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THE EMPIRICAL ANALYSIS OF RETURNS PREDICTABILITY OF FINANCIAL RATIOS IN ASIA-PACIFIC MARKETS

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วิทยานิพนธ์นี้ ศึกษา ความสามารถในการพยากรณ์อัตราผลตอบแทนของอัตราส่วนทางการเงิน ซึ่งก็คือ อัตราส่วนเงินปันผลต่อราคา (dividend to price)และ อัตราส่วนกำไรต่อราคา (earnings to price) ในตลาดเอเชียแปซิฟิก ตัวอย่างที่ใช้ในการศึกษาครั้งนี้ครอบคลุมระยะเวลาตั้งแต่เดือน มกราคม 2533 ถึง ธันวาคม 2548 และผู้จัดทำยังได้ทำการศึกษา ความสามารถในการพยากรณ์อัตราผลตอบแทน ทั้งช่วงก่อนและหลังวิกฤตเศรษฐกิจ (ม.ค. 2533 – มิ.ย. 2540 และ ม.ค. 2543 – ธ.ค. 2548) แยกต่างหากจากกัน จากการศึกษาพบความสามารถในการพยากรณ์ของอัตราส่วนเงินปันผลต่อราคา และ อัตราส่วนกำไรต่อราคา ภายในภูมิภาคเอเชียแปซิฟิก สำหรับอัตราส่วนเงินปันผลต่อราคาพบว่า มีความสามารถในการพยากรณ์ที่ค่อนข้างคงที่ทั้งในช่วงก่อนและหลังวิกฤตเศรษฐกิจในหลายๆประเทศ มีความเป็นไปได้ว่าผลกระทบเฉพาะตัวในแต่ละประเทศมีอิทธิพลต่อความสามารถในการพยากรณ์ของอัตราส่วนเงินปันผลต่อราคา นอกจากนี้ยังพบว่าอัตราส่วนเงินปันผลต่อราคา มีบทบาทสำคัญในการพยากรณ์ผลตอบแทนของตลาดที่พัฒนาแล้วมากกว่าตลาดที่กำลังพัฒนา เมื่อเปรียบเทียบกับอัตราส่วนเงินปันผลต่อราคาแล้วพบว่าอัตราส่วนกำไรต่อราคา ให้ผลลัพธ์ที่น่าพอใจน้อยกว่า จากการศึกษาพบว่าความสามารถในการพยากรณ์ อัตราส่วนกำไรต่อราคา ไม่คงที่และเป็นไปได้ว่าขึ้นอยู่กับผลกระทบเฉพาะตัวของแต่ละประเทศและช่วงเวลาในการทำการศึกษา ยิ่งไปกว่านั้นการวิจัยเต็มช่วงระยะเวลาแสดงให้เห็นว่าความสามารถในการพยากรณ์ อัตราส่วนเงินปันผลต่อราคา มีแม่นยำขึ้น ในตลาดที่พัฒนาแล้ว ในขณะที่ให้ผลในทางตรงกันข้ามกับการพยากรณ์ อัตราส่วนกำไรต่อราคา

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TARADOL VIJAKKIT: THE EMPIRICAL ANALYSIS OF RETURNS PREDICTABILITY OF FINANCIAL RATIOS IN ASIA-PACIFIC MARKETS. THESIS ADVISOR: MANAPOL EKKAYOKKAYA, PH.D., THESIS CO-ADVISOR: ANANT CHIARAWONGSE, PH.D., 51 pp. ISBN 974-14-3473-1

This study investigates predictive ability of financial ratios; namely the dividend to price ratio (*D/P*) and earnings to price ratio (*E/P*), in ten Asia-Pacific markets. The sample used in this study covers the period January 1990 through December 2005. Return predictability is also analyzed separately during the pre-crisis period (January 1990 - June 1997) as well as the post-crisis period (January 2000 - December 2005). This study found significant predictive power of the *D/P* and *E/P* ratios in Asia Pacific. For *D/P*, consistent predictive powers are found in both pre and post-crisis period in several countries. There is a likelihood that certain country-specific effects may partly influence the predictability of *D/P*. Comparing among countries that exhibit *D/P* predictability, *D/P* plays an important role in predicting returns in developed markets more than in emerging markets. In comparison to *D/P*, *E/P* is a less successful variable. Evidence of *E/P* predictability is inconsistent and varies across countries and periods. Over the full sample period, evidence of predictive power is stronger for developed markets than for emerging markets.

Department: Banking and Finance	Student's Signature: ....
Field of Study: Finance	Advisor's Signature: ....
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CHAPTER I

Introduction

1.1 Background and Problem Review

For a long time, uncertainties in stock market return have been leading investors to wonder what the factors that drive the stock returns are. There are several empirical studies focusing on many variables. For example, DeBondt and Thaler (1985), Jegadeesh (1990), and Jegadeesh and Titman (1993) test whether changes in price could be predicted using past returns. They focus on using past returns to predict future returns. Some focus on using macroeconomic variables such as inflation rates (see, Bodie (1976); Jaffe and Mandelker (1976); Fama and Schwert (1977); Fama (1981)), unemployment rates (e.g., Boyd, Hu and Jagannathan (2005)), and interest rates (e.g., Campbell (1998), Bekaert and Hodrick (1992)). Another strand of the literature focuses on using financial ratios (e.g., Campbell and Shiller (1988a); Kothari and Shanken (1997); Fama and French (1988b)). Comparing to other variables, it is likely that financial ratios, specifically *D/P* and *E/P* are one of the best-known variables that are found to have forecasting power for stock returns.

However, several studies suggest that the typical forecasting regression for stock returns appears to face some econometric problems especially when using variables such as *D/P* and *E/P* as a regressor. Early work such as Fama and French (1988b) and Campbell and Shiller (1988a), which mostly ignore this issue, concludes that there is generally a strong evidence of stock returns predictability. In the context of predictive regressions, when the rate of return is regressed on a lagged stochastic regressor, such as *D/P*, the price component in *D/P* depends on price at the end of period $t-1$. In this case the value of that regressor at the end of period t reflects changes in asset prices during period t, as the rate of return does. The standard regression-model assumption that error-term is serially uncorrelated and has zero expectation condition on predictive variable is violated. The consequence is that the OLS estimators of the coefficients are biased and have sampling distribution that differs from those in the standard setting.

Later, several new econometric methods have been developed. As a result, the methodological advances lead to a more accurate assessment of the return predictability especially for *D/P* and *E/P*. Two superior approaches for this kind of problem are Stambaugh (1999) and Lewellen (2004). Stambaugh (1999) studies the exact small-sample distribution of the estimated predictive slope and introduces a unique Bayesian practice to this type of predictability problem. Lewellen (2004) shows that more information can be added to the frequentist approach to correct the bias in the OLS method. His work proves that if we incorporate more information to the frequenist approach, the result we get will be more precise. He tests predictive ability of *D/P* and *E/P* of the U.S. market. The evidence from the U.S. market shows that the information added to the frequentist approach makes the result of the frequentist approach consistent to the Stambaugh (1999) Bayesian approach. Thus far, it appears that the two superior methods put forward by Stambaugh (1999) and Lewellen (2004) have been applied only to the U.S. market. Leamer (1983) points out that it is not appropriate to continue testing a hypothesis using data from where the hypothesis was first generated since any tests may lead to fragile inference. A comprehensive out-of-sample study to investigate the predictability of financial ratios is then warranted.

This thesis chooses a balance mix of both developed and emerging markets from the Asia-Pacific region as out-of-sample data. Emerging market countries are interesting because of their relative isolation from the capital markets of other countries (see, Harvey (1995)). In addition, the study of Harvey (1995) provides some differences between the predictability in emerging and developed markets, especially testing the return predictability of the local information variables, which are lagged country returns, the change in the foreign exchange rate, a local short-term interest rate, and *D/P*. Another interesting aspect of the Asia-Pacific markets is the 1997 Asian Financial Crisis. There are several empirical and analytical studies on the 1997 Asian crisis (e.q., Chowdhry and Goyal (2000), Chakrabartia and Roll (2002)). The sharp fall in asset prices and currency values in several countries simultaneously affects both developed and emerging Asian capital markets. It is possible that the crisis has an impact on investors' perception of fundamental information. For example, the finding of DeLint (2002) indicates that during the stable periods and close to the crisis period, investors are concerning about different factors that influence the return. Therefore, it is possible that the way investors investing outside the U.S. perceive and interpret fundamental information that is publicly available such as financial ratios differs from the way investors in the U.S. market see.

