Determinants of Commodity Prices: Banadir, Lower Shabelle and World Commodity Prices

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Abstract

The purpose of this study is to unveil the relationship between commodity prices of Banaadir region, Lower Shabelle, the World food prices, and world agricultural prices between the period of 2000M01 to 2016M12. The study will elucidate if the composite commodity prices of Banaadir region has an association with the world commodity prices (food and agriculture) and Lower Shabelle as well. Johansen cointegration test along with VECM and Pairwise Granger Causality are applied. For the cointegration, trace statistics indicate one cointegrating equation, therefore, there a long run association for about in 4 month equilibrium. VECM supported the existence of long run relationship with a speed of adjustment of 19%. For Granger Causality, the results show, no causality between Lower Shabelle CCPI and Banaadir region CCPI, unidirectional causality between world food index and Banaadir CCPI, unidirectional causality for world agricultural commodity price index and Banadir CCPI, unidirectional causality for world food price index and Lower Shabelle CCPI, unidirectional causality for world agric index and Lower Shabelle CCPI and finally no causality between world food index and agricultural index.

Keywords: Composite commodity price index (CCPI); World food price (WFP); Vector error correction model (VECM); Granger causality; Johansen cointegration

Introduction

International markets have experienced declines in commodity prices in 2015 and 2016. Thanks to global weak demand, low investment, and turbulences in financial markets (UN, 2016). During the same time, however, prices in Somalia have varied considerably by commodity and region. Maize and sorghum prices have vastly elevated in the last quarter of 2016 across the country. Thanks to below average Deyr harvest (Figure 1). While, imported rice and wheat flour remained stable in 2016 nationwide (Figure 2). (FEWSNET, 2017).

As Figure 1 depicts in December 2016, the southern part of the country, especially, the main maize producing Qoryooley Market was 87 and 50% above December 2015 estimates, as well as 2011 to 2015 average prices. Moreover, Sorghum prices in main producing Baidoa market were 68 and 88% above 2015. Maize and sorghum prices in central and Northern Somalia have also soared. These figures have signaled domestic increase in agricultural commodity prices, particularly maize and sorghum. In addition, a stable condition has been reported in the two mostly imported commodity prices-namely rice and wheat flour. This study will consider 11 mostly used commodities that include food, agriculture and oil for Banaadir region and Lower Shabelle. These commodities were average weighted to produce composite commodity prices index (CCPI). The world food and agricultural price index will also be considered in the study.

Furthermore, from our knowledge, no research have been made

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Furthermore, from our knowledge, no research have been made
in the determinants of commodity prices and the impact of world
commodity prices to the domestic (Banaadir and Lower Shabelle)
commodity prices. Our research will focus on finding: if there’s an
association between Banaadir, Lower Shabelle commodity prices and
international commodity prices as well. The following part of the study
will give a nutshell of the literature broadly related to the determinants
of commodity prices. The literature will range from real to monetary
determinants of commodity prices. Data, results, interpretations and
conclusion will follow the discussion.

Literature Review

This section will focus concisely on what has been said so far from
the determinants of commodity prices. Real determinants like GDP
and monetary determinants like exchange rate, interest rate will be
further detailed.

Carmen and Eduardo [1] jointly studied the macro economic
determinants of commodity prices. The study has stressed on a
structural approach to determine the impact of commodity prices on
the macroeconomic variables. The theoretical model built on this study
took into account, commodity supply as a determinant of commodity
prices and the world aggregate demand. The results seem to comply
the prior information provided by the theory. The structural model
outperformed the random walk prediction over a longer term forecast
horizon (5-31) quarters.

Frank and David [2], conducted a study in an attempt to establish
long run relationship between commodity prices, consumer prices and
money. Cointegration tests have been made and Vector Autoregression
framework for US data was built. Results elucidated the existence of
such relationship between commodity prices and consumer prices
namely to money supply in the long run.

Paul, Hong, and Cai [3] examined the persistent of shocks to world
commodity prices. A monthly data from the International Financial
Statistics from January 1957 to December 1988 was used in the study.
The medium unbiased procedure was adopted. The results depict that
shocks to commodity prices are consistent over a long term period.

Akram [4], investigated commodity prices, interest rate and the
dollar- the study is about whether a decrease in interest rates and the
US dollar cause an increase in commodity prices. Structural Vector
Autoregressive analysis adopting an estimated quarterly data was
used. The findings of the study showed prices increase significantly to
offset a reduction in real interest rates, and a decline in the US dollar
lead to a sudden and great increase in commodity prices.

