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Market Integration: A Sector Level Approach

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Abstract

This study aims to find out the long-run associations among emerging Turkish stock market and three developed stock markets (the German, the US and UK stock markets) for portfolio diversification by employing Augmented Dickey Fuller (ADF) Test, Johansen Cointegration Test and Vector Error Correction Model (VECM). The data includes the companies from 11 different sectors of Turkish Stock Market. The results revial five cointegration equations with the selected factors including both micro and macro variables. The paper is concluded with the discussion of identified relationships for each sector.

Keywords: Market Integration, Co-Integration, Sector Level Analysis

Introduction

Capital markets effectively force the savings towards the investment portfolios and they contribute to development of an investment culture. The globalization extremely increases the investments into the financial instruments as a result of the growth of world economy and reduces the risk of financial crisis. The market integration can be influenced by global economy and financial environment. Therefore, it has become hard to control and monitor the investment decisisons (Hamid & Hasan, 2011).

Since stock market integration may represent the potential benefits of international portfolio diversification and financial stability of a country, besides explaining stock returns variations by considering national factors, the significance of global factors and the integration of the world's capital markets have been considered by scholars (Ibrahim, 2005). Stock market integration studies are started by Grubel (1968), Levy and Sarnat (1970) and Solnik (1974). They report low correlations among national stock returns. This means investors can gain benefits from international portfolio diversification.

Financial specialists have been searching the interlinkages among national stock markets in order to identify potential benefits of international diversification. The currency crises and the political instability of those markets influence investor behaviours and take their attention to globally emerging markets (Syllignakis & Kouretas, 2010). Therefore, the research on the convergence among stock markets has been increased on different aspects of stock market "integration". Cointegrated stock markets are important for the long-term investors, since the national stock markets converge over the long-term (Syllignakis & Kouretas, 2010).

This study applies autoregressive distributed lag (ARDL) to provide empirical evidence on stock market integration and dynamic causal linkages between Turkey and its major trading partners namely the US, Germany, and England.

Literature Review

The literature suggests that US macroeconomic variables are informative about global factors (Andersen et al. 2003, Ehramann and Fratzscher, 2004, and Wongswan, 2006).

Rockinger and Urga (2001) study the integration of the four emerging markets including Czech Republic, Hungary, Poland, and Russia from 1994 to 1997 and identify the significant influence of the German market on both Czech and Hungarian stock returns, while Czech and Polish stock returns are not influenced by the US market.

Gilmore and McManus (2002) search for the relationships between the US stock market and three Central European emerging markets including Hungary, Poland, and Czech Republic from 1995 to 2001 in the short- and long-run and detect low short-term correlations between the CEE markets and the US, however no longterm relationship is identified among them.

Narayan et al. (2004) study the interlink among Pakistan, India, Bangladesh and Sri Lanka markets by using Granger causality approach, Auto Regressive distributive lag and impulse response method from 1995 to 2001 and find a long run relationship among these stock markets. Moreover, it is observed that India, Sri Lanka and Bangladesh stock markets Granger cause to Pakistan stock prices and a unidirectional relationship exists in short run and the Bangladesh equity market is the most exogenous market among the others.

Voronkova (2004) studies and identifies long-run linkages between the UK, the German, the French and three Central European stock markets of Hungary, Poland, and Czech Republic for the period from 1993 to 2002.

Syriopoulos (2004) searches and observes long-run relationship between the US, the German and four Central European stock markets of Hungary, Poland, Czech Republic and Slovakia from 1997 to 2003.

Koedijk and van Dijk (2004) study global risk factors and identify that they are not vitally important for practical cost-of-capital calculations for global integration by analyzing almost 3,300 stocks from nine industrialized countries between 1980 and 1999.

Gilmore et al. (2005) search and observe no strong cointegration relationship between the UK, the German and three Central European stock markets of Hungary, Poland, and Czech Republic from July 1995 to February 2005.

Schotman and Zalewska (2005) observe that the Hungarian market is the most and the Czech market is the least sensitive to the Asian and Russian crises.

Lamba (2005) finds a long run relationship among South Asian emerging stock markets and some developed equity markets from July 1997 to December 2003, as a result of multivariate co-integration test. Furthermore, developed equity markets of US, UK and Japan are observed to have influence on Indian stock market and the stock markets of Pakistan and Sri Lanka are identified to be relatively independent and not affected by the developed stock markets. It is concluded that the three South Asian equity markets are becoming slowly integrated.