Despite extensive empirical researches on the international capital markets, examination of the predictive power of the important financial ratios, specifically *D/P* and *E/P*, using superior methodology appears to have been neglected in the extant literature. More understanding in regards to the predictability of return can be gained by applying superior methodology of Stambaugh (1999) and Lewellen (2004) to an analysis of the international markets both emerging and developed markets.

1.2 Statement of Problem / Research Questions

The research gap discussed in the above section points to the following problem which is investigated in this thesis: whether or not the empirical conclusion on the predictive ability of financial ratios drawn in the U.S. market can be generalized in markets outside the U.S.

1.3 Objective of the Study

Given the problem stated above, the objective of this thesis is to examine the predictive ability of financial ratios in Asia-Pacific markets, namely: Japan, Hong Kong, Singapore, Australia, New Zealand, Korea, Taiwan, India, Malaysia, and Thailand, using the methodologies adopted in the recent studies by Stambaugh (1999) and Lewellen (2004).

1.4 Scope of the Study

In empirically carrying out the research objective stated in section 1.3, the scope of this study is restricted to only the analysis of financial ratios. Tests of return predictability using past returns and macro-economic variables are alternative tests to tests involving financial ratios – like those to be conducted in this study. Tests based on past returns and macroeconomic variables are hence beyond the scope of this thesis.

1.5 Contribution

Following from the discussion above, this thesis makes important contribution to the extant literature in two folds. First, it provides new and original evidence on return predictability in the Asia-Pacific region, both emerging and developed markets.

Secondly, it provides methodological robustness for the results by employing two different statistical approaches: one from the frequentist school and one from the Bayesian school.

CHAPTER II

Literature Review

2.1 Market Efficiency and Return Predictability

If stock markets are efficient then it should not be possible to predict stock returns. The question is: what does an efficient market mean? Basically, the explanation would be that stock prices reflect all available information that is relevant for the stock. Thus, no investor can earn an abnormal return, which is an excess return after adjusting for risk. Fama (1970) made a distinction between three forms of efficient market hypothesis according to the reflection of the information set, which are weak-form, semi-strong form, and strong-form. The weak form of the hypothesis suggests that current stock prices fully reflect all security market information, including the historical prices, trading volume data, and other market-generated information. This hypothesis implies that past rates of return and other historical market data should have no relationship with future rates of return. The semi-strong form of the efficient market hypothesis asserts that security prices reflect all publicly available information. Public information includes all non-market information, such as *D/P* and *E/P*. This hypothesis implies that investors who base their decisions on any new information after it is public should not get above-average risk-adjusted rates of return from their transactions. The strong form suggests that all information in a market, whether public or private, is accounted for in a stock price. Therefore, even using insider information, no group of investors should be able to consistently earn above-average risk-adjusted rates of return. However, it is the semi-strong form of efficient market that has formed the basis for most empirical research.

Yet, before we can conclude that certain investors are able to earn abnormal return, the normal rate of return, or risk-adjusted rate of return, need to be defined. An asset pricing model or risk adjustment procedure is used to calculate this risk-adjusted rate of return. For a procedure like this, tests of market efficiency are joint tests of efficient market hypothesis and the risk adjustment procedure. Therefore, by opting to reject the risk adjustment procedure, it leaves with no conclusion about market efficiency. For example, if any investment policies are likely to generate realized return, which is significantly higher than the normal return, on the one hand it can be concluded that market is inefficient, on the other hand it can be concluded that it simply is the risk adjustment procedure that has failed.

Even it is impossible to test market efficiency, it is likely that the empirical work on market efficiency helps improving the ability to describe the time-series and cross-section behavior of security returns. Since market efficiency and equilibrium-pricing model are inseparable, *tests for return predictability* were later defined by Fama (1991) in order to cover a new perspective of weak-form tests and semi-strong form tests. Instead of focusing on testing the degree of market efficiency, *tests for return predictability* change the focus to the ability to describe the time-series and cross-section behavior of security returns. In addition, they concern not only the forecasting power of past returns, but also other observable variables.

Early return predictability tests focus on whether trends in past prices can be used to predict movement in price. Technical analysts believe that profits can be made by trend following (see e.g. Campbell, Grossman and Wang (1993)). In other words if a particular stock price is steadily rising or trending upward then a technical analyst will look for opportunities to buy this stock. The widely used approach for detecting trend in stock prices is by measuring the serial correlation of stock market returns (see e.g. Hsieh and Fung (2001)). Serial correlation, or autocorrelation, measures the correlation coefficient between a series of numbers with lagged numbers in the same series. A significant positive serial correlation indicates the presence of trends. The negative serial correlation indicates the existence of more reversals than might occur randomly. If this serial correlation is different from zero, it seems that certain degree of return predictability is found. In addition, numbers that are truly random will have zero serial correlation. If capital market is efficient, zero serial correlation is expected.

Several serial correlation studies about security prices have been published. Many different securities, different lags, and different sample periods have been used. Evidence of positive serial correlations has been reported. For example, French and Roll (1986) find positive serial correlations of daily returns on the individual stocks of NYSE firms. Lo and MacKinlay (1988) investigate weekly returns of NYSE stocks and find positive serial correlation over short horizons. However, evidence of return predictability in short horizon, which basically less than one year, is not strong. Even though correlation coefficients of short-horizon returns deviate from zero, they are still not economically significant different from zero. In the other words, the evidence does not suggest the existence of trading opportunities.

Longer horizons, or returns over multiyear periods, are also examined. Summer (1986) test of long horizon have found that even short horizon returns serial correlation are close to zero, at long horizon, strong negative serial correlation, close to -0.5, is found. This strong negative serial correlation suggests that stock price fluctuating around it fair value more than it might occur randomly. However, the interpretation of this time variation in returns is controversial. On the one hand Summer (1986) interpreted temporary swings in stock prices as a result of irrational bubbles, which stand for a wave of public enthusiasm that evolved into herd behavior. On the other hand, Fama and French (1988a) interpreted it as a result of rational time-varying expected returns. These returns are driven by rational economic behavior, which are the investment opportunities of firms and the tastes of investors for current versus risky future consumption.

Comparing technical analysis to fundamental analysis, fundamental analysis concerns with a wider set of information to create portfolios than does technical analysis. Therefore, several studies have further investigated whether stock returns can be predicted by other publicly available information beyond the treading history of a security, such as, *D/P*, and *E/P* (see e.g. Charest (1978), Rozeff (1984), and Harvey (1991)). The most influential papers, for example, are Campbell and Shiller (1988b) and Fama and French (1988b). They use a regression framework to show that fundamentals such as *D/P* and *E/P* are able to predict a significant proportion of returns. Campbell and Shiller (1988b) find that *E/P* has reliable forecast power that increases with the return horizon, that is, *E/P* is better at predict long run returns than short run returns especially when past earnings are averaged over 10 years. Fama and French (1988b) show that *D/P* is able to predict a significant proportion of the value-weighted and equally weighted portfolios of NYSE stock for horizons from 1 to 60 months, and explanatory power also increases with the return horizon.

Evidence of *D/P* or *E/P* return predictability is not in itself evidence for or against market efficiency. Again, the interpretation of these results is difficult. Whether *D/P* or *E/P* return predictability be interpreted as irrational bubbles or rational time-varies expected return is controversial. Fama and French (1989) show that there are common variations in expected returns, which are systematic patterns in the variation of expected returns of different securities through time, due to variation risk premium which suggest that it is rational. They find that risk premium, which is represented by yield spread between high- and low-grade bonds, and *D/P* had greater predictive power for returns on low-grade bonds than for returns on high-grade bonds, and greater predictive power for stock returns than bond returns. Since *D/P* and *E/P* are proxying for variation in risk premium (Fama and French (1989), Campbell and Shiller (1988b)), this suggests that the predictability in returns is in fact a rational expectation of change in risk premium rather than evidence of market inefficiency, or irrational bubbles. Therefore, evidence that stock returns can be predicted by *D/P* or *E/P* do not violate of the efficient market hypothesis.

The irrational-bubble side could argue that common variation in expected returns can be interpreted as irrational bubbles are correlated across assets. However, the efficient-market side may argue that irrational bubbles which correlated across assets may occur due to rational expectation on business conditions. Business conditions make the interpretation become more ambiguous. For example, consider a case that there is common variation in expected returns of different securities due to a variation in business conditions. Then measured variations in expected returns that are the spurious result of sample-specific conditions is likely to be common across securities. Therefore, interpreting it as a rational variation in expected returns is likely to be inappropriate.

