THE RELATIONSHIP BETWEEN COMMODITY PRICES AND STOCK PRICES: EVIDENCE FROM TURKEY

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Many studies have found strong relationship between stock market and economic growth. Because of this strong relationship, we need to examine many factors that have impact on the stock market more closely. Despite the high importance of commodity prices, only few studies have emphasized the impact on stock prices. For this reason, in this study, by using time-series analysis, the relationship between and the impact of commodity prices on stock market will be examined. The long-run relationship and causality will examined with an econometric model. The results obtained from the examination of relationship between commodity prices and stock market would provide to discussions about drivers of stock prices. Due to importance of such impact, findings obtained from the case of Turkey will be interpreted. These findings will help in the decision making process of the investors. In addition, the findings of this study are important for policy-makers to strengthen the stock markets to promote economic growth.

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1. INTRODUCTION

Over the past decade, the world economy experienced an unprecedented boom-bust cycle with extreme fluctuations in commodity prices. Investors have sought an ever greater exposure to commodity prices – by directly purchasing commodities, by taking outright positions in commodity futures, or by acquiring stakes in exchange-traded commodity funds (ETFs) and in commodity index funds. This pattern has accelerated in the last few years (Büyükşahin, Haigh, & Robe, 2008). The dynamics of commodity price cycles are of continuing interest to policymakers and market participants, given their significant impact on economic and financial developments (Saadi Sedik & Cevik, 2011).

A fundamental issue in finance is which factors affect the expected returns on assets, the sensitivity of expected returns to those factors, and the reward for bearing this sensitivity. As a related issue, predicting stock market behavior has long been one of the most elusive goals for investors in developed markets, but recently has also included emerging markets (Soenen & Johnson, 2009).

The role of the commodity markets on financial markets has been an important area for researchers. There is growing evidence that equity and commodity markets are inter-connected and that the correlations between commodities and equities have increased since the early 2000s (Olson, J. Vivian, & Wohar, 2014).

Many studies have found strong relationship between stock market and economic growth. Because of this strong relationship, we need to examine many factors that have impact on the stock market more closely. At a macroeconomic level, policymakers pay particular attention to commodity prices and their volatility given their potential to feed inflation pressures. Volatility of commodity prices is thus a central issue for the world economy, as notably illustrated by the G20 which addressed the question of excessive fluctuations and volatility of commodity prices in its September 2009 Pittsburgh Summit (Creti, Joëts, & Mignon, 2013).

Despite the high importance of commodity prices, only few studies have emphasized the impact on stock prices. For this reason, in this study, by using time-series analysis, the

relationship between and the impact of commodity prices on stock market will be examined. The purpose of this study is to investigate the influence of the commodity prices on Stock prices in Turkey. Main idea is that commodity price increases may have very different effects on the stock prices. Commodity price increases often come on the back of a sharp demand increase due to booming economic activity (Kilian, 2009). If prices of inputs in the production process (energy, metals, raw materials) increase, firm will see their profits shrink, other things equal, and will therefore have less dividend to distribute (Lombardi & Ravazzolo, 2013). Then this will cause a pressure on stock prices and stock prices probably will decrease.

This study contributes to the empirical literature about the relationships between stock and commodity markets. These findings also help us assess the macroeconomic implications of commodity price shocks for the Turkish economy. The paper is organized as follows: literature is reviewed in section 2, Methodology and data is presented in section 3, results are given in Section 4 and results are concluded in section 5.

2. LITERATURE REVIEW

There is a growing literature investigating the relationship between commodity prices and equity markets or financial assets. This section presents a short literature review of papers that focus on the dynamics between commodity prices and equity markets.

Gorton and Rouwenhorst (2004) examined the relationship between equity and commodity assets over the period 1959–2004. They found that commodity futures contracts have the same average returns as equities along with a negative correlation between bonds and equities, and present less volatile returns (Delatte & Lopez, 2013) (Gorton & Rouwenhorst, 2004).

Sadorsky (1999) examines the links between fuel oil prices and stock prices. Using an unrestricted Vector Autoregressive (VAR) model that includes a short-term interest rate and industrial production, Sadorsky highlights the importance of the oil price in explaining the movements of the other variables (Chan, Treepongkaruna, Brooks, & Gray, 2011) (Sadorsky, 1999).

Thuraisamy, Sharma, & Ali Ahmed, (2013) in their paper, they tested spillover effects between Asian equity market volatility and the volatility of the two most dominant

commodities, namely, crude oil and gold futures. They find that volatility shocks in established and mature equity markets, such as the Japanese market, spill over to the crude oil and gold futures markets, while immature markets tend to have spillover effects from commodity futures to equity markets (Thuraisamy, Sharma, & Ali Ahmed, 2013).

