



## The Effects of Global Commodity Prices on Domestic Prices in Saudi Arabia

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### ABSTRACT

This paper evaluates the impacts of global commodity prices on domestic prices in Saudi Arabia with aid of econometric techniques and monthly data over the period 2000:01-2016:09. We find evidence suggesting the influential role of global commodity prices on Saudi domestic prices over long run. In particular, we find that non-fuel commodity prices have more impacts on domestic prices than energy prices. Likewise, we find evidence, based on Granger causality analysis, suggesting that global commodity prices are useful indicators in capturing the movements in domestic prices.

**Keywords:** Global Commodity Prices, Domestic Prices, Saudi Arabia

**JEL Classifications:** C13, C22, C50, E31, Q43

### 1. INTRODUCTION

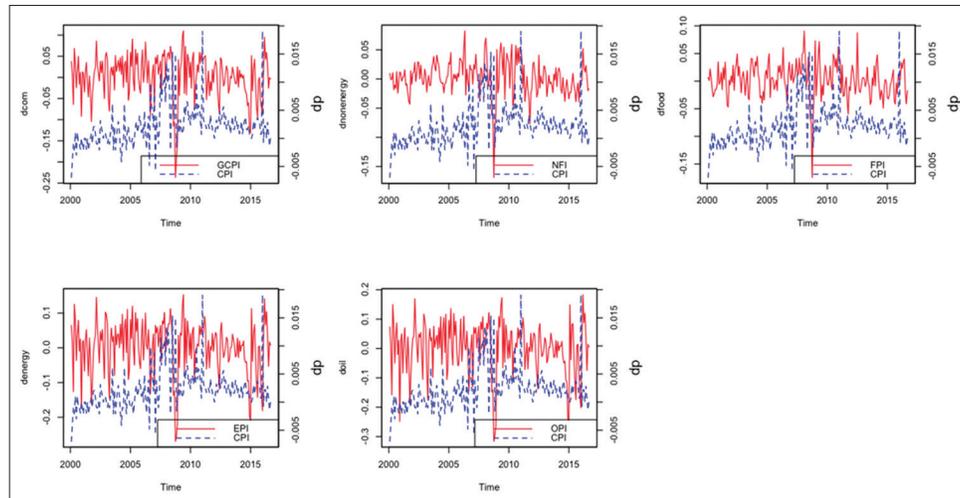
Volatility in commodity prices has revitalized the interest of researchers and economists considering commodity prices as useful indicators in capturing the movements of consumer price inflation in advanced and emerging economies. In case of Saudi Arabia, shocks to global commodity prices with no doubts have influential role in generating inflationary pressures in Saudi Arabia due to its heavy dependence on imported goods and services. Put differently, it can be observed from Figure 1 that global commodity price inflation and consumer price inflation tend to some extent to move in the same direction. Over the past decade, for example, inflation in Saudi Arabia and global commodity prices recorded high rates. Specifically, in March 2007, inflation registered 2.9% and jumped to 6.5% by December 2007 and continued rising to reach more than 11% by July 2008. On the other hand, global commodity prices recoded an increase by 8% in March 2007 and ended the year of 2007 rising by 29.6%; 6 months later, global commodity prices surged by 59%. Importantly, during these periods of time, the rise of global commodity prices was attributed to the rise of non-fuel commodities' prices notably global food prices. In recent years, global commodity prices declined due to the weak global demand; thus, inflation in Saudi Arabia was

moderate ranging between 2% and 3.5%. Over the year of 2016, while global commodity prices were declining, inflation in Saudi Arabia peaked in March 2016 recording 4.3% then started to ease down by end of 2016. This rise of inflation was attributed to one-time shock reflecting the implementation of energy price reforms imposed in January 2016.