All of which shows that, it is difficult to decide whether return predictability is the result of rational variation in expected returns or irrational bubble. Fama (1991) suggests that evidence of predictability should be met with skepticism and a diligent search for out-of-sample confirmation.

2.2 Empirical Studies

The literature on stock returns predictability is extensive. Many studies find that there are several variables that can be used to predict stock returns (see e.g., Fama and French (1988b), Campbell and Shiller (1988b), Harvey (1989), Ferson and Harvey (1991), Nelson and Kim (1993), Whitelaw (1994), Kothari and Shanken (1997), Pontiff and Schall (1998), Stambaugh (1999), and Lewellen (2004)). Table 1 summarizes these results. Comparing to other many different variables, it is likely that *D/P* is one of the best-known variables that are found to have forecasting power for stock returns. Additionally, it can be seen from table 1 that the predictability of *D/P* has been investigated overtime.

One of the reasons of the *D/P* predictability reinvestigating has been mainly driven by the development of several new econometric methods that enable us to more accurately assess the evidence of stock returns predictability. Since the typical forecasting regression for stock returns is plagued with some difficult econometric problems due to the near persistence. In other words, the problem comes from the value of the forecasting variable’s autocorrelation which is close to one and the endogeneity of the forecasting variables.

Table 1
Variables and Predictability

This table reports predictability of variables, which are included in the analysis for a selection of 10 articles on stock returns predictability from the U.S market. Under I/P, I refers to index of stocks (e.g. NYSE or S&P index), P refers to a stock portfolio based on financial characteristics of the data (e.g. size or industry). Sample period refers to what period of returns is studied. For M/Q/A, M refers to monthly data, Q refers to quarterly data and A refers to annual data. For variable used in the studies: ‘DP’ denotes dividend-to-price, ‘EP’ denotes earnings-to-price, ‘BM’ denotes book-to-market, ‘SIJ’ denotes credit spread between the yields of investment grade and below investment grade bonds, ‘TS’ denotes yield on a short-term T-Bill, ‘SSL’ denotes term spread between the yields on long-term government bonds and the short term T-bill, ‘SCS’ denotes yield spread between the yields on commercial paper and the short-term T-bill. ‘+’ (‘-’) is used to signify a positive (negative) but insignificant relation, and ‘+*’ (‘-*’) means a significant positive (negative) relation.

Study	I/P	Sample period	M/Q/A	DP	EP	BM	SIJ	TS	SSL	SCS
Fama and French (1988b)	P	1927-1986	M,Q,A	+*						
Campbell and Shiller (1988b)	P	1926-1986	A	+*	+*					
Harvey 1989	I	1941-1987	M	+*			+*		+*	
Ferson and Harvey (1991)	I	1964-1986	M	+*			+	-*	+	
Nelson and Kim (1993)	I	1972-1986	A	+*						
Whitelaw (1994)	I	1953-1989	M	+*			+*	-*		-
Kothari and Shanken (1997)	I	1926-1991	A	+*		+*				
Pontiff and Schall (1998)	I	1926-1994	M	-		+	+*	-	+	
Stambaugh (1999)	I	1927-1996	M	+*						
Lewellen (2004)	I	1963-2000	M	+*	+	+				

Using forecasting variable which is not really exogenous variable but lagged endogenous variable will lead to violation of one of the standard assumptions of OLS, namely the independence at all leads and lags. This is especially true in the case where the forecasting variable is a financial ratio, including *D/P* and *E/P*. Section 3.3.1 discusses how those financial ratios cause the bias in the predictive slopes in more detail.

Although early work such as Fama and French (1988b) and Campbell and Shiller (1988b) ignored these issues and concluded that there is generally strong evidence of stock returns predictability, more recent research tends to support and further refine the evidence for return predictability. Several new econometric methods have been developed (see e.g., Nelson and Kim (1993), Goetzmann and Jorion (1993), Kothari and Shanken (1997), Stambaugh (1999), Lewellen (2004)). As a result, these methodological advances lead to more accurately assess the return predictability of persistence variable, such as *D/P* and *E/P*.

In addition to studies that provide predictability evidence, only a few studies point out that there is not a strong statistical relationship between *D/P* and stock returns, for example, Goetzmann and Jorion (1993). Bossaerts and Hillion (1999) use several statistical model selection criteria to investigate the predictability of stock returns using *D/P* and find in-sample predictability but no out-of-sample forecasting power. Goyal and Welch (2003) find the predictive power of the *D/P* is present in pre- but not post-1990 data. They suggest that any explanatory predictive ability of the *D/P* in the pre-1990 period is due to two really good predictive years only, which are 1973 and 1974.

However, using the most efficient and robust methods to date to test the *D/P* and *E/P* predictability, Stambaugh (1999) and Lewellen (2004) still find evidence of *D/P* predictability in the U.S market; however, their results are less conclusive than the earlier studies. Specifically, the predictive ability of *D/P* and *E/P* appear sensitive to the sample period and the choice of frequency (annual to monthly).

2.3 International Return Predictability

In spite of these substantial methodological advances, there have been surprisingly few attempts at furthering our understanding of stock returns predictability using data other than that of the U.S. market. Because the predictable component of stock returns appears to be small, if one does exist, there seems to be little possibility of reaching a decisive conclusion using just the U.S. data alone. In fact the U.S. data provides simply one time-series at the market level. In addition, Leamer (1983) states that it is not appropriate to continue testing a hypothesis using data from which the hypothesis was first generated since any tests may lead to fragile inference. A comprehensive out-of-sample study to investigate the predictability of financial ratios is thus warranted.

Early international return predictability tests focus on other developed country. A motivation for examining international markets is that, to the extent that these markets move independently from the U.S., they provide independent samples to study returns predictability. A number of studies have found evidence of return predictability in developed markets outside of the U.S. Bekaert and Hodrick (1992) study the *D/P* predictability from other three different countries, including U.K, German, and Japan from period 1981-1989. Variable such as *D/P*, that were known to predict returns, are demonstrated to have predictive power for returns in the foreign markets. Similarly, Harvey (1991) and Ferson and Harvey (1993) consider various aspects of predictability, including *D/P* and *E/P* , in international stock returns. The data sets used in these studies cover several countries. However, no robust econometric methods are used. Most results are based on regressions framework. Campbell (2003) considers the evidence of stock returns predictability using an international data set of 11 developed countries with observations going back to the 1970s, including Australia, Canada, France, Germany, Italy, Japan, the Netherlands, Sweden, Switzerland, the U.K, and the U.S.. However, his study focuses on testing the predictability of macro-economic variables. Ang and Bekaert (2003) analyze predictability in stock returns from four different countries, in addition to the U.S, including U.K., France, and German. Their result provides supportive evidence of *D/P* return predictability. Similarly, only developed markets have been analyzed and their results are based on regression framework. Rapach, Wohar and Rangvid (2005) test the predictive ability of forecasting variables outside the U.S. They measure and assess the statistical and economic predictability of stock returns in several developed countries, including Australia, Canada, France, Germany, Japan, Netherlands, Sweden, the U.K. and the U.S.. Five forecasting variables are taken into account, including *D/P*, *E/P*, the short-term interest rate, the long-term interest rate, and the term spread. Their study finds no common pattern of stock returns predictability across countries. The ability of predictive regression models to predict international stock returns appears to be very limited.

From the perspective of collecting independent samples, emerging market countries are interesting because of their relative isolation from the capital markets of other countries. Comparing to developed markets, the correlation between most emerging markets and other stock markets has been low (see, Harvey (1995)), and until recently several emerging countries restricted investment by foreign investors. Therefore, the relative segmentation of emerging markets provides a unique opportunity to examine returns predictability. Harvey (1995) provides a comprehensive analysis of 20 new equity markets in emerging economies. The predictability of the emerging market returns is investigated using both world and local information variables. His study shows that there are some differences between the predictability in emerging and in developed markets. For example, in developed markets, the market's correlation with the U.S return is closely linked to the degree of predictability while there is not so for the emerging markets. In addition, the local information variables, which are lagged country returns, the change in the foreign exchange rate, a local short-term interest rate, and *D/P*, play an important role in predicting emerging market returns. The fact that much of the predictability is induced by local information is possibly due to that some of there countries are segmented from world capital markets. Polk, Thompson and Vuolteenaho (2004) use an international sample consisting of 22 countries with observations dating back to 1975, but they only analyze the predictive ability of their cross-sectional beta-premiums. Still, they do not consider common forecasting variables such as *D/P* and *E/P*. Hjalmarsson (2004) is one of the up-to-date econometric studies that test the predictive ability of forecasting variables outside the US, which contain over 40 international markets both developed and emerging markets. Four common forecasting variables are taken into account, including *D/P*, *E/P*, the short-term interest rate, and the term spread. However, his approach does not adjust for the bias which specifically occurs when using variables like *E/P* and *D/P*. He finds that no strong or consistent evidence of predictability is found when considering the *E/P* and *D/P* as predictors. Interest rate variables are more robust predictors of returns.

