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Article *in* International Research Journal of Finance and Economics · December 2011

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International Research Journal of Finance and Economics
ISSN 1450-2887 Issue 79 (2011)

http://www.internationalresearchjournaloffinanceandeconomics.com

Investigating the Relationship between Stock Market Returns and Macroeconomic Variables: Evidence from Developed and Emerging Markets

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Abstract

This study examines the links between the macroeconomic variables (real economic activity, inflation, interest rate, money supply and exchange rate) and stock prices for developed and emerging markets during the period of January 2002 to December 2008. The study uses various testing methods including Granger causality test and Pedroni panel cointegration tests. These tests were applied by using panel data from 16 developed markets and 16 emerging markets. The empirical results show a significant causal relationship between macroeconomic variables, with the exception of interest rate and money supply, and stock prices for developed and emerging markets. It also finds a significant causal relationship between stock prices and macroeconomic variables for developed and emerging markets with the exception of exchange rate and money supply for developed markets. The findings also show a positive long-run relationship between real economic activity level and stock prices for developed markets. Furthermore, the results find that the relationship between macroeconomic variables and stock return in emerging markets is significantly more established than in developed markets.

Keywords: Macroeconomic Variables, Stock Prices, Developed Markets, Emerging Markets, Granger Causality Test, Pedroni Panel Cointegration Tests.
JEL Classification Codes: C58, E44, G12, G15.

1. Introduction

Establishing the lead-lag relationship between macroeconomic variables and stock prices is highly important. The significant time lagged effects of macroeconomic variables on stock prices indicates informational inefficiency of the stock market. This means that individual investors can earn abnormal profits by exploiting past macroeconomic information. The presence of this exploitable opportunity would then seriously distort the market ability to efficiently allocate scarce resources. The reverse effects of stock prices on macroeconomic variables imply that stock market movements can anticipate future economic conditions (Mukherjee and Nake, 1995). Accordingly, they may be employed as a leading indicator in helping formulate current economic stabilization policies.

By using publicly available information about macroeconomic fundamentals, it is widely accepted that stock returns are partially predictable. Although the precise cause and effect relationship between macroeconomic variables and stock prices is debatable. The existing empirical evidence regarding the short and long-run relationship between macroeconomic variables and stock returns is mixed because of different data sets and testing methods used, see for example, (Frennberg and Hansson, 1993), (Chappel, 1997). Moreover, the predictability of returns by using macroeconomic information could be regarded as evidence of market inefficiency. Therefore, by investigating the short and long-run relationship between macroeconomic variables and stock returns, conclusions regarding the efficiency of the stock market can be derived and relevant policy regulations to improve stock market conditions can be reviewed.

The relationship between stock prices and macroeconomic variables has been investigated assuming that macroeconomic fluctuation is influential on stock prices through their effects on future cash flows and the rate at which they are discounted. Some studies such as (Fama, 1991) suggested that stock prices reflect earnings, dividends and interest rate expectations, as well as information about future economic activity. Moreover, stock returns affect the wealth of investors which in turn affect the level of consumption and investment. The development of the cointegration technique by Granger (1986) and Engle and Granger (1987) has motivated research on the short and long-term relationships between variables. Also the empirical results imply that the information available on macroeconomic variables and trading volumes, is informational inefficient and can be potentially used to predict stock prices; as evidenced by the study of Patra and Poshakwale (2006) which examined the short-run dynamic adjustments and the long-run equilibrium relationships between selected macroeconomic variables, trading volumes and stock returns in the emerging Greek stock market during the period of 1990 to 1999. The empirical results showed that a short-run and long-run equilibrium relationship exists between inflation, money supply and trading volumes and the stock prices in Athens stock exchange. However, no short-run or long-run equilibrium relationship is found between the exchange rates and stock prices. The results also imply that Athens stock exchange (ASE) is informational inefficient because publicly available information on macroeconomic variables and trading volumes can be potentially used in predicting stock prices.

This relationship between macroeconomic variables and the stock market provides the study with the challenge of examining this relationship from a multi-dimensional perspective. Therefore, it aids in discovering if the relations between the variables changes depending on the type of market (developed, emerging) development in diverse countries.

The structure of the emerging stock markets differs from that of the developed markets. Therefore, the stock market index movement may also be varied. In this retrospect, the emerging stock markets return may respond differently to macroeconomic variables than those of the developed markets. Consequently, this study is trying to detect if there is a difference in the response of stock price movement to the movement of macroeconomic variables between emerging and developed markets.

The dynamic linkages between stock markets and macroeconomic variables are equally important. Roland (2002) found that the emerging economies are characterized by political instability, strong currency turbulence and high foreign debt. Furthermore, the emerging markets distinguish themselves from the capital markets of developed economies with regard to the degree of informational efficiency and institutional infrastructure. A stock market's institutional infrastructure is generally characterized by the taxation of dividends and capital gains, the restriction of capital flow and the quality of information provided. The importance of this study also comes from the variation in this relationship over time. The study conducted by Kizys and Pierdzioch (2009) focuses on whether asymmetric macroeconomic shocks help to explain changes in the international co-movement of monthly stock returns in major industrialized countries over the period 1975–2004. Based on a time-varying parameter model, they find that the international co-movement of stock returns has changed over time, but that asymmetric macroeconomic shocks do not significantly help in explaining these changes.

Also, it is important to consider the question of whether macroeconomic variables that capture stock market return is important for investors, macroeconomists and policymakers. Finding an answer to this question may help investors to refine theories of stock pricing; to calculate more exact solutions to problems of optimal portfolio selection; and to efficiently monitor and manage financial risks. Macroeconomists and policymakers can benefit from finding an answer to this question because it would enable them to develop a clearer understanding of potential macroeconomic variables that affect the stock markets. However, until now, such links have solely been investigated with regard to developed markets (Mukherjee and Nake, 1995) and emerging markets (Muraoglu et al., 2000) independent of one another respectively. This study intends to establish the links between emerging[1] and developed[2] markets, with regard to the relationship between stock markets and macroeconomic variables.

The main purpose of this study is to investigate whether current macroeconomic activities in emerging markets can explain stock market returns in a different manner to that witnessed in developed markets.

The study also concentrates on the relationship between macroeconomic variables and stock market returns in the long-run and the short-run by comparing emerging and developed markets. This study does so by considering the following questions:

1. Is there a bi-causal relationship between stock prices index and real economic activities?
2. Is there a bi-causal relationship between stock prices index and inflation?
3. Is there a bi-causal relationship between stock prices index and interest rate?
4. Is there a bi-causal relationship between stock prices index and money supply (M2)?
5. Is there a bi-causal relationship between stock prices index and exchange rate?

These questions will be answered by comparing analysis taken from emerging and developed markets to find if there is a difference in the response of stock markets to macroeconomic variables.

This study is organized into seven sections as follows: Section 2 describes the theoretical framework, while section 3 addresses the literature review. On the other hand, section 4 presents the hypotheses of this study. Data and research methodology are illustrated in section 5. Section 6 reports the data analysis, hypotheses testing and empirical results. Finally, section 7 provides the concluding remarks.

2. Theoretical Framework

Financial economists, policymakers and investors have long attempted to understand the dynamic interactions among macroeconomic variables, exchange rate and stock prices. Theoretically, their causal interactions may be considered using models such as the standard stock valuation model.

[1] **Emerging markets** is used to describe a nation's social or business activity in the process of rapid growth and industrialization. In the 2008 Emerging Economy Report (http:// www.emergingeconomyreport.com), the Center for Knowledge Societies defines ***Emerging Economies*** as "regions of the world that are experiencing rapid informationalization under conditions of limited or partial industrialization".

[2] **Developed markets** are those countries that are thought to be the most developed and therefore less risky.

According to the stock valuation model, stock price represents the discounted present value of the firm's future cash flows. This approach of discounted cash flow or present value model (PVM) was used by Chen, Roll and Ross (1986)[3] to investigate the impact of the systematic risk factors upon stock returns.

At the same time, changes in stock prices may also influence variations in economic activities and act as a channel of monetary transmission mechanisms. In particular, reflecting real economic activities, changes in stock prices lead to an increase in the demand for real money and the interest rate and, subsequently, the value of domestic currency (Ajayi et al., 1998). Moreover, the increase in domestic stock prices means that domestic financial assets become more attractive. As a result, individual investors or firms will adjust their domestic and foreign portfolios by requiring more domestic assets. Furthermore, under the standard open-economy Aggregate Demand – Aggregate Supply (AD-AS) model, changes in money supply affect real activity through various channels. These include the traditional liquidity channel, exchange rate channel and stock prices channel via Tobin's Q theory, wealth effects and household liquidity effects (Mishkin, 1998). The AD-AS model also allows for interactions among macroeconomic variables representing such markets as goods and services, money, and international markets.

From these standard models, we may discern the interactions among these variables dynamic. Economic variables affect and are affected by stock prices.

An efficient capital market is one in which security prices adjust rapidly to the arrival of new information. Therefore, the current prices of securities reflect all information about the security. Some of the most interesting and important academic research during the past 20 years has analyzed whether capital markets are efficient. This extensive research is important because its results have significant real-world implications for investors and portfolio managers. In addition, the question of whether capital markets are efficient is one of the most controversial areas in investment research. Recently, a new dimension has been added to the controversy because of the rapidly expanding research in behavioral finance that, likewise, has major implications regarding the concept of efficient capital markets.

Most of the early work related to efficient capital markets was based on the random walk hypothesis, which contended that changes in stock prices occurred randomly. This early academic work contained extensive empirical analysis without much theory behind it. An article by Fama attempted to formalize the theory and organize the growing empirical evidence. Fama presented the efficient market theory in terms of a fair game model, contending that investors can be confident that a current market price fully reflects all available information about a security and the expected return based upon this price is consistent with its risk (Fama, 1970).

In his original article, Fama divided the overall efficient market hypothesis (EMH) and the empirical tests of the hypothesis into three sub hypotheses depending on the information set involved: (1) weak-form EMH; (2) semi-strong-form EMH; and (3) strong-form EMH (Fama, 1970).

