Master's Thesis

Stock Return Predictability: Evidence from ASEAN Market Indices

주식 수익률의 예측가능성:
ASEAN 국가들의 주가지수를 중심으로

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Abstract

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I investigate stock return predictability on ASEAN market indices using lagged return of industrialized countries. The data contains weekly return from six market indices in ASEAN along with twelve industrialized countries indices. Using pairwise Granger causality test, I find that lagged returns of Canada, Germany, United Kingdom, and United States are positive and significant in predicting index returns of six ASEAN countries even after controlling for country's macroeconomic variables as well as their own lagged return. Meanwhile, lagged ASEAN returns do not have predictive ability to industrialized countries returns. By using news-diffusion model to examine the source of their predictive power, I find that the results indicating the predictive ability of those four countries are consistent with the existence of information frictions across national equity markets.

Keywords:
Stock Return Predictability, ASEAN indices, Pairwise Granger Causality, Lead-lag Relationship, News-Diffusion Model, Information Frictions.
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CHAPTER 1 INTRODUCTION

Understanding the stock market return behavior becomes one important concern in financial market. Numerous studies have been conducted in order to predict stock return since few decades ago. Ferson & Harvey (1994), Ang & Bekaert (2006), Campbell & Thompson (2007), Campbell & Yogo (2010), Hjalmarsson (2010) relate financial and economic variables such as interest rates, term spread, earning price ratio, and dividend price ratio as variables to predict stock market returns.

Another studies focused on lead-lag relationship as source of stock return predictability. Hong, Torous, & Valkanov (2007) in their study stated that returns of industry portfolios leads the stock markets movement. Lo and Mackinlay (1990) also find that return on large cap U.S stocks lead return on small-cap U.S. stocks. Another study by Chordia and Swaminathan (2000) also mentioned the existence of lead-lag relationship in predicting stock market return. In their study, they conclude that return of low trading volume stocks follows return of high trading volume stocks with a lag. In addition to lead-lag relationship in stock return predictability, Jegadeesh and Titman (1995) find that liquid stocks (e.g., have more analysts following or have institutional ownership) have tendency to lead less liquid stocks.

In international context, several studies raise the issue about lead-lag relationship on stock return predictability. Shahrur, Becker, Rosenfeld (2010) use international data from 22 developed countries to find that equity returns of customer industries lead the returns of supplier industries. Similar result regarding lead-lag effect

proposed by Rizova (2010) who investigates about return of trade-linked countries. He finds that stock market returns of a country's major trading partners forecast that country's stock market returns.

Chang, Mcqueen, & Pinegar (1999) test about cross-autocorrelation in Asian stock markets which is the extended study of Lo and Mackinlay (1990). Result of their study argues that cross-autocorrelation between large and small cap stocks also present not only in U.S market but also in several Asian equity markets. In addition, lead-lag relationship study suggested by Rapach, Strauss, & Zhou (2013), examines about predictive power of lagged US return to numerous non-US industrialized countries which suggest that lagged US return is better in explaining return market of those countries more than countries' own economic variables.

Most of the previous studies regarding stock return predictability focused on US market and European market, only several of them discuss about stock return predictability in Asian countries especially South East Asian region. The existing literatures related to South East Asian region only cover several countries in ASEAN (Hjalmarsson (2010), Chang et al (1999), Rizova (2010), Shahrur et al (2010), Ferson et al (1994))).

In the world, ASEAN market accounted for 4% of the world market capitalization[1] which is smaller compare to another Asian market like Japan, China and Korea which is probably the reason why only few papers documented about ASEAN market returns compare to other markets. Despite of its small size compare to world

[1] Data based on Worldbank data year 2012

market capitalization, ASEAN market shines during these past years as rising star in global investment. Approximately about 122 trillion USD of foreign funds has been flowing to this region in 2013 which is 7% higher compare to total foreign investment in 2012[2]. In order to promote the development of ASEAN as an asset class, members of ASEAN established ASEAN exchanges which offer more than 3000 companies to invest in. ASEAN exchanges is a collaboration formed by 6 countries of ASEAN in order to boost market liquidity of ASEAN members as well as providing better understanding and opportunities for investors to invest in ASEAN region. Based on these backgrounds and its market development, I find it is very interesting to conduct a study related to stock return predictability using ASEAN data.

The study about stock return predictability in international market has great implications for international diversification. Nowadays, aiming for greater return, more investors are engaged not only in domestic but also international assets to diversify their portfolios. Investors diversify their portfolio to other countries in order to reduce risk which is country-specific risk. By studying the return predictability across countries, we will understand the risk-return relationship among countries for a better judgment regarding asset allocation and security selection as well as minimizing investment risks. In addition, understanding stock return predictability also contributes to market timing decision for investors. Understanding stock return predictability in country-level also important for policymakers. It is well known that monetary policies influence macroeconomic variables, and some macroeconomics variables affect the stock return

[2] Data based on ASEAN Indicators (official website of ASEAN)

such as interest rates. Shock to monetary policies in a country will have direct impact to interest rates which turns out affecting the domestic stock market. Beside its domestic impact, additional impact will transmit to other countries as markets today are integrated around the world. Another problem such as financial instability will arise because of this issue in case we fail to understand the market itself.

To conduct study about stock return predictability in ASEAN, I use data from six ASEAN equity markets and 12 industrialized countries. Following Lewellen (2004), Rapach et al (2010) and many previous studies, I conduct predictive regressions which I relate the return of stock market indices of ASEAN countries along with industrialized countries to their own macroeconomic variables which are short term interest rate and term spread as the predictors. As mentioned in his international return predictability study, Hjalmarsson (2010) argued that interest rate and terms spread are two most prominent economic predictors for asset pricing model in international context.

Second, to assess lead-lag relationship between ASEAN market indices and industrialized countries, I perform pairwise Granger causality test which commonly used as standard tool for studying lead-lag relationship in portfolios in U.S stocks (e.g., Chordia and Swaminathan (2000), and Hou (2007)) and also in international market (Rapach et al (2013)). In pairwise Granger causality test, I augment the predictive regression model based on macroeconomic variables using lagged return from industrialized countries as regressors. The own countries' macroeconomic variables are included to control for predictive ability of these variables on national stock market returns. To confirm the reliability of Granger causality test, I also test for general

specification model which includes all lagged returns of industrialized countries jointly as predictors for ASEAN equity market indices.

Third, in extension to those two steps, I also perform empirical news-diffusion model. This model allows us to examine how returns shocks arising in one country can affect another country's stock return, the across countries' shock adjustments are governed by diffusion parameter. The model also important to assess the existence of information frictions in international equity markets. Following Rapach et al (2013), the empirical news-diffusion model will be estimated using Generalized Model of Moments (GMM). The diffusion parameter inside the model allows for returns shocks from industrialized countries only reflected to ASEAN equity markets with a lag. I also compare the estimated coefficients of lagged returns industrialized countries from news-diffusion model to results from pairwise Granger causality tests in order to observe how big the influence of information frictions in generating predictive ability of lagged returns industrialized countries. Furthermore, with the concern of potential fragility that might arise on the in-sample results (Goyal & Welch (2008)), out of sample evidences are provided related to predictive power of lagged returns industrialized countries.

This paper is aimed to contribute to literatures by addressing two questions related to stock return predictability in ASEAN equity market indices. The first one is *Do lagged returns of industrialized countries predict stock market returns in ASEAN equity market indices.* The second one is *Do predictive abilities in lagged returns of industrialized countries consistent with information frictions across national equity markets*. Six ASEAN countries with well-developed market index (Indonesia, Malaysia,

Philippines, Singapore, Thailand, and Vietnam) are included in the sample. To investigate about lead-lag relationship between ASEAN countries and industrialized countries, additional sample from 12 industrialized countries are added to the research. The data starts from 21 March 2007 to 24 September 2014.

This study will contribute in following ways. First, adding ASEAN countries will enrich existing literature about stock return predictability which used to be focused on US, Europe, and developed Asian market data only. Second, in predicting return of ASEAN market indices, this study not solely focus on predictive power of country's own economic variables but also lagged return of other countries. Third, in order to bring evidences from world equity markets, I do not only focus on countries in Asian region but also countries from Europe, North America as well as Australia in conducting predictability tests for ASEAN equity market indices. Fourth, the empirical news-diffusion model which is specified in this study allows us to provide better understanding of lead-lag relationship in stock market return related to information frictions.

The rest of this paper is organized as follows. Section 2 provides review from previous studies related to stock return predictability and economic variables, stock return predictability and lead-lag relationship, and information diffusion. Section 3 presents the data and methodologies including benchmark predictive regression, Granger pairwise causality model, news-diffusion model, and out of sample evidence. Section 4 describes empirical findings and section 5 provides summary and conclusions.

CHAPTER 2 LITERATURE REVIEW

2.1. The Economic Development in ASEAN

ASEAN community which was established in 1967 comprises of 10 countries located in South East Asia region. The economic development of ASEAN marked with a growing GDP which accounted around 2.3 trillion USD at the end of 2013 or approximately 3% of world total GDP. The huge population which is about 600 million people adds another attractive point of ASEAN as potential market for international as well as domestic investors. Trade growth in ASEAN reaches an amount of 2.5 trillion USD up to year 2013 or around 7% of total world trade. The attractiveness of ASEAN managed to bring around 122 billion USD of total foreign direct investment inflows to these region in 2013 which is 7% higher compare to year 2012. Given its positive outlooks and upward trend of foreign direct investment, several ASEAN countries have been chosen as destination for investment by domestic as well as international investors.[3]

In order to boost economic development of ASEAN, many practices have been taken to promote financial development in ASEAN since 1983 until nowadays. The latest innovation for ASEAN development is ASEAN Economic Community (AEC) which was declared by ASEAN Leaders on Bali Summit in October 2013. The goal of

[3] Based on UNCTAD World Investment Report 2012 (survey based on 174 companies) and ASEAN Business Advisory Council (ABAC) Survey in 2010.

AEC is to improve regional economic integration which aims to create single market for ASEAN. To support ASEAN as a single market, five core elements needed to be comprised including free flow of goods, free flow of services, free flow of investment, free flow of capital, and free flow of skilled labors.

In order to accomplish the missions of AEC, strengthening ASEAN capital market development is needed including enhancing market access, linkages and liquidity through some initiatives such as ASEAN exchange linkages, Bond Market linkages, and promoting credit ratings comparability between domestic and international credit rating agencies. The establishment of ASEAN exchanges is a proof to support capital market development in ASEAN region.

ASEAN exchanges collaboration is aimed to promote development of ASEAN as an asset class, with the intention to increase liquidity of the member exchanges. ASEAN exchanges consist of 6 countries of ASEAN including Indonesia, Malaysia, Singapore, Philippine, Thailand, and Vietnam. These 6 countries have a combined GDP of 2.3 trillion USD which contributes around 90% of total GDP of ASEAN. These 6 countries consider as the strongest pillar that support economic development in ASEAN. Total FDI inflows to these countries are around 110 billion USD.[4] The exchanges collaboration of these countries offer 3000 companies to invest in with total stock market capitalization of USD 2 trillion.

[4] Data based on summary of ASEAN indicator published at ASEAN official website as of August 2014

2.2. Stock Return Predictability and Economic Variables

Predictive power of several economic variables has been a debate since a long time ago. Mixed evidences related to predictive power of economic variables have been documented with the respect to their ability to forecast future stock excess returns. Campbell (1991), Cochrane (1992), and Lewellen (2004) stated that aggregate dividend yields strongly predict excess return and the predictability is stronger at longer horizon. Lamont (1998) argues that earning yield has independent forecasting power for excess stock return. Ang and Bekaert (2006) investigate the predictive power of dividend yield to forecast excess return, cash flow, and interest rate. Using data from US, UK, France, and Germany along with OLS regression, they find that univariate dividend yield model provide poor proxy to predict excess return. Meanwhile, using dividend yield along with short rate in bivariate model improves the power of dividend yield to predict stock excess return. They also find weak evidence of earning yields independent power in predicting excess return.

