Journal of Applied Economics and Business

OPEN ACCESS ARTICLE

GCC EQUITY INDICES AND OIL PRICE CHANGES: AN ANALYSIS OF THEIR RELATIONSHIP

Robert Boldin, Mukesh Chaudhry, Tore Okland

Department of Finance and Legal Studies, Eberly College of Business and Information Technology

Indiana University of Pennsylvania

Abstract

This research focuses on the long-term relationship between oil price changes and GCC country equity market indices and covers a twelve-year period through April 2017. It is important for investors to know the impact of oil prices on GCC country equity markets for their portfolio hedging, cross-hedging, diversification and other trading strategies. Johansen's cointegration methodology was used for this investigation. A strong relationship was found between oil price changes and equity indices for the UAE (Abu Dhabi and Dubai), Qatar and Oman. This implies that the equity indices of these countries are affected by oil price changes. On the other hand, no relationship was found between oil price changes and equity indices for Bahrain, Kuwait and Saudi Arabia.

Keywords: *GCC country equity indices; Oil price changes; Cointegration; Error correction model.*

INTRODUCTION

As noted by Kisswani, Elian and Kruse (2017) only a limited number of studies have been undertaken which examined the impact of oil price changes in the GCC countries. Their own research focused on the GCC country of Kuwait. Major sectors were examined which showed asymmetric long run effects between oil prices and certain sectoral stock prices. Ghosh (2017) analyzed long-term cointegration of oil prices and GCC stock indices, as well as cointegration among the GCC stock indices per se. He attempted to investigate if there is any early sign of disintegration between GCC stock markets and oil price cyclicality. He found that efforts to reduce oil dependency in GCC countries is yet to result in decoupling of financial markets from oil price cyclicality.

Arouri and Rault (2012) noted there was a causality link between oil prices and stock price markets in the GCC countries. Sehgal and Kapur (2012) showed that regardless of the nature of oil price shocks (whether increasing or decreasing prices) high growth

emerging economies do not provide significantly positive returns on a post-event basis. There were no serious leakages in oil price information which could be exploited by investors in the Asian economies.

Earlier work by Nandha and Faff (2008) examined oil price changes and equity prices. They analyzed data during the period 1983-2005 and found that oil price increases negatively impact equity returns for all global industry sectors except mining and the oil and gas industries. Their review of several studies indicated that there is an adverse linkage between increasing oil prices and economic growth.

This study focuses on Gulf Cooperation Council countries (GCC) of Bahrain, Kuwait, Qatar, Oman, Saudi Arabia and the UAE. Opportunities to invest has diminished somewhat due to the reduction (and volatility) of oil prices. Over the years, GCC had been an attraction for investors due to their significant accumulation of petrofund surpluses. Because of the surplus of oil throughout the world, however, GCC has agreed to reduce their output. As a result, GCC economies grew by only 0.5% in 2017 compared to 2.2% in 2016. Still, for investors, it is important to know the extent of oil price changes on equity indices. Oil price changes have implications for investor portfolio hedging and/or diversification strategies particularly in the long-run. Such information should also provide opportunities for investor cross-hedging and other trading strategies.

LITERATURE REVIEW

Other recent studies include work by Memis and Kapusuzoglu (2015) who examined 19 OECD countries and their interactions related to energy, financial and macroeconomic factors. The effect of oil price changes was not substantiated. Richard and Philip (2015) focused their Nigerian study on the connection between oil price and stock market activity and the rate of their change. They found that the spill-over effect of oil price changes can manifest itself 40 days or later after their occurrence.

Research by Ajmi et al., (2014) examined the potential of nonlinear causal relationships between world oil prices and stock markets in the Middle East and North Africa (MENA) during the black swan period from 2007-2012. They found that oil prices and MENA stock markets interact in non-linear fashion. Further, sign changes in the causing variables are important for detecting causality links. Soucek and Todorova (2013) showed that oil price fluctuations are a significant contributor to risk for the Russian market but improve risk-return characteristics when trading Chinese equities.