Although there has been some investigation of predictability in international stock returns, there are surprisingly few studies that deal with the well-known predictive variables, which specifically are *D/P* and *E/P*. For those studies that focus on the predictability of financial ratios, most of them do not explicitly address the issue of the small-sample bias in the OLS slope estimate by using either the Stambaugh (1999) or Lewellen (2004) correction approach. Besides, most of these rely on non-robust econometric methods. For the time being, there exist efficient and up-to-date econometric methods, which are developed particularly for testing the predictability of a particular variable like *D/P* and *E/P*. Thus far, there are no attempts to investigate the predictive ability of these common forecasting variables using up-to-date econometric methods for international markets apart from the U.S market.

CHAPTER III

Data and Methodology

3.1 Data

Data selection is reflected by a balance mix of 10 capital markets representing the main regions in Asia Pacific both developed and emerging markets, which includes Japan, Korea, Hong Kong, Singapore, Australia, New Zealand, Taiwan, India, Malaysia, and Thailand. The data in this study, market returns, market *D/P*, and market *E/P*, are obtained from Datastream®, on a monthly basis from January 1990 through December 2005. The data is arranged into three sets, the whole period, the pre-crisis, and the post-crisis periods. The Asian-financial crisis in this study began early in July 1997 and ended in December 1999 referring to an article of Lemco and Donald (1999). Therefore, for the whole period dataset, July 1997 to Deceomber1999 which considered a crisis period is excluded from the study due to a possible unreliable results caused by any volatility in variables during the crisis period. The pre-crisis is defined as the dataset that range from January 1990 to June 1997 and the post-crisis is defined as the January 2000 to December 2005.

3.2 Research Hypotheses

The recent literature suggests that emerging markets are segmented from the world's capital market. Local variables play a more important role in predicting returns of emerging markets than in developed markets (see e.g. Harvey (1995)). Since *D/P* and *E/P* are considered to be local variables, it can be expected that the predictability of those financial ratios in the U.S. market and emerging markets will be different.

3.3 Methodology

Three methodologies, OLS, Bayesian approach, and conditional approach are examined. For each methodology, an objective is to estimate the predictive slope which is β and standard deviation of β. However, before we can estimate β we have to calculate y_t, which is the return in period t and x_t. For x_t, I substitute two financial ratios, which are *D/P* and *E/P*. This study uses the natural log of *D/P* (log *D/P*), rather than the raw series, because Lewellen (2004) suggests that it has better time-series properties. For example, raw D/P being measured as a ratio is likely to be positively skewed. Taking logs helps solving this problem. Section 3.3.1 starts from discussing the properties of predictive regression as well as how ordinary least square bias. How to estimate β from Stambaugh (1999) Bayesian is provided in section 3.3.2. Finally, section 3.3.3 shows how to estimate β from Lewellen (2004) conditional approach.

3.3.1 Properties of Ordinary Least Square in Finite Samples

Many empirical studies in economics and finance focus on the regression

$$y_t = a + bx_{t-1} + u_t, \tag{1}$$

where y_t reflects the return in period t, x_{t-1} is a predictive variable known at the end of the period $t-1$, and u_t is the error term. This predictive regression has been commonly used to test if x_{t-1} (for example, past returns, financial ratios, interest rates, and many macroeconomic variables) can predict stock and bond returns, y_t.

In this illustration, I denote y_t as the return on the stock market and x_t as market dividend yield at time t. Next, assuming that the predictive variable, x_t, follows a first-order autoregressive (AR(1)) process,

$$x_t = f + r x_{t-1} + v_t, \tag{2}$$

where the vector $(u_t \;\; v_t)'$ is assumed to be normally distributed, independently across *t*, and $|r|$ is less than one, which implies the stationarity of the regression. However, the value of $|r|$ can be close to one. The OLS estimators of the coefficients in Eq.(1) can be calculated from

$$\begin{bmatrix} \hat{a} \\ \hat{b} \end{bmatrix} = (X'X)^{-1} X'y, \tag{3}$$

where $y = (y_1,...,y_T)'$, $X = [i_T \, x_{(l)}]$, $x_{(l)} = (x_0,...,x_{T-1})'$, and i_T denotes a $T \times 1$ vector of ones. The OLS estimates of Eq.(1) and Eq.(2) can be written as

$$\hat{b} = b + (X'X)^{-1} X'u, \tag{4}$$

$$\hat{p} = p + (X'X)^{-1} X'v, \tag{5}$$

where $b = (a \;\; b)'$ and $p = (f \;\; r)'$. The standard regression-model assumption which has to be maintained here is that u_t is serially uncorrelated and has zero expectation condition on $\{x_{t-1}, x_{t-2},...\}$. It can be written generally as

$$E(u_t \,|\, x_s, x_w) = 0, s < t \le w. \tag{6}$$

Eq.(6) is the assumption used to obtain finite-sample results in the standard setting. In this case, the price component in x_{t-1}, depends on price at the end of period $t-1$, then the value of that regressor at the end of period *t* reflects changes in asset prices during period *t*, as y_t does. Therefore, the assumption of Eq.(6) is violated. The consequence is that the OLS estimators of the coefficients in Eq.(1) are biased and have sampling distribution that differ from those in the standard setting. Stambaugh (1999) shows that, in this case, $E(u_t)$ has the relation in form

$$u_t = g\, v_t + e_t \text{, where } \gamma = \text{cov}(u,v)/\text{var}(v). \tag{7}$$

Because of the violation of Eq.(6), $\hat{r}$ is biased downward. The bias is propagated through the correlation between u_t and v_t. Stambaugh (1999) also discusses that if σ_{uv} < 0, it will lead to upward bias in $\hat{b}$ and if σ_{uv} > 0, it will lead to downward bias in $\hat{b}$. The bias disappears when σ_{uv} approaches zero. By substituting Eq.(5) and Eq.(7) into Eq.(4) where, $E(e|v) = 0$ implied by the i.i.d. normality assumption, so $E(e|X) = E(e \mid x_0, v_1, ..., v_{t-1}) = 0$ yields

$$\hat{b} - b = g\,(\hat{p} - p) + h \text{, where } h \equiv (X'X)^{-1} X'e, \tag{8}$$

where the random error, η, has mean zero and variance $s_e^2 (X'X)^{-1}$. Eq.(8) implies that autocorrelations, $\hat{r}$, has an influence on predictive slope, $\hat{b}$. From Eq.(8), let's consider the marginal distribution of $\hat{b}$ based on repeated sampling of both $\hat{r}$ and h. Taking expectation of Eq.(8) yields

$$E[\hat{b} - b] = gE(\hat{r} - r), \tag{9}$$

Sample autocorrelations are biased downward by approximately $-(1+3\rho)/T$, as shown by Marriot and Pope (1954) and Kendall (1954). Because $g < 0$, it induces an upward bias in the predictive slope. Moreover, autocorrelations are negatively skewed and more variable than suggested by OLS. Consequently, $\hat{b}$ is also positively skewed and more variable than suggested by OLS. The finite-sample estimation and inference cannot be done straightforwardly. Stambaugh (1999) discusses the marginal distribution of $\hat{b}$ in detail. However, to put this thesis in a position relative to prior studies, the traditional OLS-based results are also reported.

3.3.2 Bayesian Approach

Stambaugh (1999) introduced Bayesian approach for this kind of regression problem which departs from the classical approach. This section begins with the likelihood function and prior. Then I use prior and likelihood to form posterior distribution. Finally this posterior distribution has been used to compute *β*.