Rossi (2012) further explore the linkage between equity, commodity, and the exchange rate markets, focusing in particular on studying its evolution over time. They document that a country's equity market value has significant out-of-sample predictive ability for the future global commodity price index for several primary commodity-exporting countries. They find, however, little evidence of in-sample predictive ability, even after allowing for instabilities (Rossi, 2012).

Tang and Xiong (2010) observe that increasing investment levels have flowed into commodity markets between 2006 and 2010, which spurred a debate on whether speculation might have caused excessive increases in the cost of primary commodities (including energy and food) and their volatility (Tang & Xiong, 2010).

Soenen & Johnson, (2009) present empirical evidence that largely supports the hypothesis that the stock markets of South American countries are highly affected by changes in commodity prices after controlling for changes in exchange rates, interest rates, and North American stock market changes. In total, six different Goldman Sachs commodity price indexes are tested against the unexplained variation in stock market returns for Argentina, Brazil, Chile, Colombia, Peru, and Venezuela, covering the period 1995–2007 (Soenen & Johnson, 2009).

Kang study examines causal relationships between international food commodity prices and daily stock indices in China, including Shanghai Stock Exchange (SSE) and Shenzhen Stock Exchange (SZSE), during 2000-2010. The empirical results show that both China's stock indices have bilateral Granger causality relationships with international food commodity futures including wheat, corn, soybean, and soybean oil, while rough rice is found to have a unilateral Granger causal relationship with these stock indices (Kang, Hu, & Chen, 2013).

Delatte & Lopez (2013), in their paper, they investigate the cross-market linkages between equity and commodity markets using a copula approach. Their findings showed that the integration of some commodities with equity indices started mildly in the 2000s, a trend that the global crisis has definitely strengthened (Delatte & Lopez, 2013).

Chan et al. (2011) use a general Markov switching model to examine the relationships between returns over three different asset classes: financial assets (US stocks and Treasury bonds), commodities (oil and gold) and real estate assets (US Case–Shiller index). They confirm the existence of two distinct regimes: a ‘‘tranquil” regime with periods of economic expansion and a ‘‘crisis” regime with periods of economic decline. During tranquil regime periods, there is evidence of a flight from quality – from gold to stocks. During the crisis regime, there is strong evidence of a flight to quality – from stocks to Treasury bonds (Chan et al., 2011).

3. METHODOLOGY AND DATA

This study utilizes VAR and cointegration analysis in order to examine the impact of commodity prices on BIST. The empirical modeling framework consists of three steps. First, the data is seasonally adjusted. Second, stationarity properties of the variables are investigated using unit root tests. Third, the cointegration relationship is tested (Nazlioglu, Erdem, & Soytas, 2013).

The monthly data is used in this study. The data ranging from 2002M01 to 2014M06 for Turkey obtained from IMF eLibrary system and CBRT EDDS system. The study thus does not cover the period of the Financial Crisis of 2001, which heavily affected the country. And we use the price indexes to counteract the sudden rises of some commodities.

The data’s definitions are as follows.

Table 1: Data Definitions

Data	Contents
All Commodity Price Index, 2005 = 100	includes both Fuel (Fuel (Energy) Index, 2005 = 100, includes Crude oil (petroleum), Natural Gas, and Coal Price Indices) and

	Non-Fuel Price Indices
Non-Fuel Price Index, 2005 = 100	includes Food and Beverages (Food Price Index, 2005 = 100, includes Cereal, Vegetable Oils, Meat, Seafood, Sugar, Bananas, and Oranges Price; Beverage Price Index, 2005 = 100, includes Coffee, Tea, and Cocoa) Indices and Industrial Inputs Price Indices
Agricultural Raw Materials Index, 2005 = 100	includes Timber, Cotton, Wool, Rubber, and Hides Price Indices
Metals Price Index, 2005 = 100	includes Copper, Aluminum, Iron Ore, Tin, Nickel, Zinc, Lead, and Uranium Price Indices
Industrial Inputs Price Index, 2005 = 100,	includes Agricultural Raw Materials and Metals Price Indices
BIST100	Borsa Istanbul Stock Indices

4. RESULTS

Results of the ADF tests for unit roots and check for the presence of cointegrating relations between commodity market variables and BIST variable are shown below.

4.1. UNIT ROOT TEST

Time series variable can be divided into being stationary or non-stationary. A stationary time series variable is one whose statistical properties, such as mean, variance, autocorrelation, etc., are all constant over time. This can be tested by a unit root test using an autoregressive model (Kang et al., 2013). All of the variables tested by ADF unit root test for stationary. The lag length are chosen by the result of Akaike's Information Criterion and shown in the parenthesis. Table 1 illustrates that all variables have unit root and cointegrated of the same order, I (1).

