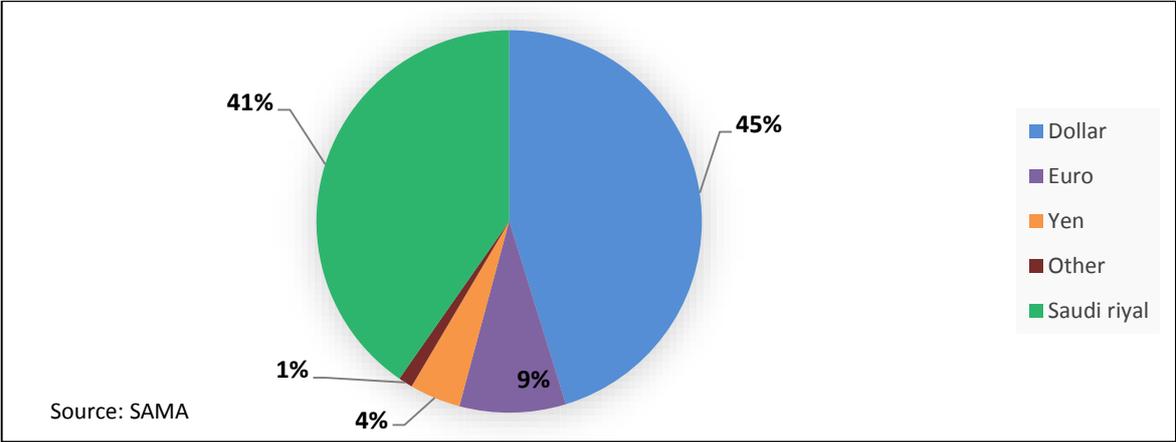


Figure 13 illustrates the new letters of credit opened during the last two years, showing that approximately 86 percent of these letters were in the US dollar and Saudi riyal. This concentration in the US dollar may be inflated by oil sales, which are denominated in dollars. In theory, from the standpoint of measuring the impact on import prices, the relevant trade weights that should be used to determine the nominal effective exchange rate is the proportion of Saudi imports from each of its import-providing partners (excluding the US).

Figure 13: Letters of Credit by Currency during 2014-2015



Domestic Liquidity during the Study Period

In this section, we will discuss domestic liquidity factors during the study period to examine their effects. Figures 14 and 15 illustrate money supply and riyal deposits respectively during the study period. The two Figures show much the same trends, which is undoubtedly due to the fact that riyal deposits are a major component of the broad money supply, M3.

It is evident that the domestic liquidity factors rose significantly during most of the study period; this may have stimulated the demand for goods and services. On the other hand, it may have just been a passive response to the liquidity demands created by the fiscal stimulus resulting from the extra two months of salary given to government workers. Although these factors represent individuals' purchasing power, we presume that people do not spend their all money domestically, as part of their money goes for travel, as the number of travelers abroad have been increasing substantially. Finally, note the downward trend in the last 6-8 months of the data. Since there has been no indication of a general tightening of monetary policy on the part of SAMA, it is reasonable to conclude that this represents a passive response to a slowdown in the demand for money during this period.

Figure 14 : Broad Money Supply (M3) (2014-2015) (SAR Billion)