3. Literature Review

Empirical work has provided evidence for the effect of a number of macroeconomic variables on stock returns. ***Real economic activity*** represented by ***Industrial Production Index*** through its effect on expected future cash flows, is likely to affect stock prices in the same manner. Chen, Roll and Ross (1986) suggest a positive relation between stock returns and real economic activity. Also, the study by Nasseh and Strauss (2000) finds a significant long-run relationship between stock prices, and domestic and international economic activity in France, Germany, Italy, the Netherlands, Switzerland and the U.K. In particular, they find large positive coefficients for industrial production. Another study

[3] They found that the yield spread between long and short-term government bonds, expected inflation, unexpected inflation, industrial production growth and the yield spread between corporate high and low grade bonds significantly explain stock market returns.

conducted by Mansor and Hassanuddee (2003) analyzes the dynamic linkages between stock prices and four macroeconomic variables for Malaysia. They employed standard and well-accepted methods of cointegration and Vector autoregression (VAR) on monthly data for the period of January 1977 to August 1998. They found a positive long-run relationship between stock prices and industrial production.

Maghyereh (2003) investigated the long-run relationship between Jordanian stock prices and selected macroeconomic variables using Johansen methodology of cointegration analysis and monthly time series data for the period of January 1987 to December 2000. He found that industrial production is reflected in stock prices in the Jordanian capital market. Also, Suliaman et al., (2009) investigated the relationship between macroeconomic variables and shares prices in Karachi stock exchange. They used quarterly data of several economic variables such as foreign exchange rate, foreign exchange reserves, the industrial production index (IIP), the sale whole price index, gross fixed capital formation (GFCF) and money supply (M2). They utilized multiple regression analysis on a sample covering the period from 1986 to 2008. Their results showed that the IIP does not significantly affect stock prices.

The relationship between ***inflation*** and stock return is highly controversial. Geske and Roll (1983) documented a negative relationship between inflation and stock return. An increase in inflation has been expected to increase the nominal risk-free rate, which in turn will raise the discount rate used in valuating stocks. If cash flows increase at the same rate, the effect of a higher discount rate will be neutralized. On the other hand, if contracts are nominal and cannot adjust immediately, the effect will be negative. Also, the empirical evidence suggests that high and variable inflation rates increase inflation uncertainty and thus lower share value. Further research also supports the hypothesis that stock returns are negatively related to both expected and unexpected inflation rate. However, the study conducted by Caporale and Jung (1997) rejected the hypothesis that stock returns and inflation are negatively correlated. While other studies such as (Chatrath et al., 1997) and (Adrangi et al., 1999) show only partially support to this hypothesis in the developing stock markets of India, Peru and Chile respectively. Another study by Salameh (1997) documented that there is no relationship between stock prices and inflation for period of December 1993 to June 1996 in Jordan. Furthermore, Joo (2000) examined whether monetary policy accounts for the negative relationship between real stock returns and inflation. His evidence suggests that about 30% of the observed negative relationship is attributed to monetary innovations. Also, Patra and Poshakwale (2006) found that short-run and long-run equilibrium relationship exists between inflation and stock prices for stocks listed at Athens stock exchange. On the other hand, Zoicas and Fat (2008) found that inflation rate has led to the estimation of significant relationships to the variations of stock market. The study by Suliaman et al., (2009) also found that whole sale price index is significantly and positively related to stock prices. Similarly, Antonio and Francisco (2009) examined the short-run response of daily stock prices on the Spanish market to the announcements of inflation news at the industrial level. They observed a positive and significant response of stock returns in the case of "bad news" (total inflation rate higher than expected one) in recession, and also in the case of negative inflation surprises ("good news") in non-economic recession. The study conducted by Durai and Bhaduri (2009) tested the relationship between stock returns, inflation and output for the post-liberalized period in India using the wavelet methodology. The findings showed that there is a strong negative relationship between inflation and real stock return in the short and medium term.

The effect of ***nominal interest rates*** on stock prices is also expected to be negative; the level of real economic activity is expected to have a positive effect on future cash flows and thus will affect stock prices in the same direction (Fama, 1990). Maghyereh (2003) found that interest rates are reflected in stock prices in the Jordanian capital market. On the other hand, Melina (2005) concluded that there is a uni-directional causal relationship between the interest rates and the general index of Athens stock exchange, with direction from the interest rates to the general index of Athens stock exchange. Also, Uddin and Alam (2007) examined the linear relationship between share prices and interest rates, share prices and changes of interest rates, changes of share prices and interest rates, and changes of share prices and changes of interest rates on Dhaka stock exchange (DSE). They found that interest rates have significant negative relationship with share prices and changes of interest rates have significant negative relationship with changes of share prices. Zoicas and Fat (2008) analyzed the return series behavior of the main index of the Bucharest Stock Exchange (BSE) during different periods of time, compared to the evolution of some macroeconomic variables. The results confirm that there is a weak relation between interest rates and stock market index. Similarly, Alam and Uddin (2009) examined the impacts of interest rates on stock exchange. Their findings showed empirical relationship exists between stock market index and interest rates for fifteen developed and developing countries: Australia, Bangladesh, Canada, Chile, Colombia, Germany, Italy, Jamaica, Japan, Malaysia, Mexico, the Philippine, South Africa, Spain, and Venezuela. The stock market returns stationary is tested and the findings indicate that none of these stock markets follow random walk model (not efficient in weak-form). For all of the countries, it is found that interest rates have significant negative relationship with share prices and for six countries, it is found that changes of interest rates have significant negative relationship with changes of share prices. Therefore, if the interest rate is considerably controlled for these countries, it will be the great benefit of these countries' stock exchange through demand pull way of more investors in share market, and supply push way of more extensional investment of companies. Also, Suliaman et al., (2009) found that interest rates in Pakistan are significantly affecting stock prices.

The effect of ***money supply*** on stock prices is argued by Mukherjee and Nake. Since the rate of inflation is positively related to money growth rate; an increase in money supply may lead to an increase in the discount rate. Therefore, the negative effect on stock prices may be countered by the economic stimulus provided by money growth (Mukherjee and Nake, 1995). Such stimulus often referred to as a corporate earning effect, would likely result in increased future cash flows and stock prices. Also, Patra and Poshakwale (2006) found that short-run and long-run equilibrium relationship exists between, money supply and the stock prices in Athens stock exchange. Other studies investigated macroeconomic factors as a source of systematic risk, which determined expected stock market returns. For instance, Azeez and Yonezawa (2006) examined through the use of APT, the empirical evidence of the pricing of macroeconomic factors in the Japanese stock market during the bubble economy; which enables them, first, to identify macroeconomic factors that are a source of systematic risk, and second, to compare the priced factors of the bubble period with the priced factors of pre- and post-bubble periods. They concluded that money supply risk factor is one of four factors that have significant influence on expected returns. Also, Suliaman et al., (2009) showed that the money supply (M2) is significantly and negatively related to stock prices.

Several studies related to ***Exchange rates*** effects on stock prices are performed. A depreciation of the local currency makes exporting goods cheaper and may lead to an increase in export sales. Consequently, the value of an export firm would benefit from depreciation in local currency. On the other hand, because of the decrease in foreign demand of an exporting firm's products when the local currency appreciates, the firm's profit will decline and so does its stock price. In contrast, for importing firms the sensitivity of the firm value to exchange rate changes is just the opposite. An appreciation (depreciation) of the local currency leads to an increase (decrease) in the firm value of importing firms. This has been shown to influence stock prices through the term of trade effect (Geske and Roll, 1983). Also, there are a number of studies which have investigated the relationship between exchange rate movements and stock returns using data from developed and emerging markets. Granger et al., (2000) use a Bayesian Vector autoregression model to examine the relationship between stock prices and exchange rates for nine Asian countries and found mixed results. Their findings suggested that there is no relationship between the stock prices and the exchange rate for Japan and Indonesia. However, they find that exchange rate leads stock prices in Korea, whereas stock prices lead exchange rates in Hong Kong, Malaysia, Thailand and Taiwan. Patra and Poshakwale (2006) indicated that their empirical results show that no short-run or long-run equilibrium relationship is found between the exchange rate and stock prices. Also, Ming-Shiun et al., (2007) examined the dynamic links between exchange rates and stock prices for seven East Asian countries, including Hong Kong, Japan, Korea, Malaysia, Singapore, Taiwan and Thailand, for the period of January 1988 to October 1998. Their empirical results show a significant causal relationship between exchange rates and stock prices for Hong Kong, Japan, Malaysia, and Thailand before the 1997 Asian financial crisis. They also found a causal relationship between the equity markets and the foreign exchange markets for Hong Kong, Korea and Singapore. Further, while no country showed a significant causality between stock prices and exchange rates during the Asian crisis, a causal relationship between exchange rates and stock prices were found for all countries with exception of Malaysia. Recent study by Yau and Nieh (2009) investigated the exchange rate effects of the New Taiwan Dollar against the Japanese Yen (NTD/JPY) on stock prices in Japan and Taiwan from January 1991 to Mach 2008. The empirical evidence suggests that there is a long-run equilibrium relationship between NTD/JPY and the stock prices of Japan and Taiwan. However, no short-run causal relationship exists between the two financial assets considered in the case of both countries. Other recent studies investigated the relation between real effective exchange rates and stock prices. Zhao (2009) empirically analyzed the dynamic relationship between RMB[4] real effective exchange rate and stock prices with Vector autoregression (VAR) and multivariate GARCH models, by using monthly data for the period of January 1991 to June 2009. The results show that there is no stable long-term equilibrium relationship between RMB real effective exchange rate and stock prices. On the other hand, the study by Manish (2009) examined the dynamic relationship between stock market index of India and exchange rates utilizing daily data. The empirical evidence suggests that there is no long-run relationship. However, there is bi-directional causality between stock index and exchange rates. The findings of the causality tests strongly support portfolio or macroeconomic approach on the relationship between exchange rates and stock prices. An attempt is also made to forecast daily returns of INR/USD exchange rates by exploiting the information of causal relationship between exchange rates and stock index using VAR model. VAR's out-of-sample performance is benchmarked against the traditional ARIMA model. The potential of the two models are rigorously evaluated by employing a cross-validation scheme and statistical metrics like mean absolute error, root mean square error and directional accuracy. Out-of-sample performance shows that VAR model is robust, and consistently produces superior predictions than ARIMA model. Most of other studies such as (Ai-Yee Ooi et al., 2009), (Aydemir and Demirhan, 2009) have reported causality between stock prices and exchange rates. Their results support the presence goods market approach or portfolio approach. Suliaman et al., (2009) indicated that their results show that exchange rates are highly affected stock prices.