Joseph, Giorgio, and Norbert [5], investigated determinants of
primary commodity prices: co-movements, common factors and
fundamentals. The study applied nonstationary panel method to make
sure the existence of statistically significant degree of co-movement due
to a common factor. Results from factor Augmented VAR approach
reveal real interest rate and uncertainty are negatively related to the
common factors.

Jeffrey and Andrew [6] studied the determinants of agricultural
and mineral commodity prices; especially, macroeconomic
determinants. The study utilized world GDP and real interest rates
as the macroeconomic variables that can determine the commodity
prices whilst, inventory, uncertainty and spot-forward spread were
considered as the microeconomic determinant. Univariate and
bivariate regression analysis for eleven individual commodity prices
was applied. The results show that global GDP and inflation positively

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Dynamics of Commodity Prices, he used an endogenously clustered
dynamic factor model to gain a better under-standing of commodity
price co-movements and their determinants. From a large dataset of
commodity prices, he extracted the fundamental sources behind the
price dynamics and found that commodity price co-movements are
mostly the result of sparse cluster factors that represent correlations
of distinct group of commodities. Moreover, his results showed that a
wide range of macroeconomic variables like crude oil prices, fertilizer
prices, and the federal funds rate as possible sources of commodity
price co-movements.

David and Martin [7] explored what drives commodity price
booms and busts? They provided evidence on the dynamic effects of
commodity demand shocks, commodity supply shocks, and inventory
demand shocks on real commodity prices. In particular, they analyzed
data set of price and production levels for 12 agricultural, metal, and
soft commodities from 1870 to 2013. Their results indicated that the
contribution of commodity demand shocks to real price varies across
the different commodities. However, they indicated commodity
demand shocks exhibit common patterns with respect to timing across
the markets for agricultural, metal, and soft commodities. Inventory
or commodity-specific demand shocks are the most important driver
in commodity price fluctuations for most of our agricultural and soft
commodities. Finally, they concluded that commodity supply shocks
play some role in explaining fluctuations for particular commodities,
but in the main, their influence on real commodity prices is limited in
impact and transitory in duration.

Jan and Paolo [8] Research to produce forecasts of commodity
price movements that can systematically improve on naive statistical
benchmarks. They revisit how well changes in commodity currencies
perform as potential efficient predictors of commodity prices, a view
emphasized in the recent literature they considered different types of
factor-augmented models that use information from a large data set
containing a variety of indicators of supply and demand conditions
across major developed and developing countries. They found that, of
all the approaches, the exchange-rate-based model and the PLS factor-
augmented model are more likely to outperform the naive statistical
benchmarks, and across their range of commodity price indices, they
are not able to generate out-of-sample forecasts that, on average, are
systematically more accurate than predictions based on a random walk
or autoregressive specifications.

Arndian et al. [9] carried a joint research in an attempt to examine the
relationship between primary agricultural commodities, exchange rate
and oil prices. Johansen cointegration method was applied to check
the existence of long run relationship between the mentioned variables
to estimate a monthly data from 2000 to 2008. The results from this
research confirm a consistent long run relationship between crude
oil and commodity prices and for the exchange rate - it’s role for the
relationship to prices exists over time.

Berna and Gabriel [10] explained short and longrun determinants of
commodity price volatility in the US agricultural, energy and metal
markets. The General Autoregressive Conditional Heteroskedasticity
model has been applied to check volatility that may exist in the
commodity prices. The study depicts the persistence of volatility shocks
is weaker than the requirement of the prior information (i.e. GARCH
assumptions), the study also found that decomposing realized volatility
into high- and low-frequency components better reveals the impact
of slowly-evolving aggregate variables on price volatility. Moreover, over the period 1990-2005, most of the macroeconomic variables had similar effects within the same commodity category but, their effects differed across commodity groups.