Campbell and Thompson (2007) find that many predictive regressions beat the historical average return in forecasting future excess returns. Their study is inspired by Goyal and Welch (2007) where they argue about historical average excess stock return as better element to forecasts future stock return rather than regression of excess return on predictor variables. Through their research, they list several robust predictor variables to forecast stock return including earnings yield, Treasury bill rate, and term spread.

Another different study employed by Ferson and Harvey (1994) about risk and expected returns in international equity markets. To forecast equity returns in international scale, they insert global economic risk variables as regressors in the regression model. In their result, variables like log difference of trade-weighted currencies, crude oil price, industrial production growth, along with excess return of world market provide an improved explanation about equity returns compare to world market beta as single factor.

Other test about predictive power of economic variables on stock return proposed by Campbell & Yogo (2006). They find strong evidence of stock return predictability using short term nominal interest rate and long-short yield spread. In international section, similar result about predictive power of short interest rate and long-short yield also documented by Hjalmarsson (2010) using data from 40 international markets. In addition to his finding, he argues that predictive power of earning price ratios and dividend price ratio to forecast stock returns are weak and inconsistent.

2.3. Stock Return Predictability and Lead-Lag Effect

The evidences of lead-lag effect in equity markets have been well documented through years. For simple explanation, suppose there are two stocks, A and B, therefore lead-lag effect is defined as price change of stock A in second period follows stock price change of stock B in first period. However, the definition of lead-lag effect in equity

markets is not restricted to this definition only. Through this section, I provide another stories about lead-lag effect in equity markets around the world.

Lo and MacKinlay (1990) reports about return of small firms in US equity market follow the past return of big firms in the same market but the correlation does not exist in other way. Similar finding about lead-lag effect between big and small firms suggested by Chan (1993). Lead-lag effect between big and small firms also exist not only in US market but also in several Asian market (Hong Kong, Japan, Singapore, South Korea, Taiwan, and Thailand) which is well documented by Chang et al (1999). Besides its presence in firm size category, Chordia and Swaminathan (2000) argue that lead-lag effect also persist in portfolios with different trading volume. They explained, daily and weekly returns of high volume portfolios lead returns on low volume portfolios after controlling the firm size. Their findings suggest that trading volume as significant determinant of lead-lag effect in stock returns.

In addition to previously mentioned papers, lead-lag effect also exist within industries where big firms in the industry drive return of small firms as documented by Hou (2007). He also mentioned another important finding in his paper which said that intra-industry lead-lag effect is more firm than across industries lead-lag effect. Another story of industry's lead-lag effect presented by Hong, Torous, and Valkanov (2007). In their study, they investigate whether the lagged returns of industry portfolio predict stock market movements. In the beginning section of their study, they examine this effect using US data only and find that returns from several industries, including retail, services, commercial real estate, metal, and petroleum, forecast the stock market by up

to two months. In addition to their findings in US market, they employ another data from eight largest non-US stock markets and the result also show similar patterns to the US data.

The earlier part of this section, has mentioned about lead-lag effect within equity market. In this part, I explain about the presence of lead-lag effect across equity markets. Harvey (1995) use lagged value of world return as single factor to predict stock index return in emerging markets. They capture little influence related to predictive power of world market portfolio returns to forecast index return in emerging markets. Another international evidence brought by Shahrur, Becker, and Rosenfeld (2010), they examine whether equities along the same supply chain in developed markets exhibit lead-lag effects. In conducting this research, they identify customer industries for each supplier country to create customer return index which is different between countries. They discover that returns of customer industries lead the returns of supplier industries.

Rizova (2010) brings another story of lead-lag effect using different approach which relates the stock market returns and international trade. He uses sample from developed and emerging markets to complete his research. He discovers that stock market returns of a country's major partners forecast the subsequent stock market return of that country. Another cross market evidence of lead-lag effect discovered by Rapach, Strauss, and Zhou (2010). They investigate the lead-lag relationship in index return using US data and 10 non-US industrialized countries. While they test about predictive power of lagged return countries to return of a country, they discovered interesting evidence about lagged US return as significant predictor variables of numerous non-US

industrialized countries, while in other hand lagged returns of non-US countries only display limited predictive ability to U.S returns. In their study, they conclude that lagged US return is a powerful return predictor in analyzing stock return between countries.

2.4. Analysis of Lead-Lag Relationship in Equity Market

As discussed in previous section, the evidences of lead-lag relationship in equity markets already well documented by many researchers, but the source of lead-lag relationship remains as a puzzle. In this section, I present several ideas about the presence of lead-lag relationship in equity market. Lo and Mackinlay (1990) test about lead-lag effect and nonsynchronous trading. In nonsynchronous trading, stocks that trades more frequently receive earlier information and influence the returns of thinly traded stocks with a lag. They find the consistency of this relationship even after controlling for nonsynchronous trading.

Boudoukh et al (1994) mentions three views of thoughts related to lead-lag relationship in equity market. First, Loyalists which believe that existence of lead-lag relationship due to market frictions like non-synchronous trading, trading mechanism, or microstructure effect. Another view, Revisionist, see the lead-lag effect as the result of time varying economic risk premiums (past market returns, past size returns, or interest rate spreads). The last, Heretics, believe that markets are irrational and investors need time to adjust information they received in the market. Out of three views that mentioned previously, they focus in assessing whether lead-lag relationship related to

Loyalists view which they find non-synchronous trading as important determinant in lead-lag relationship.

Chan (1999) proposed a model to assess whether nonsynchronous trading can explain lead-lag relationship among securities, the finding shows that lead-lag relationship is well explained by nonsynchronous trading. In contrast with findings about nonsynchronous trading as source of lead-lag relationship, Chang et al (1999) argued that lead-lag relationship still exists after they control for non-synchronous trading. In addition, they mention that behavioral model might be able to explain the lead-lag relationship of equity market in their study.

In addition with evidences about nonsynchronous trading and lead-lag relationship, Chordia and Swaminathan (2000) consider another source of lead-lag relationship which is speed of information adjustment. In their study they show that the presence of lead-lag relationship as a tendency of low volume stock price reacts sluggishly to new information, which confirmed speed of information adjustment as noticeable source of lead-lag relationship. McQueen et al (1996) also find that speed of adjustment which is related to Heretics view by Boudoukh et al (1994) as a determinant of lead-lag relationship in equity market. They also test another two views which are Loyalist and Revisionist but these two fail to capture the lead-lag occurrence.

Another story of speed of information adjustment brought by Hou and Moskowitz (2005), they analyze price response of equities to earning announcement. Using this analysis, they find that lead-lag relationship captures the speed of information adjustment. Peng (2004) added similar story about lead-lag effect in equity market. She

stated that because of capacity constraint in assessing information directly, delay reactions of some investor to fundamental information arise, therefore some equities' price incorporate to this shock in different speed and lead-lag relationship occurred.

Hou (2007) primarily focused on slow diffusion of information as the main reason for lead-lag relationship in equity market. He argues that lead-lag relationship arises as some firms react more sluggishly to common information than others do. In one of his findings, he stated that lead-lag relationship in intra-industry largely driven by slow diffusion of bad news. Hong, Tourous, and Valkanouv (2007) also documented speed of information diffusion as the factor which drives the lead-lag relationship. Similar with the description in other papers, they define speed of information diffusion as ability of some equities to absorb information more quickly than others, thus lead to slow diffusion and generate return predictability for equities whom have slower response.

Another analysis of lead-lag relationship comes from Rizova (2010), he lists several possible explanation for cross country lead-lag effects including systemic differences, non-synchronous trading, liquidity, capital controls, and gradual diffusion of information. Out of 5 explanations that he mentioned, gradual diffusion of information proved as the best fitted reason to explain cross country return predictability in his paper. Additional evidence presented by Rapach, Strauss, Zhou (2010), which test on information diffusion model to describe the presence of lead-lag relationship across country. They stated that information diffusion is the key for predictive power of lagged

US return to return of other countries. They also argue that this factor is not the main source of the phenomenon of lead-lag relationship in equity markets.

2.5 Modelling Lead-Lag Effect in Equity Markets

There are several methodologies employed by researchers in examining the lead-lag relationship in equity markets. Chang et al (1999), Lo and Mackinlay (1990) use simple cross autocorrelation regression to investigate lead-lag relationship between big firms return and small firms return in equity market. They regress the return on small firms on lagged return of big firms. Similar regression model also applied by Hou and Moskowitz (2005) for studying lead-lag effect. Rizova (2010) used a simple regression which includes 1 month lagged return and 12 months lagged return of a country's major trading partners to forecast return of that country at present time. Another similar regression proposed by Hong, Torous, and Valkanov (2007) which they insert lagged return of industries to forecast return of stock market index.

Apart from some methodologies mentioned earlier, Shahrur, Becker, and Rosenfeld (2010) on their paper about return predictability along supply chain employ regression model proposed by Fama-MacBeth (1973) which include variables such as lagged customer return, lagged industry return, lagged of market value, lagged of book to market and lagged of firm size return as explanatory variables in the regression. Another methodologies suggested by Hou (2007), Chordia and Swaminathan (2000) use VAR (Vector Auto-Regression) for testing lead-lag relationship. In VAR model,

multiple lagged time-series are included to capture interdependencies between the independent variables and dependent variable.

In a recent paper by Rapach, Strauss, and Zhou (2013), they employ pairwise Granger causality tests that already proven as suitable tools for studying lead-lag relationship especially in US and also in international context. In their paper, Granger causality model is tested using augmented predictive regressions, which they include other country's lagged return as additional regressors in the predictive regression along with own country lagged return and own country macroeconomic variables.

CHAPTER 3 DATA & METHODOLOGY

3.1 Data

The data consists of ASEAN country members with well-developed stock markets including Indonesia, Malaysia, Philippine, Singapore, Thailand and Vietnam. In addition, sample from industrialized countries also included which consists of Australia, Canada, France, Germany, Hong Kong, Japan, Netherlands, South Korea, Switzerland, Taiwan, United Kingdom, and United States.[5] Price index for each country are obtained from Data Stream. Weekly return index is calculated from Wednesday to Wednesday in order to minimize effects of cross country differences in weekend market closures. Weekly return index for each country is calculated by taking log natural differences of price index, $R_{i,t} = \log(\frac{Pt}{Pt-1})$. I also collect risk free rate and long term interest rate data for each countries via Data Stream. Risk free rate data use 3-months Treasury bill rate when available or interbank rates or private discount rate and return yield (yield to maturity) of 10 years government index bond is served as long term interest rate.[6] All returns are measured in country's local currency and cover period from 21 March 2007 to 24 September 2014. Details on each country's data is reported below:

[5] The list of industrialized countries is based on IMF Advanced Economies list. World Economic Outlook, April 2014 (page 160).

[6] Details on risk free rate and long term interest rate data can be found on Appendix I. Return yield (yield to maturity) of 10 years government bond index for each country is calculated by Data Stream.

Table I

Information on Index Country

The table reports sample countries for ASEAN and Industrialized countries. Column 3 reports series name for each country index according to Data Stream series. Column 4 explains the coverage for each index series. Data is collected from Data Stream.

