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**About**

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INSIGHT Journal focuses on social science and humanities research. The main aim of INSIGHT Journal is to provide an intellectual forum for the publication and dissemination of original work that contributes to the understanding of the main and related disciplines of the following areas: Accounting, Business Management, Law, Information Management, Administrative Science and Policy Studies, Language Studies, Islamic Studies and Education.

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# FOREWORD BY DEPUTY RECTOR OF RESEARCH, INDUSTRIAL LINKAGES & ALUMNI

Since 2018, the INSIGHT JOURNAL (IJ) from Universiti Teknologi MARA Cawangan Johor has come up with several biennial publications. Volume 1 and 2 debuted in 2018, followed by Volume 3 this year as well as Volume 4 with 19 published papers due to the great response from authors both in and out of UiTM. Through Insight Journal, lecturers have the ability to publish their research articles and opportunity to share their academic findings. Insight Journal is indexed in MyJurnal MCC and is now an international refereed journal with many international reviewers from prestigious universities appointed as its editorial review board members.

This volume 5 as well as volume 6 (which will be published in 2020) are special issues for the 6th International Accounting and Business Conference (IABC) 2019 held at Indonesia Banking School, Jakarta. The conference was jointly organized by the Universiti Teknologi MARA Cawangan Johor and the Indonesia Banking School Jakarta. Hence, the volumes focus mainly on the accounting and business research papers compiled from this conference, which was considered a huge success as over 66 full papers were presented.

Lastly, I would like to thank the Rector of UiTM Johor, Associate Professor Dr. Ahmad Naqiyuddin Bakar for his distinctive support, IJ Managing Editor for this issue Dr. Noriah Ismail, IJ Assistant Managing Editor, Fazdillah Md Kassim well as all the reviewers and editors who have contributed in the publication of this special issue.

Thank you.

**ASSOCIATE PROF. DR. SAUNAH ZAINON**
*Deputy Rector of Research, Industrial Linkages & Alumni*
*Editor-in-Chief for INSIGHT Journal*
Universiti Teknologi MARA Cawangan Johor

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# Stock Market Efficiency: A Pooled Mean Group Approach

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## Abstract

The efficient market theory has been widely focused on the market efficiency in the developed countries but not in the developing countries despite the valuable diversification opportunities developing stock markets offer. Therefore, the objective of this study is to examine the informational efficiency of stock markets in both the selected developed and developing countries. The informational efficiency is examined by the cointegration between stock return and its determinants, namely output, interest rate and exchange rate using the dynamics heterogeneous panel cointegration model over the period of 1994Q1 to 2016Q2. The results of the study reveal that there are long run relationships between stock return and the three observed economic indicators in the developed and developing countries. Evidenced by the information of real output and real interest rate that are impounded into the stock return, the study further revealed that stock markets in developed countries are semi strong form efficient. Therefore, one cannot use real output and real interest rate as trading rule to earn abnormal return in developed countries. On the other hand, the information on real output, real interest rate and real exchange rate have not fully captured by the stock return in the developing countries, thus demonstrate that these markets are informational inefficient. The overall findings suggest that output, interest rate and exchange rate can serve as important explanatory variables for the investors and policy makers in making investment and policy decisions by providing better understanding that the developed stock markets are relatively more informational efficient compared to developing stock markets.

**Keywords:** Stock Return, Informational Efficiency, Co-integration, Pooled Mean Group.

## 1. Introduction

Stock market is an important barometer for economic performance. By channeling the financial resources to fund the economic activities, stock market helps to promote economic development. Market participants, i.e. investors, security issuers or policy makers make decisions in the stock market based on a range of information attached to the stock prices. If the stock prices accurately reflect all available information, stock market is considered informational efficient. Financial theory advocates the market efficiency in three forms of hypothesis, i.e. weak form, semi strong form and strong form hypothesis (Fama, 1970). Weak form market efficiency hypothesizes that stock price cannot be predicted from past information; semi strong form market hypothesis proposes that stock

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price reflects all publicly available information and strong form efficiency shows that stock price reflects all available private and public information.