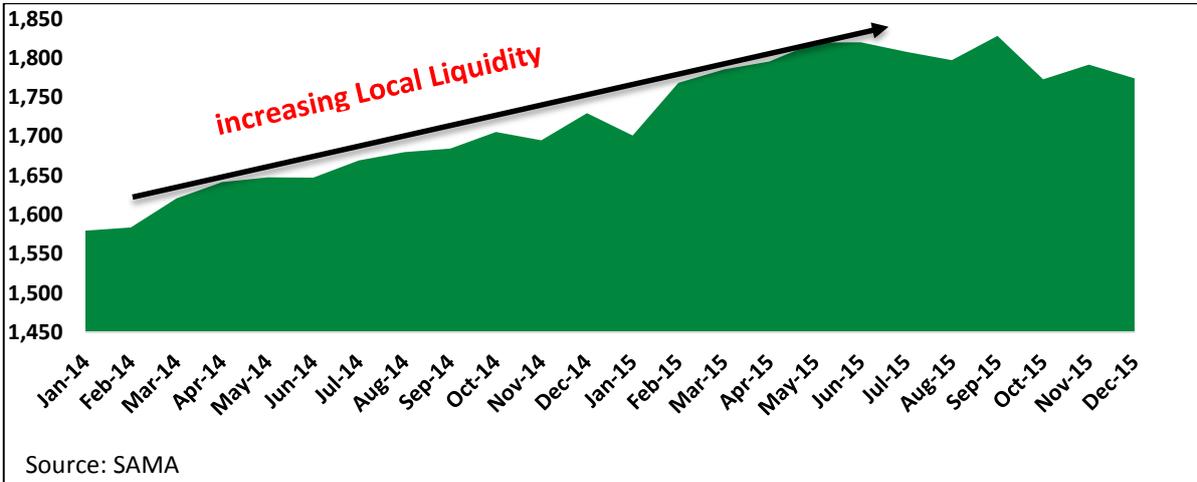
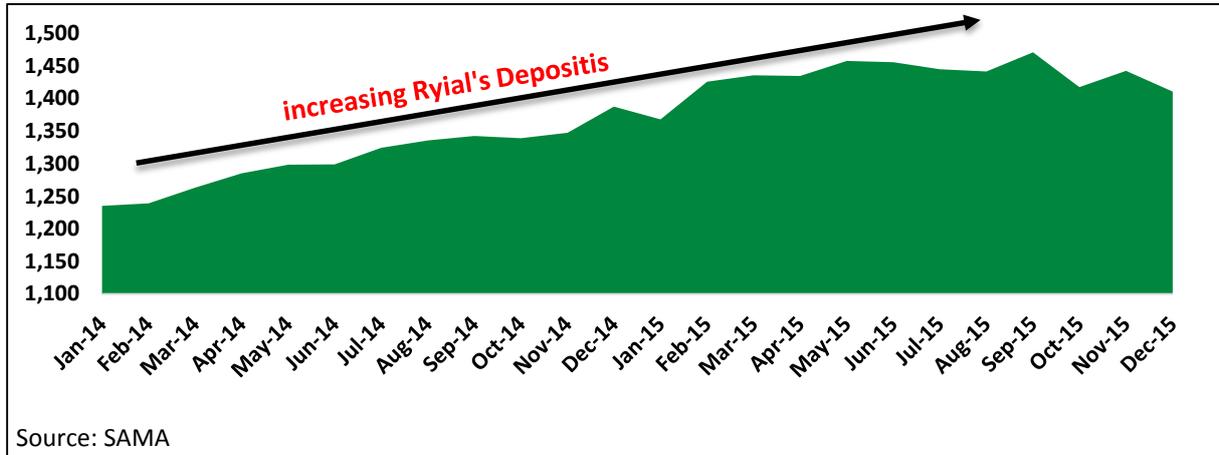


Figure 15 : Riyal Deposits (2014-2015) (SAR Billion)



The Empirical Section

Methodology

Keeping in view economic theory, we will attempt to explain the influence of exchange rate pass-through on domestic prices in the Kingdom. For this purpose we use the standard vector autoregression model. It divides domestic prices into wholesale prices and consumer prices to analyze response of such prices to changes in the riyal exchange rates against a basket of foreign currencies.

The empirical analysis is based on annual time series that covers the period 1985-2015, and largely depend on paper written by Ito and Sato (2006), which used a vector autoregression model to analyze the relationship between a group of major variables that include: oil prices, output gap, M2, nominal effective exchange rates, wholesale and consumer prices. The relationship between these variables can be analyzed by using the following vector autoregression model:

$$X_t = \Gamma_0 + \Gamma_1 X_{t-1} + \dots + \Gamma_p X_{t-p} + u_t$$

This vector X_t includes the following variables:

$$X_t = (oil_t, y_t, m_t, neer_t, ppi_t, cpi_t)$$

oil_t : oil price

y_t : Output gap in real terms

m_t : Monetary Aggregate (M2)

$neer_t$: nominal effective exchange rate

ppi_t : Wholesale prices

cpi_t : Consumer Prices

u_t is known as the vector autoregression model residuals,

Γ as coefficient matrix, and p as lag periods.