By reviewing the previous studies concerning the relationship between macroeconomic variables and stock market returns, we found several studies concentrating on the characteristics of the relationship, for example (Melina, 2005), (Mansor and Wan Sulaiman, 2001), (Nasseh and Strauss, 2000) and (Abdalla and Murinde, 1997). Despite of these studies, there is a lack of studies considering the linkage between stock market returns and macroeconomic variables, comparing the emerging markets with developed markets; and hence investigating whether there are significant differences in stock market returns in response to changes in macroeconomic variables between emerging and developed markets. Therefore, this study helps to fill the gap in the current related literature in two ways. First, it includes most available emerging and developed markets, as they were defined as of January 2008 by Morgan Stanley Capital International Barra, to investigate if there are significant differences in the response of stock market returns to change in macroeconomic variables between emerging and developed markets. Second, using panel data analysis for the whole sample altogether, while most other studies reviewed, analyzed the data for each cross-section country separately.

[4] Chinese currency is called Renminbi (people's money), often abbreviated as RMB. Issued by the People's Bank of China. It is the sole legal tender for both the Chinese nationals and foreign tourists.

4. Hypotheses

This study examines six null hypotheses to investigate the relationship between selected macroeconomic variables and stock market index by comparing emerging and developed countries. These hypotheses are:

H_{01}: There is no statistical significant relationship between stock returns and industrial production.

H_{02}: There is no statistical significant relationship between stock returns and inflation.

H_{03}: There is no statistical significant relationship between stock returns and interest rates.

H_{04}: There is no statistical significant relationship between stock returns and money supply (M2).

H_{05}: There is no statistical significant relationship between stock returns and exchange rates.

H_{06}: The relationship between macroeconomic variables and stock returns in emerging markets is statistically significant and less comprehensive than in developed markets.

5. Data and Research Methodology

5.1. The Data Set

This study investigates the relationship between several macroeconomic variables and stock market index (SMI). The macroeconomic variables used in this paper are consistent of those that were used in most previous studies. The macroeconomic variables include: Consumer Price Index (CPI) as used by Melina, (2005), Money Supply M2, (MS) as used by Hashemzadeh and Taylor (1998), Exchange Rate (ExR) as used by Ming-Shiun et al., (2007), Interest rate (IR) as used by Melina (2005) and Industrial production index (IP) as used by Mansor and Hassanuddee (2003). The relationship between macroeconomic variables and stock market prices will be analyzed using panel data (collective, not individual analysis of countries' data), and by comparing emerging markets with developed markets.

The data of this study consists of monthly closing prices of the stock markets in selected emerging and developed countries, as well as the consumer price index, money supply, exchange rates, interest rates, and industrial production. Monthly data was chosen to avoid a spurious correlation problem that might be found when using the quarterly and the annual data, and without compromising the available degrees of freedom that are required in selecting appropriate lag structures. Also, the choice of monthly data was constrained by the fact that variables used in the study were available at a minimum in monthly intervals. Consumer price index is used as a proxy for inflation. The base year will be 2000 depending on data available from the International Financial Statistics (IFS). The money supply variable used is M2. The exchange rate is measured as the domestic currency per US dollar. The industrial production is used as a proxy for real economic activity. Three months of treasury bills are used as a proxy for interest rates. In all cases the natural logarithmic transformation of the original time series is used. This is done because the main advantage of using logarithmic form is that the continuously compounded form is symmetric, while the arithmetic form is not.

The stock market data was obtained from Thomson DataStream using Morgan Stanley Capital International (MSCI) Market Indexes[5] for the complete period with the exception of 2008 because it was not available. Stock market data for the year 2008 was instead obtained from International Financial Statistics (IFS) published by the International Monetary Fund (IMF). The macroeconomic variables were obtained from International Financial Statistics (IFS) published by the International Monetary Fund (IMF). However, if they were not available from the IFS the macroeconomic variables were obtained from the Central Banks Statistics of each country.

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[5] The MSCI indexes are fully comparable across countries since they are constructed on a consistent basis. These indexes are value weighted, computed with dividends reinvested. In constructing the MSCI indexes, the market values of investment companies and of foreign domiciled companies are excluded to avoid double counting. Data descriptions are contained in issues of the *Morgan Stanley Capital International Perspectives*.

As of January 2008, MSCI Barra[6] classified the following 25 countries as emerging markets[7] : ***China***, ***India***, ***Indonesia***, Korea, ***Malaysia***, Pakistan[8], ***the Philippines***, Taiwan, ***Thailand***, ***Argentina***, ***Brazil***, ***Chile***, ***Colombia***, ***Mexico***, Peru, ***Czech Republic***, ***Hungary***, Jordan[9], ***Poland***, ***Russia***, ***Turkey***, Egypt, Morocco, and South Africa. It also classified the following 23 countries as developed markets[10]: ***Austria***, ***Belgium***, ***Denmark***, ***Finland***, ***France***, Germany, Greece, Ireland, Italy, the Netherlands, Norway, ***Portugal***, Spain, ***Sweden***, ***Switzerland***, ***United Kingdom***, ***Australia***, ***Hong Kong***, ***Japan***, **New Zealand**, ***Singapore***, ***Canada***, and ***USA***.

The sample covers the period from 2002 to 2008. The countries used were chosen based on the availability of their data; with the category of emerging markets encompassing Argentina, Brazil, Chile, China, Colombia, Czech Republic, Hungary, India, Indonesia, Malaysia, Mexico, the Philippines, Poland, Russia, Thailand, and Turkey. The category of developed markets including Australia, Austria, Belgium, Canada, Denmark, Finland, France, Hong Kong, Japan, New Zealand, Portugal, Singapore, Sweden, Switzerland, United Kingdom, and United States.

5.2. The Research Methods

The analytical framework of the study is based on Granger causality tests. Since it is now well-accepted that the standard Granger tests[11] are not appropriate when the variables being analyzed are non-stationary and cointegrated, we will employ *a priori* tests of integration and cointegration. These tests serve as a guide for proper implementation of Granger causality models. Notably, if all variables under consideration are I(1)[12] and they are not cointegrated, then we will need to implement the Granger tests using the first differences of the variables. For example Kwon and Shin (1999) investigated whether current economic activities in Korea can explain stock market returns by using a cointegration test and a Granger causality test from a Vector error correction model. They subsequently concluded that within the Korean stock market, macroeconomic variables influence stock prices indices. On the other hand, they found that the stock prices indices are not a leading indicator of economic variables. The foregoing brief discussion suggests there are three essential steps in our analysis. The first step is to establish the order of integration of the variables concerned. Briefly stated, a variable is said to be integrated into order d, written $I\ (d)$, if it is stationary after differencing d times. This means that the variable that is integrated of order greater than or equal to 1 is non-stationary. In the present analysis, we will employ (Levin, Lin and Chu, 2002) (LLC), who assume that there is a common unit root process so that ρ_i is identical across cross-sections. The tests employ a null hypothesis of a unit root.

LLC consider the following basic Augmented Dickey–Fuller (ADF) specification:

$$\Delta y_{it} = \alpha y_{it-1} + \sum_{j=1}^{k} \beta_{ij} \Delta y_{it-j} + X'_{it}\delta + \varepsilon_{it} \tag{1}$$

6 MSCI Inc. (NYSE: MXB), trading as MSCI Barra, is a leading provider of investment decision support tools to investment institutions worldwide. MSCI Barra products include indices and portfolio risk and performance analytics for use in managing equity, fixed income and multi-assets classes of portfolios. In 2004 Morgan Stanley Capital International (MSCI) acquired Barra, Inc., to form MSCI Barra. The company is headquartered in New York City, with operations in Geneva, London, Mumbai, Hong Kong, Paris, Tokyo, Sao Paulo, Dubai, Sydney, Frankfurt, Milan, Berkeley and San Francisco.

7 The available country's data was classified in Italic Bold.

8 As of April 2009, MSCI Barra classified Pakistan as frontier markets (The term "frontier markets" was coined by IFC's Farida Khambata in 1992. It is commonly used to describe a subset of emerging markets (EMs). Frontier markets (FMs) are investable but have lower market capitalization and liquidity than the more developed emerging markets).

9 As of April 2009, MSCI Barra classified Jordan as frontier markets.

10 The available country's data was classified in Italic Bold.

11 Granger causality is used for testing the short-run relationship between stock returns and economic variables.

12 Integrated from the first degree.

Here we assume a common $\alpha = \rho - 1$, but allow the lag order for the different terms, ρ_i, to vary across cross-sections. The null and alternative hypotheses for the tests may be written as: $H_0 : \alpha = 0$, $H_1 : \alpha < 0$ under the null hypothesis, there is a unit root, while under the alternative, there is no unit root.

Also, we will employ (Im, Pesaran, and Shin, 2003), Fisher-type tests using ADF and Phillips-Perron (PP) (1988) tests (Maddala and Wu, 1999). The Im, Pesaran, and Shin (IPS), and the Fisher-ADF and PP tests all allow for individual unit root processes so that ρ_i may vary across cross-sections. The tests are all characterized by the combining of individual unit root tests to derive panel-specific results. Im, Pesaran and Shin begin by specifying a separate ADF regression for each cross section as indicated in equation (1).

The null hypothesis may be written as: $H_0 : \alpha_i = 0$, for all *i* under the null hypothesis, there is a unit root, while the alternative hypothesis is given by:

$$H_1 : \begin{cases} \alpha_i = 0 & \text{for } i = 1, 2, \ldots, N_1 \\ \alpha_i < 0 & \text{for } i = N + 1, N + 2, \ldots, N \end{cases}$$

In other words the alternative hypothesis is some cross-sections without unit root.

An alternative approach to panel unit root tests uses Fisher (1932) results to derive tests that combine the *p*-values from individual unit root tests. This idea has been proposed by Maddala and Wu (1999). The null hypothesis and the alternative will be the same as IPS. For both Fisher tests, we must specify the exogenous variables for the test equations. We may elect to include no exogenous regressors, to include individual constants (effects), or include individual constant and trend terms. Additionally, when the Fisher tests are based on ADF test statistics, we must specify the number of lags used in each cross-section of ADF regression. For the PP test, we must instead specify a method for estimating. If the findings reject the null hypothesis, then the series is stationary. However, the test statistics corrects for some serial correlation and heteroskedasticity in the residuals. These tests are conducted with and without the trend term.

For the lag specification in cointegration analysis, the lag order *k* (see equations 1, 4 and 13) was first estimated using a model selection procedure based on the Schwarz (1981) information criterion (SIC). The maximum lag length considered is 14. The corresponding residuals were tested for serial correlation using the Ljung-Box test[13]. If the residuals could not pass the serial correlation test, the lag length would be increased until the serial correlation was removed statistically.