3.3.2.1 The Likelihood

The likelihood function is defined as the joint probability density function for all the data conditional on the unknown parameter. Using the definition of multivariate normal density we obtain

$$p(z \mid x_0, b, \Sigma) = (2p\left|\Sigma\right|)^{-(T/2)} \exp\{-\tfrac{1}{2}(z - Zb)'(\Sigma^{-1} \otimes I_T)(z - Zb)\} \qquad (10.1)$$

where $z = (y' \; x')$, $y = (y_1, ..., y_T)'$, $x = (x_1, ..., x_T)'$, x_0 is the initial observation of the regressor, b= ($\alpha \;\; \beta \;\; \varphi \;\; \rho$)’, Σ is the covariance matrix of error term in (1) and (2), $Z = I_2 \otimes X$, I_T denotes the $T \times T$ identity matrix, $X = [i_T \, x_{(l)}]$, $x_{(l)} = (x_0, ..., x_{T-1})'$, and i_T denotes a $T \times 1$ vector of ones. It is inappropriate to use Eq.(10.1) alone as likelihood function because Eq.(10.1) treats the initial observation x_0 as nonstochastic. To reflect stochastic nature of x_0, we assume x_0 has a normal distribution with mean $q/(1-r)$ and variance $s_v^2/(1-r)^2$. Also assumed that $|r| < 1$, the density of x_0 given b and *Σ* is

$$p(x_0 \mid b, \Sigma) = \left(\frac{1-r^2}{2p s_v^2}\right)^{1/2} \exp\{-\frac{1-r^2}{2s_v^2}\left(x_0 - \frac{q}{1-r}\right)^2\} \qquad (10.2)$$

Then multiply Eq.(10.1) and Eq.(10.2) results in Eq.(10.3) which is the likelihood function that reflects the stochastic nature of x_0.

$$p(z, x_0 \mid b, \Sigma) = p(z \mid x_0, b, \Sigma)\, p(x_0 \mid b, \Sigma) \qquad (10.3)$$

3.3.2.2 The Prior

I use Stambaugh (1999) flat prior which reflect a non-informative belief about ρ. However, ρ is confined to the stationary region. Since stationarity of the predictive variable is a property that one might wish to impose a priori in many applications. The prior used here is

$$p(b,\Sigma) \propto |\Sigma|^{-3/2},\ r \in (-1,1)\,. \tag{11}$$

If the prior in Eq.(11) is combined with the conditional likelihood function in Eq.(10.3).The resulted posterior density for b, a matrix t distribution, will follow standard results for the Bayesian multivariate regression model (see Zellner (1971, pp. 41-53 and pp.224-233)).

3.3.2.3 The Posterior

The posterior is proportional to the prior times the likelihood. Hence, we multiply Eq.(10.3) and Eq.(11) and ignore terms that do not depend upon b and $\sum$ to obtain

$$p(b,\Sigma \mid z,x_0) \propto |\Sigma|^{-(T+5)/2} \exp\{-\frac{1}{2}(z-Zb)'(\Sigma^{-1}\otimes I_T)(z-Zb)\}\times$$

$$(\frac{1-r^2}{s_v^2})^{1/2} \exp\{-\frac{1-r^2}{2s_v^2}(x_0-\frac{q}{1-r})^2\},\ r \in (-1,1) \tag{12}$$

Eq.(12) is the joint posterior density for b and $\sum$. To estimate β and S.D. of β we have to obtain the marginal posterior density $p(b \mid z,x_0)$, where D denotes the available data which are z and x_0. We calculate the marginal posterior density $p(b \mid z,x_0)$ by using the Metropolis-Hastings (MH) (see, Chib and Greenberg (1995)). Finally, the mean of this marginal posterior density is proposed as an estimator.

3.3.3 Conditional Approach

This section discusses the bias correction using conditional approach, borrowing liberally from Lewellen (2004). This approach emphasizes the conditional distribution of $\hat{b}$ given $\hat{r}$. Eq.(8) shows that, because of the irregularities in sample autocorrelations, the distribution of $\hat{b}$ and $\hat{r}$ is not bivariate normal; however, when condition on $\hat{r}$, $\hat{b}$ is normally distributed. The conditional expectation of $\hat{b}$ is

$$E[\hat{b} - b \mid \hat{r}] = g(\hat{r} - r), \tag{13}$$

which Lewellen refers to as the 'realized bias' in $\hat{b}$. The conditional variance is $s_e^2(X'X)^{-1}$. Regarding Eq.(13), if $\hat{r} - r$ is known, an unbiased estimator of β can be found by subtracting $g(\hat{r} - r)$ from $\hat{b}$. Lewellen (2004) test focuses on the conditional distribution of $\hat{b}$. He defines the bias-adjusted estimator as

$$\hat{b}_{adj} = \hat{b} - g(\hat{r} - r). \tag{14}$$

Although $\hat{r} - r$ is not known, a lower bound can be put on it by assuming that $r \approx 1$.This $r \approx 1$ is the most conservative assumption for testing predictability because it maximizes the bias in Eq.(13), and minimizes the estimator in Eq.(14). Lewellen also defines the variance of $\hat{b}_{adj}$ as

$$\mathrm{var}(\hat{b}_{adj}) = s_e^2(X'X)^{-1}_{(2,2)}. \tag{15}$$

The subscript (2,2) refers to the element in the second row and the second column of the matrix. From the predictability perspective, if $\hat{b}_{adj}$ is significantly different from zero under this conservative assumption, it must be even more significant given the true value of r, which usually less than one. In addition, Lewellen (2004) claimed that " Prior studies focus on the marginal distribution of $\hat{b}$, which implicitly assumes that we have no information about $\hat{r} - r$. That assumption is fine when $\hat{r}$ is small because the constraint ρ<1 provides little information (high values of ρ are unlikely anyway). But the tests ignore useful information when $\hat{r}$ is close to one. ” Before implementing the tests, γ and s_e have to be estimated from $u_t = g v_t + e_t$. This study uses OLS estimates based on the sample values of u_t and v_t. Lewellen (2004) discusses how the estimation error in γ and s_e affects the statistical tests and how the information we put in the test can increase the significance level in detail.

CHAPTER IV

Results

4.1 Methodologies and Results

Previous studies find that predictive regressions can be biased toward finding predictability. The predictive slope obtained from OLS approach tends to bias upward, especially in the case where the forecasting variable is *D/P*. Table 2 provides a comparison between the predictive slope obtained from the OLS approach and Bayesian approach.

For developed markets such as Hong Kong and Singapore markets, the estimated predictive slopes obtained from Bayesian approach are close to those obtained from OLS. Evidence of the upward bias in predictive slope are still observable in other markets. Especially Australia and Japan, the estimated predictive slopes obtained from Bayesian approach drop quite a lot comparing to those obtained from OLS approach. For example, consider January 1990 to June 1997 period, the OLS estimated predictive slopes are 0.0061 and 0.1147 for Australia and Japan markets, while the slopes drop to 0.0032 and 0.0511 after applying Bayesian approach. Comparing to developed market, the predictive slopes of most emerging markets obtained from Bayesian approach are slightly different from those obtained from OLS approach. However, evidence of the upward bias in predictive slope is still found. For example, in the post-crisis period of Korea market, OLS approach found the predictability of both *D/P* and *E/P* at 99% confidence level. On the other hand, using Bayesian approach adjusted for the biased the predictability disappears. It is observable that the biased in OLS predictive slopes are found in several sample periods. Based on the evidence, I conclude that, in this case, Bayesian approach is considered to be a more suitable approach than OLS.

Regarding to Lewellen (2004) conditional test, the predictive slopes obtained from the test are far lower than those of both Bayesian test and OLS estimation. Tables 4 to table 9 provide a comparison between the predictive slopes obtained from Bayesian approach and conditional approach. The value of biased adjusted slopes obtained from conditional test tends to be lower than their real value and may come close to zero or even become negative. Even though the test results of Stambaugh (1999) Bayesian and Lewellen (2004) conditional test from the U.S. market appears to go in the same direction. However, by applying Stambaugh (1999) Bayesian test and Lewellen (2004) conditional test to Asia-Pacific markets, the result shows that the Bayesian test has more predictability of *D/P* and *E/P*, than the conditional test, especially in emerging markets. For *D/P*, the conditional test reports that *D/P* has forecasting power only in India and Taiwan in post-crisis period, while Stambaugh (1999) Bayesian test finds that *D/P* has forecasting power in India, Malaysia, Taiwan, and Thailand in both pre and post crisis periods. For *E/P*, results of *E/P* predictability tests show that Lewellen (2004) conditional test reported no predictability of *E/P* in all five emerging markets while Bayesian test finds some evidence of *E/P* predictability.