Research by Rosmy and Balli (2014) found that there is a low to mild degree of synchronization between oil price and stock market returns (volatilities). Only in a few instances was there strong (above 80%) association between these variables. For the GCC, shocks to volatility are more important than shocks to oil price returns. Ulussever and Demirer (2017) examined the effect of crude oil prices on herd behavior among investors in the GCC stock markets. Their research indicated that investors'

tendency to act as a herd in these markets is significantly affected by the developments in the oil market. Onour (2007) investigated the short and long-term determinants of the GCC stock market's volatility. Mainly, he noted that unobservable speculative factors cause short term stock market returns. In the long run, it is major macroeconomic factors that tend to influence GCC stock markets.

This research focuses more on the implications for investors who have an interest in GCC countries. An understanding of the relationship between GCC country equity indices and oil price changes can be useful for decision making. The period for data used in this study includes significant oil price volatility and captures the recent global market oil price downturn in 2016. Since the relationship between oil price changes and GCC equity indices is relatively long-term in nature, a more than twelve-year period was used to provide more detail about the nature of how these two factors can be important for investment decision-making. The model used for this analysis is described further followed by a section that discusses the results, while the last section presents the conclusions.

MODEL DESCRIPTION

Economic factors such as inflation, GDP, money supply, interest rates and exchange rates are already embedded within the equity indices. Therefore, equity indices are a good proxy for studying the relationship between the impact of oil price changes on equity indices. The pricing benchmarks for the oil industry used in this study are West Texas Intermediate (WTI), Brent and OPEC. It should be noted, however, that recently Brent has become the most important benchmark.

This research used Johansen's cointegration methodology as an alternative framework for investigating equilibrium price adjustments for long-run relationships. The Error Correction Model (ECM) was used to account for disequilibrium found in one period but corrected in the next. According to Engle and Granger (1987), if a system of variables if cointegrated, their economic forces interact to bind these variables together in a long-run equilibrium relationship. An EMC can represent the cointegrated variables, and in general, shows the dependence of the current period's price change on the last period's price change to provide a measure of how far the system is out of its long-run equilibrium. In effect, it indicates the level of integration between oil prices and the GCC equity markets.

Monthly oil price and equity market index data were collected for each of the six GCC countries using Bloomberg as the source. The data covered the period from October 2004 to April 2017. An examination of idiosyncratic data in the relationships between oil prices and equity indices was accounted for in each step. Autocorrelations in the time series was reviewed and eliminated. Testing for stationarity in each equity market index time series was accomplished using the Philips-Perron unit root test.

The lag length for each time series was computed by minimizing the Akaike Information Criteria (AIC) values. The long-term relationship between oil prices and equity indices was determined along with the specification of which GCC 'dominates' in equity indices and oil price relationships.

To eliminate autocorrelations in the time-series, the appropriate lag length is found using the Akaike information criterion (AIC). The lag length is selected by minimizing the AIC over different choices for the length of the lag. The values of AIC are formulated by computing the value of the equation $T \log (RSS) + 2K$, where K is the number of regressors, T is the number of observations and RSS is the residual sum of squares. These results are shown in Table 1 where it becomes clear that the time series require a range of lags to correct for the presence of autocorrelation.

TABLE 1. AUGMENTED DICKEY-FULLER UNIT ROOT TEST WITH: AIKAIKE INFORMATION CRITERION WITH MAXIMUM 13 LAGS WERE USED

Variable	Intercept		Trend & Intercept		None	
	t-Statistic	*p-value*	*t-Statistic*	*p-value*	*t-Statistic*	*p-value*
Brent	-2.418	0.1387	-2.306	0.4280	-0.642	0.4374
WTI	-2.659	0.0837	-2.650	0.2591	-0.679	0.4214
OPECOil	-2.426	0.1362	-2.320	0.4200	-0.711	0.4075
Saudi	-2.243	0.1921	-2.659	0.2552	-0.498	0.4993
Dubai	-1.844	0.3580	-2.065	0.5617	-0.521	0.4907
Abu Dhabi	-1.923	0.6338	-2.650	0.0850	0.109	0.7165
Oman	-3.638	0.0048	-3.714	0.0299	-0.589	0.4605
Kuwait	-2.940	0.1530	-0.203	0.2749	-0.542	0.4808
Qatar	-2.492	0.1194	-2.576	0.2921	-0.031	0.6710
Bahrain	-1.615	0.4723	-2.707	0.2354	-0.723	0.4022

Tests for Stationarity of Each Time Series Using the Philips-Perron (P&P) Test

TABLE 2. PHILLIPS-PERRON UNIT ROOT TEST WITH: BARTLETT KERNEL SPECTRAL ESTIMATION METHOD AND NEWEY-WEST BANDWIDTH (DEFAULT SETTINGS).