Once the order of integration is established for each variable, we will proceed to the second step to evaluate the cointegration properties of the data series. The cointegration of the time series such as stock market returns and macroeconomic variables suggests the existence of a long-run relationship that constrains their movements. Although the variables are individually non-stationary, they cannot arbitrarily drift farther away from each other. The requirements for cointegration are that the variables are integrated in the same order and yet their linear combination is stationary. To test for cointegration, we will employ the most commonly used tests – the residual-based test of (Engle and Granger, 1987).

The Engle–Granger (EG) test is a two-step procedure involving (i) an OLS estimation of a specified cointegrating regression to obtain the residuals; and (ii) a unit root test of the residuals. The null hypothesis of non cointegration is rejected if the unit root statistics falls below certain critical values. The Engle-Granger (1987) cointegration test is based on an examination of the residuals of a spurious regression performed using I(1) variables. If the variables are cointegrated then the residuals should be I(0). On the other hand, if the variables are not cointegrated then the residuals will be I(1). Pedroni (1999, 2004) extended the Engle-Granger framework test involving panel data. Pedroni

[13] The Ljung-Box *Q*-statistic at lag *k* is a test statistic for the null hypothesis that there is no autocorrelation up to order *k* (Ljung & Box, 1979).

proposes several tests for cointegration that allow for heterogeneous intercepts and trend coefficients across cross-sections. Therefore, the following regression is considered:

$$y_{it} = \alpha_i + \delta_i t + \beta_{1i}\chi_{1i,t} + \beta_{2i}\chi_{2i,t} + ... + \beta_{Mi}\chi_{mi,t} + \varepsilon_{i,t} \tag{2}$$

for $t = 1, \ldots, T$; $i = 1, \ldots, N$; $m = 1, \ldots, M$ where T refers to the number of observations over time, N refers to the number of individual provinces in the panel, and M refers to the number of regression variables, y and x are assumed to be integrated of order one, *e.g.* I(1). The parameters α_i and δ_i are individual and trend effects which may be set to zero if desired. Under the null hypothesis of non cointegration, the residuals $\varepsilon_{i,t}$ will be I(1). The general approach is to obtain residuals from the equation (2) $\hat{\varepsilon}_{it} = \varepsilon_{it}$ and then to test whether the residuals are I(1) by running the auxiliary regression,

$$\hat{\varepsilon}_{it} = \rho_i \hat{\varepsilon}_{it-1} + u_{it} \tag{3}$$

, for Non-Parametric Statistics or

$$\hat{\varepsilon}_{it} = \rho_i \hat{\varepsilon}_{it-1} + \sum_{j=1}^{k} \psi_{ij} \Delta\hat{\varepsilon}_{it-j} + u_{it} \tag{4}$$

, for parametric Statistics

For each cross-section i, Pedroni describes various methods of constructing statistics to test for null hypothesis of non cointegration ($\rho_i = 1$). There are two alternative hypotheses: the homogenous alternative, ($\rho_i = \rho$) < 1 for all i (which Pedroni terms the within-dimension test or panel statistics test), and the heterogeneous alternative, ρ_i < 1 for all i (also referred to as the between-dimension or group statistics test).

The Pedroni panel cointegration statistic is constructed from the residuals from either (3) or (4). A total of eleven statistics with varying degrees of properties (size and power for different N and T) are generated. Pedroni shows that the standardized statistic is asymptotically normally distributed.

Panel ν-Statistic

$$Z_\nu = T^2 N^{3/2} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{i,t-1}^2 \right)^{-1} \tag{5}$$

Panel ρ-Statistic

$$Z_\rho = T^2 \sqrt{N} \left(\sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{i,t-1}^2 \right)^{-1} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \left(\hat{\varepsilon}_{i,t-1}^2 \Delta\hat{\varepsilon}_{i,t} - \hat{\lambda}_i \right) \tag{6}$$

Panel t-Statistic (non- parametric / Phillips-Perron)

$$\overline{Z}_t = \left(\sigma_{N,T}^2 \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{i,t-1}^2 \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{2} \left(\hat{\varepsilon}_{i,t-1} \Delta\hat{\varepsilon}_{i,t} - \hat{\lambda}_i \right) \tag{7}$$

Panel t-Statistic (parametric / Augmented Dickey-Fuller)

$$\overline{\overline{Z}}_t = \left(\tilde{s}_{N,T}^{*2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{-2} \hat{\varepsilon}_{i,t-1}^2 \right)^{-1/2} \sum_{i=1}^{N} \sum_{t=1}^{T} \hat{L}_{11i}^{2} \hat{\varepsilon}_{i,t-1}^{*} \Delta\hat{\varepsilon}^{i,t*} \tag{8}$$

Group ρ-Statistic:

$$\tilde{Z}_\rho = TN^{-1/2} \sum_{i=1}^{N} \left(\sum_{t=1}^{T} \hat{\varepsilon}_{i,t-1}^2 \right)^{-1} \sum_{t=1}^{T} \left(\hat{\varepsilon}_{i,t-1} \Delta\hat{\varepsilon}_{i,t} - \hat{\lambda}_i \right) \tag{9}$$

Group t-Statistic (non- parametric / Phillips-Perron)

$$\tilde{Z}_t = N^{-1/2} \sum_{i=1}^{N} \left(\hat{\sigma}_i^2 \sum_{t=1}^{T} \hat{\varepsilon}_{i,t-1}^2 \right)^{-1/2} \sum_{t=1}^{T} \left(\hat{\varepsilon}_{i,t-1}^{*} \Delta\hat{\varepsilon}_{i.t}^{*} - \hat{\lambda}_i \right) \tag{10}$$

Group t-Statistic (parametric / Augmented Dickey-Fuller)

$$\tilde{\tilde{Z}}_t = N^{-1/2}\sum_{i=1}^{N}\left(\sum_{t=1}^{T}\hat{s}_i^{*2}\hat{\varepsilon}_{i,t-1}^{*2}\right)^{-1/2}\sum_{t=1}^{T}\left(\hat{\varepsilon}_{i,t-1}^{*}\Delta\hat{\varepsilon}_{i.t}^{*}\right) \tag{11}$$

Where:

$\hat{L}_{11i}^2$: The long-run variance of $\eta_{i,t}$ using any Kernel estimator

$\eta_{i,t}$: The residuals for the differenced regression

$$\Delta y_{i,t} = \sigma_{1i}\Delta x_{1i,t} + \sigma_{2i}\Delta x_{2i,t} + ... + \sigma_{Mi}\Delta x_{Mi,t} + \eta_{i,t} \tag{12}$$

Where y and x as Equation 2

$\hat{\lambda}_i$: This term is computed as $\hat{\lambda}_i = 1/2\left(\hat{\sigma}_i^2 - \hat{s}_i^2\right)$,

$\hat{s}_i^2$: is just the simple variance of u_{it} (from Equations 3, 4) for parametric we denoted it as $\hat{s}_i^{*2}$

$\hat{\sigma}^2$: is the pooled long-run variance for the non-parametric model given as $1/N\sum_{i=1}^{N}\hat{L}_{11i}^{-2}\hat{\sigma}_i^2$

$\hat{\varepsilon}_{it}^*$: is the estimated residual from the non-parametric model while $\hat{\varepsilon}_{it}$ is the estimated residual from the parametric cointegration.

The next step is to specify the dynamic interactions of the variables based on the Granger causality models (Granger, 1969). Granger causality is used for testing the short-run relationship between stock market returns and economic variables. Although there are many approaches to examine temporal linkages, the Granger procedure is chosen because it is a powerful, yet simple way of testing causal relationship. The following bivariate model is estimated:

$$Y = \sum_{j=1}^{k} a_j Y_{t-1} + \sum_{j=1}^{k} b_j \Delta X_{t-j} + \mu_t \tag{13}$$

Where, X is the explanatory variable and μ_t is a zero mean white-noise error term. The null hypothesis that a given variable, (X) does not Granger-cause (Y) in equation 13 is tested by calculating the F statistic. If the F statistic is large and significant, it is concluded that the lagged right hand side variable (X) Granger-causes the left-hand side variable (Y) and vice versa by using equation 14.

$$X = \sum_{j=1}^{k} a_j X_{t-1} + \sum_{j=1}^{k} b_j \Delta Y_{t-j} + \mu_t \tag{14}$$

When we estimate panel data regression models, we will consider the assumptions about the intercept, the slope coefficients, and the error term. In practice, the estimation procedure is either the fixed effects model or the random effects model (Greene, 2003). Since the random effects model requires the number of cross-section units to be greater than the number of coefficients; with our 16 cross-section units for the developed markets sample and 16 cross-section units for the emerging markets sample, we can estimate the panel model.

We are going to estimate six Models; the first five models estimate the type of relationship between each macroeconomic variable and stock price regarding to emerging and developed markets. On the other hand, the sixth model estimates the type of relationship between all macroeconomic variables at the same time and stock prices regarding to emerging and developed markets. These models are:

Model 1 (M1): $(SMI)_{it} = \alpha_i + \beta_1(IP) + u_{it}$ (15)

Model 2 (M2): $(SMI)_{it} = \alpha_i + \beta_2(CPI) + u_{it}$ (16)

Model 3 (M3): $(SMI)_{it} = \alpha_i + \beta_3(IR) + u_{it}$ (17)

Model 4 (M4): $(SMI)_{it} = \alpha_i + \beta_4(MS) + u_{it}$ (18)

Model 5 (M5): $(SMI)_{it} = \alpha_i + \beta_5(EXR) + u_{it}$ (19)

Model 6 (M6): $(SMI)_{it} = \alpha_i + \beta_1(IP) + \beta_2(CPI) + \beta_3(IR) + \beta_4(MS) + \beta_5(EXR) + u_{it}$ (20)

The fixed effects model (FEM) assumes that the slope coefficients are constant for all cross-section units, and the intercept varies over individual cross-section units but does not vary over time. Where *i* in Eqs. (15, 16, 17, 18, 19 and 20) is the *i*th cross-section unit and *t* is the time of observation. The intercept, α_i takes into account the heterogeneity influence from the unobserved variables which may differ across the cross-section units. The β's is a column Vector of the common slope coefficients for all countries in the sample. The error term u_{it} follows the classical assumptions that $u_{it} \rightarrow N(0, \sigma_u^2)$. The FEM is estimated by the method of the least squares.

The random effects model (REM) also assumes that the slope coefficients are constant for all cross-section units. The intercept is a random variable, that is, $\alpha_i = \alpha + \varepsilon_i$ where α is the mean value for the intercept of all cross-section units, and ε_i is a random error term which reflects the individual differences in the intercept value of each cross-section unit, and $\varepsilon_i \rightarrow N(0, \sigma_\varepsilon^2)$.