Empirical Results

The model was created by using data and time series for the period 1985-2015 from different sources that include: General Authority for Statistics, Saudi Arabian Monetary Agency (SAMA), Organization of the Petroleum Exporting Countries (OPEC) and International Monetary Fund (IMF). To estimate the output gap, this paper used the gap data from the study [*Alkhareif and Alsadoun (2016)*]. In this study, the number of lags is determined by three years ($3=p$) based on the Selection Criteria Test AIC as outlined in the table below:

Table 1: VAR Lag Order Selection Criteria Results

Lag	AIC
0	27.88900
1	27.82838
2	27.69465
3	26.41123*

* indicates lag order selected by the criterion. AIC: Akaike information criterion.

Additionally, the time series characteristics for all variables were analyzed and the presence of stationarity was verified by using unit root tests (Augmented Dickey-Fuller). The results show the stability and stationarity of the time series for all variables when converted into logarithms and taking the first difference as shown in Table 2.

Table 2: Unit Root Tests for Variables (in Logarithm) for the Entire Period (1985-2015)

Augmented Dickey -Fuller Test (first differences)

	t-Statistic	Prob.	5% level
oil price	-5.76	0.0001	-2.98
Output gap	-6.59	0.0000	-2.98
Money Supply	-6.74	0.0000	-2.97
Nominal Effective Exchange Rate	-6.85	0.0000	-2.97
Wholesale prices	-7.74	0.0000	-2.97
Consumer Prices	-7.78	0.0000	-2.97

To analyze economic shock impacts, especially exchange rate shocks, on domestic prices, impulse-response functions were used. The results are shown in Figures 16 and 17. Note that wholesale prices are referred to as PPI (producer price index) in the Figures. When interpreting these Figures, keep in mind that they are based on the log first difference of the PPI, CPI, and NEER. This means that it is the percent change in the NEER (referred to as an “impulse”) that causes a percent change in either the PPI or CPI.

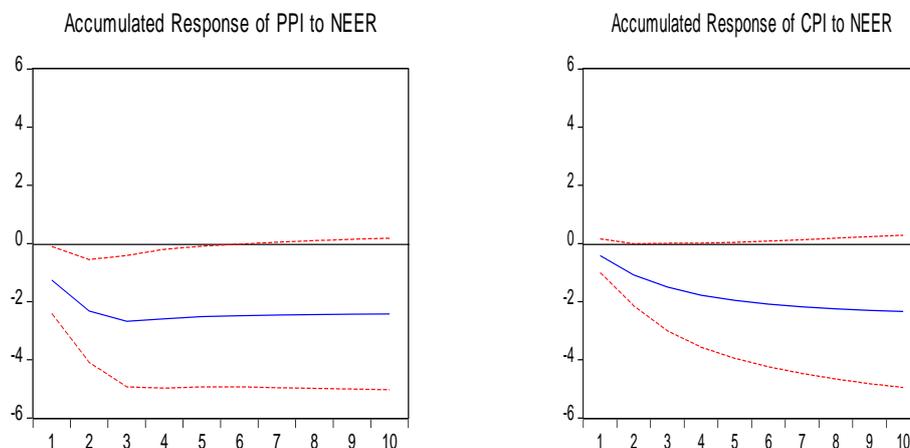
An examination of the graph on the left (Accumulated Response of PPI to NEER) shows the following:

The blue line is entirely below the zero (0) axis. This means that the cumulative response is negative – a positive percent change in the NEER is associated with a negative percent change in the PPI.

The blue line is at around -1 for the first period (year). This means that a one percentage point increase in the percent change of the NEER is associated with a one percentage point decrease in the percent change of the PPI.

Figure 16 : Impulse Response Functions of PPI and CPI to a NEER Shock

Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E. Accumulated Response to Cholesky One S.D. Innovations ± 2 S.E.



The upper red line is below zero for the first four periods (years). Since the red line is the +2 S.E. line, this means that there is a significant likelihood (95 percent) that the cumulative response stays negative for an extended period of time before it fades out.