Furthermore, correlation between global commodity prices and domestic consumer prices appears to be strong, as shown in Table 1. These correlation coefficients in turn suggest that the inflationary pressures in Saudi Arabia are imported since Saudi Arabia's industrial base is less diversified. This is also consistent with various empirical studies (i.e., Hassan and Alogeel, 2008; Kandil and Morsy, 2011) reporting that inflation in Saudi Arabia is mostly imported and other studies (i.e., Ramady, 2009; Nazar, 2016) suggesting the presence of strong correlation of commodity-consumer prices.

Thus, it is essential to understand the link between global commodity prices and domestic prices. To do so, we need first to be aware of the channels in which changes in commodity prices pass through consumer prices. For this reason, recent literature (i.e., Blomberg and Harris, 1995; Cutler et al., 2005;

**Figure 1:** Inflation of consumer price index and global commodity prices co-movements . Note: CPI: Consumer price index; GCPI: Global commodity price index; NFI: Global non-fuel price Index; FPI: Global food price index; EPI: Global energy (fuel) price index; OPI: Oil price index



**Table 1: Correlation commodity-consumer prices**

Commodities	GCPI	NFI	EPI	FPI	OPI
Correlation coefficient	0.7	0.8	0.6	0.9	0.6

GCPI: Global commodity price index, NFI: Non-fuel price index, FPI: Food price index, EPI: Energy (fuel) price index, OPI: Oil price index

Cheung, 2009) identifies three channels, in which changes in global commodity prices transmitted to consumer prices. First, some commodities like agricultural raw materials, metals, and energy are key inputs for producing final goods. Thus, an unexpected rise in commodity prices would lead to increasing the prices of final goods, which in turn would be passed to consumer prices. Alternative channel connecting commodity prices to consumer prices is through global demand conditions. In other words, shocks to commodity prices may attributed to the rise in global demand for final goods and services, which may generate an upward inflationary pressure on domestic prices. Lastly, valuable commodities such as gold, silver, platinum, or other precious metals are popular in hedging against inflation. Thus, rising in such commodity prices might be interpreted as signals for rising inflation leading firms to take into account these signals into their price adjustment, which in turn generate actual inflation.

Based on these identified channels, therefore, there is an adequate number of studies exploring the nexus between global commodity prices and consumer price inflation in advanced and emerging economies. Undoubtedly, global commodity prices also play essential role in generating inflationary pressures in Saudi Arabia though the literature is scarce. Therefore, it is important to shed light on the role of global commodity prices, not only oil prices, on domestic inflation in Saudi Arabia. This is very important issue to examine to provide policymakers some insight regarding the sources of inflation in Saudi Arabia to take the necessary actions in mitigating the inflationary pressures. By doing so, we contribute into the existing literature by exploring the role of global commodity prices in impacting domestic prices in Saudi Arabia since no other research paper, based on our knowledge, has looked into such relationships.

The rest of the paper organized as follows: Section 2 overviews the existing literature, while section 3 describes the employed dataset. The empirical methodology and results are presented in section 4. An overview of monetary policy in Saudi Arabia is summarized in section 5, while the conclusion is contained in section 6.

## 2. LITERATURE REVIEW

There is substantial literature analyzing the nexus between commodity prices and inflation with more attention paid to advanced and emerging economies. For instance, Blomberg and Harris (1995) assess the relationship between the US consumer prices and eight commodity price indices. Their evidence reveals that most commodity prices are useful in signaling inflation during the 1970s and until the mid-1980s, in which commodities lost their predictive power in capturing inflationary pressures. Likewise, Furlong and Ingenito (1996) assess empirically the relationship between commodity prices and US inflation. Their findings indicate that commodity prices are useful indicators for inflation during the 1970s and early 1980s; however, since mid-1980s, commodity prices become weak in signaling inflation. The authors also explore the role of non-oil commodity in capturing inflationary pressures and conclude that these commodities are leading indicators for inflation. Cutler et al. (2005) also probe the connection between global commodity prices and inflation in Mainland China and Hong Kong and concluded that changes in non-fuel commodity prices are associated with the rise in consumer prices in both countries. Moreover, their evidence indicates that the inflationary effects of non-fuel commodity prices are larger than advanced economies and attribute this to the high degree of openness in these countries. Furthermore, Spange (2011) provides an analysis showing the influential role of food and energy prices in causing inflationary pressures in Denmark. Chuah et al. (2013) investigate the response of domestic inflation in Malaysia to global commodity prices and report the strong influence of global commodity prices in generating inflation.