Data and Results

Monthly time series data of world food index and world agricultural commodity price index is sourced from the World Bank historical data and the data for the commodity prices of Banadir and Lower Shabelle region is originated from FSNAU. But further derived for calculation. For example, The composite commodity price index for both regions is based on our calculation from a selected group of eleven commodity prices. These commodities were selected because of the availability of their data in full. We have calculated the weighted average for these commodities to obtain a single composite commodity price index (CCPI). The study period is from 2000M01 to 2016M12. On the other hand, Banaadir region which is a hub for trade with a fine scale seaport that can accommodate international trade is selected among the other regions of Somalia. Lower Shabelle region that supply enormous agricultural commodities to Banaadir region and to the world is included in the study. The aim is to check if there is a long run relationship between them and if theirs is a causality between these variables, Johansen cointegration test along with VECM is tested for long run and short run relationship and Granger Causality test is employed to verify causation as well as the leading variable. For the cointegration results, Trace statistics indicate one cointegrating equation. This means we reject the null hypothesis of no cointegration among these variables as seen in Table 1, therefore, there’s a statistically significant degree of co-movement between these variables. VECM supported the long run association meaning the whole system gets back to long run equilibrium at the speed of 19%, and p-value of (0.0034) supported the long run association meaning the whole system gets back to a significant degree of co-movement between these variables. VECM among these variables as seen in Table 1, therefore, there’s a statistically significant degree of co-movement between these variables. VECM supported the long run association meaning the whole system gets back to long run equilibrium at the speed of 19%, and p-value of (0.0034) (Table 2).

Granger Causality tests indicate that the null hypothesis of Lower Shabelle CCPI doesn’t Granger Cause Banadir CCPI is rejected at 5% significance level and vice-versa. We don’t reject the null hypothesis that indicates World food index doesn’t Granger Cause Banadir CCPI, therefore, there’s causation at 1% significance level. But, rejected the null hypothesis of Banadir doesn’t Granger Cause WFI. However, this relationship is unidirectional because its only coming from one side. The null hypothesis of API doesn’t Granger Cause Bandir CCPI is failed to reject at 1% significance level. But, for the other side, we can reject the null hypothesis of Banadir CCPI doesn’t Granger Cause API at 5% critical value. For Lower Shabelle CCPI and WFP, we fail to reject the null hypothesis for WPI doesn’t Granger Cause Lower Shabelle CCPI, but we reject the null hypothesis of the vice versa. We also failed to reject the null hypothesis for API doesn’t Granger Cause Lower Shabelle CCPI, but, rejected the null hypothesis of the vice versa. Finally, the null hypothesis of WFI and API for both directions is rejected and there’s no causality between them (Table 3).

Conclusion

The study elucidated the relationship and causality of Banadir CCPI, world food index, Lower Shabelle and World agricultural price index. The aim of this study was to check the existence of cointegration and causality between the aforementioned variables. Johansen method of Cointegration was run to find long run relationship whilst, Pair wise Granger Causality test was run to explore causality. Vector error correction model was also checked for short run relationship. The cointegration results showed that variables are cointegrated. Further, the findings for the causality test revealed that no causality between Lower Shabelle and Banaadir, unidirectional causality between world food index and Banaadir, unidirectional causality for world agricultural commodity price index and Banadir, unidirectional causality for world food price index and Lower Shabelle, unidirectional causality for world agric index and Lower Shabell and finally no causality between world food index and agricultural index.

| Hypothesized No. of CE(s) | Eigenvalue | Trace Statistic | 0.05 Critical Value | Prob.* |
|---------------------------|------------|----------------|---------------------|--------|
| None                      | 0.10879938 | 48.01294566    | 47.8561272          | 0.04832427 |
| At most 1                 | 0.07467547 | 25.07299963    | 29.7970733          | 0.15884692 |
| At most 2                 | 0.035474386| 9.628461144    | 15.4947129          | 0.31040691 |
| At most 3                 | 0.012190424| 2.440801968    | 3.8414655           | 0.11821413 |

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level.
Rejection of the hypothesis at the 0.05 level.

| Hypothesized No. of CE(s) | Eigenvalue | Max-Eigen Statistic | 0.05 Critical Value | Prob.* |
|---------------------------|------------|---------------------|---------------------|--------|
| None                      | 0.10879938 | 22.93994605         | 27.5843378          | 0.1760583 |
| At most 1                 | 0.07467547 | 15.44453849         | 21.1316163          | 0.25896744 |
| At most 2                 | 0.035474386| 7.187659176         | 14.2646002          | 0.4671828 |
| At most 3                 | 0.012190424| 2.440801968         | 3.8414655           | 0.11821413 |

Max-eigenvalue test indicates no cointegration at the 0.05 level.
Rejection of the hypothesis at the 0.05 level.