Suchismita and Paramita (2006) examine the integration of India with developed US and Japan equity markets and emerging markets of Hong Kong, Malaysia, South Korea, Singapore, Taiwan, and Thailand from January 1999 to June 2004 and observe that US equity markets are not linked with the Asian Stock markets.

Gan (2006) searches the interaction between the New Zealand Stock Index (NZSE40) and a group of macroeconomic variables including consumer price index, exchange rate, gross domestic product (GDP), money supply (m1), long term interest rate, and short term interest rate for the period between January 1990 and January 2003 by applying Johansen Multivariate Co-integration test and Granger-Causality test, Impulse Response and Error Variance Decomposition analysis. It is identified that the New Zealand Stock Index is co-integrated in the long and short run.

Hasan and Durrani (2008) search the relationship among Pakistan equity market and nine developed equity markets of US, UK, France, Germany, Japan, Canada, Italy and Australia from 2000 to 2006 and observe no co-integration between Pakistani equity market and the equity markets of the US, UK, Germany, Canada, Italy and Australia while there is co-integration with France and Japan. Furthermore, the influence of the UK and US stock markets on Pakistan equity market is observed to be little.

Liu and Shrestha (2008) examine the relationship between the Chinese stock market indices and some macroeconomic variables, including money supply, industrial production, inflation, exchange rate and interest rates and observe co-integration relationships between stock prices and macroeconomic variables.

Merica et al. (2008) employ principal components analysis and Granger causality tests in order to study the portfolio diversification implications of the co-movements of sector indices in bull and bear markets including US, UK, German, French, and Japanese stock markets and find that investors can gain more with global diversification than with domestic diversification. They suggest investing in the same sector in different countries instead of investing in different sectors within the same country in a bull market. Moreover, the sectors of different countries seem to be more correlated and country diversification opportunities are seemed to be less in a bear market.

Majid et al. (2009) find that Asian stock markets are becoming more integrated among them or with the US and Japan stock markets.

Vuran (2010) studies the integration of Turkish equity market with developed and developing eight international equity markets including FTSE 100, DAX, CAC 40, S&P500, Nikkei 225, Bovespa, Merval, and Mexico IPC by using Johansen Cointegration technique from January 2006 to January 2009 and identifies a cointegration between Turkish equity market and two developed (FTSE 100, DAX) and three developing (Merval, Bovespa, IPC) equity markets implying that Turkish equity market is not a good diversification alternative for investors of those markets.

Syllignakis and Kouretas (2010) search the long-term relationship between seven Central and Eastern European (CEE) emerging stock markets and two developed stock markets (the German and the US markets) by employing recursive cointegration analysis and observe the increase of financial interlinkages between the CEE markets and the world markets with the beginning of the EU acceding period. Moreover, the considered stock markets are found to be partially integrated and the global financial crisis of 2007–2009 causes a slowdown in the convergence process.

Abdul Karim and Abdul Majid (2010) aim to re-examine the stock market integration and short-run dynamic interactions between the Malaysian stock market and the stock markets of its major trading partners (the US, Japan, Singapore, China and Thailand) on weekly stock indices from January 1992 to May 2008 by employing autoregressive distributed lag (ARDL) bound testing approach and vector autoregression (VAR) framework. They identify that Stock markets of Malaysia and its major trading partners are integrated.