Country	Abbreviation	Series Name	Coverage
Indonesia	INA	IDX Composite	All companies listed on Indonesia Stock Exchange
Malaysia	MAL	FTSE Bursa Malaysia KLCI	30 largest companies in FBMEMAS by full market capitalisation.
Philippine	PHIL	PhilippineSE I(PSEi)	All stocks listed on Phillipines Stock Exchange
Singapore	SG	Straits Times Index L	All companies listed on Singapore Exchange
Thailand	THAI	Bangkok S.E.T.	All common stocks listed on Stock Exchange of Thailand
Vietnam	VIET	Ho Chi Minh VSE	All companies listed on Ho Chi Min City Stock Exchange
Australia	AUS	S&P/ASX 300	300 largest companies listed on Australian Securities Exchange
Canada	CAN	S&P/TSX Composite Index	300 largest companies listed on Toronto Stock Exchange
France	FRA	France CAC All-Tradable	250 largest companies listed on Paris Stock Exchange
Germany	GER	CDAX "Gen" Performance Index	All companies listed on Frankfurt Stock Exchange
Hongkong	HK	Hang Seng	95% companies listed on Hong Kong Stock Exchange
Japan	JPN	TOPIX	All companies listed on First Section of Tokyo Stock Exchange
Netherlands	NED	AEX All Share	All companies listed on Amsterdam Stock Exchange
South Korea	KOR	Korea SE Composite (KOSPI)	All companies listed on Korea Stock Exchange
Switzerland	SWISS	Swiss Performance Index	All companies listed on Swiss Exchange
Taiwan	TAIW	Taiwan SE Weighed TAIEX	All companies listed on Taiwan Stock Exchange
United Kingdom	UK	FTSE All SHare	All companies listed on London Stock Exchange
United States	US	NYSE Composite	All common stocks listed on New York Stock Exchange

3.2. Methodologies

The analysis of return predictability in ASEAN equity markets follows Rapach et al (2013), where they divide the process into 3 major steps. In section below, I will describe the whole processes thoroughly.

3.2.1. Predictive Regression

In this first stage, I measure the predictive regression using lagged variables of macroeconomic on return of ASEAN equity market. Predictive regression is well

known in financial area to test whether past prices, financial ratios, and other economic variables can predict return in stock and bond markets.[7] Many previous literatures use this predictive regression in their study. Ang and Bekaert (2006) and Rapach et al (2013) use short term rate and dividend yield as variables that forecast equity market return. Another study employed by Campbell & Yogo (2006) and Hjalmarsson (2010) consider short rate and term spread as predictive variables, while Campbell & Thompson (2008) adds another variable which is earning yield to predict stock return in market.

As said earlier, this research follows Rapach et al (2013) methodology to study about predictive regression for each country. While they use dividend yield and lagged interest rate in measuring regression, this research take another approach by switching the variables to own country's short term interest rate and term spread for instruments in predictive regression model which is suggested as the prominent instruments for return predictability by Campbell & Yogo (2006) also Hjalmarsson (2010). The model is as follows:

$$r_{i,t+1} = \beta_{i,0} + \beta_{i,b} bill_{i,t} + \beta_{i,s} spread_{i,t} + \epsilon_{i,t+1}$$

Where $r_{i,t+1}$ is the return of broad stock market index in excess of risk free rate from the end of month *t* to the end of month *t+1* for country *i* (*i* = 1,…..,N), $bill_{i,t}$ is the short term interest rate, meanwhile $spread_{i,t}$ is term spread at the end of time *t*, and $\epsilon_{i,t+1}$ is a zero-mean disturbance term. All return indices are value weighted (according to market capitalization) and cover the broad market. Excess returns are measured in

[7] Lewellen (2004) on "Predicting Return with Financial Ratios".

national currency, as noted by Solnik (1993), the national currency excess return is approximately equal to currency hedged excess return for investors from any country due to interest rate parity, where the forward premium equals the difference in risk free rates and also using national currency, thus eliminate the need to modelling for risk premium in exchange rates.

Excess returns are computed in relative to each country's risk free rate. The country's risk free rate also served as $bill_{i,t}$ in equation above. Term spread is defined as the log difference between the long and short interest rates. Long interest rate represents the yield on long term government bonds.

In this first stage, I aim to test the null hypothesis of no return predictability using short interest rate and term spread variables. The null hypotheses are defined as follows.

$H_0 : \beta_{i,b} = 0$ (no return predictability of short interest rate for country *i*)

$H_0 : \beta_{i,s} = 0$ (no return predictability of term spread for country *i*)

$H_0 : \beta_{i,b} = \beta_{i,s} = 0$ (no return predictability of short interest rate and term spread for country *i*)

3.2.2. Pairwise Granger Causality Test

In this second stage, augmented predictive regressions (Pairwise Granger causality tests) is performed to investigate lead-lag relationships between ASEAN indices and industrialized countries. The model is specified as follow:

$$r_{i,t+1} = \beta_{i,0} + \beta_{i,i} r_{i,t} + \beta_{i,j} r_{j,t} + \beta_{i,b} bill_{i,t} + \beta_{i,s} spread_{i,t} + \epsilon_{i,t+1} \quad i \neq j$$

The model allows us to analyze the predictive power of lagged country "*j*" returns with the respect of returns Granger causes country "*i*" returns. Dependent variable ($r_{i,t+1}$) is the excess return on market index country "*i*". Additional variables are added to this equation including the lagged return of country "*i*" ($r_{i,t}$) and also lagged return of country "*j*" ($r_{j,t}$). Lagged return country "*i*" is included to hinder spurious evidence of lead-lag relationship. Predictive instruments from the previous equation which are short interest rate ($bill_{i,t}$) and term spread ($spread_{i,t}$) are included to control for the predictive ability of national economic variables as emphasized in return predictability literature.

3.2.3. News Diffusion Model

As stated in the beginning, this research is aimed to assess speed of information adjustment as the source of lead-lag relationship in ASEAN equity markets. I follow news diffusion model by Rapach et al (2010) to examine this effect. In this model, country *i* represents ASEAN equity indices while country *j* represents industrialized countries. The detail of the model is as follows:

$$r_{i,t+1} = \mu_{i,t} + u_{i,t+1} + \theta_{i,j}\lambda_{i,j}u_{j,t+1} + (1-\theta_{i,j})\lambda_{i,j}u_{j,t}, \quad (1)$$

$$r_{j,t+1} = \mu_{j,t} + \theta_{j,i}\lambda_{j,i}u_{i,t+1} + (1-\theta_{j,i})\lambda_{j,i}u_{i,t} + u_{j,t+1}, \quad (2)$$

where

$$\mu_{i,t} = \beta_{i,0} + \beta_{i,b}\, bill_{i,t} + \beta_{i,s}\, spread_{i,t}, \quad (3)$$

$$\mu_{j,t} = \beta_{j,0} + \beta_{j,b}\, bill_{j,t} + \beta_{j,s}\, spread_{j,t}, \quad (4)$$

$\mu_{i,t}$ and $\mu_{j,t}$ are the expected return components corresponding to national economic variables in countries i and j. $u_{i,t+1}$ and $u_{j,t+1}$ are serially and contemporaneously uncorrelated return shocks in countries i and j, respectively. Moreover, $\lambda_{i,j}$ measures the total impact of country j return shock on country i returns, and $\theta_{i,j}$ is a diffusion parameter that measures the proportion of the total impact of country j return shock that incorporated into country i returns.[8] Solving (2) for $\mu_{j,t+1}$, lagging one period, and substituting into (1) we have

$$r_{i,t+1} = \mu_{i,t} - (1-\theta_{i,j})\lambda_{i,j}\mu_{j,-1} + (1-\theta_{i,j})\lambda_{i,j}r_{j,t} + e_{i,t+1}, \qquad (5)$$

Where,

$$e_{i,t+1} = u_{i,t+1} + \theta_{i,j}\lambda_{i,j}u_{j,+1} - (1-\theta_{i,j})\lambda_{i,j}[\theta_{j,i}\lambda_{j,i}u_{i,t} + (1-\theta_{j,i})\lambda_{j,i}u_{i,t-1}] \qquad (6)$$

The coefficient on $r_{j,t}$ in (5) establishes the condition under which lagged country j returns predict country i returns in the context of the news-diffusion model:

$$\lambda_{i,j} \neq 0, \qquad (7)$$

$$\theta_{i,j} \neq 1 \qquad (8)$$

Equation (7) requires country j return shocks to affect return in country i, if country j shocks are irrelevant for country i, then lagged country j returns will not predict country i returns. If $\lambda_{i,j} \neq 0$, equation (8) indicates that lagged country j returns affect country

[8] The news-diffusion model allows for a return shock in one country to fully incorporate into another country with a log, thus permitting cross-country information frictions (Rapach et al, 2010). The news-diffusion model allows for either under-reaction ($\theta_{i,j} < 1$) or over-reaction ($\theta_{i,j} > 1$) in country i to a country j return shock; information frictions imply $\theta_{i,j} < 1$.

i returns if it takes more than one period for a country *j* return shock to be fully reflected in country *i* equity prices, which is the result of information frictions.

$\lambda_{i,j}$, indicates the total impact of country *j* returns on country *i* returns, the larger the coefficient of $\lambda_{i,j}$ means the greater the predictive ability of lagged country *j* returns on country *i* returns. Meanwhile $\theta_{i,j}$ measures diffusion parameter, greater information frictions marked with smaller value of $\theta_{i,j}$, indicating greater predictive power of lagged return of country *j* to country *i*. As $\theta_{i,j}$ decreases, investors focus more on the country *j* compare to country *i* so that larger portion of shock or new information arises in country *j* is reflected to country *i* with a delay.

When country *j* return shocks are important for country *i* and information frictions exist, equation (5) indicates that a conventional predictive regression based on national economic variables alone is insufficient for modelling return predictability for country *i*, therefore the predictive regression should be added with lagged country *j* returns. To gather further understanding on international frictions, I follow Rapach et al (2013) in estimating structural parameters of news-diffusion model. In the model, I assumed that ASEAN countries are small so that the return shocks arise in these countries do not affect industrialized countries ($\lambda_{j,i} = 0$). In real world, the assumption might not be hold, but considering the economy size of industrialized countries along with their GDP share are larger than ASEAN countries so it is assumed to be a "safe assumption" for this news-diffusion model. Thus, the model is simplified to

$$r_{j,t+1} = X'_{j,t}\beta_j + u_{j,t+1}$$

$$r_{i,t+1} = X'_{i,t}\beta_i + \theta_{i,j}\lambda_{i,j}u_{j,t+1} + (1-\theta_{i,j})\lambda_{i,j}u_{j,t} + u_{i,t+1}$$

Parameters in the news-diffusion model are estimated using GMM procedure.

3.2.4. Out of Sample Evidence

According to Goyal and Welch (2008), historical average return forecast of stock excess return are better than the predictive regression based on predictor variables (e.g. macroeconomic variables), thus creating potential fragility of in-sample evidence of return predictability. In response to this possibility, I test whether forecasting models that use lagged return of country *j* (alternative model) can outperform the historical average baseline forecasts (null model) in out-of-sample test. The historical average baseline forecasts model (null model) described as below

$$r_{i,t+1} = \beta_{i,0} + \epsilon_{i,t+1}$$

The equation above represents no predictability model of excess return country *i*. For each ASEAN countries, I conduct this historical average baseline forecasts model and compare the result to forecasting model based on predictive regression (alternative model) that includes lagged country *j* returns as regressor:

$$r_{i,t+1} = \beta_{i,0} + \beta_{i,j}r_{j,t} + \epsilon_{i,t+1}$$

The variables in predictive regression forecasting model above are estimated using OLS. To compare the null model and alternative model, I employ Campbell and Thompson (2008) out-of sample R^2 statistic, R^2_{OS}.The R^2_{OS} is computed as follows:

$$R^2_{OS} = 1 - \frac{\sum_{t=1}^{T}(r_t - `r_t)^2}{\sum_{t=1}^{T}(r_t - "r_t)^2}$$

Where `r_t is the fitted value from predictive regression model and "r_t is the mean return from historical average baseline forecasts model. R^2_{OS} measures the proportional reduction in mean-square forecast error (MSFE) for predictive regression forecasts model that include lagged return of country j against historical average baseline forecasts model. MSFE-adjusted statistic is computed based on Clark and West (2007) in order to test the null hypothesis of MSFE (R^2_{OS} = 0) against the alternative hypothesis (R^2_{OS} > 0) which stated the alternative model has lower MSFE than the null model. The positive value of R^2_{OS} statistic indicates that the predictive regression model (alternative model) which include lagged returns of other country as regressors outperform the result based on historical average return forecasts model (null model).