We use both FEM and REM to estimate the panel data model using macroeconomic variables for all countries in the sample collectively. We also apply the Hausman test (Hausman, 1978) to choose between FEM and REM estimations. The null hypothesis in the Hausman test is that the correlated REM is appropriate. It is a Chi-square test. If the null hypothesis is rejected, then we use FEM estimation.

Johnston and DiNardo (1997) argued about Hausman test. In this regard, the Hausman test can be computed by means of a simple F test on y in the following auxiliary regression:

$$\tilde{y} = \tilde{X}\beta + \tilde{\tilde{X}}\gamma + error \tag{21}$$

The hypothesis being tested is whether the omission of fixed effects in the REM has any effect on the consistency of the random effects estimates. It is important to stress that if the REM “passes" these tests all is not necessarily well. In fact, one unfortunate result, which is not uncommon in applied work, is that the two estimators are not significantly different from each other. This may indicate that there is not enough variance in the change in X to provide results precise enough to distinguish between the two sets of estimates. Furthermore, an imprecisely estimated fixed effect estimate that is not significantly different from zero is no reason to exult that the effect of the variable is zero. Indeed, if one wishes to argue that a variable does not matter, a precisely estimated zero is more convincing than an imprecisely estimated zero.

6. Data Analysis, Hypotheses Testing and Empirical Results

6.1. Data Analysis

Table 1 (See Appendix) depicts the descriptive statistics for the natural logarithmic of the stock market index, industrial production, consumer price index, interest rate, money supply and exchange rate closing price series, and for their corresponding first difference series. We can notify that the mean of SMI, IR, and MS are higher in emerging markets in comparison to developed markets. Also, higher standard deviation in emerging markets was notified for SMI, IP and CPI. Therefore, Table 1 shows that SMI, IP and CPI in emerging markets have higher volatility than the developed markets, and IR, MS and ExR in developed markets have higher volatility than the emerging markets. On the hand SMI, IP, CPI, IR, MS and ExR don’t follow normal distribution for developed and emerging markets. However, the SMI, IP and ExR in developed market sample are closer to normal distribution than emerging markets sample, which was concluded by using the Jarque-Bera[14] test. This result was

[14] Jarque-Bera is a test statistic for testing whether the series is normally distributed. The test statistic measures the difference of the skewness and kurtosis of the series with those from the normal distribution. The statistic is computed as:

consistent with skewness and kurtosis statistical value (in normal distribution the skewness is zero, and the Kurtosis is 3)[15], and vice-versa for CPI, IT and MS.

6.2. Hypotheses Testing and Empirical Results

Table 2 in the appendix depicts the panel unit root test for both developed and emerging markets, showing the panel unit root test for SMI, IP, CPI, IR, MS and ExR. The test is reported with trend and without trend for the natural logarithmic of the level, and of the first difference, using LLC to test the unit root, which assumes common unit root process with null hypothesis of unit root and an alternative hypothesis of no unit root; and using IPS, ADF-Fisher, and PP-Fisher tests to test the unit root assumes individual unit root process with null hypothesis of unit root and an alternative hypothesis of some cross-sections without unit root. We find that at first difference all series have some cross-sections without unit root for developed and emerging markets. This result is concluded by discovering that the statistics of LLC, IPS, ADF-Fisher, and PP-Fisher are significant for SMI, IP, CPI, IP, MS and ExR series at the first difference; and SMI, IP, CPI, IR and MS in developed market are not significant at level series, and SMI, CPI, MS and ExR in Emerging market are not significant at level series. Consequently, we reject the null hypothesis for tests which assumes individual unit root process and accept the alternative hypothesis of no unit root at the first difference. Therefore, we can conclude that (SMI and IP), (SMI and CPI), (SMI and IR) and (SMI and MS) are integrated in the first order I(1) in developed markets. On the other hand, in emerging markets, we find that (SMI and CPI), (SMI and MS) and (SMI and ExR) are integrated in the first order I(1). In other words, in developed markets the log level series for (SMI and IP), (SMI and CPI), (SMI and IR) and (SMI and MS) have a joint unit root, so they are not stationary, but on the other hand, the first-difference series don't have a joint unit root and they are a stationary series. While in emerging markets the log level series for (SMI and CPI), (SMI and MS) and (SMI and ExR) have a joint unit root, so they are not stationary. On the other hand, the first-difference series don't have a joint unit root and they are a stationary series. The last result was conducted without trend. We did not find the same result with trend analysis where we found that (SMI and IP), (SMI and CPI), (SMI and IR), (SMI and MS) and (SMI and ExR) are integrated in the first order I(1) in developed markets. On the other hand, in emerging markets, we find that (SMI and CPI), (SMI and IR) and (SMI and MS) are integrated in the first order I(1).

We employ the Pedroni residual cointegration test to test panel cointegration between (SMI and IP), (SMI and CPI), (SMI and IR) and (SMI and MS) in developed market (without trend), and to test panel cointegration between (SMI and IP), (SMI and CPI), (SMI and IR), (SMI and MS) and (SMI and ExR) in developed market (with trend), and to test panel cointegration between (SMI and CPI), (SMI and MS) and (SMI and ExR) in emerging market (without trend), and to test panel cointegration between (SMI and CPI), (SMI and IR) and (SMI and MS) in emerging market (with trend), since the last series are integrated at first order. Table 3 (see appendix) depicts the results from Pedroni residual cointegration test for developed and emerging markets with and without trend. It provides several Pedroni panel cointegration test statistics which evaluate the null against both the homogeneous and the heterogeneous alternatives. The without trend results for (SMI and IP) indicate that five of eleven statistics in developed markets are significant, hence five of eleven statistics reject the null of no cointegration without trend in the developed markets sample at the conventional size of 1% for four statistics. On the other hand, most of statistics for other series are not significant so we accept the null of no cointegration for other series. Therefore, we can conclude by using without trend results that there is cointegration between stock market and industrial production index, for developed markets. In

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$$Jarque-Bera = \frac{N}{6}\left(S^2 + \frac{(K-3)^2}{4}\right)$$ where S is the skewness and K is the kurtosis. Under the null hypothesis of a normal distribution, the Jarque-Bera statistic is distributed as x^2 with 2 degrees of freedom.

[15] KJagdish Patel and Campbell B. Read, Handbook of the normal distribution, CRC Press1996.

order to do these tests, we should specify the time lag (k) for each variable (see equation 4). The appropriate lag length for cointegration testing is selected using Schwarz Information Criterion (SIC).

Up to now we conclude that there is a relationship between (SMI and IP), (SMI and CPI), (SMI and IR), (SMI and MS) and (SMI and ExR), but it does not necessarily imply that a causality relationship exists, (in any meaningful sense of the word). Consequently, we use the (Granger, 1969) approach to answer another question of whether x causes y, to see how much of the current y can be explained by past values of y and then to see whether adding time lagged values of x can improve the explanation. Y can be said to be Granger-caused by x, if x helps in the prediction of y, or equivalently if the coefficients of the lagged x's are statistically significant. The results of Granger Causality Tests are reported in Table 4 (see appendix), and the F-statistics of Granger regression (see equation 13) is depicted in panel A and B of Table 4. By using 11 time lags (SIC lags), the F-Statistics were significant in developed markets for all equations except (IR does not Granger Cause SMI, MS does not Granger Cause SMI and SMI does not Granger Cause MS). The F-statistics reject the null hypothesis of (IP does not Granger Cause SMI, SMI does not Granger Cause IP, CPI does not Granger Cause SMI, SMI does not Granger Cause CPI, SMI does not Granger Cause IR, EXR does not Granger Cause SMI and SMI does not Granger Cause EXR) and accept the alternative. While the F-Statistics were significant in emerging markets for all equations except (IR does not Granger Cause SMI and MS does not Granger Cause SMI). The F-statistics reject the null hypothesis of (IP does not Granger Cause SMI, SMI does not Granger Cause IP, CPI does not Granger Cause SMI, SMI does not Granger Cause CPI, SMI does not Granger Cause IR, SMI does not Granger Cause MS, EXR does not Granger Cause SMI and SMI does not Granger Cause EXR) and accept the alternative. The same result was also found using other time lags.

To test if the relation between macroeconomic variables and stock returns in developed markets is significantly less comprehensive than in emerging markets, we will estimate the panel models (see equations from 15 to 20) for each sample, and then compare the result of each two models. We will do this by considering adjusted R^2 (which will be used as the tool measurement); the model with the lower adjusted R^2 provides a less comprehensive model of the relationship between macroeconomic variables and stock returns. In addition to estimate the model, we should determine if the model has fixed or random effect. The results for choosing between FEM and REM are reported in Table 5 in the appendix. Table 5 shows that the Hausman test results indicate that it is better to use the REM to estimate Models 1, 2 and 3 because the Hausman test statistics were not significant for the three models. However, Table 5 also shows that it is better to use FEM to estimate Models 4, 5 and 6 in developed markets sample; because the Hausman test statistics were significant for the three others. Meanwhile, the Hausman test results in the emerging markets sample indicate that it is better to use the REM to estimate Models 1, as the Hausman test statistics were not significant for these models. However, Table 5 also shows that it is better to use FEM to estimate Models 2, 3, 4, 5 and 6; because the Hausman test statistics were significant for the five models. The results of estimating models based on Hausman tests were reported in Table 6 in the appendix. Table 6 indicates that all six models confirming that the relationship between macroeconomic variables and stock returns in developed markets is significantly less comprehensive than in emerging markets, while the rest do not. Hence, we can conclude that the relationship between macroeconomic variables and stock returns in developed markets is significantly less comprehensive than in emerging markets.

Table 7 (see appendix) summarizes all results with the exception of the result of testing the sixth hypothesis, hence the table show comprehensive look about the results of this study.

7. Conclusion

This study on data from developed and emerging markets projects complementary knowledge to the existing literature on short-run relationship between stock returns and macroeconomic variables. While these relationships are not found in the long-run with all macroeconomic variables, with the exception of the industrial production index variable in developed markets. These results are summarized as follows:

First, there is a long-run relationship between stock prices and the real economic activity in developed markets. In contrast, this long-run relationship was not discovered in emerging markets. On the other hand, the short-run relationship between stock prices and the real economic activity was discovered in two-ways manners for both developed and emerging markets. These results are consistent with the study by Nasseh and Strauss (2000). They discovered a long- run relationship between stock prices and the real economic activity using a sample from developed markets. Also, the findings of short-run relationship are consistent with the study of Chung and Tai (1999). They found that the stock price index and the production index simultaneously affect each other.