Table 2: Results of ADF Unit Root Tests (2002M01-2014M06)

Level	***Constant***	***Constant and Trend***
All Commodity Price Index	-1.868887 (1)	-2.413416 (1)
Non-Fuel Price Index	-1.840105 (1)	-2.352440 (2)
Agricultural Raw Materials Index	-1.577696 (1)	-2.932743 (2)
Metals Price Index	-2.010828 (1)	-1.289298 (1)
Industrial Inputs Price Index	-1.861330 (1)	-2.060698 (2)
BIST	-1.461361 (1)	-1.950948 (1)
1st Difference	***Constant***	***Constant and Trend***
All Commodity Price Index	-8.688062 (0)*	-8.734437 (0)*
Non-Fuel Price Index	-8.159650 (0)*	-8.246725 (0)*
Agricultural Raw Materials Index	-8.841958 (0)*	-8.809187 (0)*
Metals Price Index	-8.709275 (0)*	-8.886692 (0)*
Industrial Inputs Price Index	-8.614203 (0)*	-8.700105 (0)*
BIST	-10.46145 (0)*	-10.46786 (0)*

* %1 level

4.2. JOHANSEN COINTEGRATION TEST

If all of the variables are integrated of same order, one has the opportunity to apply the cointegration test. Cointegration between the variables identifies the long-term relationship, if there is no cointegration states that there are no long-term relationships. In our study, we employ the Johansen cointegration test procedure. Cointegration test results are given in the following tables. In each table we have a test result for one commodity price variable. According to the results of cointegration tests there is no cointegration relationship between commodity price variables and BIST100 indices. This implies that there are no long-term relationships between any of the commodity price variables and stock prices.

Table 3: Johansen Cointegration Test Results for All Commodity Price Index (2002M01-2014M06)

	λ_{trace}	
	Trace Statistic	*%5 Critical Value*
None	24.49196	25.87211
At most 1	7.974154	12.51798

	λ_{max}	
	Max-Eigen Statistic	*%5 Critical Value*
None	16.51781	19.38704
At most 1	7.974154	12.51798

Table 4: Johansen Cointegration Test Results for Non-Fuel Price Index (2002M01-2014M06)

	λ_{trace}	
	Trace Statistic	*%5 Critical Value*
None	17.60512	25.87211
At most 1	5.912294	12.51798
	λ_{max}	
	Max-Eigen Statistic	*%5 Critical Value*
None	11.69283	19.38704
At most 1	5.912294	12.51798

Table 5: Johansen Cointegration Test Results for Agricultural Raw Materials Index (2002M01-2014M06)

	λ_{trace}	
	Trace Statistic	*%5 Critical Value*
None	16.35385	25.87211
At most 1	4.555999	12.51798
	λ_{max}	
	Max-Eigen Statistic	*%5 Critical Value*
None	11.79786	19.38704
At most 1	4.555999	12.51798

Table 6: Johansen Cointegration Test Results for Metals Price Index (2002M01-2014M06)

	λ_{trace}	
	Trace Statistic	*%5 Critical Value*
None	13.71385	25.87211

At most 1	4.835210	12.51798
	λ_{max}	
	Max-Eigen Statistic	*%5 Critical Value*
None	8.878642	19.38704
At most 1	4.835210	12.51798

Table 7: Johansen Cointegration Test Results for Industrial Inputs Price Index (2002M01-2014M06)

	λ_{trace}	
	Trace Statistic	*%5 Critical Value*
None	19.90106	25.87211
At most 1	6.886764	12.51798
	λ_{max}	
	Max-Eigen Statistic	*%5 Critical Value*
None	13.01430	19.38704
At most 1	6.886764	12.51798

5. CONCLUSION

In this paper, the interactions between stock market and commodity prices are examined. The interaction during the entire sample period (January 2002–June 2014) is investigated. Using multivariate Johansen tests to investigate the relationships between the commodity price variables and stock variables shows important results. Our results show that there is no relation between commodity and stock markets. The results from the whole sample reveal that any of commodity prices is not related to Turkish equity market.

The results of this paper have implications for investors. There are three implications from our results. First, findings clearly presents that there is no evidence that any of the commodity price variable affect the stock prices. Second, our analysis imply that there is no evidence for effects of commodity prices on stock markets but one must research the effect of the commodity prices on stock markets solely. Third, our findings also imply that a boom or a

recession at global economy increases or decreases the commodity prices but this rise or decline does not affect the stock markets.

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