Concerning Saudi Arabia, on the other hand, there is a handful number of studies exploring how commodity prices, predominantly oil prices, influence inflation. In particular, several studies (i.e., Hassan and Alogeel, 2008; Ramady, 2009; Kandil

and Morsy, 2011; Nazar, 2016) find evidence suggesting the weak association between oil prices and inflation in Saudi Arabia, while other research papers (i.e. Al Rasasi and Banafea, 2015; Kamel et al., 2016) document the influential role of oil prices in generating inflationary pressures in Saudi Arabia.

### 3. DATA

In order to understand how fluctuation in commodity prices influences inflation in Saudi Arabia, we rely on monthly dataset covering the period 2000:01-2016:09. The dataset contains consumer price index (CPI) for Saudi Arabia, global commodity price index (GCPI), global fuel (energy) price index (EPI), global non-fuel price index (NFPI), crude oil price index (OPI), and food price index (FPI). It is crucial to emphasize that our choice for oil price and food price indices, which are sub-indices of the global fuel and non-fuel indices, attributed mainly to the high share of energy and food in Saudi household’s budget. Likewise, it is important to bear in mind that we take logarithm for all variables that obtained from the international monetary fund databases.

## 4. EMPIRICAL METHODOLOGY

### 4.1. Unit root and Cointegration Tests

The outcome of spurious regressions means that the produced standard errors are biased. Hence, the interpretation of the parameter estimates would be inaccurate since the provided statistical evidence is misleading regarding the existence of a valid relationship between various non-stationary variables. For this reason, it is common in empirical analysis to verify the stationarity of the employed economic variables. To reach this verification, we apply the most popular unit root tests; namely, the Augmented Dickey-Fuller (ADF) Said and Fuller (1984) “ADF”, and Phillips and Perron (PP) (1988) “PP” to test the order of integration of all variables at their level and their first difference. The reported results from both tests, as shown in Table 2, indicate that all variables are integrated of order one. Following the stationarity tests, Engle and Granger (1987) point out to the possibility of having cointegrated variables in case the variables are integrated of order one. This in turn suggests the necessity of checking whether our variables are cointegrated or not. To do so, the common cointegration tests of Johansen and Juselius (1990) are used. Table 3 presents the cointegration tests’ results, which indicate the presence of at least one cointegration relationship between CPI and commodity prices. This in turn indicates the existence of a long run relationship between CPI and commodity prices.

### 4.2. Long-run Relationship

Now, with the confirmation of the existence of cointegration relationships between various global commodity prices and domestic consumer prices, we can precede our analysis by interpreting the long run and short run relationship between global commodity prices and domestic consumer prices. Hence, we estimate the long run relationship, via ordinary least square method, for equation (1) as given below.

$$CPI_t = \beta_0 + \beta_1 Commodity_t + \varepsilon_t \tag{1}$$

Where  $CPI_t$  and  $\varepsilon_t$  denote the CPI and error term at time  $t$  respectively, while  $Commodity_t$  represents the commodity indices (GCPI, NFPI, EPI, FPI, and crude OPI).