The theory of efficient market has been widely tested in the literature (Jensen, 1978, Fama, 1991, Muradoglu & Metin, 1996, Giannellis & Papadopoulos, 2009). However, enormous of emphasis have been placed on the market efficiency in the developed countries and there are scant studies focus on the efficiency of the developing stock markets despite the valuable diversification opportunities these markets offer. Developed countries has better institutions and market structure, thus are perceived to be more efficient compared to developing countries (Bruner, Conroy, Estrada, Kritzman and Li, 2002; Steil, 2001; Tay & Gan, 2016). On the other hand, the pricing of assets in developing countries is different from the developed countries due to smaller market capitalization, speculative investment and manipulation, which may influence the ways information is incorporated into the stock prices. Despite scant study on the developing countries, this study is motivated by the lack of empirical literature that comparing the efficiency of both developed and developing stock markets. Therefore, a study of stock market efficiency across developed and developing countries may contribute to the existing literature and may provide valuable information to the investors and policy makers in their decision making.

Empirical study on stock return typically focused on output, interest rate and exchange rate. With regards to output, output that measure the growth of the real economic activities have positive impact on stock markets (Giri & Joshi, 2017; Ismail et al., 2016). Chen et al., (1986) find that output is positively related to the US stock return as evidenced by the changes in the industrial production that influence firm's cash flow. Avouyi-Dovi and Matheron (2006) point out that productivity growth rate granger causes cyclical component of stock return. Variations in the output reveal the changes of expectation of corporate earnings, which are reflected in the cash flow received by the firm, thus is important to determine stock return (Donangelo, 2014; Gallegati, 2008). Campbell and Shiller (2001) highlighted that the stock market analysts regard the boom of the stock prices is partly due to the growth of labor productivity.

The changes of interest rate have negative bearing on stock return through the rise in funding cost (Bjornland & Leitemo, 2009; Pirovano, 2012). Negative influence of interest rate on stock return in the developed countries may be partly contributed by the relatively more developed and mature capital markets (Assefa et al., 2017). Volatility of interest rates may have more impacts on sectors that are highly interest rate sensitive, i.e. banking industries, utilities, real estate, technology and telecommunications (Moya-Martínez et al., 2015). On the other hand, fluctuations in the interest rates that were succeeding by the monetary policy shocks may cut down the amount of cash flows received by firms therefore could dampen stock market performance (Laeven & Tong, 2012; Tobin, 1978). The changes of interest rate as a result of monetary policy announcement had more impact on small firms compared to larger firms (Thorbecke, 1997). This type of monetary policy shock was found to have more prominent effects on financially constrained stocks (Maio, 2014).

Exchange rate and stock market are found to be significantly correlated especially during the period of financial crisis (Wong, 2017). This is supported by Sui and Sun (2017) who show the significant influences of exchange rates on stock returns and observed worsen

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spillover effects between exchange rates and stock returns during the period of financial crisis. An increase in the value of a currency made domestic currency more attractive and thus attract more capital to the local market (Yau & Nieh, 2009). The domestic currency appreciation may result in the risk of 'hot money' inflow that boost the stock market performance (Tian and Ma, 2010; Ülkü and Weber, 2014). Therefore, exchange rate may adversely affect stock market via volatility of the international capital funds that moved into the local market for the purpose of managing portfolio and pursuing better investment opportunities (Katechos, 2011; Liang, Lin and Hsu, 2013; Moore and Wang, 2014). However, changes in exchange rate may have asymmetric effects on the stock market (Bahmani-Oskooee and Saha, 2016).