Second, there is no long-run relationship between stock prices and inflation in both developed and emerging markets. On the other hand, we found the short-run relationship between stock prices and inflation with two-ways manner for both developed and emerging markets. These results are consistent with the study of Melina (2005). It found that there is a uni-directional causal relationship between inflation rates and the general index of Athens stock exchange, with direction from the inflation rate to the general index of Athens stock exchange. Also, the result is consistent with the study conducted by Durai and Bhaduri (2009) where they found that there is a strong negative relationship between inflation and real stock return in the short and medium term.

Third, there is no long-run relationship between stock prices and interest rates in both developed and emerging markets. On the other hand, we found the short-run relationship between stock prices and interest rates in one-way manner from stock process to interest rates in both developed and emerging markets. These results are not consistent with the study conducted by Melina (2005). It concluded that there is a uni-directional causal relationship between the interest rates and the general index of Athens stock exchange, with direction from the interest rates to the general index of Athens stock exchange. This is because the study was looking at all markets as a whole depending on their types, developed and emerging, not focusing individually on country by country, as done in most previous studies. Also, the varied results stem from the fact that we were comparing the relationship between two markets with diverse characteristics.

Fourth, there is no long-run relationship between stock prices and money supply in both developed and emerging markets. On the other hand, we found the short-run relationship between stock prices and money supply in one-way manner from stock prices to money supply in emerging markets. This result is consistent with the result of Suliaman et al., (2009) where they found that money supply M2 is significantly and negatively related to stock prices.

Fifth, there is no long-run relationship between stock prices and exchange rates in both developed and emerging markets. On the other hand, we found that the short-run relationship between stock prices and money supply in two-ways manner in emerging markets, and in one-way manner from exchange rates to stock prices in developed markets. This result is also consistent with the result of the study conducted by Abdalla and Murinde (1997), where their results show uni-directional causality from exchange rates to stock prices in most studying countries.

Finally, we conclude that the relationship between macroeconomic variables and stock returns in emerging markets is significantly more comprehensive than in developed markets.

References

[1] Abdalla, I. S. A. and Murinde, V. (1997). “Exchange rate and stock price Interactions in emerging financial markets: evidence on India, Korea, Pakistan and The Philippines”. *Applied Financial Economics*, 7, 25-35.

[2] Adrangi, B., Chatrath, A. and Shank, T. M. (1999). “Inflation, output and stock prices: evidence from Latin America”. *Managerial and Decision Economics*, 20, 63-74.

[3] Ai-Yee Ooi, Syed Azizi Wafa Syed Khalid Wafa, Nelson Lajuni, Mohd Fahmi Ghazali (2009). “Causality between exchange rates and stock prices: Evidence from Malaysia and Thailand”. *International Journal of Business and Management*, 4(3), 86-98.

[4] Ajayi, R.A., Friedman, J. and Mehdian, S. M. (1998). “On the relationship between stock returns and exchange rates: Tests of Granger Causality”. *Global Finance Journal*, 9, 241-251.

[5] Alam, Md. Mahmudul and Uddin, Md Gazi Salah (2009). “Relationship between interest rate and stock price: Empirical evidence from Developed and Developing Countries”. *International Journal for Business and Management*, 4 (3), 43-51.

[6] Antonio Diaz, Francisco Jare˜no (2009). “Explanatory factors of the inflation news impact on stock returns by sector: The Spanish case”. *Research in International Business and Finance*, 23, 349-368.

[7] Aydemir, O. and Demirhan, E. (2009). “The relationship between stock prices and exchange rates: Evidence from Turkey”. *International Research Journal of Finance and Economics*, 23, 207-215.

[8] Azeez A.A. and Yonezawa Yasuhiro (2006). “Macroeconomic factors and the empirical content of the Arbitrage Pricing Theory in the Japanese stock market”. *Japan and* the *World Economy*, 18, 568-591.

[9] Chappel, K. (1997). “Cointegration, error correction and Granger causality: an application with Latin American stock markets”. *Applied Economics Letters*, 4, 469-471.

[10] Caporale, T. and Jung, C. (1997). “Inflation and real stock prices”. *Applied Financial Economics*, 7, 265-266.

[11] Chatrath, A., Ramchander, S. and Song, F. (1997). “Stock prices, inflation and output: evidence from India”. *Applied Financial Economics*, 7, 439-445.

[12] Chen, N.F., Roll, R. and Ross, S. A. (1986). “Economic forces and the stock market”. *Journal of Business*, 59, 383-403.

[13] Chung S. Kwon and Tai S. Shin (1999). “Cointegration and causality between macroeconomic variables and stock market returns”. *Global Finance Journal*, 10(1), 71-81.

[14] Durai S. Raja Sethu and Bhaduri Saumitra N. (2009). “Stock prices, inflation and Output: Evidence from wavelet analysis”. *Economic Modeling*, 26, 1089-1092.

[15] Engle, R. and Granger, C. W. S. (1987). “Cointegration and error correction: representation estimation and testing”. *Econometrica*, 55, 251-276.

[16] Fama, E. (1970). “Efficient Capital Markets: A Review of Theory and Empirical Work”. *Journal of Finance*, 25 (2), 383-417.

[17] Fama, E. (1991). “Efficient capital markets: II”. *Journal of Finance*, 5, 1575-1618.

[18] Fama, E. (1990). “Stock returns, expected returns and real activity”. *Journal of Finance*, 45, 1089-1108.

[19] Fisher, R. A. (1932). Statistical Methods for Research Workers (4th Ed.). Edinburgh: Oliver& Boyd.

[20] Frennberg, P. and Hansson, B. (1993). “Stock returns and inflation in Sweden”. Lund University working Paper No. 25.

[21] Gesek, R., and Roll, R. (1983). “The fiscal and monetary linkage between stocks returns and inflation”. *Journal of Finance*, 38, 7-33.

[22] Granger, C. W. J. (1969). “Investigating causal relations by econometric models and cross-spectral methods”. *Econometrica*, 37, 424-438.

[23] Granger, C. W. (1986). “Some recent developments in the concept of causality”. *Journal of Econometrics*, 39, 194-211.

[24] Granger, C. W., Huang, B.-N. and Yang, C.-W. (1986)."A bivariate causality between stock prices and exchange rates: Evidence from recent Asian flu”. *Quarterly Review of Economics and Finance,* 40(3), 337-354.

[25] Greene, W. H. (2003). Econometric analysis (5th Ed.). Upper Saddle River, NJ: Prentice Hall.

[26] Hashemzadeh N. and Taylor, P. (1998). "Stock prices, money supply, an interest rates: The question of causality". *Applied Economics*, 20, 1603-1611.
[27] Hausman, Jerry A. (1978). "Specification tests in econometrics". *Econometrica,* 46, 1251-1272.
[28] Im, K. S., Pesaran, M. H., and Shin, Y. (2003). "Testing for unit roots in heterogeneous panels". *Journal of Econometrics*, 115, 53-74.
[29] Johnston, J. and DiNardo, J. (1997). Econometric Methods (4th Ed.). Singapore: McGraw Hill.
[30] Joo, S. (2000). "Stock returns and inflation: covariance decomposition". *Applied Economic Letters*, 7, 233-237.
[31] Kizys, Renatas and Pierdzioch, Christian (2009). "Changes in the international comovement of stock returns and asymmetric macroeconomic shocks". *International Financial Markets, Institution and Money*, 19, 289-305.
[32] Kwon C.S. and Shine T.S. (1999). "Cointegration and causality between macroeconomic variables and stock market returns". *Global Finance Journal*, 10(1), 71-81.
[33] Levin, A., Lin, C. F., and Chu, C. (2002). "Unit root tests in panel data: asymptotic and finite-sample properties". *Journal of Econometrics*, 108, 1-24.
[34] Ljung, G. and Box, G. (1979). "On a measure of lack of fit in time series models". *Biometrika*, 66, 265-270.
[35] Maddala, G. S. and Wu, S. (1999). "A Comparative study of unit root tests with panel data and a new simple test". *Oxford Bulletin of Economics and Statistics*, 61, 631-652.
[36] Maghyereh, A. (2003). "Causal relations among stock prices and macroeconomic Variables in the small open economy of Jordan". *King Abdulaziz University: Econ. & Adm.*, 17(2), 3-12.
[37] Manish Kumar (2009). "Exploiting the information of stock market to forecast exchange rate movements". Analele Stiintifice ale Universitatii "Alexandru Ioan Cuza" din Iasi - Stiinte Economice, 56, 563-575.
[38] Mansor H. Ibrahim and Hassanuddeen Aziz (2003). "Macroeconomic variables and the Malaysian equity market. A view through rolling subsamples". *Journal of Economic Studies*, 30(1), 6-27.
[39] Mansor H. Ibrahim and Wan Sulaiman Wan Yusoff (2001). "Macroeconomic variables, exchange rate and stock price: a Malaysian perspective". The International Islamic University Malaysia (IIUM). *Journal of Economics and Management*, 9 (2), 141-163.
[40] Melina dritsaki (2005). "Linkage between stock market and macroeconomic fundamentals: case study of Athens stock exchange". *Journal of Financial Management and Analysis*, 18(l), 38-47.
[41] Ming-Shiun Pan, Fok, Robert Chi-Wing and Liu, Y. Angela (2007). "Dynamic linkages between exchange rates and stock prices: Evidence from East Asian markets". *International Review of Economics and Finance,* 16, 503-520.
[42] Mukherjee T.K. and Nake, A. (1995). "Dynamic relation between macroeconomic variables and the Japanese stock markets: An application of a Vector Error Correction Model". *Journal of Financial Research*, 43, 223-37.
[43] Muraoglu Gulnur, Tskin Fatma and Bigan Ilke (2000). "Causality between stock returns and macroeconomic variables in emerging markets". *Journal of Russian and East European Finance and Trade*, 36 (6), 33-53.
[44] Mishkin, F. S. (1998). The Economics of Money, Banking, and Financial Markets (5th Ed.). Addison-Wesley.
[45] Nasseh, A. and Strauss, J. (2000). "Stock prices and domestic and international macroeconomic activity: A cointegration approach". *Quarterly Review of Economics and Finance*, 40, 229-245.
[46] Patra Theophano and Poshakwale Sunil (2006). "Economic variables and stock market returns: evidence from the Athens stock exchange". *Journal of Applied Financial Economics*, 16(13), 993-1005.
[47] Pedroni, P. (1999). "Critical values for cointegration tests for heterogeneous panel with multiple regressors". *Oxford Bulletin of Economics and Statistics*, 61, 653–670.