To test the out-of-sample evidence, I set the forecasting period from 18 March 2009 until 24 September 2014. Data from the beginning of observation (21 March 2007) until 11 March 2009 is used to estimate parameters for initial out-of-sample forecasts.

CHAPTER 4 EMPIRICAL FINDINGS

4.1 Summary Statistics

Summary statistic of weekly return indices for ASEAN and industrialized countries are presented below:

Table II
Summary Statistics

The table reports summary statistic for weekly national currency excess return for ASEAN and Industrialized countries. These excess return is the return on a board market return in excess of risk free rate. Sharpe ratio is the mean of the excess return divided by its standard deviation. Data is collected from Data Stream.

[1]	[2]	[3]	[4]	[5]	[6]	[7]
Country	**Mean**	**Standard Deviation**	**Minimum**	**Maximum**	**Autocorrelation**	**Sharpe Ratio**
			ASEAN			
Indonesia	0.001	0.035	-0.235	0.202	-0.057	0.038
Malaysia	0.001	0.019	-0.087	0.098	0.063	0.032
Philippine	0.001	0.026	-0.126	0.105	0.000	0.058
Singapore	-0.000	0.029	-0.150	0.159	0.059	-0.002
Thailand	0.002	0.033	-0.192	0.174	-0.041	0.053
Vietnam	-0.003	0.043	-0.166	0.127	0.115	-0.079
			Industrialized Countries			
Australia	-0.001	0.025	-0.115	0.119	-0.048	-0.042
Canada	0.000	0.025	-0.153	0.078	-0.043	0.007
France	-0.001	0.030	-0.152	0.108	-0.089	-0.023
Germany	0.001	0.032	-0.159	0.106	-0.067	0.022
Hongkong	0.000	0.037	-0.162	0.173	-0.023	0.010
Japan	-0.001	0.033	-0.203	0.152	-0.081	-0.021
Netherlands	-0.001	0.030	-0.160	0.090	0.001	-0.022

South Korea	0.000	0.033	-0.168	0.197	-0.081	0.008
Switzerland	-0.000	0.024	-0.135	0.115	-0.072	-0.011
Taiwan	0.000	0.031	-0.108	0.156	-0.014	0.006
United Kingdom	0.000	0.025	-0.124	0.071	-0.031	0.002
United States	0.000	0.029	-0.176	0.101	-0.050	0.013

The average weekly excess return for ASEAN countries range from -0.003% (Vietnam) to 0.002% (Thailand), while for industrialized countries the range starts from -0.001% (Australia, France, Japan, Netherlands) to 0.001% (Germany). The standard deviations and maximum/minimum value indicate high volatility of excess returns in each country, with Vietnam displaying high volatility in ASEAN market and Hong Kong for industrialized country. The highest Sharpe ratio in ASEAN market belongs to Philippine which is 0.058, meanwhile Vietnam has the lowest Sharpe ratio of -0.079. Among industrialized countries, Germany and United States has higher Sharpe ratio compare to others which are 0.022 and 0.013, respectively. The lowest Sharpe ratio among industrialized countries owned by Australia. Autocorrelation are vary in each country, among ASEAN countries except Indonesia and Thailand, the rest of them shows positive autocorrelation. Meanwhile, among industrialized countries, all of them exhibit negative autocorrelation except Netherlands. Moreover, Philippine and Netherlands display the smallest autocorrelations which are 0.000 and 0.001 respectively.

4.2 Predictive Regression

Table III presents predictive regression results of ASEAN and industrialized countries based on two economic variables which are short interest rate and term spread. Estimation value of short interest rate ($\beta_{i,b}$) reported in column 1 and 4, while estimation value for term spread ($\beta_{i,s}$) reported in column 2 and 5. I reject null hypotheses of no predictability for return index of country i using short interest rate ($H_0 = \beta_{i,b}$) and term spread ($H_0 = \beta_{i,s}$)based on bootstap procedures.[9] The parentheses below the estimation value represent t-statistic of each coefficient based on bootstrap procedures.[10] The R^2 statistics reported in column 3 and 6, the parentheses under R^2 statistics display X^2 (chi-square) statistics for testing null hypothesis of no return predictability using short interest rate and term spread for country i ($H_0 = \beta_{i,b} = \beta_{i,s} = 0$). For brevity, coefficient estimates, R^2 statistics, and chi-square statistics are highlighted based on 5% significance level (**) and (*) for 10% significance level.

[9] Goncalves and Killian (2004) and Cavaiere, Rahbek, Taylor (2010) mentioned the application of bootstrap procedure to increase the robustness of statistical inferences. Bootstrap procedure also preserves contemporaneous correlation across all variables in data, and allows for general forms of conditional heteroskedasticity.

[10] Bootstrap procedure is repeated 2000 times.

Table III
Benchmark Predictive Regression Model

The table reports OLS estimates of $\beta_{i,b}$ and $\beta_{i,s}$ and the R^2 statistic for the predictive regression model:

$$r_{i,t+1} = \beta_{i,0} + \beta_{i,b} bill_{i,t} + \beta_{i,s} spread_{i,t} + \epsilon_{i,t+1}$$

Where $r_{i,t+1}$ is the weekly national currency excess return and $bill_{i,t}$ ($spread_{i,t}$) is the short term interest rate (term spread) for country i. t-statistics are reported in parentheses in first, second, fourth and fifth column; t-statistics for $\beta_{i,b}$ ($\beta_{i,s}$) are for testing H_0: $\beta_{i,b}$ = 0 against H_A: $\beta_{i,b}$ < 0 (H_0: $\beta_{i,s}$= 0 against H_A: $\beta_{i,s}$ > 0). Parentheses below the R^2 statistics in third and sixth columns report X^2 for testing H_0: $\beta_{i,b}$ = $\beta_{i,s}$= 0 . (**) & (*) indicate significance at 5% and 10% level according to wild bootstrapped p-values.

	(1)	(2)	(3)		(4)	(5)	(6)
i	$\beta_{i,b}$	$\beta_{i,s}$	R^2	i	$\beta_{i,b}$	$\beta_{i,s}$	R^2
Indonesia	-28.75*	20.19**	3.51%**	Germany	-8.96	8.59	1.89%**
	(-1.84)	(2.44)	(14.15)		(-1.23)	(0.63)	(7.50)
Malaysia	-82.93**	-39.82**	4.46%**	Hongkong	-2.05	-0.10	0.02%
	(-3.03)	(-2.34)	(18/12)		(-0.22)	(-0.01)	(0.08)
Philippine	-1.99	6.31	0.30%	Japan	-68.75	-65.36	1.96%**
	(-0.39)	(0.74)	(1.16)		(-1.19)	(-1.36)	(7.79)
Singapore	-36.82**	-28.04*	1.38%*	Netherlands	-12.31*	5.89	2.82%**
	(-2.07)	(-1.85)	(5.45)		(-1.74)	(0.45)	(11.31)
Thailand	-53.69**	-46.54**	3.01%**	South Korea	-13.69	4.86	1.13%
	(-3.41)	(-2.95)	(12.07)		(-1.11)	(0.54)	(4.44)
Vietnam	7.66	15.58	1.08%	Switzerland	-18.47**	-15.80	1.82%**
	(0.75)	(1.06)	(4.23)		(-2.67)	(-1.50)	(7.25)
Australia	8.57	3.66	1.63%**	Taiwan	-41.12**	-13.56	2.16%**
	(-1.49)	(0.41)	(6.46)		(-1.97)	(-0.31)	(8.52)

Canada	-10.32	-4.68	0.52%	United Kingdom	-8.89	-1.42	1.52%**
	(-1.35)	(-0.45)	(2.02)		(-1.54)	(-0.16)	(5.99)
France	-11.68	2.71	2.00%**	United States	-15.36**	-15.72	0.83%**
	(-1.34)	(0.18)	(7.92)		(-2.00)	(-1.25)	(3.25)
				Pooled	-8.41*	1.29	0.9%*
					(-1.65)	(0.26)	(5.89)

With the exception of Vietnam and Australia all the $\beta_{i,b}$ values are negative which in line with literature [Ang & Bekaert (2005) & Hjalmarsson (2010)]. The short interest rate is significant return predictor for Indonesia, Malaysia, Singapore, Thailand, Netherlands, Switzerland, Taiwan, and United States. Meanwhile term spread variable only positively significant in Indonesia. In Malaysia, Singapore, and Thailand, term spread are significantly predict return in those countries but in negative direction. As stated earlier, X^2 (chi square) statistics in parentheses below the R^2 statistics are used to test short interest rate along with term spread as predictive variables for stock excess returns for each country. For most of the countries, I reject null hypotheses of both variables have no predictive ability to predict stock excess returns, exception of the results displayed by Philippine, Vietnam, Canada, Hong Kong, and South Korea. The results align with literatures about both variables as good predictor in predicting stock returns [Campbell & Yogo (2006), Campbell & Thompson (2007, and Hjalmarsson (2010)].

The R^2 statistics are relatively small for each countries, however Campbell & Thompson (2007) mention in their paper, if R^2 value is still larger compare to squared

Sharpe ratio, the model is said to be economically meaningful. Therefore in this paper, I compare R^2 value with squared Sharpe ratio which is squared Sharpe ratio indeed smaller than R^2 value for each country, so I conclude that the predictive regression model for each country is economically meaningful. Following Hjalmarsson (2010) and Rapach et al (2013), I also estimate pooled regression for predictive model which imposes that $\beta_{i,b} = \bar{\beta}_b$ and $\beta_{i,s} = \bar{\beta}_s$ for all *i* (allowing for country-specific constants). The t-statistics for $\bar{\beta}_b$ and $\bar{\beta}_s$ are estimated based on standard errors computed from GMM procedure that accounts for heteroskedasticity and the contemporaneous correlations among country returns. The sign for $\bar{\beta}_b$ is negative while sign for $\bar{\beta}_s$ is positive which in line to literature (e.g Hjalmarsson (2010)). Only coefficient for $\bar{\beta}_b$ is significant in predicting stock excess return. X^2 (chi- square) statistics reported under the R^2 of pooled regression displays rejection of null hypothesis of no predictability based on short interest rate and term spread.

4.3. Pairwise Granger Causality Test

Table IV reports $\beta_{i,j}$ estimates for each i using OLS estimation. Country i consists of each country in ASEAN, while country j represents each industrialized country. Heteroskedasticity robust t-statistics are reported in parentheses below the $\beta_{i,j}$ estimates. Statistical significance for t-statistics are estimated using bootstrapped p-values.[11] The p-values are used to test H_0: $\beta_{i,j} = 0$ against H_A: $\beta_{i,j} > 0$. (**) and (*)

[11] Bootstrap procedure is repeated 2000 times.

are used to highlight significance level of 5% and 10%, respectively. As mentioned in Rapach et al (2013), a positive $\beta_{i,j}$ can be interpreted as adjustment delays in country *i* equity prices in respond to information relevant for country *i* that contained in country *j* equity prices.

Table IV proves the predictive ability of industrialized countries to ASEAN equity markets, which is aligned with some literatures of lead-lag relationship in international market (e.g. Rapach et al (2013), Rizova (2010)). Among industrialized countries, lagged South Korea failed to predict all the equity markets in ASEAN. The rest of industrialized countries display various results about predictive abilities to ASEAN markets. According to the results, the strongest predictors for ASEAN markets are lagged return of Canada, Germany, United Kingdom, and United States which are positive and significant in predicting return of equity markets in ASEAN, except lagged Germany, the rest of them are succeed in predicting six equity markets in ASEAN.