Table 2

Predictability of *D/P* and *E/P* from OLS and Bayesian approach

The table provides the predictive slopes (b) in Eq.(1). y_t denotes the return in period t, x_{t-1} are dividend yield and earnings to price ratio known at the end of the period t-1. 'Jan 1990 – Dec 2005' represents the whole sample period, omitting July 1997-December 1999. 'Jan 1990 – Jun 1997' represents the pre-crisis period. 'Jan 2000 – Dec 2005' represents the post-crisis period. For each country, the upper row represents the predictive slope obtained from the OLS approach. The lower row represents the biased adjusted predictive slope obtained from Stambaugh (1999) Bayesian approach.

	Dividend yield			*Earnings to price*		
	Jan 1990-Dec 2005	Jan 1990 - Jun 1997	Jan 2000-Dec 2005	Jan 1990-Dec 2005	Jan 1990 - Jun 1997	Jan 2000-Dec 2005
Developed market						
Australia	0.0123	0.0061	0.0709	0.0043	-0.0066	0.0800
	0.0029	0.0032	0.0753^{C}	-0.0034	-0.0094	0.0742^{B}
New	-0.0045	-0.0053	0.0012	-0.0100	-0.0223	0.0137
Zealand	-0.0005	0.0048	0.0053	-0.0085	-0.0091	0.0148
Japan	0.0832^{A}	0.1147^{A}	0.0713^{A}	0.0347^{B}	0.0248	0.0443^{B}
	0.0570^{A}	0.0511^{B}	0.0606^{A}	0.0384^{A}	0.0355	0.0306^{B}
Hong	0.0775^{A}	0.0634^{A}	0.0843^{A}	0.0498^{B}	0.0872^{B}	-0.0106
Kong	0.0741^{A}	0.0655^{A}	0.0870^{A}	0.0481^{B}	0.0885^{B}	-0.0200
Singapore	0.0593^{A}	0.0473^{B}	0.0901^{A}	0.0221^{C}	0.0201	0.0340
	0.0630^{A}	0.0535^{B}	0.0780^{A}	0.0248^{B}	0.0221^{C}	0.0158
Emerging market						
India	0.0336^{B}	0.0383	0.1085^{A}	0.0064	-0.0014	0.0948^{B}
	0.0381^{B}	0.0497^{B}	0.1103^{A}	0.0070	-0.0005	0.0924^{B}
Korea	0.0519^{A}	0.0292	0.0693^{A}	0.0256^{C}	-0.0026	0.0690^{A}
	0.0528^{A}	0.0334	0.0307	0.0273^{C}	0.0017	0.0342
Malaysia	0.0160	0.0286	0.0281	0.0103	0.0626^{B}	0.0265
	0.0216^{C}	0.0287^{C}	0.0325^{C}	0.0174	0.0736^{B}	0.0340
Taiwan	0.0448^{B}	0.0767^{B}	0.0491^{B}	0.0554^{A}	0.1070^{A}	0.0433^{B}
	0.0464^{A}	0.0804^{B}	0.0533^{A}	0.0432^{B}	0.0774^{B}	0.0468^{B}
Thailand	0.0315^{B}	0.0234	0.0410^{B}	0.0374^{B}	0.0390	0.0808^{B}
	0.0327^{B}	0.0370^{B}	0.0291^{B}	0.0395^{B}	0.0522^{B}	0.0808^{B}

^{A}Indicates significant at the 99% confidence level
^{B}Indicates significant at the 95% confidence level
^{C}Indicates significant at the 90% confidence level

The reason why conditional approach captures less predictability than it should do is possibly because conditional approach tests predictability based on a conservative assumption, which assumes that the value of the real r is close to 1. Referring to Lewellen (2004) test results, in the U.S. market, the lowest value of the estimated r from several periods is 0.986. Therefore, the assumption that the value of the real r is close to 1 seems to be appropriate and test predictability using Lewellen (2004) conservative assumption provides a favorable test result. However, Table 3 provides that the estimated values of *D/P*'s and *E/P*'s r obtained from regression for Asia-Pacific markets varied from 0.6778 to 0.9733. It is noticeable that, for Asia-Pacific markets, the highest value of estimated r is 0.9733. It still has lower value even comparing to the lowest r of the U.S. market. Using the same assumption that the real r of every market is close to 1 seems to be inappropriate. This possibly causes the value of predictive slopes come close to zero or become negative. Hence, the values of most predictive slopes become insignificant.

In brief, Lewellen (2004) assumption appears to be unsuitable for markets in the Asia-Pacific region though it seems to be appropriate when applying the U.S. market data. That is because the values of r of *D/P* and *E/P* obtained from the data in developed markets in the Asia-Pacific are still quite far from 1 unlike those of Lewellen (2004) using data drawn from the U.S. market that are a lot closer to 1. Thus, I will discuss the outcome of *D/P* and *E/P* predictability based on the result obtained from Bayesian approach in the following sections.

Table 3
AR1 regressions of dividend yield and earnings to price

The table reports r of AR1 regressions for dividend yield (*D/P*) and earnings-to-price (*E/P*) of 10 Asia-Pacific markets. 'Jan 1990 – Dec 2005' represented the whole sample period, omitting July 1997-December 1999. 'Jan 1990 – Jun 1997' represented the pre-crisis period. 'Jan 2000 – Dec 2005' represented the post-crisis period. Observations are monthly and all data come from Datastream®.

	$\log(D/P)_t = f + r\log(D/P)_{t-1} + v_t$			$\log(E/P)_t = f + r\log(E/P)_{t-1} + v_t$		
	Jan 1990-Dec 2005	Jan 1990 - Jun 1997	Jan 2000-Dec 2005	Jan 1990-Dec 2005	Jan 1990 - Jun 1997	Jan 2000-Dec 2005
Developed market						
Australia	0.9567^{A}	0.9608^{A}	0.8810^{A}	0.9556^{A}	0.9650^{A}	0.8804^{A}
New Zealand	0.9475^{A}	0.9377^{A}	0.9389^{A}	0.9196^{A}	0.9699^{A}	0.7493^{A}
Japan	0.9303^{A}	0.8791^{A}	0.9503^{A}	0.9650^{A}	0.9469^{A}	0.9470^{A}
Hong Kong	0.9314^{A}	0.9348^{A}	0.9216^{A}	0.8407^{A}	0.8939^{A}	0.7593^{A}
Singapore	0.9396^{A}	0.9339^{A}	0.9240^{A}	0.9661^{A}	0.9637^{A}	0.9197^{A}
Emerging market						
India	0.9566^{A}	0.9436^{A}	0.9068^{A}	0.7764^{A}	0.6778^{A}	0.8984^{A}
Korea	0.8475^{A}	0.9290^{A}	0.8033^{A}	0.9030^{A}	0.9064^{A}	0.7994^{A}
Malaysia	0.9733^{A}	0.9564^{A}	0.9480^{A}	0.9674^{A}	0.9039^{A}	0.9258^{A}
Taiwan	0.9487^{A}	0.9061^{A}	0.9489^{A}	0.9266^{A}	0.8592^{A}	0.9459^{A}
Thailand	0.9221^{A}	0.9664^{A}	0.9387^{A}	0.9142^{A}	0.9450^{A}	0.7530^{A}

[A]Indicates significant at the 99% confidence level
[B]Indicates significant at the 95% confidence level
[C]Indicates significant at the 90% confidence level

4.2 The Predictability of *D/P*

4.2.1 Pre-crisis Period

Table 4 provides evidence of testing *D/P* predictability in 10 Asia-Pacific markets for period January 1990 to June 1997. Results of return predictability of *D/P* in Asia-Pacific markets are diverse. Since the predictive component is likely to be small, I use a 90% confident level, which is the lowest level but still acceptable from the statistical point of view, so that the evidence of predictability will not be missed. Evidence of Bayesian predictability test using pre-crisis data reports that *D/P* of some developed markets in Asia-Pacific such as Japan, Hong Kong, and Singapore have the ability to predict return. Fama and French (1989) explain that *D/P* can predict return because it captures market risk premium or a common risk factor. However, the other two major developed markets, Australia and New Zealand markets, provide no evidence of *D/P* predictability. For emerging markets, evidence of *D/P* predictability is found in four markets except Korea. As a result, testing predictability in out-of-sample provides evidence that not *D/P* of all markets can predict return. Literature states that *D/P* predicts return because it captures market risk premium; however, this study provides evidence that *D/P* does not always capture the market risk premium

Table 4
Predictability of dividend yield, 1990-1997

The table reports predictive regressions for dividend yield (*D/P*) of 10 Asia-Pacific markets for period, January 1990-June 1997 (90 months) which represented the pre-Asia financial crisis period. Observations are monthly. All data come from Datastream®. 'Stambaugh' reports the bias-adjusted estimate and *p*-value based on Stambaugh (1999), and 'Lewellen' reports the bias-adjusted estimate and *p*-value based on Lewellen (2004).