Korkmaz et al. (2011) study the causality between US stock market and Turkish stock market by using Turkcell security returns that are traded as American Depository Receipt in the New York Stock Exchange and ISE 100 and observe that S&P 500 has impact on ISE 100 and Turkcell returns implying that there is a spillover effect of US stock market on Turkish stock market.
López-Herrera and Ortiz (2011) use a multi factor beta model in order to measure the relationship between local macroeconomic factors and asset pricing on the NAFTA countries, Mexico, Canada and United States and the integration of each market to global macroeconomic variables. They observe that local factors have more influence than international factors at each market, revealing mild segmentation among these markets. Furthermore, it is observed that the integration level of local markets with global variables is the greatest for United States and is the lowest for Mexico.
Albuquerque and Vega (2011) study the effects of real-time domestic and foreign news on the co-movement between stock returns of small and open Portuguese economy and a large United States economy. They observe that US macroeconomic news and Portuguese earnings news do not affect stock market co-movement while Portuguese macroeconomic news negatively influences stock market co-movement. They identify the effect of US news on Portuguese stock market returns.
Hamid and Hasan (2011) aim to investigate the causal and dynamic linkages of Karachi Stock Exchange (KSE) with some emerging stock markets including India, China, Hong Kong, Malaysia, Indonesia, Thailand, Turkey, and Brazil, and with developed stock markets of Japan, US, UK and France from January, 1998 to December, 2008 on monthly basis. They employ descriptive analysis, correlation analysis, unit root test, co-integration test, vector error correction model, granger causality test, variance decomposition test and impulse response test to identify the existence of short run and long run relationships. They identify that KSE-100 is a volatile market and have long run relationships with Indonesian and Brazilian markets and short run relationships with Chinese market. The equity markets of Indian, Chinese, Thailand, Malaysian, Indonesian, Turkish, Brazilian markets and Nikkei-225 granger cause to KSE-100 and KSE-100 granger causes to Hong Kong, Thailand, Malaysian, Indonesian markets.
Khan et al. (2011) study the co-movement among selected Asian stock markets by employing Augmented Dicky Fuller (ADF), Multivariate Cointegration and Engle- Granger Causality tests from August 1998 to August 2008. They identify market integration among the equity markets and the pair wise cointegrations changes from country to country. Large and developed stock markets i.e. Hong Kong, Singapore, Tokyo, Shanghai, and Bombay are observed to be cointegrated with each other while small stock markets i.e. Karachi, Dhaka, and Kuala Lumpur present weak co-integration. Causality test results show that large stock markets granger cause small stock markets and suggest a short-term lead-lag relationship among them.

Data and Methodology

This work employs the data of the companies from Istanbul Stock Exchange (ISE) Market for the analyses. The period for the analyses spans from March, 2000 to September, 2012. This study selects 48 companies which are operating in 11 different sectors of Istanbul Stock Exchange including electric, food, communication, paper, chemistry, metal-main, metal-product, stone, textile, commerce and transportation sectors. While selecting the companies FORTUNE 500 list for Turkey is considered. Since the other classification channels such as Istanbul Sanayi Odası (ISO) do not include the list of all companies in the sectors, FORTUNE 500 list for Turkey is found to be proper in order to select the companies. The companies are

selected from each sector by considering their data availability, profitability and performance in Istanbul Stock Exchange Market.
After the determination of the companies, the necessary data is obtained from Istanbul Stock Exchange (ISE)'s, Turkish Central Bank (TCMB)'s, Turkish Statistical Institute (TUIK)'s and company's websites.
As a result of the analyses of internal and external factors for the considered sectors (Ozlen**,** 2014a; 2014b; 2014c), the highest loaded significant factors are selected for the cointegration analysis extending from the second quarter of 2005 to the third quarter of 2012 including 31 quarterly data. Augmented Dickey Fuller (ADF) test is used in order to run Unit Root Test. As a result of this test, the factors which cannot satisfy Unit Root Test are taken away from the analyses. The identified factors for each sector are given as follows:

Metal-Main Sector: Book Value, XMANA (Sector Index), Inflation Rate, FTSE-100 (England) and ISE.
Transportation Sector: Debt Ratio, Book Value, XULAS (Sector Index), GDAX-Germany, and ISE.
Textile Sector: Book Value, Inflation Rate, XTEKS (Sector Index), GDAX-Germany, and ISE.
Stone Sector: Book Value, Inflation Rate, Exchange Rate, and ISE.
Metal-Product Sector: Book Value, Debt Ratio, XMESY (Sector Index), GDAX-Germany, and ISE.
Paper Sector: Book Value, GDAX-Germany, and ISE.
Communication Sector: Book Value, Price to Earning Ratio, NYSE-Composite, and ISE.
Commerce Sector: Book Value, Exchange Rate, GDAX-Germany, FTSE-100 (England), and ISE.
Electric Sector: Book Value, XELKT (Sector Index), and ISE.
Food Sector: Book Value, XGIDA (Sector Index), NYSE-Composite, and ISE.
Chemistry Sector: Book Value, XKMYA (Sector Index), FTSE-100 (England), and ISE.
Eviews 6.0 is employed for Unit Root Test, Johansen Cointegration Test and Vector Error Correction Model Test.