The parameter estimates of the long run relationship, as shown in Table 4, indicate that global commodity prices have statistically significant impact on domestic prices. For instance, an increase of global commodity prices by 10% leads domestic prices to rise by 2.7% at 5% significance level. Of note, it appears that non-fuel prices have more impacts on consumer prices than energy prices. In other words, domestic prices increase by 5.1% due to the rise of global food prices by 10%, whereas increasing global crude oil prices by 10% pushes domestic prices up by 2%. It is obvious that the impact of non-fuel commodity is twice the impact coming from energy prices. This might be due to the fact that Saudi Arabia is an energy exporter country with less diversified industrial base. In other words, it depends heavily on importing goods and services from abroad to meet its domestic demand. Thus, any rise in global commodity prices would lead to the rise in the prices of imported goods and services, which would be passed to consumers leading to higher consumer prices. Comparing our finding to existing studies on Saudi Arabia, we find that our evidence is equivalent to the reported evidence of Al Rasasi and Banafea (2015) and Kamel et al. (2016) showing the significant role of oil prices in generating inflationary pressures in Saudi Arabia.

### 4.3. Error Correction Model

The existence of cointegration relationship between domestic prices and global commodity prices, as reported in section 4.1, encourages us to estimate the error correction model, as equation (2) shows, to obtain some insight into how long-run equilibrium is restored between domestic prices and commodity prices.

$$\Delta CPI_t = \beta_0 + \sum_{i=1}^k \beta_{1i} \Delta CPI_{t-i} + \sum_{i=1}^k \beta_{2i} \Delta Commodity_{t-i} + \lambda_{cpi,z} Z_{t-1} + \varepsilon_t \tag{2}$$

**Table 2: ADF (1984) and PP (1988) unit root tests**

Variables	ADF test						PP test			
	Level data			First difference			Level data		First difference	
	None	Trend	Drift	None	Trend	Drift	Constant	Trend	Constant	Trend
GCPI	0.28	-1.25	-1.63	-7.19	-7.26	-7.19	-1.64	-1.04	-9.39	-9.44
EPI	0.14	-1.35	-1.72	-8.04	-8.11	-8.03	-1.73	-1.15	-10.06	-10.11
NEPI	0.57	-1.28	-1.48	-6.86	-6.93	-6.88	-1.44	-1.08	-8.83	-8.87
OPI	0.07	-1.62	-1.82	-8.24	-8.27	-8.22	-1.80	-1.39	-10.26	-10.29
FPI	0.65	-2.07	-1.56	-7.67	-7.73	-7.71	-1.45	-1.63	-8.55	-8.56
CPI	5.66	-3.16	2.00	-4.91	-6.91	-6.57	1.95	-3.31	-10.99	-11.59

The ADF 5% critical values are for none: -1.95, trend: -3.43, and drift: -2.88. The PP 5% critical values for constant: -2.87 and trend: -3.43, GCPI: Global commodity price index, NFI: Non-fuel price index, FPI: Food price index, EPI: Energy (fuel) price index, OPI: Oil price index, CPI: Consumer price index, ADF: Augmented Dickey-Fuller, PP: Phillips-Perron

Where  $Z_t = CPI_t - \beta_0 - \beta_1 Commodity\_t$  and  $\lambda_{cpi,z}$  denotes the error-correction coefficient. The lag length  $k$  is chosen based on the Akaike information criterion (AIC). The parameter estimates of the error correction coefficients that govern the adjustment to the long-run equilibrium are shown in Table 4. It is clear that the error correction coefficients are not only negative for all global commodities, but also statistically significant. This in turn implies that domestic consumer prices adjust to return to the long-run equilibrium whenever domestic prices deviate from their long-run equilibrium. The estimated magnitude of the error correction coefficient indicates that the half-live ranges between 10 and 32 months. For illustration, the error correction coefficient capturing the link between CPI and global food prices indicates that it would take about 10 months to return to equilibrium when CPI deviates from its long-run equilibrium. Similar interpretation applies for the rest of the commodities.