The pooled estimates reported in the last row of table IV impose several slope homogeneity restrictions (allowing for country-specific constants): $\beta_{i,i} = \bar{\beta}_{AR}$, $\beta_{i,j} = \bar{\beta}_j$, $\beta_{i,b} = \bar{\beta}_b$, $\beta_{i,d} = \bar{\beta}_d$ for all $i \neq j$. [12] The pooled $\bar{\beta}_j$ estimates are significant for all industrialized countries except South Korea. The pooled estimates and average value of lagged return of Canada, Germany, United Kingdom, and United States are larger compare to other indutrialzed countries displaying stronger predictive ability on return of ASEAN equity markets. In contradiction to Rapach et al (2013) about lagged US

[12] Hjalmarsson (2010): pooled estimates can meaningfully measure average relationships in the data, even if the slope homogeneity restrictions do not hold exactly.

return displaying strongest predictive power to industrialized countries, in this paper, I find that lagged U.S return does not display strongest predictive power on ASEAN equity market. As I compare the coefficient of $\beta_{i,j}$ also pooled estimation and average value of lagged U.S. returns to other industrialized countries lagged returns, I find that the coefficient value of lagged U.S returns are smaller to lagged returns of Canada, which means lagged US returns fail to continue its strongest power to ASEAN equity markets.

Table IV
Pairwise Granger Causality Test
(for *i* = ASEAN countries)

The table reports OLS estimates of $\beta_{i,j}$ for the predictive regression model

$$r_{i,t+1} = \beta_{i,0} + \beta_{i,i} r_{i,t} + \beta_{i,j} r_{j,t} + \beta_{i,b} bill_{i,t} + \beta_{i,s} spread_{i,t} + \epsilon_{i,t+1}, \quad i \neq j$$

Where $r_{i,t+1}$ is the weekly national currency excess return and $bill_{i,t}$ ($spread_{i,t}$) is the short term interest rate (term spread) for country i. t-statistics are reported in parentheses; t-statistics are for testing H_0: $\beta_{i,j}$ = 0 against H_A: $\beta_{i,j}$ > 0. (**) & (*) indicate significance at 5% and 10% level according to wild bootstrapped p-values. "Pooled" estimates impose the restrictions that $\beta_{i,j} = \bar{\beta}_j$ for i ≠ j.

(i)	(βi,AUS)	(βi,CAN)	(βi,FRA)	(βi,GER)	(βi,HK)	(βi,JPN)	(βi,NED)	(βi,KOR)	(βi,SWISS)	(βi,TAIW)	(βi,UK)	(βi,US)
Indonesia	0.25**	0.40**	0.16	0.21**	0.22**	0.15**	0.23**	0.15	0.13	0.25**	0.26**	0.31**
	(2.39)	(3.09)	(1.61)	(2.09)	(2.21)	(2.00)	(2.12)	(1.32)	(1.10)	(2.80)	(2.05)	(2.91)
Malaysia	0.07	0.19**	0.09	0.12**	0.64	0.02	0.10*	-0.01	0.05	0.01	0.13*	0.15**
	(1.21)	(3.08)	(1.62)	(2.25)	(1.42)	(0.56)	(1.66)	(-0.12)	(0.75)	(0.16)	(1.70)	(2.74)
Philippines	0.19**	0.32**	0.17**	0.18**	0.15**	0.14**	0.20**	0.05	0.18**	0.14**	0.26**	0.27**
	(2.42)	(4.55)	(3.12)	(3.11)	(2.45)	(2.19)	(3.16)	(0.66)	(2.38)	(2.31)	(3.38)	(4.31)
Singapore	-0.02	0.36**	0.14	0.20**	-0.08	-0.04	0.21	-0.16	0.11	0.03	0.26*	0.32**
	(-0.18)	(2.97)	(1.41)	(2.06)	(-0.76)	(-0.65)	(1.63)	(-1.40)	(0.90)	(0.28)	(1.67)	(2.77)

Thailand	0.15	0.37**	0.17*	0.20**	0.13	0.12*	0.21**	0.10	0.10	0.17**	0.23**	0.28**
	(1.60)	(3.49)	(1.94)	(2.18)	(1.51)	(1.66)	(2.15)	(0.86)	(0.99)	(1.99)	(2.04)	(3.27)
Vietnam	0.04	0.22**	0.10	0.11	0.06	-0.00	0.11	-0.03	0.04	-0.01	0.19*	0.16**
	(0.32)	(2.17)	(1.32)	(1.36)	(0.79)	(-0.05)	(1.20)	(-0.31)	(0.43)	(-0.10)	(1.81)	(2.02)
Average	0.11	0.31	0.14	0.17	0.19	0.06	0.18	0.02	0.10	0.10	0.22	0.25
POOLED	0.10**	0.29**	0.13**	0.15**	0.08**	0.06**	0.16**	0.01	0.09**	0.08**	0.20**	0.22**
	(3.09)	(9.89)	(5.22)	(6.52)	(3.44)	(2.41)	(6.24)	(0.26)	(3.04)	(3.26)	(6.88)	(8.84)

I also run pairwise Granger causality test for country *i* equals to industrialized countries and country *j* equals to ASEAN countries. The results are not robust for all lagged ASEAN countries because most of the coefficient of $\beta_{i,j}$ are less than zero ($\beta_{i,j} < 0$).[13] The result table is presented in the Appendix II table. The pooled regression for this test also conducted. The results show that lagged return of ASEAN countries do not have predictive ability towards return of industrialized countries.

In this part, I conduct general specification model to test the predictive power of lagged industrialized countries returns. This general specification controls for all other lagged country return. The model is specified below:

$$r_{i,t+1} = \beta_{i,0} + \beta_{i,i} r_{i,t} + \sum_{j \neq i} \beta_{i,j} r_{j,t} + \beta_{i,b} bill_{i,t} + \beta_{i,s} spread_{i,t} + \epsilon_{i,t+1}$$

The equation above is single equation from an augmented VAR(1) which include lagged return from all ASEAN countries, all industrialized countries, and also country *i*'s national economic variables as regressors, which simultaneously control for all lagged country returns when testing for Granger causality. However, OLS estimates from this model might resulting inaccurate parameter estimates and weak statistical tests. Thus, pooled OLS estimates from above equation is performed to improve the estimation and considering several homogeneity restrictions ($\beta_{i,i} = \bar{\beta}_{AR}$, $\beta_{i,j} = \bar{\beta}_j$, $\beta_{i,b} = \bar{\beta}_b$, $\beta_{i,d} = \bar{\beta}_d$ for all *i=INA, MAL, PHIL, SG, THAI, VIET*).[14] Table V shows the result of

[13] According to Chordia and Swaminathan (2000) observe, by testing for the existence of predictability and its sign, the $\beta_{i,j} > 0$ is more stringent test.

[14] Pooling might introduce biases, but it increases estimation efficiency by reducing mean squared error. Pooled estimates also measure average relationship in data.

general specification model. Bias corrected bootstrapped procedure is applied to the model (90% confidence intervals), t-statistic is reported in parentheses below the $\beta_{i,j}$ estimates.[15]

Table V
Pooled General Specification Model Results

The table reports OLS estimates of $\beta_{i,j}$ for the predictive regression model

$$r_{i,t+1} = \beta_{i,0} + \beta_{i,i} r_{i,t} + \sum_{j \neq i} \beta_{i,j} r_{j,t} + \beta_{i,b} bill_{i,t} + \beta_{i,s} spread_{i,t} + \epsilon_{i,t+1}, \quad \text{i = ASEAN countries}$$

Where $r_{i,t+1}$ is the weekly national currency excess return and $bill_{i,t}$ ($spread_{i,t}$) is the short term interest rate (term spread) for country i. t-statistics are reported in parentheses; (*) indicate significance at 10% level according to wild bootstrapped p-values.

Country	$\beta_{i,j}$	Country	$\beta_{i,j}$
Australia	-0.04	Netherlands	0.05
(βi,AUS)	(-0.79)	(βi,NED)	(0.53)
Canada	0.18*	South Korea	-0.08
(βi,CAN)	(2.73)	(βi,KOR)	(-1.57)
France	-0.32*	Switzerland	-0.22*
(βi,FRA)	(-3.28)	(βi,SWISS)	(-2.88)
Germany	0.24*	Taiwan	0.03
(βi,GER)	(2.96)	(βi,TAIW)	(0.71)
Hong Kong	-0.01	United Kingdom	0.19*
(βi,HK)	(-0.15)	(βi,UK)	(1.67)
Japan	0.01	United States	0.16*
(βi,JPN)	(0.25)	(βi,US)	(2.30)

The pooled estimation results in Table V largely agree with the causality result in Table IV. Lagged return of Canada, Germany, United Kingdom and United States remained as strongest predictors for ASEAN equity markets which have $\beta_{i,j}$ estimates of 0.18, 0.24, 0.19, and 0.16, respectively. They influence the equity markets in ASEAN in positive direction. Again, I find that lagged US returns do not display strongest predictive power in ASEAN equity market, which differ to Rapach et al (2013) finding

[15] Bootstrapped procedure is repeated 2000 times

of US lagged return as strongest predictive power in industrialized countries. Moreover, lagged France returns and Switzerland returns which are positive and statistically significant in table IV, in table V the results show that both lagged returns have significant negative effect on ASEAN equity market returns.

4.4. News Diffusion Model

According to Granger causality tests which I performed before, indicating that lagged return of Canada, Germany, United Kingdom, and United States are the strongest predictors in ASEAN equity markets among industrialized countries. Therefore in news-diffusion model, I estimate the model based on country *j* = CAN, GER, UK, and US. I do not estimate the other industrialized countries as they can't be proved for having robust results regarding predictive ability to ASEAN equity markets. Table VI reports the result for news-diffusion model for country *i* = INA, MAL, PHIL, SG, THAI, and VIET. Results for each country *j* news-diffusion model are presented on different panel in Table VI.