Johansen Cointegration Test and Vector Error Correction Model

The final obtained data through internal and external analyses is used to run Johansen Cointegration Test and Vector Error Correction Model (VECM) Test in order to identify whether there are long term and dynamic relationships respectively among the identified factors and stock returns for each sector.
Before employing Johansen Cointegration Test, the data is checked for Unit Root by the help of Augmented Dickey Fuller (ADF) test. Some of the data are removed from the analyses because of the stationarity problems. In the second step, Johansen Cointegration Test is performed for each sector. If there are cointegration relations, the final test is applied through Vector Error Correction Model (VECM) Test in order to identify dynamic associations.

Results

The findings of Johansen Cointegration test imply that there appear co-integrating equations for five sectors including Food, Textile, Paper, Commerce and Chemistry sectors. Therefore, these sectors are tested by employing Vector Error Correction Model (VECM) and identified to have dynamic relationships with the evaluated factors. The results are provided in below tables (Table 4.27, Table 4.28, Table 4.29, Table 4.30, and Table 4.31).

Food Sector is significantly observed to have a cointegrating equation with its Book Value, its Sector Index, ISE, and US Stock Market in the long run. The significant results also reveal that it has a positive dynamic relation with its Book Value, but, a negative and strong dynamic relatiohip with US Stock Market.

Table 1
The Results of Cointegration and Vector Error Correction Model Tests for Food Sector

Test	Dependent variable	STOCK AEFES		
	Independent variables	BOOK VALUE, ISE, NYSE COMPOSITE, XGIDA		
Vector Error Correction Model (VECM)	BOOK VALUE (-1)			0,606
	t-value			[3.18630]
	XGIDA (-1)			0,189
	t-value			[0.77809]
	NYSE COMPOSITE (-1)			-3,750
	t-value			[-5.05668]
	ISE (-1)			-0,358
	t-value			[-0.68666]
	e(-1)			[-0.23851]
Johansen Cointegration Test	Trace Statistic	Critical Value	Max-Eigen Value Statistic	Critical Value
	7.433.939*	6.981.889	4.091.358*	3.387.687

*indicates 1 cointegrating eqn(s) at the 0.05 level

Textile Sector is identified to have a cointegrating equation with its Sector Index, ISE and German Stock Market. But, it has no dynamic relationship with these factors.

Table 2
The Results of Cointegration and Vector Error Correction Model Tests for Textile Sector

Test	Dependent variable	STOCK ALTIN		
	Independent variables	XTEKS, GDAX, ISE		
Vector Error Correction Model (VECM)	GDAX GERMANY (-1)			3,699
	t-value			[1.43263]
	XTEKS (-1)			1,430
	t-value			[0.80907]
	ISE (-1)			-1,350
	t-value			[-0.58368]
	e(-1)			[2.05566]
Johansen Cointegration Test	Trace Statistic	Critical Value	Max-Eigen Value Statistic	Critical Value
	7.844.798*	4.785.613	4.931.813*	2.758.434

*indicates 1 cointegrating eqn(s) at the 0.05 level

Paper Sector is observed to form a cointegration equation with its Book Value, ISE and German Stock Market. It also has a dynamic relationship with these variables.

Table 3
The Results of Cointegration and Vector Error Correction Model Tests for Paper Sector

Test	Dependent variable	STOCK IPEKE		
	Independent variables	BOOK VALUE, GDAX, ISE		
Vector Error Correction Model (VECM)	BOOK VALUE (-1)			-1,94506
	t-value			[-3.47635]
	GDAX			-8,88814
	t-value			[-17.3944]
	ISE (-1)			2,67242
	t-value			[7.49848]
	e(-1)			[-0.63059]
Johansen Cointegration Test	Trace Statistic	Critical Value	Max-Eigen Value Statistic	Critical Value
	6.203.236*	4.785.613	3.378.274*	2.758.434

*indicates 1 cointegrating eqn(s) at the 0.05 level

Commerce Sector is found to have a cointegration association with its Book Value, exchange rate, ISE, English and German Stock Markets. Furthermore, it has a dynamic relationship with these factors except its Book Value.