**Table 3: Johansen and Juselius (1990) tests**

Variables ( $H_0$ )	Trace test		Maximum eigenvalue test	
	$r=0$	$r \leq 1$	$r=0$	$r \leq 1$
GCPI-CPI	59.41*	2.85	56.56*	2.85
EPI-CPI	57.69*	2.88	54.81*	2.88
NEPI-CPI	62.25*	2.80	59.44*	2.80
FPI-CPI	64.18*	3.51	60.67*	3.51
OPI-CPI	58.09*	2.89	55.20*	2.89

\*Indicates the rejection of the  $H_0$  at 5% significance level. GCPI: Global commodity price index, NFI: Non-fuel price index, FPI: Food price index, EPI: Energy (fuel) price index, OPI: Oil price index

**Table 4: Long run parameter estimates and ECT estimates**

Index	Parameter estimates			HL
	$\beta_0$	$\beta_1$	ECT <sub>t-1</sub>	
Global commodity price	3.20** (31.51)	0.27** (12.96)	-0.004*** (-1.94)	24
Non-fuel price	2.41** (19.61)	0.43** (17.17)	-0.007** (-3.21)	14
Energy price	3.53** (40.11)	0.21** (11.23)	-0.003 (-1.45)	32
Food price	2.08** (19.61)	0.51** (23.07)	-0.010** (-3.65)	10
Oil price	3.58** (41.83)	0.20** (11.02)	-0.004*** (-1.841)	24

Numbers in parenthesis are t-statistics. (\*), (\*\*), (\*\*\*) denote 1%, 5%, and 10% significance levels respectively

**Table 5: Granger causality tests**

$H_0$	F-statistics		$H_0$	F-statistics	Decision
GCPI $\nrightarrow$ CPI	0.6722 (0.76)	Reject $H_0$	GCPI $\nrightarrow$ CPI	3.4509 (0.00)	Fail to reject $H_0$
NFPI $\nrightarrow$ CPI	1.5728 (0.09795)	Reject $H_0$	NFPI $\nrightarrow$ CPI	3.9725 (0.00)	Fail to reject $H_0$
EPI $\nrightarrow$ CPI	0.6602 (0.7759)	Reject	EPI $\nrightarrow$ CPI	3.6613 (0.00)	Fail to reject $H_0$
FPI $\nrightarrow$ CPI	1.4577 (0.1387)	Reject $H_0$	FPI $\nrightarrow$ CPI	2.9068 (0.00)	Fail to reject $H_0$
OPI $\nrightarrow$ CPI	0.754 (0.686)	Reject $H_0$	OPI $\nrightarrow$ CPI	2.84 (0.00)	Fail to reject $H_0$

Numbers in parenthesis are P values. GCPI: Global commodity price index, CPI: Commodity price index, NFI: Non-fuel price index, FPI: Food price index, EPI: Energy (fuel) price index, OPI: Oil price index

Engle and Granger (1987) point out that the negative and significant error correction parameters provide stronger support regarding the existence of cointegration relationship between economic variables, in our case between domestic prices and global commodities' prices. Likewise, our estimates of error correction parameters suggest that domestic prices are predictable.

**4.3. Granger Causality Analysis**

In order to judge whether changes in commodity prices cause changes in domestic prices, we rely on the popular causality test of Granger (1969), which determines if the past values of a certain variable, let say denotes consumer prices, are able to predict the changes in the current value of another variable, let say denotes commodity prices, given its past values, commodity<sub>t-1</sub>. In case, the parameters' estimates are related to the past values of CPI are statistically significant, then we can say that CPI Granger cause Commodity. It is also important to bear in mind that it is possible to observe bidirectional causality, when we find Granger causality running from both directions. Now to assess whether we have bidirectional causality or not, we estimate a bivariate vector autoregression (VAR) model consisting domestic consumer prices and global commodity prices with the first difference as given by equations (3) and (4) below:

$$\Delta CPI_t = \alpha_0 + \sum_{i=1}^k \alpha_{1i} \Delta CPI_{t-i} + \sum_{i=1}^k \alpha_{2i} \Delta Commodity_{t-i} + \epsilon_{1t} \tag{3}$$

$$\Delta Commodity_t = \beta_0 + \sum_{i=1}^k \beta_{1i} \Delta CPI_{t-i} + \sum_{i=1}^k \beta_{2i} \Delta Commodity_{t-i} + \epsilon_{2t} \tag{4}$$