January 1990-June 1997

$$\log(r)_t = a + b\log(D/P)_{t-1} + u_t$$

	Stambaugh			*Lewellen*		
	b	S.E.(*b*)	*p*-value	*b*	S.E.(*b*)	*p*-value
Developed market						
Australia	0.0032	0.0174	0.4556	-0.0181	0.0084	0.9830
New Zealand	0.0048	0.0280	0.4442	-0.0424	0.0159	0.9960
Japan	0.0511	0.0314	0.0213	0.0033	0.0058	0.3018
Hong Kong	0.0655	0.0306	0.0063	0.0139	0.0127	0.1407
Singapore	0.0535	0.0238	0.0107	0.0250	0.0192	0.0983
Emerging market						
India	0.0497	0.0289	0.0383	0.0075	0.0193	0.3487
Korea	0.0334	0.0283	0.1175	-0.0165	0.0139	0.8789
Malaysia	0.0287	0.0203	0.0665	0.0010	0.0095	0.4610
Taiwan	0.0804	0.0395	0.0113	0.0015	0.0145	0.4592
Thailand	0.0370	0.0221	0.0363	0.0056	0.0119	0.3184

Table 5
Predictability of dividend yield, 2000-2005

The table reports predictive regressions for dividend yield (*D/P*) of 10 Asia-Pacific markets for period, January 2000-December 2005 (72 months) which represented the post-Asia financial crisis period. Observations are monthly. All data come from Datastream®. 'Stambaugh' reports the bias-adjusted estimate and *p*-value based on Stambaugh (1999), and 'Lewellen' reports the bias-adjusted estimate and *p*-value based on Lewellen (2004).

January 2000-December 2005

$$\log(r)_t = a + b\log(D/P)_{t-1} + u_t$$

	Stambaugh			*Lewellen*		
	b	S.E.(b)	p-value	b	S.E.(b)	p-value
Developed market						
Australia	0.0753	0.0467	0.0515	0.0105	0.0357	0.3870
New Zealand	0.0053	0.0202	0.3972	-0.0105	0.0179	0.7195
Japan	0.0606	0.0192	0.0000	0.0377	0.0089	0.0000
Hong Kong	0.0870	0.0273	0.0000	0.0433	0.0151	0.0025
Singapore	0.0780	0.0306	0.0020	0.0387	0.0183	0.0206
Emerging market						
India	0.1103	0.0374	0.0009	0.0546	0.0252	0.0174
Korea	0.0307	0.0283	0.1347	0.0005	0.0207	0.4914
Malaysia	0.0325	0.0233	0.0750	0.0067	0.164	0.3415
Taiwan	0.0533	0.0218	0.0052	0.0329	0.0172	0.0267
Thailand	0.0291	0.0166	0.0361	0.0173	0.0132	0.1027

Table 6
Predictability of dividend yield, 1990-2005

The table reports predictive regressions for dividend yield (*D/P*) of 10 Asia-Pacific markets for period, January 1990-December 2005 which is the whole sample period (162 months), omitting July 1997-December 1999. Observations are monthly. All data come from Datastream®. 'Stambaugh' reports the bias-adjusted estimate and *p*-value based on Stambaugh (1999), and 'Lewellen' reports the bias-adjusted estimate and *p*-value based on Lewellen (2004).

January 1990-December 2005

$$\log(r)_t = a + b\log(D/P)_{t-1} + u_t$$

	Stambaugh			*Lewellen*		
	b	S.E.(b)	p-value	b	S.E.(b)	p-value
Developed market						
Australia	0.0029	0.0133	0.4295	-0.0105	0.0086	0.8827
New Zealand	-0.0005	0.0169	0.5156	-0.0249	0.0126	0.9750
Japan	0.0570	0.0179	0.0000	0.0335	0.0083	0.0000
Hong Kong	0.0741	0.0203	0.0000	0.0360	0.0101	0.0000
Singapore	0.0630	0.0191	0.0003	0.0343	0.0142	0.0081
Emerging market						
India	0.0381	0.0183	0.0164	0.0117	0.0123	0.1709
Korea	0.0528	0.0209	0.0060	0.0052	0.0158	0.3745
Malaysia	0.0216	0.0139	0.0524	0.0049	0.0085	0.2795
Taiwan	0.0464	0.0199	0.0059	0.0178	0.0123	0.0731
Thailand	0.0327	0.0150	0.0149	0.0182	0.0137	0.0940

regardless of developed or emerging market.

4.2.2 Post-crisis Period

Testing predictability of *D/P* again in different period ensures the reliability of the result. Table 5 provides evidence of *D/P* predictability for period January 1990 to December 2005. Comparing table 5 to table 4, the estimated predictive slopes at 90% confidence level, which are significant in the pre-crisis period, remain significant in the post-crisis period except for Australia market. The estimated predictive slopes of the New Zealand and Korea markets, which are not significant in the pre-crisis period, remain insignificant in the post-crisis period. Consequently, the presented result confirms the stability of forecasting power of *D/P*. Additionally, comparing *D/P* predictability of 10 Asia-Pacific markets between pre and post-crisis periods provide evidence that it is country-specific factors rather than the differences in sample period that make *D/P* predictability differ among countries.

4.2.3 A Longer Look at *D/P* Predictability

Table 6 provides evidence of testing *D/P* predictability using a full sample period. Investigating predictability again using a longer sample period ensures that *D/P* predictability found in pre and post-crisis periods is not a noise or a coincidence in statistical approach.

Comparing *D/P* predictive power between pre and post-crisis periods, only Australia market found differences in *D/P* predictability. Specifically *D/P* predictive slope is not significant in pre-crisis period, but it is significant in post crisis period. However, testing again over full sample period provides evidence of no predictability of *D/P*. For other developed markets, the *D/P* predictive slope of Japan, Hong Kong, and Singapore, which are significant in the pre and post-crisis periods, remain significant in the full sample period. *D/P* predictive slope of New Zealand market, which is not significant in the pre and post-crisis periods, remains not significant in the full sample period. By focusing on the full sample period, results of *D/P* predictability from five emerging markets provide complete supporting evidence that *D/P* can predict return. It is noticeable for Korea market, that *D/P* does not predict return in pre and post-crisis periods. Testing again using longer period provides evidence of *D/P* predictability. Additionally, the *D/P* predictive slope is significant at the 99% confidence level as well as higher value of estimated predictive slope is observed.

The presented result shows that except for Australia and Korea markets, the significant of *D/P* predictive slope of most markets found in pre and post-crisis period still hold in a full sample period. Evidence supports that *D/P* captures some predictable components of stock returns. However, it is possible that predictability of *D/P* is sensitive to country-specific effect.

Comparing developed markets, specifically Japan, Hong Kong, and Singapore, which *D/P* predictive slope is significant, to emerging markets, it is noticeable that, *D/P* predictive slope of those developed markets are larger than those of emerging markets and having higher significance level. The predictive slopes of those developed markets estimated from either Bayesian or conditional approach are significant at 99% confidence level. It can be explained that comparing to developed markets, there are many young companies that do not pay dividend in emerging markets (see e.g. Brigham and Houston (1996)), consequently, for those developed markets in which *D/P* can predict returns, it is likely that higher *D/P* predictive slope can be observed, compare to *D/P* predictive slope of emerging markets.

Hjalmarsson (2004) also studies the return predictability of several markets, including the countries examined in this study, using a long sample period (over 20 years). However, his study found no predictability of *D/P* in almost all the countries discussed here, except Japan. There is likelihood that because his testing approach is derived from Lewellen (2004) approach, therefore, adjusting bias with that conservative assumption results in no predictability found in most of the countries.

4.3 The Predictability of *E/P*

4.3.1 Pre and Post-crisis Periods

E/P is a less successful predictor variable. Unlike *D/P*, which provides consistent predictability in both pre and post crisis periods, result of *E/P* predictability in the ten Asia-Pacific markets shows that evidence of *E/P* predictability is somewhat varies. Table 7 and table 8 suggest that *E/P* predictability is possibly sensitive to the country effect. Specifically, results of Bayesian test of *E/P* predictability reported that at the 90% confidence level, the *E/P* predictive slope of Taiwan and Thai markets are significant in both pre and post-crisis periods, while the result from New Zealand and Korea markets provide no evidence of *E/P* predictability found in both pre and post-crisis periods. In addition to the apparent country effect, evidence also suggests that *E/P* predictability is sensitive to test period. For instance, in Hong Kong, Singapore, and Malaysia the estimated *E/P* predictive slopes are significant only in pre-crisis period, while in Australia, Japan, and India *E/P* predictability is significant only in the post-crisis period.