[48] Pedroni, P. (2004). “Panel Cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis”. *Econometric Theory*, 3, 579-625.

[49] Phillips, P. and Perron, P. (1988). “Testing for unit root in time series regression”. *Biometrika*, 75, 335-346.

[50] Roland Füss (2002). “The financial characteristics between emerging and developed equity markets, International Conference on Policy Modeling Université Libre de Bruxelles, 4-6, 2002.

[51] Salameh, Rashed Mohammad (1997). “Forecasting share prices traded at Amman financial market”, *Al-Basaer*, 1, no.1.

[52] Schwert, P. (1981). “The adjustment of stock prices to information about inflation”. *Journal of Finance*, 36, 15-29.

[53] Suliaman D. Mohammad, Adnan Hussain, and Adnan Ali (2009). “Impact of macroeconomic variables on stock prices: Empirical evidence in case of KSE (Karachi Stock Exchange)”. *European Journal of Scientific Research*, 38 (1), 96-103.

[54] Uddin, M. G. S. and Alam, M. M. (2007). “The impacts of interest rate on stock market: Empirical evidence from Dhaka stock exchange”. *South Asian Journal of Management and Sciences*, 1(2), 123-132.

[55] Yau, Hwey-Yun and Nieh, Chien-Chung, (2009). “Testing for cointegration with threshold effect between stock prices and exchange rates in Japan and Taiwan”. *Japan and the World Economy*, 21, 292-300.

[56] Zhao, H. (2009). “Dynamic relationship between exchange rate and stock price: Evidence from China”. *Research in International Business and Finance*, Paper Accepted in 25-9-2009.

[57] Zoicas Ienciu Adrian and Fat Maria (2008). “The Analysis of the relation between the evolution of the bet index and the main macroeconomic variables in Romania. *Codruta Annals of Faculty of Economics*, 3(1), 632-637.

Appendix

Table 1: Descriptive Statistics for Log Level Series and First Difference Series

Developed Markets												
	SMI	**D(SMI)**	**IP**	**D(IP)**	**CPI**	**D(CPI)**	**IR**	**D(IR)**	**MS**	**D(MS)**	**EXR**	**D(EXR)**
Mean	**6.94**	**0.00**	4.61	0.00	**4.63**	**0.00**	0.63	0.00	9.78	0.00	0.79	0.00
Std. Dev.	**1.06**	**0.05**	0.11	0.08	**0.10**	**0.00**	1.58	0.53	3.06	0.01	1.25	0.02
Skewness	**-0.12**	**-0.99**	0.15	-0.54	**2.80**	**-0.17**	-3.46	-2.54	0.20	0.72	1.92	0.38
Kurtosis	**3.36**	**8.01**	4.99	8.95	**11.06**	**5.61**	17.17	138.83	1.60	8.34	6.34	6.89
Jarque-Bera	**10.70**	**1606.14**	228.04	2029.96	**5401.17**	**384.33**	13935.32	1022470.42	118.19	1700.10	1459.84	873.85
Probability	**0.00**	**0.00**	0.00	0.00	**0.00**	**0.00**	0.00	0.00	0.00	0.00	0.00	0.00
Observations	**1344**	**1328**	1344	1328	**1344**	**1328**	1344	1328	1344	1328	1344	1328
Emerging Markets												
	SMI	**D(SMI)**	**IP**	**D(IP)**	**CPI**	**D(CPI)**	**IR**	**D(IR)**	**MS**	**D(MS)**	**EXR**	**D(EXR)**
Mean	**7.77**	**0.00**	4.50	**0.00**	4.60	0.00	1.72	**0.00**	**10.99**	**0.01**	**0.00**	0.00
Std. Dev.	**3.16**	**0.07**	0.48	**0.10**	0.12	0.00	0.72	**0.14**	**2.24**	**0.02**	**0.03**	0.03
Skewness	**1.20**	**-0.83**	-3.27	**-2.66**	-0.34	3.82	0.27	**0.09**	**0.14**	**7.28**	**3.12**	3.09
Kurtosis	**3.81**	**9.16**	14.28	**136.93**	4.21	43.87	3.35	**21.39**	**1.98**	**146.00**	**28.47**	28.55
Jarque-Bera	**362.29**	**2256.47**	10137.08	**994149.70**	108.86	95664.37	23.56	**18730.08**	**62.03**	**1143308.00**	**38077.62**	40643.94
Probability	**0.00**	**0.00**	0.00	**0.00**	0.00	0.00	0.00	**0.00**	**0.00**	**0.00**	**0.00**	0.00
Observations	**1344**	**1328**	1428	**1328**	1344	1328	1344	**1328**	**1344**	**1328**	**1328**	1411

All of these statistics was done by using E-Views 6.

Table 2: Panel Unit Root Test for SMI. IP, CPI, IR, MS and ExR.

Exogenous Variables: Individual Effects - Sample Period: 2002M01 2008M12												
Panel A: Panel Unit Root Test for Developed Countries - No. of Countries (16)												
	SMI		**IP**		**CPI**		**IR**		**MS**		**ExR**	
	Without trend	**With trend**	**Without trend**	**With trend**	**Without trend**	**With trend**	**Without trend**	**With trend**	**Without trend**	**With trend**	**Without trend**	**With trend**
Level												
Lag	6	6	11	11	6	6	4	4	10	10	1	1
Null: Unit root (assumes common unit root process)												
Levin, Lin & Chu t	0.27	12.51	2.62	6.73	0.99	-2.24**	1.64	7.31	9.63	-0.01	-5.24*	2.28
Null: Unit root (assumes individual unit root process)												
Im, Pesaran and Shin W-stat	2	11.34	2.58	7.84	6.08	-3.75*	0.41	6.55	13.1	2.4	-3.06*	1.17
ADF – Fisher Chi-square	12.06	1.73	15.17	29.26	7.68	86.81*	27.28	13.4	2.63	23.24	53.67*	28.97
PP – Fisher Chi-square	11.4	2.1	264.08*	439.50*	10.17	32.22	32.24	18.05	3.25	74.39*	51.43*	22.72

Table 2: Panel Unit Root Test for SMI. IP, CPI, IR, MS and ExR. - continued

1st difference												
Lag	5	5	11	11	11	11	7	8	11	11	0	0
Null: Unit root (assumes common unit root process)												
Levin, Lin & Chu t	-27.21*	-29.2*	42.46	58.24	-19.84*	-17.58*	-4.95*	-3.51*	-22.30*	-20.76*	-26.61*	-28.79*
Null: Unit root (assumes individual unit root process)												
Im, Pesaran and Shin W-stat	-24.69*	-24.07*	-12.08*	-10.93*	-23.00*	-19.71*	-12.15*	-10.03*	-24.61*	-23.94*	-26.21*	-26.66*
ADF – Fisher Chi-square	478.62*	471.56*	154.42*	182.13*	377.94*	387.49*	194.35*	250.8*	302.13*	476.54*	479.22*	512.09*
PP – Fisher Chi-square	497.55*	542.34*	287.29*	352.25*	412.07*	512.11*	287.00*	367.18*	399.44*	758.84*	471.19*	503.15*
Panel B: Panel Unit Root Test for Emerging Countries – No. of Countries (16)												
	SMI		**IP**		**CPI**		**IR**		**MS**		**ExR**	
	Without trend	**With trend**	**Without trend**	**With trend**	**Without trend**	**With trend**	**Without trend**	**With trend**	**Without trend**	**With trend**	**Without trend**	**With trend**
Level												
Lag	2	2	11	11	4	9	6	6	3	1	9	9
Null: Unit root (assumes common unit root process)												
Levin, Lin & Chu t	-2.92*	13.16	-1.64**	1.15	-0.9	-2.33*	-2.29**	-2.12**	4.93	-0.67	2.22	0.8
Null: Unit root (assumes individual unit root process)												
Im, Pesaran and Shin W-stat	1.01	11.55	-2.58*	0.54	5.41	-2.65*	-2.66*	-0.55	10.8	0.61	-0.35	-2.23**
ADF - Fisher Chi-square	17.03	5.21	78.03*	76.16*	13.55	54.77*	58.66*	35.59	2.27	31.65	45.01	80.28*
PP – Fisher Chi-square	17.21	5.85	84.56*	250.42*	21.26	45.98***	48.7**	29.65	2.4	32.29	57.62*	62.14*
1st difference												
Lag	1	1	11	11	6	6	1	11	11	11	8	8
Null: Unit root (assumes common unit root process)												
Levin, Lin & Chu t	-31.12*	-34.83*	-7.41*	-1.01	-12.26*	-13.8*	-23.76*	-25.85*	-28.84*	-31.94*	-24.42*	-26.69*
Null: Unit root (assumes individual unit root process)												
Im, Pesaran and Shin W-stat	-28.34*	-29.04*	-17.9*	-15.78*	-17.06*	-16.16*	-26.15*	-25.87*	-30.58*	-32.34*	-24.54*	-24.85*
ADF - Fisher Chi-square	501.19*	581.76*	168.89*	222.75*	324.19*	300.07*	405.23*	508.43*	397.66*	657.43*	442.12*	490.31*
PP – Fisher Chi-square	509.45*	642.79*	255.14*	510.8*	330.79*	294.36*	423.48*	587.16*	426.5*	772.05*	458.38*	510.44*

* Indicate significant at 1% , ** indicate significant at 5% and *** indicate significant at 10%
All of these statistics was done by using E-Views 6.