Table 4
The Results of Cointegration and Vector Error Correction Model Tests for Commerce Sector

Test	Dependent variable	STOCK MGROS		
	Independent variables	BOOK VALUE, EXCHANGE RATE, FTSE, GDAX, ISE		
Vector Error Correction Model (VECM)	BOOK VALUE (-1)			-0.066228
	t-value			[-0.44530]
	EXCHANGE RATE (-1)			8.813.701
	t-value			[22.1945]
	FTSE 100 (-1)			1.344.332
	t-value			[17.8184]
	GDAX (-1)			5.058.011
	t-value			[12.8032]
	ISE (-1)			-3.163.024
	t-value			[-14.9941]
	e(-1)			[0.99025]
Johansen Cointegration Test	Trace Statistic	Critical Value	Max-Eigen Value Statistic	Critical Value
	1.327.283*	9.575.366	5.276.565*	4.007.757

*indicates 1 cointegrating eqn(s) at the 0.05 level

Chemistry Sector is observed to have a cointegrating equation with its Book Value, its Sector Index, ISE and English Stock Market. Furthermore, it forms a dynamic relationship with all these factors.

Table 5
The Results of Cointegration and Vector Error Correction Model Tests for Chemistry Sector

Test	Dependent variable	STOCK TUPRS		
	Independent variables	BOOK VALUE, XKMYA, FTSE-100, ISE		
Vector Error Correction Model (VECM)	BOOK VALUE (-1)			0.117686
	t-value			[5.35513]
	FTSE 100 (-1)			-0.461274
	t-value			[-8.61871]
	ISE (-1)			0.064604
	t-value			[2.23028]
	XKMYA (-1)			-0.999904
	t-value			[-29.1802]
	e(-1)			[0.56116]
Johansen Cointegration Test	Trace Statistic	Critical Value	Max-Eigen Value Statistic	Critical Value
	7.476.709*	6.981.889	3.433.336*	3.387.687

*indicates 1 cointegrating eqn(s) at the 0.05 level

Conclusion

This search is motivated to identify the integration of the sectors with the identified most powerful internal and external factors. The results reveal five cointegrating associations among 11 sectors.

The main determinant of Food sector is observed to be Sectoral Index. However, there appear high negative effect of ISE and negative impact of American Stock Market. Their internal factor (Book Value) has a positive impact on the stock movements implying that the financial strength of the companies in this sector seems highly related with stock movements. Therefore, the companies in this sector should be strong inside and focus more on sectoral compatibility. Furthermore, they should find ways in order to protect themselves from external threads of ISE and American Stock Market Index.

Observed cointegration relationship with its Sector Index, ISE, and US Stock Market in the long run may be considered in portfolio diversification. The diversified portfolio which includes a stock from Food Sector should not consider any other stock from its Sector Index, ISE, and US Stock Market.

Paper Sector is identified to have a cointegration association with ISE and German Stock Market. Therefore, it should not be consider with these two markets in order to decrease investment risks.

Chemistry Sector is identified to have a cointegrating relationship with its Sector Index, ISE and English Stock Market. Therefore, it should not be considered with these markets in order to have a well-diversified portfolio.

Since Textile Sector has a cointegration relationship with its Sector Index, ISE and German Stock Market, it should not be included in a diversified portfolio with any stocks from these markets.

Commerce Sector is not a good option to make investment with any stocks from ISE, English and German Stock Markets, because of the cointegration relationship with them.

This research provides some implications to the policy makers, company managers and investors as well as to the body of the literature. It is assumed that the results would help the regulatory bodies to better understand stock market behavior to obtain their goals as an implication for the policy.

Since this research provides sector specific results, the findings of this study may be useful to develop sectorally diversified portfolios in order to reduce investment risks. The findings of this study about the long-run associations among emerging Turkish stock market and three developed stock markets (the German, the US and UK stock markets) may be useful for international diversification of the portfolio. Since, international diversification can reduce the investment risk; the investors may diversify their investment portfolio by taking the potential impact of macroeconomic variables on developing stock markets into account. The study findings may enhance the awareness of economic and financial decision makers, international investors, regional investors, investment agencies and banks, in order to understand the opportunities of portfolio diversification benefits and management of stock market trends. The investors can also look beyond the domestic economic environment to determine their whole risk coverage.

This study measures the influences of some fundamental developed stock markets including American, English and German markets by considering their past relationships. Future research may consider different stock markets around the world such as the markets in Turkey's neighbor countries, Europion Union countries' stock markets, etc.

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