Table VI

News Diffusion Model Parameter Estimates

The table reports two-step GMM parameters estimates for the news-diffusion model

$$r_{j,t+1} = x'_{j,t}\beta_j + u_{j,t+1},$$

$$r_{i,t+1} = x'_{i,t}\beta_i + \theta_{i,j}\lambda_{i,j}u_{j,t+1} + (1-\theta_{i,j})\lambda_{i,j}u_{j,t} + u_{i,t+1}$$

Where $r_{i,t+1}$ is the weekly national currency excess return, $x_{i,t}$ = (1, $bill_{i,t}$, $spread_{i,t}$)', $\beta_i = (\beta_{i,0}, \beta_{i,b}, \beta_{i,s})$', and $bill_{i,t}$ ($spread_{i,t}$) is the short term interest rate (term spread) for country i. t-statistics are reported in parentheses;. The t-statistics for $\beta_{i,b}$ ($\beta_{i,s}$) are for testing H_0: $\beta_{i,b}$ = 0 against H_A: $\beta_{i,b}$ < 0 (H_0: $\beta_{i,s}$= 0 against H_A: $\beta_{i,s}$ > 0). The t-statistics for $\Theta_{i,j}$ ($\lambda_{i,j}$) are for testing H_0: $\Theta_{i,j}$= 1 against H_A: $\Theta_{i,j}$< 1 (H_0: $\lambda_{i,j}$= 0 against H_A: $\lambda_{i,j} > 0$). (**) & (*) indicate significance at 5% and 10% respectively. "Pooled " estimates impose the following homogeneity restrictions: $\beta_{i,b}$ = $\bar{\beta}_b$, $\beta_{i,s}$ = $\bar{\beta}_s$, $\Theta_{i,j}$ = $\bar{\Theta}_j$, and $\lambda_{i,j}$ = $\bar{\lambda}_j$for all *i≠j.*

Panel A: News-diffusion model : country *j* = Canada

			Canada		
(i)	βi,b	βi,s	θi,CAN	λi,CAN	βi,CAN
Indonesia	-6.47	0.37	0.70**	1.04**	0.31**
	(-0.75)	(0.10)	(19.13)	(10.47)	(5.93)
Malaysia	-36.28**	-17.17*	0.65**	0.55**	0.19**
	(-2.61)	(-2.08)	(14.64)	(10.80)	(5.33)
Philippine	-3.12	-1.31	0.61**	0.66**	0.26**
	(-1.02)	(-0.22)	(14.73)	(12.07)	(7.11)
Singapore	-28.50**	-19.50	0.72**	1.01**	0.28**
	(-3.18)	(-2.33)	(23.17)	(16.51)	(6.40)
Thailand	-36.54**	-32.29**	0.69**	0.94**	0.29**
	(-4.08)	(-4.04)	(19.41)	(13.27)	(7.03)
Vietnam	2.93	7.88	0.56**	0.72**	0.35**
	(0.43)	(0.88)	(7.76)	(6.10)	(4.37)
Pooled	-1.39	1.32	0.67**	0.84**	0.27**
	(-0.28)	(0.29)	(15.88)	(7.95)	(4.37)

Panel B: News-diffusion model : country *j* = Germany

			Germany		
(i)	βi,b	βi,s	θi,GER	λi,GER	βi,GER
Indonesia	-15.82*	7.23*	0.84**	0.64**	0.10*
	(-1.68)	(1.77)	(12.30)	(7.01)	(1.95)
Malaysia	-53.59**	-19.89*	0.76**	0.41**	0.10**
	(-3.50)	(-1.85)	(18.98)	(10.46)	(4.25)
Philippine	-0.95	1.39	0.76**	0.48**	0.12**
	(-0.29)	(0.22)	(14.79)	(7.68)	(3.51)
Singapore	-25.57**	-1.95	0.81**	0.74**	0.14**
	(-2.73)	(-0.24)	(24.90)	(13.39)	(4.76)
Thailand	-46.68**	-38.57**	0.81**	0.60**	0.11**
	(-5.03)	(-4.13)	(14.09)	(7.76)	(2.50)
Vietnam	5.70	13.65	0.65**	0.58**	0.20**
	(0.72)	(1.26)	(8.05)	(5.60)	(3.18)
Pooled	-3.54	3.43	0.75**	0.63**	0.16**
	(-0.75)	(0.77)	(17.18)	(9.25)	(4.28)

Panel C: News-diffusion model : country *j* = United Kingdom

			United Kingdom		
(i)	βi,b	βi,s	θi,UK	λi,UK	βi,UK
Indonesia	-17.54**	7.25*	0.85**	0.84**	0.13*
	(-2.29)	(1.93)	(12.26)	(9.13)	(1.90)
Malaysia	-52.17**	-26.30**	0.79**	0.50**	0.10**
	(-3.65)	(-2.68)	(16.98)	(12.52)	(3.42)
Philippine	-4.66*	-1.71	0.74**	0.69**	0.18**
	(-1.74)	(-0.30)	(17.37)	(11.45)	(4.78)
Singapore	-26.90**	-6.15	0.83**	0.99**	0.17**
	(-3.26)	(-0.83)	(23.63)	(18.49)	(4.17)
Thailand	-46.09**	-38.73**	0.82**	0.87**	0.15**
	(-6.07)	(-5.01)	(19.93)	(11.79)	(3.59)
Vietnam	5.69	12.60	0.64**	0.71**	0.25**
	(0.78)	(1.26)	(7.26)	(6.87)	(3.52)
Pooled	-3.45	2.40	0.77**	0.80**	0.18**
	(-0.73)	(0.55)	(18.35)	(9.12)	(4.01)

Panel C: News-diffusion model : country *j* = United States

			United States		
(i)	βi,b	βi,s	θi,US	λi,US	βi,US
Indonesia	-10.85	1.90	0.77**	0.82**	0.19**
	(-1.37)	(0.59)	(12.61)	(9.34)	(3.05)
Malaysia	-52.02**	-30.27**	0.70**	0.46**	0.14**
	(-4.27)	(-3.49)	(16.08)	(12.49)	(5.19)
Philippine	-3.44	-4.77	0.68**	0.58**	0.18**
	(-1.18)	(-0.80)	(15.88)	(10.24)	(5.34)
Singapore	-31.80**	-25.23**	0.77**	0.92**	0.21**
	(-4.04)	(-3.67)	(22.54)	(19.47)	(5.29)
Thailand	-42.10**	-45.90**	0.74**	0.83**	0.21**
	(-5.45)	(-5.88)	(20.30)	(11.93)	(5.21)
Vietnam	3.13	8.66	0.62**	0.65**	0.25**
	(0.43)	(0.92)	(8.13)	(7.59)	(3.90)
Pooled	-2.77	-0.12	0.70**	0.73**	0.22**
	(-0.55)	(-0.03)	(14.82)	(8.13)	(4.00)

Panel A, B, C, and D show the news diffusion model for country j = Canada (CAN), Germany (GER), United Kingdom (UK), and United States (US), respectively. $\lambda_{i,j}$ estimates are reported in column (5) on each panel, the t-statistics for $\lambda_{i,j}$ (in parentheses below the coefficient $\lambda_{i,j}$) are for testing $H_0: \lambda_{i,j} = 0$ againts $H_0: \lambda_{i,j} > 0$ and all of them are significant at 5% significance level. These results indicate that an economically significant links exist between each country in ASEAN with Canada, Germany, U.K, and U.S market. The $\Theta_{i,j}$ estimates are reported in fourth column of each panel, t-statistics below the estimates are for testing $H_0: \Theta_{i,j} = 1$ againts $H_0: \Theta_{i,j} < 1$. All of $\Theta_{i,j}$ for each country j in each panel are significantly less than one which consistent with international information frictions.[16]

Table VI also reports pooled estimates of news-diffusion model parameter based on following homogeneity restrictions: $\beta_{i,b} = \bar{\beta}_b$, $\beta_{i,s} = \bar{\beta}_s$, $\Theta_{i,j} = \bar{\Theta}_j$, and $\lambda_{i,j} = \bar{\lambda}_j$ for all $i \neq j$ *(j= CAN, GER, UK, US)*. The GMM estimates of $\bar{\Theta}_{CAN}$ ($\bar{\lambda}_{CAN}$) is 0.67 (0.84), for $\bar{\Theta}_{GER}$ ($\bar{\lambda}_{GER}$) the value is 0.75 (0.63), for $\bar{\Theta}_{UK}$ ($\bar{\lambda}_{UK}$) the estimate value is 0.77 (0.80) and estimate values for $\bar{\Theta}_{US}$ ($\bar{\lambda}_{US}$) is 0.70 (0.73), which all of them are significantly less than zero (greater than zero). Comparing the $\bar{\lambda}_j$ estimate between four j countries, I find that total impact of lagged Canada returns shock on ASEAN countries is larger compare to lagged Germany returns, lagged United Kingdom returns,

[16] The t-statistics reported in Table VI are significant based on GMM p-values. For all of the test of overidentifying restrictions that we used to estimate the news-diffusion model, we failed to reject the null hypothesis of invalid over-identifying model because the p-value of J-statistic are higher than 10% significant level which means the over-identifying model are valid for estimating news-diffusion model.

and lagged United States returns. The informations frictions also more severe between Canada market and ASEAN markets compare to other three countries, since the $\bar{\Theta}_{CAN}$ estimate which is 0.67 is smaller than $\bar{\Theta}_{GER}$, $\bar{\Theta}_{UK}$, and $\bar{\Theta}_{US}$ estimates which are 0.75, 0.77, and 0.70 respectively. Evidence from Table VI show that ASEAN countries returns are underreact to industrialized countries shocks, which consistent with information frictions in international equity markets.

The news-diffusion model does not claim that information frictions are responsible for predictive ability of lagged return of country *j*, solely. To measure the importance of information frictions on this lead-lag relationship between ASEAN equity markets and four industrialized countries, I compare the coefficient of $r_{j,t}$ in each panel (for *j* equals to CAN, GER, UK, and US) which implied by the GMM estimates of $\Theta_{i,j}$ and $\lambda_{i,j}$ in Table VI with the $\beta_{i,j}$ estimates in Table IV. To facilitate the comparisons, last columns of each panel in Table VI reports $\beta_{i,j}$ = (1-$\Theta_{i,j}$) $\lambda_{i,j}$, the t-statistics in parentheses below the $\beta_{i,j}$ estimates are for testing $H_0: \beta_{i,j} = 0$ againts $H_0: \beta_{i,j} > 0$ (for *j* equals to CAN, GER, UK, and US), standard errors used to compute t-statistics are calculted via delta method. In this case, I reject $\beta_{i,j} = 0$ in Table VI at 5% and 10% level for all ASEAN equity markets, implying that information frictions give rise to predictive power of lagged country *j* returns (for *j* equals to CAN, GER, UK, and US).

Under the comparison between the $\beta_{i,j}$ estimates obtained in Table VI to $\beta_{i,j}$ estimates reported in Table IV, if the estimated values for $\beta_{i,j}$ in Table VI are smaller

than in Table IV means that information frictions do not account for all the predictive ability of country j which j equals to lagged returns of Canada, Germany, United Kingdom, and United States.

Estimated values for $\beta_{i,CAN}$, $\beta_{i,GER}$, $\beta_{i,UK}$, and $\beta_{i,US}$ in Table VI where i equals to Indonesia, Malaysia, Phillipine, Singapore, and Thailand are smaller compare to $\beta_{i,CAN}$, $\beta_{i,GER}$, $\beta_{i,UK}$ and $\beta_{i,US}$ estimates in Table IV, which indicate that information frictions can not describe all the preditive ability of lagged returns Canada, Germany, United Kingdom, and United States on ASEAN equity markets (except Vietnam). Apart with the results from the rest of ASEAN countries, $\beta_{i,CAN}$, $\beta_{i,GER}$, $\beta_{i,UK}$, and $\beta_{i,US}$ estimates for Vietnam (country i) reported in Table VI are bigger than in Table IV which means existence of information frictions between Vietnam and Canada, Germany, United Kingdom also United States are fully account for all predictive ability of those countries to Vietnam equity markets. According to the results I obtained from news-diffusion model, they suggest that information frictions as one source for predictive ability of lagged industrialized countries on ASEAN equity markets.

4.5. Out of Sample Evidence

Table VII
Out-of-Sample Predictive Ability of Lagged Canada Returns, Germany Returns, U.K. Returns, and U.S Returns

The table reports Campbell and Thompson (2008) out of sample R^2 statistics, R^2_{OS} (in percent), which measure proportional reduction in mean-squared forecast error for the constant expected excess return model (null model) relative to alternative model which uses lagged return from other countries. The constant expected return (alternative) model is

$$r_{i,t+1} = \beta_{i,0} + \epsilon_{i,t+1} \; (r_{i,t+1} = \beta_{i,0} + \beta_{i,j} r_{j,t} + \epsilon_{i,t+1}),$$

where $r_{i,t+1}$ is the weekly national currency excess return (for *i* equals to Indonesia, Malaysia, Philippine, Singapore, Thailand, Vietnam). $r_{j,t}$ is the lagged returns for country *j* (for j equals to Canada, Germany, United Kingdom, and United States). Model is estimated using OLS. Parentheses below the R^2_{OS} statistics are the Clark and West (2007) MSFE-adjusted statistic. (*) indicates significance at 10% level or better.