Variable	Intercept		Trend & Intercept		None	
	t-Statistic	*p-value*	*t-Statistic*	*p-value*	*t-Statistic*	*p-value*
Brent	-2.2265	0.1979	-2.0889	0.5474	-0.5891	0.4607
WTI	-2.4912	0.1196	-2.4674	0.3438	-0.6588	0.4303
OPECOil	-2.1656	0.2198	-2.0389	0.5751	-0.6311	0.4425
Saudi	-2.2585	0.1869	-2.6468	0.2605	-0.6139	0.4500
Dubai	-2.3249	0.1655	-2.5049	0.3255	-0.7960	0.3697
Abu Dhabi	-2.4097	0.1408	-2.4059	0.3751	-0.1022	0.6469
Oman	-2.8992	0.0478	-2.7792	0.2073	-0.3672	0.5509
Kuwait	-1.9748	0.2977	-2.8187	0.1929	-0.4633	0.5132
Qatar	-2.7309	0.0711	-2.9148	0.1608	-0.1102	0.6442
Bahrain	-1.3164	0.6212	-2.4848	0.3353	-0.5214	0.4894

As noted in Table 2, the P&P tests suggest that all of the time series are nonstationary without trend (i.e., non-rejection of $\alpha_1 = 0$), and in most instances with trend. This

indicates the need for cointegrated methodologies (critical values at the 10% level are provided in the last row of Table 2). The time-series more often reject the presence of drift ($\alpha_0 = 0$) than trend ($\alpha_2 = 0$). Thus, the inclusion of a drift term may not be as important. While it is reassuring to note the non-rejection of nonstationarity, this is not altogether surprising since many other studies find nonstationary in time series (Phillips & Perron, 1988; Brenner & Kroner, 1995; Doukas & Rahman, 1987).

Johansen Tests for Cointegration Rank for Systems (Oil Price and Equity Indices of GCC Countries)

The results for systems (composed of oil prices and equity indices) using Johansen's method are presented in Table 3 to 9. Trace statistics are also reported. These are basically likelihood ratio tests where the null hypothesis is $L_{r+1} = L_{r+2} = \ldots\ldots = L_p = 0$, indicating that the system has *p-r* unit roots, where *r* is the number of cointegrating vectors. The rank is then determined using a sequential approach starting with the hypothesis of *p* unit roots. If this is rejected then the next hypothesis $L_2 = L_3 = \ldots\ldots = L_p = 0$ is tested and so on.

To consider hedging possibilities, the relationship between oil price and equity indices for each GCC country is analyzed. For each system there can be at most n-1 cointegrating vectors (or common factors) that bind the assets in the system (n being the number of time-series in the system). For example, for oil price and equity indices, there can be at most 1 (2-1) common factor. The cointegration results, as shown in Tables 3 through 9, are similar for all three oil price benchmarks.

TABLE 3. COINTEGRATION BETWEEN OIL PRICE AND STOCK INDICES

Abu Dhabi and	r =	Trace	Prob.	5% critical value
Brent	0	18.648	0.016	15.49
	1	1.466	0.226	3.84
WTI	0	18.845	0.015	15.49
	1	1.539	0.214	3.84
OPEC	0	18.855	0.017	15.49
	1	1.406	0.236	3.84

TABLE 4. COINTEGRATION BETWEEN OIL PRICE AND STOCK INDICES

Dubai and	r =	Trace	Prob.	5% critical value
Brent	0	16.741	0.032	15.49
	1	2.277	0.131	3.84
WTI	0	17.250	0.027	15.49
	1	2.253	0.110	3.84
OPEC	0	16.279	0.038	15.49
	1	2.170	0.141	3.84

TABLE 5. COINTEGRATION BETWEEN OIL PRICE AND STOCK INDICES

Qatar and	r =	Trace	Prob.	5% critical value
Brent	0	16.198	0.039	15.49
	1	1.594	0.207	3.84
WTI	0	17.800	0.022	15.49
	1	1.692	0.193	3.84
OPEC	0	16.348	0.037	15.49
	1	1.551	0.213	3.84