The objective of this study is to examine the informational efficiency of stock markets in the developed and developing countries. The informational efficiency is tested by examining the cointegration between stock return and its determinants, namely output, interest rate and exchange rate. Four selected developed countries, i.e. Canada, Japan, United Kingdom and United States, and six selected developing countries, i.e. Indonesia, Malaysia, Philippines, Singapore, Thailand and China were included as samples of the study. The dynamics heterogeneous panel cointegration model proposed by Pesaran, Shin and Smith (1999) was used to identify the cointegration for the informational efficiency between the stock return and its determinants. This study may provide better understanding on the fact that the developed stock markets are relatively more efficient compared to developing stock markets and the three economic indicators: output, interest rate and exchange rate are important explanatory variables for investors and policy makers in making investment and policy decisions. The rest of the paper is organized as follows. Section 2 presents the model specification. Section 3 explains the data and methodology used in this paper. Section 4 discusses the empirical results of this paper and conclusions are presented in Section 5.

## 2. Model Specification

An efficient market is a market where the security prices quickly incorporated all available information (Fama, 1970). In an efficient market, any news which could affect the stock's performance has already reflected in the stock price. Therefore, it is not possible for the investors to consistently earn excessive risk-adjusted return. This study proposes that stock market is semi strong form efficient, i.e., all the past and publicly available information including information on economic indicators had impounded into the movement of stock return. This theoretical postulate requires the absence of cointegration between stock return and economic indicators which explained the incorporation of the past and publicly available information into the stock price and return. On the other hand, when there is cointegration between stock return and economic indicators, the stock market is consider violating the semi strong form efficiency.

This study characterized the informational efficiency of the stock market by the modified Fama model (1970, 1981) that encompasses output, interest rate and exchange rate in the stock reaction function. The general form of the modified Fama model is expressed as follows:

$$sr_t = f(y_t, ir_t, er_t) \quad (1)$$

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where $sr_t$ denotes stock return, $y_t$ denotes output, $ir_t$ denotes interest rate and $er_t$ denotes exchange rate. The modified model is expressed in the following equation:

$$sr_t = \beta_0 + \beta_1 y_t + \beta_2 ir_t + \beta_3 er_t + \varepsilon_t \quad (2)$$

where $\beta_0$ is the constant, $\beta_1$,…, $\beta_3$ are the coefficients for each variable and $\varepsilon_t$ is the error term. The estimated coefficients of $\beta_2$ and $\beta_3$ are expected to be negative, and the estimated coefficient of $\beta_1$ is expected to be positive.

Equation 2 proposes that output affected stock return via its positive impact on firm's profitability, which improved firm's cash flow and hence increased its stock price (Giri & Joshi, 2017; Naik, 2013). Interest rate is the opportunity cost of money that is negatively related to stock return. It could affect stock return negatively by variation on the cost of funding or changes on discount rate of the dividend that in turn decreases the expected future earnings of the firms (Assefa et al., 2017; Bjornland & Leitemo, 2009; Laeven & Tong, 2012). Exchange rate is inversely related to stock return through the movement of the currency (Moore & Wang, 2014; Sui & Sun, 2017). Fluctuations in exchange rate affect the term of trade thus have impacts on the firms' international competitiveness, which later reflects in the firms' production and earnings.

## 3. Data and Methodology

### 3.1 Data

The analysis for this study was conducted by using panel data, i.e. panel of developed countries and panel of developing countries. The samples of developed countries include Canada, Japan, United Kingdom and United States; while the samples of developing countries comprise of Indonesia, Malaysia, Philippines, Singapore, Thailand and China. The data were collected from the DataStream database spinning from the period of 1994Q1 to 2016Q4. Real stock return is indicated by the rate of return of the stock market index minus inflation rate. Real output is calculated by dividing the nominal gross domestic product by the consumer price index. The real interest rate is proxy by the short term interest rate minus inflation rate. The proxy for exchange rate is the real effective exchange rate which is computed by the sum of the real exchange rate multiply by the weights of major trading partners. The real output and real exchange rate are transformed into natural logarithm.