Table 1: Johansen Cointegration Test.
Dependent Variable: D(CCPI_BANADIR)
Method: Least Squares (Gauss-Newton/Marquardt steps)
Date: 05/15/17 Time: 13:12
Sample (adjusted): 2000M04 2016M12
Included observations: 201 after adjustments

\[
\text{D(CCPI_BANADIR)} = \text{C(1) × ( CCPI_BANADIR(-1)+3.00762931045 × CCPI_SHABELLE(-1) - 142868.111977 × WORLD_FOOD_INDEX(-1) - 102272.612844 × AGRIC_INDEX(-1)+6340246.29981) + C(2) × D(CCPI_BANADIR(-1)) + C(3) × D(CCPI_BANADIR(-2)) + C(4) × D(CCPI_SHABELLE(-1)) + C(5) × D(CCPI_SHABELLE(-2)) + C(6) × D(WORLD_FOOD_INDEX(-1)) + C(7) × D(WORLD_FOOD_INDEX(-2)) + C(8) × D(AGRIC_INDEX(-1)) + C(9) × D(AGRIC_INDEX(-2)) + C(10)}
\]

| Coefficient | Std. Error | t-Statistic | Prob. |
|-------------|------------|-------------|-------|
| C(1) | -0.01930233 | 0.015804735 | -1.22130064 | 0.003477571 |
| C(2) | -0.15846214 | 0.07084084 | -2.23687549 | 0.026450742 |
| C(3) | -0.14880069 | 0.071461781 | -2.08224162 | 0.038652754 |
| C(4) | 0.170915601 | 0.106739328 | 1.601242995 | 0.110975735 |
| C(5) | 0.043378359 | 0.105236842 | 0.412197461 | 0.68065951 |
| C(6) | 26208.57491 | 19367.06041 | 1.353255185 | 0.177753582 |
| C(7) | -15146.5116 | 19098.47189 | -0.79307453 | 0.428718454 |
| C(8) | -36341.3798 | 23746.55072 | -1.53038562 | 0.12755828 |
| C(9) | 49085.45058 | 24085.55447 | 2.03792242 | 0.042932574 |
| C(10) | -17829.5117 | 40522.54934 | -0.43989888 | 0.660441912 |

R-squared 0.095434222  Mean dependent var -5831.98991
Adjusted R-squared 0.052810703  S.D. dependent var 583448.5793
S.E. of regression 567833.4567  Akaike info criterion 29.38551496
Sum squared resid 6.15851E+13  Schwarz criterion 29.54985849
Log likelihood -2943.24425  Hannan-Quinn criter. 29.45201548
F-statistic 2.239003851  Durbin-Watson stat 2.067572467
Prob(F-statistic) 0.021234039

Table 2: Vector error correction model.

Pairwise Granger Causality Tests
Date: 05/15/17 Time: 13:20
Sample: 2000M01 2016M12
Lags: 4

Null Hypothesis | Obs | F-Statistic | Prob. |
-----------------|-----|-------------|-------|
CCPI_SHABELLE does not Granger Cause CCPI_BANADIR | 200 | 1.6818888 | 0.1558079 |
CCPI_BANADIR does not Granger Cause CCPI_SHABELLE | 200 | 0.703783 | 0.0590252 |
WORLD_FOOD_INDEX does not Granger Cause CCPI_BANADIR | 200 | 4.8041624 | 0.0010282 |
CCPI_BANADIR does not Granger Cause WORLD_FOOD_INDEX | 200 | 1.0367207 | 0.3894986 |
AGRIC_INDEX does not Granger Cause CCPI_BANADIR | 200 | 6.224343 | 9.95E-05 |
CCPI_BANADIR does not Granger Cause AGRIC_INDEX | 200 | 0.8564967 | 0.4911787 |
WORLD_FOOD_INDEX does not Granger Cause CCPI_BANADIR | 200 | 2.6903042 | 0.032476 |
CCPI_BANADIR does not Granger Cause WORLD_FOOD_INDEX | 200 | 0.7099292 | 0.5323249 |
AGRIC_INDEX does not Granger Cause CCPI_BANADIR | 200 | 3.6163731 | 0.0072433 |
CCPI_BANADIR does not Granger Cause AGRIC_INDEX | 200 | 0.4088901 | 0.80211 |
WORLD_FOOD_INDEX does not Granger Cause WORLD_FOOD_INDEX | 200 | 1.6789885 | 0.1564838 |
AGRIC_INDEX does not Granger Cause WORLD_FOOD_INDEX | 200 | 0.7799049 | 0.5394978 |

Table 3: Pairwise granger causality test.

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