TABLE 6. COINTEGRATION BETWEEN OIL PRICE AND STOCK INDICES

Bahrain and	r =	Trace	Prob.	5% critical value
Brent	0	10.160	0.269	15.49
	1	1.431	0.232	3.84
WTI	0	11.351	0.191	15.49
	1	1.357	0.237	3.84
OPEC	0	9.514	0.320	15.49
	1	1.438	0.231	3.84

TABLE 7. COINTEGRATION BETWEEN OIL PRICE AND STOCK INDICES

Kuwait and	r =	Trace	Prob.	5% critical value
Brent	0	10.471	0.246	15.49
	1	1.466	0.226	3.84
WTI	0	11.470	0.149	15.49
	1	1.539	0.214	3.84
OPEC	0	10.000	0.281	15.49
	1	1.912	0.167	3.84

TABLE 8. COINTEGRATION BETWEEN OIL PRICE AND STOCK INDICES

Oman and	r =	Trace	Prob.	5% critical value
Brent	0	16.945	0.030	15.49
	1	2.409	0.121	3.84
WTI	0	18.083	0.019	15.49
	1	2.380	0.123	3.84
OPEC	0	16.726	0.032	15.49
	1	2.169	0.141	3.84

TABLE 9. COINTEGRATION BETWEEN OIL PRICE AND STOCK INDICES

Saudi Arabia and	r =	Trace	Prob.	5% critical value
Brent	0	12.339	0.141	15.49
	1	2.708	0.116	3.84
WTI	0	13.729	0.091	15.49
	1	2.995	0.109	3.84
OPEC	0	11.842	0.165	15.49
	1	2.665	0.118	3.84

RESULTS AND DISCUSSION

Cointegration between oil prices and equity indices indicate one cointegration vector for the following countries: UAE, Qatar and Oman. No cointegration was found, however, for Bahrain, Kuwait and Saudi Arabia. For those countries where no cointegration was found, oil companies are typically owned by the government. Based on their reform agenda, Saudi Arabia is expected to undergo deep structural changes. Bahrain does not produce much oil but derives significant income from tourism and trading. Due to lower oil and commodity prices along with its limited savings and sharply rising debt level, Bahrain has become somewhat vulnerable to economic forces. Kuwait is increasing its oil production since it is heavily dependent on petroleum export revenues.

UAE-Dubai does not produce much oil but has expensive real estate and is an attractive location for wealthy individuals, tourists and sports enthusiasts. It also serves as a trading hub for other countries. Several countries such as Dubai have diversified into other areas including chemicals and banking. UAE-Abu Dhabi, on the other hand, is rich in oil. Qatar is a country that produces mostly natural gas and is the largest supplier in the region. It has announced that it will leave OPEC in 2019. Oman is also expanding its natural gas production.

Taken cumulatively the results seem intuitive. While it is likely that the price of oil may be less related to GCC country equity indices, it is also likely that the price of oil will be closely tied to equity indices. In the latter instances, the closer bindings most likely reflect the sensitivity of oil prices to inflationary pressures.