The graph on the right (Accumulated Response of CPI to NEER) shows the following:

The blue line is also entirely below the zero axis. This also means that the response is negative – a positive percent change in the NEER seems to be associated with a negative percent change in the CPI.

The blue line is around -0.4 in the first period (year). This means that a one percentage point increase in the percent change of the NEER is initially associated with a 0.4 percentage point decrease in the percent change of the CPI.

However, the upper red line is above zero for the first period and only gets down to around zero in the next two periods, before going unambiguously positive. This means that the cumulative response is very weak and barely significant at the 95% level.

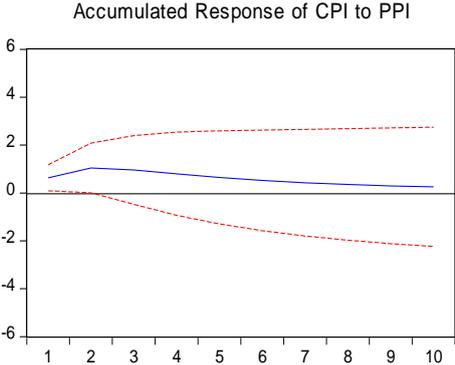
In other words, the consumer price response to changes in the percent growth of Saudi riyal exchange rates was weak compared to its impact on percent changes in the wholesale prices (PPI). An increase of 1 percentage point in the growth rate of the domestic currency exchange rate against the major trading partners' currencies resulted

in a 1 percentage point decrease in the growth rate of wholesale prices. In sharp contrast, the same percentage point increase in the growth rate of the exchange rate was associated with a percentage point decrease of only 0.43 percent in the growth rate of consumer prices.

The reason behind the variance between consumer and wholesale prices goes back to exchange rate shocks and differences in groups, elements and weights used to construct price indexes. Given that the CPI includes non-tradable goods and services that are not present in the wholesale prices index, and that the exchange rate fluctuations on the CPI only affect imported goods and services, it is not surprising that the CPI showed less of an impact.

Figure17 : Impulse Response Functions of CPI to a PPI Shock

Accumulated Response to Cholesky One S.D. Innovations \pm 2 S.E.



The findings also show that the response of the growth rate of consumer prices (inflation) to changes in the growth rate of wholesale prices is limited. The blue line in Figure 17 shows that a 1 percentage point change in the growth rate of domestic wholesale prices is associated with a positive change in the growth rate of consumer prices of only 0.6 percent in period (year) 1. Furthermore, the lower red line is barely above zero and drops below zero in later periods, indicating that the cumulative effect fades into insignificance at the 95 percent confidence level. Thus, consumer prices are influenced by other internal and external factors as mentioned earlier. The results of this empirical analysis suggest that the changes in exchange rates are entirely passed through to wholesale prices, while partially to consumer prices. This could possibly be attributed to several factors, one of which is the weak competition in the domestic market.

Conclusion

The problem of low response of domestic prices to riyal exchange rate movements, when the riyal exchange rate is high, must be addressed seriously, especially at present where the US dollar (and hence the riyal) is high against many currencies. Furthermore, the coming period may witness inflationary pressures because of raising some government fees and curtailing fuel subsidies. The value of the US dollar (and accordingly that of the riyal) may increase further, due to the Federal Reserve's decision to raise the US interest rates, which are expected to increase further during 2016. This entails further monitoring of the response of domestic prices to changes in exchange rates. If there are significant changes in the exchange rates and domestic prices, and the international trade responds slowly to such changes, it may result in accumulated imbalances in the balance of payments, since the response of imports to such changes will not coincide with that of exports. In this context, efforts exerted by the Ministry of Commerce and Industry during the past period have contributed to monitoring high prices by on-site inspections and responding to people's complaints. It is noteworthy to mention that the Ministry is determined to monitor the prices, as shown by its release of a warning statement against raising prices without justifiable reasons.

Recommendations

- More attention must be given to identify exchange rate pass-through channels to domestic price indexes.
- Competition should be encouraged, to minimize any anti-competitive forces that may exist. This should include facilitating procedures, prices monitoring and developing a sophisticated economic and financial database and information systems to enhance economic activities management and provide prices-related data and information.

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