### 3.2 Dynamics Heterogeneous Panel Cointegration Model

The dynamics heterogeneous panel cointegration model was applied to examine the relationship between stock return and output, interest rate and exchange rate. The negative and significant error correction term in the model provides the evidence of cointegration between real stock return and economic indicators. The panel data analysis which includes the data for cross sections and time periods may provide numerous advantages over the time series analysis (Wu et al., 2013; Al-Iriani, 2006). For instance, panel data analysis may avoid problems related to the low power of standard tests on unit root and cointegration (Christopoulos & Tsionas, 2004).

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The short run and long run relationships between stock return and economic indicators are examined by using pooled mean group (PMG) and mean group (MG) estimators for the dynamics heterogeneous panel cointegration models. PMG estimator that was proposed by Pesaran et al. (1999) allows the intercepts, short run coefficients and error variances to differ across groups while constrains the long run coefficients to be homogenous. The mean group (MG) estimator allows all the intercepts and slope coefficients to differ across groups and average estimation results of each group (Pesaran & Shin, 1995). The Hausman test is conducted to test the homogeneity of the long run coefficients and to select between MG and PMG estimators. If the long run homogeneity restriction cannot be rejected, the PMG estimator is more appropriate for the subsequent discussion. The advantage of PMG estimator is that the estimation from an auto regressive distributed lag (ARDL) regression for the PMG delivers consistent estimators regardless of whether the variables in consideration are *I*(0) or *I*(1) (Pesaran et al., 1999).

To capture the dynamics heterogeneous panel cointegration models, the long run model in Equation 2 is transformed into general autoregressive distributive lags, ARDL (*1,1,1,1*) dynamic panel specification as follows:

$$sr_{it} = \mu_i + \lambda_i sr_{i,t-1} + \delta_{10i} y_{i,t} + \delta_{11i} y_{i,t-1} + \delta_{20i} ir_{i,t} + \delta_{21i} ir_{i,t-1} + \delta_{30i} er_{i,t} + \delta_{31i} er_{i,t-1} + \varepsilon_{it} \quad (3)$$

The short run model is expressed as follows:

$$\Delta sr_{it} = \mu_i + \phi_i \left[ sr_{i,t-1} - \theta_{0i} - \theta_{1i} y_{i,t-1} - \theta_{2i} ir_{i,t-1} - \theta_{3i} er_{i,t-1} \right] + \delta_{10i} \Delta y_{i,t} + \delta_{20i} \Delta ir_{i,t} + \delta_{30i} \Delta er_{i,t} + \varepsilon_{it} \quad (4)$$

where $\phi_i$ denotes error correction coefficient and $\phi_i = -(1 - \lambda_i)$, $\theta_i$ denotes the long run equilibrium relationship between $sr_{it}$ and observed variables, $\theta_{0i} = \frac{\mu_0}{1-\lambda_i}$, $\theta_{1i} = \frac{\delta_{10}+\delta_{11}}{1-\lambda_i}$, $\theta_{2i} = \frac{\delta_{20}+\delta_{21}}{1-\lambda_i}$, $\theta_{3i} = \frac{\delta_{30}+\delta_{31}}{1-\lambda_i}$. From equation 4, a negative and significant value of error correction coefficient, i.e., $\phi_i$ suggests the presence of cointegration between the stock return and the observed economic indicators.

## 4. Empirical Results

### 4.1 Pooled Mean Group (PMG) estimator

Table 1 shows the results of pooled mean group (PMG) and mean group (MG) estimates based on an autoregressive distributed lag (ARDL) model over the period of 1994Q1 to 2016Q2. The error correction coefficients are negative and significant, i.e. -0.934,-0.959, -1.019, and -1.066 for both PMG and MG estimators in the developed and developing countries. These results propose that there are long run cointegrating relationships between real stock return and the economic variables, namely real output, real interest rate and real exchange rate. The results of Hausman tests show support of long run homogeneity in both the developed and developing countries, hence PMG estimators are preferred relative to the MG estimator. The subsequent discussion is therefore based on the results of PMG estimators.


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