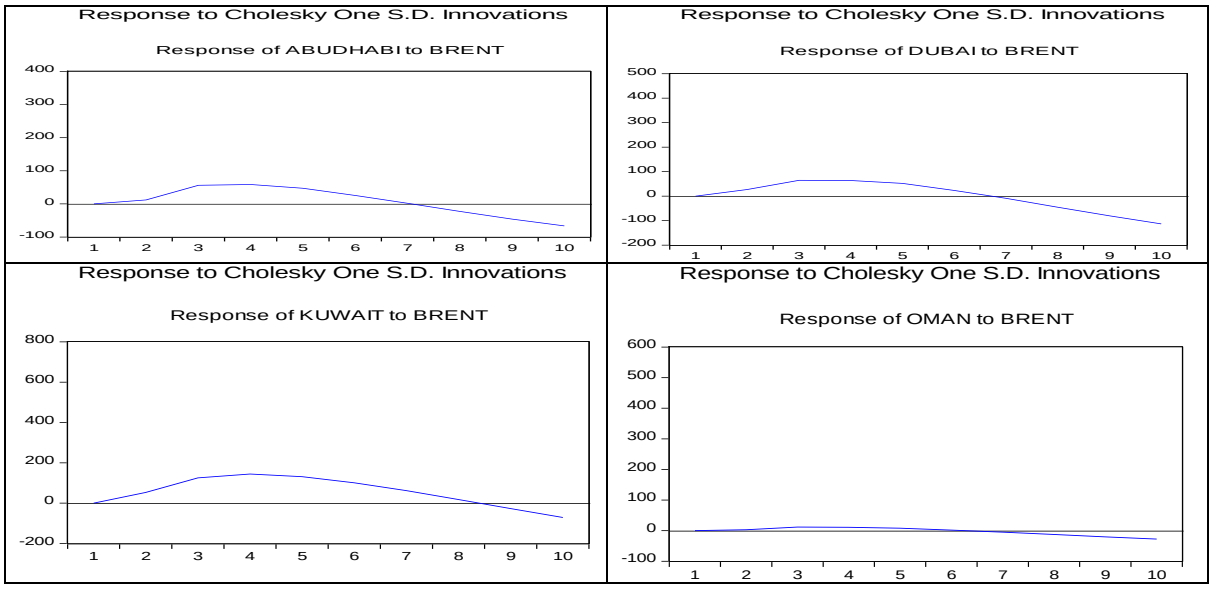
Cointegration between assets suggests that their prices exhibit a long-run relationship with each other. Higher levels of cointegration, noted by the number of cointegrating vectors, suggest potential hedging candidates. Given the lack of tailor-made hedging instruments for oil investors, and that this exercise overcomes some of the biases in standard econometric techniques, this approach might prove better at identifying potential hedging candidates for oil investors. As noted before, GCC country equity indices appear to exhibit strong bindings with the price of oil. Thus, investors might examine cross-hedging opportunities between these markets, especially if these markets differ in liquidity. Portfolios, heavily weighted in oil company securities, held over long periods of time, can be hedged over the short-run with oil price futures. Also, the lack of cointegration between oil prices and some equity indices, may be useful for investors seeking to diversify their portfolios. In summary, an analysis such as performed in this study, might aid in setting up a framework for building portfolios and for setting up hedging strategies. To understand the dynamic relationship between oil prices and the equity indices, additional tests were carried out using vector error correction model for the countries that display cointegration relationship.

The countries that have a strong relationship between oil prices and equity indices include Abu Dhabi, Dubai, Qatar and Oman.

From Table 10 it is evident that there is a significant long-run cointegrating relationship between oil prices and stock indices. Also, any short run deviations between stock indices and oil prices are corrected at the rate of 5.47% for Abu Dhabi, 4.44% for Dubai, 4.46% for Qatar and 6.46% for Oman for each time period. The speed of adjustment in the short-run is slightly higher for Abu Dhabi and Oman when compared against Dubai and Qatar. If we examine causality between oil prices and stock indices of these countries, there is a stronger bi-directional casual between Abu Dhabi and Brent. A similar bi-directional relationship is found between oil prices and Oman's stock indices. The relationship is weak between Dubai and Qatar's stock indices and oil prices. We also ran impulse response functions on the residuals from error correction models. These results also confirm that the short-run deviations are corrected in the future periods to adjust to the long-run equilibrium relationship.

TABLE 10. LONG AND SHORT RUN DYNAMICS BETWEEN OIL PRICE (BRENT) AND STOCK INDICES – ERROR CORRECTION MODEL

	Long Run	Short Run
Abu Dhabi	35.00	-0.054
(t-Values)	(3.14)	(-2.88)
Dubai	63.00	-0.044
(t-Values)	(2.94)	(-2.99)
Qatar	58.33	-0.045
(t-Values)	(2.00)	(-2.01)
Oman	20.95	-0.065
(t-Values)	(1.90)	(-3.68)



CONCLUSION

To consider traditional investing as well as hedging possibilities, the relationship between oil pricing and GCC countries equity indices were analyzed. A specific set of countries, somewhat similar in nature, were examined and included equity indices of Bahrain, Kuwait, Oman, Qatar, Saudi Arabia and UAE (Abu Dhabi and Dubai). Since the relationship between oil prices and equity indices is relatively long-term in nature, Bloomberg monthly data over more than a twelve-year period was selected to provide more detail about the nature of how the two can be useful for investment decision-making.

It should be noted that GCC country equity indices are rather new but emerging. Their returns are much higher than mature markets and, as a result, tend to attract foreign funds. There is some basis for the notion that oil prices can help forecast most equity indices returns. For GCC countries, one can surmise that oil price volatility is probably more important than shocks to their equity indices returns.