Canada		Germany		United Kingdom		United States	
(i)	R^2_{OS}	(i)	R^2_{OS}	(i)	R^2_{OS}	(i)	R^2_{OS}
Indonesia	1.42*	Indonesia	-0.61%*	Indonesia	3.32%*	Indonesia	5.87%*
	(8.20)		(7.86)		(8.19)		(8.04)
Malaysia	4.31%*	Malaysia	1.29%*	Malaysia	3.75%*	Malaysia	6.84%*
	(7.81)		(7.97)		(7.75)		(7.74)
Philippine	7.74%*	Philippine	5.04%*	Philippine	7.36%*	Philippine	9.42%*
	(6.61)		(6.36)		(6.32)		(6.58)
Singapore	0.42%*	Singapore	5.56%*	Singapore	6.44%*	Singapore	9.12%*
	(5.20)		(5.10)		(5.03)		(5.28)
Thailand	6.21%*	Thailand	-0.91%*	Thailand	2.81%*	Thailand	4.73%*
	(8.47)		(8.41)		(7.98)		(8.01)
Vietnam	4.26%*	Vietnam	4.08%*	Vietnam	4.92%*	Vietnam	4.84%*
	(6.04)		(6.00)		(5.89)		(5.76)

Table VII reports R^2_{OS} statistics comparing the historical average forecasts model (null model) and the predictive regression forecast model (alternative model) for period 18 March 2009 to 24 September 2014 for all country *i*. The alternative model use lagged returns of Canada, Germany, United Kingdom and United States as these four countries imply stronger predictive ability on ASEAN equity markets. R^2_{OS} statistics for

lagged returns Canada (Germany) reported in second (fourth) column and for lagged returns United Kingdom (United States) reported in sixth (eight) column. The MSFE-adjusted statistics in parentheses below the R_{OS}^2 statistics are calculated using bootstrap procedure. The R_{OS}^2 statistics using lagged returns Canada, United Kingdom, and United States are positive and significant for all ASEAN countries, which means the predictive regression forecast model that uses lagged return of Canada or United Kingdom or United States has a lower MSFE than the constant expected excess return model. However while using lagged Germany returns in alternative model, the R_{OS}^2 statistics of Indonesia and Thailand display a robust statistic but in negative signs, these suggest that MSFE for predictive regression model using lagged returns Germany has higher MSFE compare to the constant return model. Results on table VII show that forecasting models that include lagged returns Canada, United Kingdom and United States in the predictive regression for ASEAN returns succeed to outperform the historical average baseline forecasts that ignore those countries lagged returns.

The cumulative differences in squared forecasts errors for the historical baseline model (null model) minus square forecasts errors for predictive regression forecasts model (alternative model) are plotted in figures below (figure I.A to I.D). From the figures below, we can determine whether the alternative model outperforms the null model by looking at the line in each figure, whenever the line increases, the alternative model predicts better than null model and whenever it decreases, the null model predicts better than the alternative model. By observing the movement of each line in each figure, I conclude that the alternative model outperforms the null model, which means that

forecasting models that include lagged returns of other countries as regressor continue to provide significant out-of-sample evidence on ASEAN equity markets.

Figure I.A. Out-of-sample results, forecasts based on lagged Canada returns versus historical average forecasts; 2009/03/18-20014/09/24

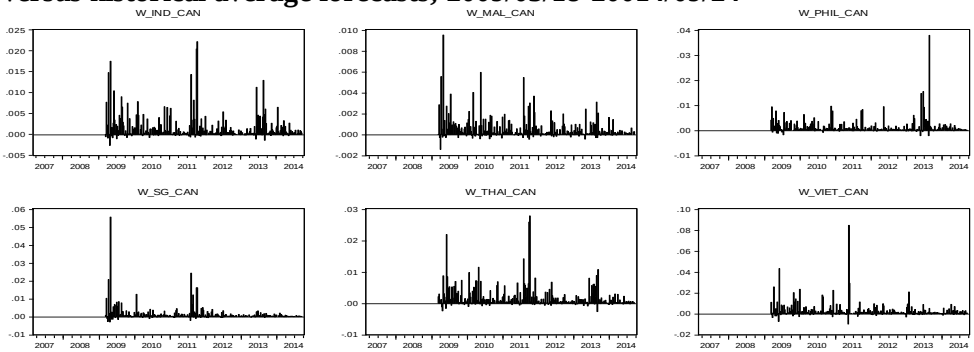


Figure I.B. Out-of-sample results, forecasts based on lagged Germany returns versus historical average forecasts; 2009/03/18-20014/09/24

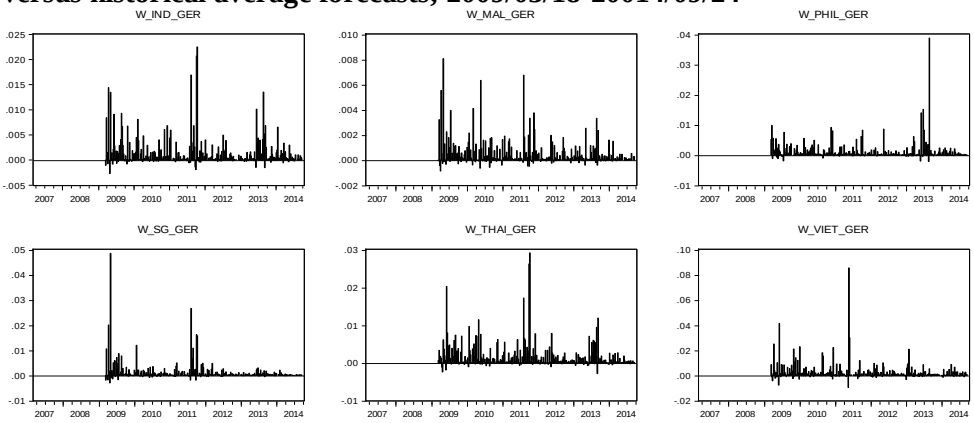


Figure I.C. Out-of-sample results, forecasts based on lagged United Kingdom returns versus historical average forecasts; 2009/03/18-20014/09/24

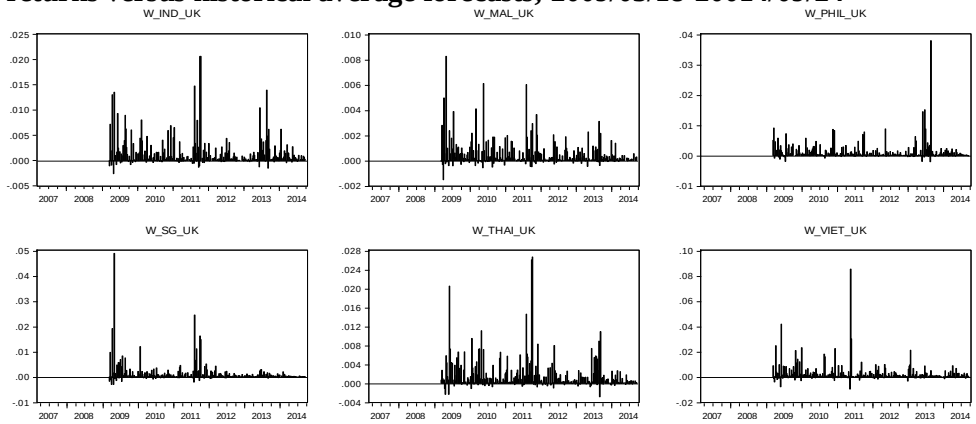
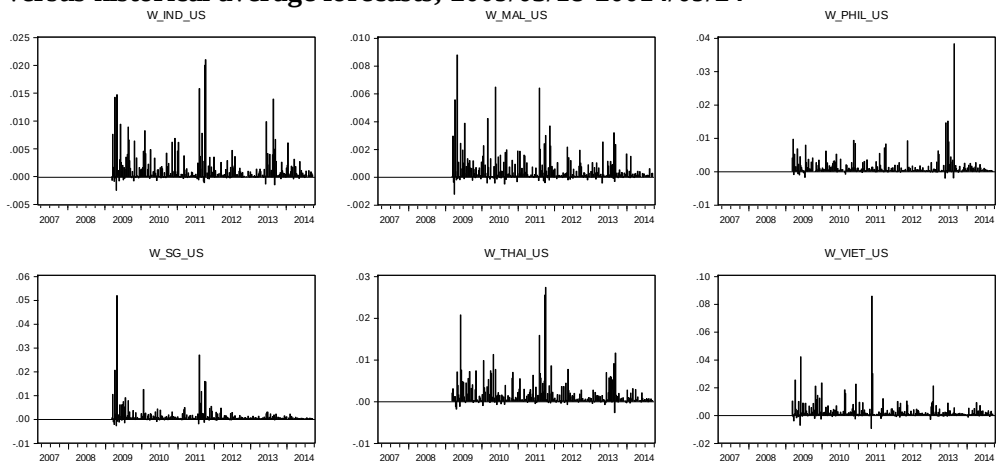


Figure I.D. Out-of-sample results, forecasts based on lagged United States returns versus historical average forecasts; 2009/03/18-20014/09/24



CHAPTER 5 CONCLUSIONS

This study analyzes about stock return predictability in ASEAN equity market indices. I include lagged returns of industrialized countries from several regions as the predictors for return in ASEAN market indices. The Granger causality test allows us to investigate the predicive ability of lagged industrialized countries return on ASEAN equity markets. After controlling for two national macroeconomic variables (short term interest rate and term spread), and also countries' owned lagged returns, lagged returns of Canada, Germany, United Kingdom, and United States still have predictive power in predicting return of ASEAN equity market indices. The results for lagged Canada returns, United Kingdom returns and United States returns still persist after conducting out-of-sample test which increasing the reliability of lagged Canada returns, lagged United Kingdom returns and lagged United States returns as predictors for returns of ASEAN equity market indices.

Using news-diffusion model which is estimated through GMM procedure, I also test for information frictions between ASEAN equity markets and Canada, Germany, United Kingdom, also United States market. As those industrialized countries are more developed and bigger than ASEAN equity markets, there might be an existence of information frictions between those countries, because investors tend to focus on bigger markets, so relevant information for ASEAN equity markets diffuses gradually from those markets, therefore generating predictive power of lagged returns from those four countries to ASEAN indices. I find that returns shocks arising in Canada, Germany,

United Kingdom, and United States are fully incorporated to ASEAN equity markets with a lag, which supports the relevance of information frictionss. However, I do not mention the information frictions as the only key of this predictive power of lagged return from industrialized countries, as there might be another possible explanations of this predictive power other than information frictions.

This research brings another story that stock return predictability based on predictive regression model which include only national macroeconomic variables is insufficient for analyzing the returns of ASEAN equity indices, therefore lagged returns from other countries in this case Canada, Germany, United Kingdom, and United States should be augmented in order to explain returns of ASEAN markets.

References

Ang, Andrew. and Bekaert, Geert. 2007. "Stock Return Predictability: Is it there?" *The Review of Financial Studies, vol.20, no.3.*

Azman-Saini, W.N.W. Habibullah, M.Azali.M.S. and Matthews, K.G. 2002. "Financial Integration and the ASEAN-5 Equity Markets" *Applied Economics 34.* p. 2283-2288.

Bekaert, Geert. and Hodrick, Robert J. 1992. "Characterizing Predictable Components in Excess Returns on Equity and Foreign Exchange Markets" *The Journal of Finance, vol.47, no.2.* p. 467-509.

Boudoukh, Jacob. Richardson, Matthew P. and Whitelaw, Robert F. 1994. "A Tale of Three Schools: Insights on Autocorrelations of Short-Horizon Stock Returns" *The Review of Financial Studies, vol.7, no.3.* p. 539-573.

Campbell, John Y. and Thompson, Samuel B. 2008. "Predicting Excess Stock Returns Out of Sample: Can Anything Beat the Historical Average?" *The Review of Financial Studies, vol.21, no.4.*

Campbell, John Y. and Yogo, Motohiro. 2006. "Efficient Tests of Stock Return Predictability" *Journal of Financial Economics 81.* p. 27-60.