Table 3: Pedroni's Panel Cointegration Test Results

Between Stock Market Index and Other Variables No. of Developed Markets (16), No. of Emerging Markets (16) Null hypothesis: No cointegration										
Panel A	**Without Trend**									
	SMI and IP		**SMI and CPI**		**SMI and IR**		**SMI and MS**		**SMI and ExR**	
	Developed Markets	**Emerging Markets**	**Developed Markets**	**Emerging Markets**	**Developed Markets**	**Emerging Markets**	**Developed Markets**	**Emerging Markets**	**Developed Markets**	**Emerging Markets**
Lag	11 Statistics	Statistics	11 Statistics	11 Statistics	11 Statistics	Statistics	11 Statistics	11 Statistics	Statistics	11 Statistics
Alternative hypothesis: common AR coefs. (within-dimension) – homogenous										
Panel v-Statistic	-0.26		0.88	1.81	-1.12		1.80**	3.6*		-2.55
Panel rho-Statistic	-4.12*		1.9	1.53	1.73		2.71	2.57		1.1
Panel PP-Statistic	-3.28*		3.14	3.05	1.79		4.63	4.76		0.36
Panel ADF-Statistic	0.76		3.2	4.03	1.76		5.16	5.52		0.04
Panel v-Statistic – W	-0.36		0.91	1.65	-1.04		1.37	3.47*		-2.36
Panel rho-Statistic – W	-3.29*		2.06	1.71	1.58		2.89	2.54		0.88
Panel PP-Statistic – W	-2.62*		3.4	3.25	1.97		4.87	4.72		0.38
Panel ADF-Statistic – W	0.92		3.41	4.38	1.8		5.36	5.67		0.14
Alternative hypothesis: individual AR coefs. (between-dimension) – heterogeneous										
Group rho-Statistic	-1.55***		3.72	3.17	2.61		4.58	3.62		2.21
Group PP-Statistic	-0.55		5.39	5.17	2.95		7.24	6.61		1.63
Group ADF-Statistic	2.19		5.46	6.18	2.8		8.03	7.92		1.51
Panel B	**With Trend**									
	SMI and IP		**SMI and CPI**		**SMI and IR**		**SMI and MS**		**SMI and ExR**	
	Developed Markets	**Emerging Markets**	**Developed Markets**	**Emerging Markets**	**Developed Markets**	**Emerging Markets**	**Developed Markets**	**Emerging Markets**	**Developed Markets**	**Emerging Markets**
	11 Statistics	Statistics	11 Statistics	11 Statistics	11 Statistics	11 Statistics	11 Statistics	11 Statistics	11 Statistics	Statistics
Alternative hypothesis: common AR coefs. (within-dimension) – homogenous										
Panel v-Statistic	-1.04		0.18	0.51	-1.02	1.42***	-0.6	1.07	-0.87	
Panel rho-Statistic	2.83		2.32	4.1	2.88	3.11	2.9	2.94	3.89	
Panel PP-Statistic	4.14		4.33	6.8	4.11	5.34	4.37	5.08	6.05	
Panel ADF-Statistic	5.04		3.93	7.79	4.63	7.42	5.23	5.3	5.97	
Panel v-Statistic – W	-1.19		0	0.71	-1.2	1.37	-0.86	1.09	-1.06	
Panel rho-Statistic – W	2.95		2.69	3.58	2.43	2.84	3.09	2.85	3.64	
Panel PP-Statistic – W	4.33		4.83	6.03	3.28	4.94	4.62	5	5.47	
Panel ADF-Statistic – W	5		4.44	6.9	3.54	7.14	5.54	5.45	5.29	
Alternative hypothesis: individual AR coefs. (between-dimension) – heterogeneous										
Group rho-Statistic	3.47		3.89	4.23	3.06	3.79	4.09	3.44	4.59	
Group PP-Statistic	5.42		6.37	7.21	4.11	6.48	6.05	5.93	6.85	
Group ADF-Statistic	6.38		5.86	7.82	4.46	8.73	7	6.61	6.88	

* Indicate significant at 1% , ** indicate significant at 5% and *** indicate significant at 10%
The Statistics column represents the statistical value, the Prop. column represents the probability value (this value suggest that the statistical value is significant or not)
All of these statistics was done by using E-Views 6.

Table 4: Granger Causality Results

Panel A: The Results for Developed Markets					
Lags	**1**	**2**	**3**	**4**	**SIC (11)**
Null Hypothesis:	**F-Statistic**	**F-Statistic**	**F-Statistic**	**F-Statistic**	**F-Statistic**
IP does not Granger Cause SMI	3.03***	2.97***	2.35***	3.11**	3.09*
SMI does not Granger Cause IP	0.79	1.45	2.32***	2.54**	4.082*
CPI does not Granger Cause SMI	4.95**	2.26	1.32	6.01*	4.86*
SMI does not Granger Cause CPI	0.38	4.03**	4.25*	2.95**	1.94**
IR does not Granger Cause SMI	2.38	1.17	0.83	0.52	0.47
SMI does not Granger Cause IR	0.29	0.98	2.3***	3.88*	3.12*
MS does not Granger Cause SMI	0.09	0.09	0.64	0.38	0.46
SMI does not Granger Cause MS	6.97*	5.18*	4.22*	2.38**	1.39
EXR does not Granger Cause SMI	0.09	0.93	2.26***	2.24***	1.58***
SMI does not Granger Cause EXR	0	0.062	0.57	0.42	0.68
Panel B: The Results for Emerging Markets					
Lags	**1**	**2**	**3**	**4**	**SIC (11)**
Null Hypothesis:	**F-Statistic**	**F-Statistic**	**F-Statistic**	**F-Statistic**	**F-Statistic**
IP does not Granger Cause SMI	1.38	0.85	0.45	0.5	3.22*
SMI does not Granger Cause IP	2.5	1.97	8.69*	7.28*	5.87*
CPI does not Granger Cause SMI	30.51*	17.88*	9.83*	7.42*	5.83*
SMI does not Granger Cause CPI	101.45*	17.65*	9.67*	5.42*	1.92**
IR does not Granger Cause SMI	0.79	0.56	0.51	0.38	0.57
SMI does not Granger Cause IR	8.78*	12.77*	11.93*	9.6*	4.5*
MS does not Granger Cause SMI	0.13	0.94	1.42	0.89	0.58
SMI does not Granger Cause MS	29.6*	14.51*	10.56*	7.59*	2.2**
EXR does not Granger Cause SMI	1.78	4.34**	4.71*	2.13***	2.91*
SMI does not Granger Cause EXR	7.03*	3.16**	3.06**	2.32***	2.76*

* Indicate significant at 1% , ** indicate significant at 5% and *** indicate significant at 10%
All of these statistics was done by using E-Views 6.

Table 5: Hausman Test

Dependent Variable: SMI						
Panel A: Hausman Test for Developed Markets						
	M1	**M2**	**M3**	**M4**	**M5**	**M6**
Cross-sections included	16	16	16	16	16	16
Constant	0.01	-9.49	6.9	-2.17	7.16	-6.21
IP	1.5					0.75
CPI		3.54				0.91
IR			0.07			0.04
MS				0.93		0.55
EXR					-0.27	-0.06
Null hypothesis: REM, Alternative hypothesis: FEM						
Chi-Sq. Statistic	2.26	1.74	0.69	127.54*	6.47**	79.88*
Type of Effect	Random	Random	Random	Fixed	Fixed	Fixed
Panel B: Hausman Test for Emerging Markets						
	M1	**M2**	**M3**	**M4**	**M5**	**M6**
Cross-sections included	16	16	16	16	16	16
Constant	-2.2	-8.2	7.77	-5.19	15.43	-3.19
IP	2.22					0.55
CPI		3.46				1.83
IR			0			-0.02
MS				1.17		0.25
EXR					-2.19	-0.82
Null hypothesis: REM, Alternative hypothesis: FEM						
Chi-Sq. Statistic	0.04	3.46**	7.26*	3.18***	33.71*	9.35***
Type of Effect	Random	Fixed	Fixed	Fixed	Fixed	Fixed

All of these statistics was done by using E-Views 6.

Table 6: Panel Least Squares

Dependent Variable: SMI						
Panel A: Regression Results for Developed Countries						
	Models					
	M1	**M2**	**M3**	**M4**	**M5**	**M6**
Cross-sections included	16	16	16	16	16	16
Type of Effect	Random	Random	Random	Fixed	Fixed	Fixed
C	0.01	-9.49	6.9	-3.46	7.2	-4.01
IP	1.5					0.67
CPI		3.54				-0.25
IR			0.07			0.04
MS				1.06		0.92
EXR					-0.31	-0.05
Statistics						
R-squared	0.24	0.33	0.07	0.96	0.93	0.96
Adjusted R-squared (1)	0.24	0.33	0.07	0.96	0.93	0.96
F-statistic	441.2	674.3	102.5	2168.6	1221.5	2003.1
Prob(F-statistic)	0	0	0	0	0	0
Panel B: Regression Results for Emerging Countries						
	Models					
	M1	**M2**	**M3**	**M4**	**M5**	**M6**
Cross-sections included	16	16	16	16	16	16
Type of Effect	Random	Fixed	Fixed	Fixed	Fixed	Fixed
C	-2.2	-8.2	7.78	-5.22	16.02	-3.06
IP	2.22					0.55
CPI		3.46				1.89
IR			-0.14			-0.02
MS				1.18		0.24
EXR					-2.36	-0.85
Statistics						
R-squared	0.53	0.99	0.97	0.99	0.98	0.99
Adjusted R-squared (2)	0.53	0.99	0.97	0.99	0.98	0.99
F-statistic	1519.3	9418.76	2854.66	9073.21	4160.99	9630.74
Prob(F-statistic)	0	0	0	0	0	0
(1)-(2)	-0.28	-0.65	-0.9	-0.02	-0.04	-0.03

All of these statistics was done by using E-Views 6.

Table 7: Study Results Summary

Hypothesis of no relation between	Market	Has a joint Unit Root		Integrated Order	Have a Panel Cointegration	Panel Causality	
SMI and IP	Developed	SMI D(SMI) IP D(IP)	Yes No Yes No	One	Yes	SMI To IP IP To SMI	Yes Yes
	Emerging	SMI D(SMI) IP D(IP)	Yes No No No	N.A	N.A	SMI To IP IP To SMI	Yes Yes
SMI and CPI	Developed	SMI D(SMI) CPI D(CPI)	Yes No Yes No	One	No	SMI To CPI CPI To SMI	Yes Yes
	Emerging	SMI D(SMI) CPI	Yes No Yes	One	No	SMI To CPI CPI To SMI	Yes Yes

Table 7: Study Results Summary - continued

SMI and IR	Developed	D(CPI) SMI D(SMI) IR D(IR)	No Yes No Yes No	One	No	SMI To IR IR To SMI	Yes No
	Emerging	SMI D(SMI) IR D(IR)	Yes No Yes No	One	No	SMI To IR IR To SMI	Yes No
SMI and MS	Developed	SMI D(SMI) MS D(MS)	Yes No Yes No	One	No	SMI To MS MS To SMI	No No
	Emerging	SMI D(SMI) MS D(MS)	Yes No Yes No	One	No	SMI To MS MS To SMI	Yes No
SMI and EXR	Developed	SMI D(SMI) EXR D(EXR)	Yes No Yes No	One	No	SMI To EXR EXR To SMI	No Yes
	Emerging	SMI D(SMI) EXR D(EXR)	Yes No Yes No	One	No	SMI To EXR EXR To SMI	Yes Yes