Overall, this research deals with important investment issues that are relevant not only today but will continue to be of primary concern in the future. There appear to be major changes which are taking place in the GCC countries. Funds, whether private, institutional, or sovereign gravitate to the country with the lowest price of oil. The result of this work should help in developing models for price discovery and provide a framework for investor decision-making.

REFERENCES

Ajmi, A. N., El-Montasser, G., Hammoudeh, S., & Nguyen, D. K. (2014). Oil prices and MENA stock markets: New evidence from nonlinear and asymmetric causalities during and after the crisis period. *Applied Economics*, 46(18), 2167-2177.

Akaike, H. (1973). Information Theory and the Extension of the Maximum Likelihood Principle, 2nd International Symposium on Information Theory, In: B. N. Petrov and F. Csaki (Eds.), Budapest.

Arouri, M. E., & Rault, C. (2012). Oil Prices and Stock Markets in GCC Countries: Empirical Evidence from Panel Analysis. *International Journal of Finance & Economics*, 17, 242-253.

Brenner, R. J., & Kroner, K.F. (1995). Arbitrage, Cointegration, and Testing the Unbiasedness Hypothesis in Financial Markets. *Journal of Financial and Quantitative Analysis*, 30(1), 23-42.

Doukas, J., & Rahman, A. (1987). Unit Roots Tests: Evidence from the Foreign Exchange Futures Market. *Journal of Financial and Quantitative Analysis*, 22(1), 101-108.

Engle, R.F., & Granger, C. W. J. (1987). Co-integration and Error Correction: Representation, Estimation, and Testing. *Econometrica*, 55, 251-276.

Ghosh, T. P. (2017). Oil Dependency of GCC Stock Markets: Co-integration of GCC Stock Market Indices and Oil Price. *International Journal of Business and Management*, 12(1), 188-200.

Gulf Cooperation Council: The Economic Outlook and Policy Challenges in the GCC Countries. (2017, December 14). (Retrieved March 13, 2018, https://www.imf.org/en/Publications/Policy-Papers/Issues/2017/12/14/pp121417gcc-economic outlook-and-policy-challenges).

Johansen, S., & Juselius, K. (1992). Testing Structural Hypotheses in a Multivariate Cointegration Analysis of the PPP and the UIP for UK. *Journal of Econometrics*, 53(1/2/3), 211-244.

Khalid M. Kisswani, & Elian, M. I. | Kruse, R. (Reviewing Editor) (2017). Exploring the nexus between oil prices and sectoral stock prices: Nonlinear evidence from Kuwait stock exchange. *Cogent Economics & Finance*, 5(1).

Memis, A., & Kapusuzoglu, A. (2015). The Impacts of Global Oil Prices Fluctuations on Stock Markets: An Empirical Analysis for OECD Countries. *International Journal of Economic Perspectives*, 9.

Nandha, M., & Faff, R. (2008). Does oil move equity prices? A global view. *Energy Economics*, 30(3), 986-997.

Onour, I. A. (2007). Impact of oil price volatility on Gulf Cooperation Council stock markets return. *OPEC Review*, 31(3), 171-189.

Phillips, P. C. B., & Perron, P. (1988). Testing for a Unit Root in Time Series Regression. *Biometrica*, 75, 335-346.

Richard, O. O., & Philip, O. O. (2015). Spillover from oil market to stock market in Nigeria: Evidence from granger causality in risk. *The Journal of Developing Areas*, 49(3), 81-101.

Rosmy, L. J., & Balli, F. (2014). Oil Price and Stock Market Synchronization in Gulf Cooperation Council Countries. *Emerging Markets Finance and Trade*, 50.

Sehgal, S., & Kapur, R. (2012). Relationship between Oil Price Shocks and Stock Market Performance: Evidence for Select Global Equity Markets. *Vision*, 16(2), 81-92.

Soucek, M., & Todorova, N. (2013). Economic significance of oil price changes on Russian and Chinese stock markets. *Applied Financial Economics*, 23(7), 561-571.

Ulussever, T., & Demirer, R. (2017). Investor herds and oil prices evidence in the Gulf Cooperation Council (GCC) equity markets. *Central Bank Review*, 17(3), 77-89.