Chan, Kalok. 1993. "Imperfect Information and Cross-Autocorrelation among Stock Prices" *The Journal of Finance, vol.48, no.4.* p. 1211-1230.

Chang, Eric C. Mcqueen, Grant R. and Pinegar, J.Michael. 1999. "Corss-autocorrelation in Asian stock markets" *Pacific-Basin Finance Journal 7.* p. 471-493.

Chordia, Tarun. Roll, Richard. and Subrahmanyam, Avanidhar. 2005. "Evidence on the Speed of Convergence to Market Efficiency" *Journal of Financial Economics 76.* p. 271-292.

Chordia, Tarun. and Swaminathan, Bhaskaran. 2000. "Trading Volume and Cross-Autocorrelations in Stock Returns" *The Journal of Finance, vol. 55, no.2.*

Ferson, Wayne E. and Harvey, Campbell R. 1994. "Sources of Risk and Expected Returns in Global Equity Markets" *Journal of Banking and Finance 18.* p. 775-803.

Goyal, Amit, and Ivo Welch. 2008. "A Comprehensive look at the empirical performance of equity premium predictions" *Review of Financial Studies 21.* p. 1455-1508.

Harvey, Campbell R. 1991. "The World Price of Covariance Risk" *The Journal of Finance 46.* p. 111-157.

Harvey, Campbell R. 1995. "Predictable Risk and Returns in Emerging Markets" *The Review of Financial Studies, vol.8, no.3.* p. 773-816.

Heston, Steven L. and Sadka, Ronnie. 2010. "Seasonality in the Cross Section of Stock Returns: The International Evidence" *Journal of Financial and Quantitative Analysis, vol.46, no.5.* p. 1133-1160.

Hjalmarsson, Erik. 2010. "Predicting Global Stock Returns" *Journal of Financial and Quantitative Analysis, vol.45, no.1.* p. 49-80.

Hong, Harrison. and Stein, Jeremy C. 1990. "Unified Theory of Underreaction, Momentum Trading, and Overreaction in Asset Markets" *The Journal of Finance, vol. 54, no.6.* p. 2143-2184.

Hong, Harrison. Torous, Walter. and Valkanov, Rossen . 2007. "Do Industries Lead Stock Markets?" *Journal of Financial Economics 83.* p. 367-396.

Hou, Kewei. 2007. "Industry Information Diffusion and the Lead-lag Effect in Stock Returns" *The Review of Financial Studies 20.* p. 1113-1138.

Hou, Kewei. And Moskowitz, Tobias J. 2005. "Market Frictions, Price Delay, and the Cross-Section of Expected Returns" *The Review of Financial Studies, vol.18, no.3.*

Lewellen, Jonathan. 2004. "Predicting Returns with Financial Ratios" *Journal of Financial Economics 74.* p. 209-235.

Lo, Andrew W. and Mackinlay, A.Craig. 1990. "When are Contrarian Profits Due to Stock Market Overreaction?" *The Review of Financial Studies, vol.3, no.2.* p. 175-205.

McQueen, Grant. Pinegar, Michael. and Thorley, Steven. 1996. "Reaction to Good News and the Cross-Autocorrelation to Portfolio Returns" *The Journal of Finance, vol.51, no.3.* p 889-919.

Peng, Lin. 2005. "Learning with Information Capacity Constraints" *The Journal of Financial and Quantitative Analysis, vol.40, no.2.* p. 307-329.

Rapach, David E. Strauss, Jack K. and Zhou, Guofu. 2013. "International Stock Return Predictability: What Is the Role of the United States?" *The Journal of Finance, vol. 68, no.4.*

Rizova, Savina. 2010. "Predictable Trade Flows and Returns of Trade-Linked" *Working Paper.* University of Chicago.

Shahrur, Husayn. Becker, Ying L. and Rosenfeld, Didier. 2010. "Return Predictability along the Supply Chain: The International Evidence" *Financial Analysts Journal, vol.66, no.3.* p. 60-77.

Solnik, Bruno. 1993. "The Performance of International Asset Allocation Strategies using Conditioning Information" *Journal of Empirical Finance 1.* p. 33-55.

Titman, Sheridan. 2013. "Financial Markets and Investment Externalities" *The Journal of Finance, vol. 68, no.4.*

Online Sources:

www.aseanexchanges.org [Asean Exchange official website]

www.asean.org [ASEAN community official website]

Appendix I

Table VIII
Information on Short Term & Long Term Interest Rates

The table reports interest rates data for ASEAN and Industrialized countries. Column 3 reports short term interest rates for each country. Column 4 mentions long term interest rates series. Data is collected from Data Stream.

Country	Abbreviation	Short Interest Rate Series	Long Interest Rate Series
Indonesia	INA	Indonesia SBI 90 Day	TR Indonesia GVT BMK Bid Yld 10Y
Malaysia	MAL	Malaysia T-bill Band 4	TR Malaysia GVT BMK Bid Yld 10Y
Philippine	PHIL	Philippine Treasury Bill 91 D	TR Philippines GVT Bid Yld 10Y
Singapore	SG	Singapore T-bill 3 Month Disc	TR Singapore GVT BMK Bid Yld 10Y
Thailand	THAI	Thailand Ref.Rate 3 Month	TR Thailand GVT Bid Yld 10Y TB
Vietnam	VIET	Vietnam Interbank 3 Month	TR Vietnam GVT BMK Bid Yld 10Y
Australia	AUS	Australia Dealer Bill 90 D	TR Australia GVT BMK Bid Yld 10Y
Canada	CAN	Canada Treasury Bill 3 Month	TR Canada GVT BMK Bid Yld 10Y
France	FRA	Euro 3 month interbank rate	FR Benchmark 10 Year DS Govt Index
Germany	GER	Euro 3 month interbank rate	BD Benchmark 10 Year DS Govt Index
Hongkong	HK	HKD Interbank Fix 3 Month	TR Hong Kong GVT BMK Bid Yld 10Y
Japan	JPN	Japan Interbank 3M	JP Benchmark 10 Year DS Govt Index
Netherlands	NED	Euro 3 month interbank rate	TR Netherlands GVT Bid Yld 10 Y
South Korea	KOR	Korea NCD 91 Days	TR Korea GVT BMK Bid Yld 10Y
Switzerland	SWISS	Swiss Liq. Financing Rate	TR Switzerland GVT Bid Yld 10Y
Taiwan	TAIW	Taiwan Money Market 90 Days	TR Taiwan GVT BMK Bid Yld 10Y
United Kingdom	UK	UK Treasury Bill Tender 3M	UK Benchmark 10 Year DS Govt Index
United States	US	US T-bill Sec Market 3 Month	US Benchmark 10 Year DS Govt Index

Appendix II

Table IX
Pairwise Granger Causality Test (for *i* = Industrialized Countries)

The table reports OLS estimates of $\beta_{i,j}$ for the predictive regression model

$$r_{i,t+1} = \beta_{i,0} + \beta_{i,i} r_{i,t} + \beta_{i,j} r_{j,t} + \beta_{i,b} bill_{i,t} + \beta_{i,s} spread_{i,t} + \epsilon_{i,t+1}, \quad i \neq j$$

Where $r_{i,t+1}$ is the weekly national currency excess return and $bill_{i,t}$ ($spread_{i,t}$) is the short term interest rate (term spread) for country i. t-statistics are reported in parentheses; t-statistics are for testing H_0: $\beta_{i,j}$ = 0 against H_A: $\beta_{i,j}$ > 0. (**) & (*) indicate significance at 5% and 10% level according to wild bootstrapped p-values. "Pooled" estimates impose the restrictions that $\beta_{i,j} = \bar{\beta}_j$ for i ≠ j.

(i)	(βi,IND)	(βi,MAL)	(βi,PHIL)	(βi,SG)	(βi,THAI)	(βi,VIET)
Australia	-0.12	-0.17	-0.08	0.01	-0.12	0.00
	(-1.57)	(-1.32)	(-0.93)	(0.13)	(-1.62)	(0.08)
Canada	-0.11*	-0.26**	-0.11	-0.11	-0.07	-0.03
	(-1.80)	(-2.69)	(-1.55)	(-1.38)	(0.31)	(-0.93)
France	-0.12*	-0.24**	-0.13*	-0.12	-0.13*	-0.01
	(-1.77)	(-2.11)	(-1.70)	(-1.20)	(-1.74)	(-0.32)
Germany	-0.14**	-0.28**	-0.17*	-0.17	-0.16**	-0.01
	(-1.98)	(-2.17)	(-1.94)	(-1.44)	(-2.15)	(-0.16)
Hong Kong	-0.19	-0.13	-0.02	0.70	-0.18	-0.01
	(-1.61)	(-0.70)	(-0.14)	(0.44)	(-1.49)	(-0.18)
Japan	-0.19**	-0.20	-0.22**	0.04	-0.16*	-0.02
	(-2.15)	(-1.34)	(-2.01)	(0.44)	(-1.87)	(-0.51)
Netherlands	-0.14*	-0.33**	-0.16*	-0.14	-0.14*	-0.02
	(-1.89)	(-2.57)	(-1.85)	(-1.30)	(-1.82)	(-0.38)
South Korea	-0.16*	-0.04	0.04	0.20*	-0.10	-0.02
	(-1.63)	(-0.28)	(0.42)	(1.94)	(-0.97)	(-0.48)
Switzerland	-0.05	-0.15	-0.08	-0.07	0.11**	0.01
	(-1.03)	(-1.54)	(-1.27)	(-0.86)	(-1.97)	(0.19)
Taiwan	-0.15*	-0.23*	-0.09	0.04	-0.10	-0.03
	(-1.67)	(-1.84)	(-1.10)	(0.38)	(-1.11)	(-0.71)
United Kingdom	-0.08	-0.25**	-0.08	-0.14	-0.11	0.00
	(-1.30)	(-2.32)	(-1.07)	(-1.46)	(-1.62)	(0.08)
United States	-0.11	-0.27**	-0.13*	-0.12*	-0.12	0.00
	(-1.45)	(-2.27)	(-1.73)	(-1.66)	(-1.57)	(0.06)
POOLED	-0.13**	-0.21**	-0.10**	-0.05*	-0.12**	-0.01
	(-5.75)	(-5.62)	(-3.84)	(-1.70)	(-5.01)	(0.53)

Abstract (in Korean)

주식 수익률의 예측가능성:
ASEAN 국가들의 주가지수를 중심으로

본논문에서는 선진국의 과거 주식수익률을 이용하여 ASEAN 국가들의 주식시장 수익률을 예측할 수 있는지 분석하였다. 분석을 위하여 ASEAN 의 6 개국의 주가지수와 12 개 선진국 주가지수의 주간 수익률 자료를 이용하였다. 국가들을 둘씩 짝지어 그랜저 인과관계 검증을 수행한 결과 캐나다, 독일, 영국 및 미국의 과거 수익률이 아세안 6 개국의 주가지수 수익률 예측에 통계적으로 유의한 양의 상관관계를 갖는다는 것을 밝혔으며 이는 ASEAN 국가들의 과거 수익률 및 거시경제 변수들을 통제한 이후에도 유의한 것으로 나타났다. 반면 ASEAN 국가들의 과거 수익률은 선진국 주식 수익률에 대해 예측력이 없는 것으로 나타났다. 본 분석에서는 예측력의 근원을 확인하기 위하여 정보 확산 모형(news-diffusion model)을 사용하였다. 분석결과 4 개 국가의 주식시장에서 정보 마찰이 존재하는 것으로 나타났다.

주요어:
주식수익률 예측력, 아세안주가지수, pairwise그랜저 인과관계, 선후행성, 정보 확산 모형, 정보 마찰.

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