Where  $\Delta CPI_t$  and  $\Delta Commodity_t$  denote the first difference of domestic prices (inflation) and the first difference of global commodity prices (GCPI, NFPI, EPI, FPI, and OPI) at time  $t$ . Likewise, and are the error terms at time  $t$  for equations (3) and (4) respectively, while  $\alpha_0, \alpha_{1i}, \alpha_{2i}, \beta_0, \beta_{1i}, \beta_{2i}$  are the parameter to be estimated. The AIC is used to determine the optimal lag length in the VAR model. Once the VAR model being estimated, to test for the Granger causality between domestic prices and commodities' prices, we need to assess the joint statistical significance of the  $\alpha_{1i}$  and  $\alpha_{2i}$  parameter estimates. Put differently, we need to test the null hypothesis saying that  $\Delta CPI_t$  does not Granger cause  $\Delta Commodity_t$   $\alpha_{1i} = \alpha_{2i} = 0$ . Table 5 presents the results of Granger

causality test, which indicate the presence of unidirectional causality running from all commodity prices to domestic prices. We expect to not find Granger causality running from domestic prices to global commodities because Saudi exports primarily are oil in addition to the lack of diversified industrial base. In sum, changes in global commodity prices have predictive power in capturing changes in domestic prices and not vice versa.

## 5. MONETARY POLICY IN SAUDI ARABIA

During the last three decades, the monetary policy conducted by the Saudi Arabian Monetary Authority (SAMA) has served the country well in terms of price stability and highly resilient financial system. Despite the one time incident of high inflation reaching 6.5% in 2007, inflation has been subdued with average of 1.6% for the period 1988-2015<sup>1</sup>. Although the monetary policy of SAMA is not independent due to the peg to the US dollar, SAMA has several tools at its disposal and when deemed necessary to maintain stability in prices and to support economic growth. For instance, to counter the rising inflationary pressures in 2007-2008 driven by imported food prices and increasing levels of money supply, SAMA has raised its bank reserve requirements four times only in 2008. In particular, the reserve requirement on demand deposits had been increased from 9% to 13%, while the reserve requirement on time and saving deposits was up to 4% from 2%. In the same vein, a well-coordination between monetary policy and fiscal policy would enhance price stability since fiscal policy is dominant in the Saudi economy. For instance, in deflation cases, fiscal policy via spending on projects and infrastructure can raise inflation again and maintain stable prices.

## 6. CONCLUSION

This paper explores the link between domestic prices in Saudi Arabia and global commodity prices using global indices for commodities consisting of GCPI, NFPI, EPI, FPI, and OPI. The authors employ monthly data spanning from 2000:01 to 2016:09 as well as employing various econometric techniques. The empirical evidence shows the presence of long run relationship between domestic prices and global commodity prices. In particular, the results suggest that non-fuel commodities have more impacts on domestic prices than energy prices, in which the impacts of non-fuel commodity are twice the impact of energy prices. Causality analysis also reveals the predictive power of global commodity prices in capturing the movements in domestic prices. Summing it all, the findings of this paper are useful in giving policymakers some insight into the sources of inflation in Saudi Arabia, which is predominantly imported from abroad, and quantifying the impacts of global commodities in influencing domestic inflation.

<sup>1</sup> The base year was 2007

Although several studies have been investigating the causes of inflation in Saudi Arabia, there is still some room for future research. For instance, applying non-linear econometric techniques is worth considering. Our finding is also can be applicable to other GCC countries since they have similar economies to the Saudi economy.

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