Table 7
Predictability of earnings to price, 1990-1997

The table reports predictive regressions for earnings-to-price (*E/P*) of 10 Asia-Pacific markets for period, January 1990-June 1997 (90 months) which represented the pre-Asia financial crisis period. Observations are monthly. All data come from Datastream®. 'Stambaugh' reports the bias-adjusted estimate and *p*-value based on Stambaugh (1999), and 'Lewellen' reports the bias-adjusted estimate and *p*-value based on Lewellen (2004).

January 1990-June 1997

$\log(r)_t = a + b\log(E/P)_{t-1} + u_t$

	Stambaugh			*Lewellen*		
	b	S.E.(b)	p-value	b	S.E.(b)	p-value
Developed market						
Australia	-0.0094	0.0153	0.7379	-0.0233	0.0105	0.9855
New Zealand	-0.0091	0.0226	0.6656	-0.0333	0.0169	0.9781
Japan	0.0355	0.0284	0.1005	-0.0143	0.0112	0.8970
Hong Kong	0.0885	0.0412	0.0105	0.0074	0.0196	0.3561
Singapore	0.0221	0.0148	0.0636	0.0083	0.0115	0.2366
Emerging market						
India	-0.0005	0.0261	0.5072	-0.0314	0.0243	0.8840
Korea	0.0017	0.0241	0.4734	-0.0265	0.0204	0.9000
Malaysia	0.0736	0.0360	0.0150	-0.0027	0.0163	0.5638
Taiwan	0.0774	0.0428	0.0252	-0.0097	0.0143	0.7386
Thailand	0.0522	0.0277	0.0218	0.0070	0.0148	0.3179

Table 8
Predictability of earnings to price, 2000-2005

The table reports predictive regressions for earnings-to-price (*E/P*) of 10 Asia-Pacific markets for period, January 2000-December 2005 (72 months) which represented the post-Asia financial crisis period. Observations are monthly. All data come from Datastream®. 'Stambaugh' reports the bias-adjusted estimate and *p*-value based on Stambaugh (1999), and 'Lewellen' reports the bias-adjusted estimate and *p*-value based on Lewellen (2004).

January 2000-December 2005

$\log(r)_t = a + b\log(E/P)_{t-1} + u_t$

	Stambaugh			*Lewellen*		
	b	S.E.(b)	p-value	b	S.E.(b)	p-value
Developed market						
Australia	0.0742	0.0355	0.0170	0.0386	0.0293	0.0985
New Zealand	0.0148	0.0225	0.2541	-0.0122	0.0202	0.7159
Japan	0.0306	0.0156	0.0225	0.0203	0.0121	0.0542
Hong Kong	-0.0200	0.0372	0.7071	-0.0624	0.0322	0.9604
Singapore	0.0158	0.0266	0.2782	-0.0030	0.0218	0.5526
Emerging market						
India	0.0924	0.0440	0.0104	0.0141	0.0210	0.2557
Korea	0.0342	0.0299	0.1285	0.0060	0.0235	0.4132
Malaysia	0.0340	0.0327	0.1473	-0.0058	0.0243	0.5950
Taiwan	0.0468	0.0239	0.0212	0.0223	0.0185	0.1154
Thailand	0.0808	0.0444	0.0344	0.0093	0.0365	0.4052

A conclusion of *E/P* predictability, which relied mostly on U.S. evidence, is that *E/P* can predict return because it captures market risk premium (see e.g. Fama and French (1989)). This out-of-sample study provides evidence against that conclusion of *E/P* predictability which implies that *E/P* is not a good proxy for risk premium. In fact, our study suggests that interpreting the evidence of *E/P* return predictability is rather difficult. Given that the forecasting power of *E/P* varies among countries and is sensitive to the test periods, it is clearly possible that *E/P* having different economic meanings in different countries (e.g., due to differences in accounting conventions, dividend policies, etc.) is the likely explanation.

4.3.2 A Longer Look at *E/P* Predictability

In relation to table 7 and table 8, the result from a full sample period of 162 months in table 9 provides an additional perspective of *E/P* predictability between developed and emerging markets. Notice that for developed markets, in spite of the fact that, Japan market found no predictability of *E/P* in the pre-crisis period. Also Hong Kong and Singapore also found no predictability of *E/P* in the post-crisis period. Testing *E/P* predictability again over the full sample period provides evidence that strengthen *E/P* predictability (with the exception of Australia market, which *E/P* predictability found in post-crisis disappears when testing over the full sample period).

On the other hand, testing on the full sample period provides evidence that weakens the *E/P* predictability of most emerging markets. For example, the predictability of *E/P* found in the India market and the Malaysia market disappears in the full sample period. In addition, for Taiwan and Thailand markets, evidence of *E/P* predictability is still found in the full sample period, however the value of the estimated predict slope is smaller. For Taiwan market, the estimated predict slope of *E/P* for full sample period is 0.432. It is lower than the estimated predict slope of the pre-crisis period, which is 0.774 and the post-crisis period, which is 0.468. For Thai market, the estimated predict slope of *E/P* from a full sample period is 0.0395. It is lower than the estimated predict slope of the pre and post-crisis period, which are 0.522 and 0.0808. It is possible that earnings of developed markets are more reliable than earnings of emerging markets. Therefore, *E/P* of developed markets captures more predictable components of stock returns than *E/P* of emerging markets.

4.3.3 *E/P* Predictability vs. *D/P* Predictability

Table 10 provides a comparison between *E/P* and *D/P* predictive slopes, which are estimated using both Stambaugh (1999) Bayesian and Lewellen (2004) conditional approaches. The presented result is consistent with the finding of Lamont (1998). His study shows that the coefficient on the *D/P* predictive slope on S&P index estimated from regression is significant and is more than twice as large as the *E/P* predictive slope. For developed markets in Asia-Pacific, the result documented in this thesis is somewhat similar to the U.S. market. Most of *D/P* predictive slopes estimated either from Bayesian approach and conditional approach are larger than those of *E/P*. On the other hand, emerging markets results are quite mixed. For Malaysia and Thai markets *D/P* predictive slopes in pre and post-crisis periods estimated from Bayesian approach are less than those of *E/P*. However, India and Taiwan markets *D/P* predictive slopes in pre and post-crisis periods are higher than those of *E/P*. The possible explanation why *D/P* predictive slopes in some emerging markets are weaker than *E/P* predictive slopes is, comparing to developed markets, there are many young companies that do not pay dividend in emerging markets (see, Brigham and Houston (1996)). As a result, *D/P* predictive slopes in some emerging markets are weaker than *E/P* predictive slopes.

Table 9

Predictability of earnings to price, 1990-2005

The table reports predictive regressions for earnings-to-price (*E/P*) of 10 Asia-Pacific markets for period, January 1990-December 2005 which is the whole sample period (162 months), omitting July 1997-December 1999. Observations are monthly. All data come from Datastream®. 'Stambaugh' reports the bias-adjusted estimate and *p*-value based on Stambaugh (1999), and 'Lewellen' reports the bias-adjusted estimate and *p*-value based on Lewellen (2004).

January 1990-December 2005

$$\log(r)_t = a + b\log(E/P)_{t-1} + u_t$$

	Stambaugh			*Lewellen*		
	b	S.E.(b)	p-value	b	S.E.(b)	p-value
Developed market						
Australia	-0.0034	0.0121	0.6180	-0.0139	0.0091	0.9318
New Zealand	-0.0085	0.0141	0.7264	-0.0265	0.0121	0.9843
Japan	0.0384	0.0151	0.0033	0.0191	0.0100	0.0285
Hong Kong	0.0481	0.0266	0.0356	-0.0065	0.0212	0.6154
Singapore	0.0248	0.0130	0.0259	0.0121	0.0105	0.1234
Emerging market						
India	0.0070	0.0186	0.3536	-0.0195	0.0174	0.8563
Korea	0.0273	0.0169	0.0525	0.0012	0.0140	0.4668
Malaysia	0.0174	0.0164	0.1438	-0.0044	0.0102	0.6688
Taiwan	0.0432	0.0219	0.0176	0.0085	0.0119	0.2413
Thailand	0.0395	0.0209	0.0278	0.0048	0.0159	0.3831

Table 10

Predictability of *D/P* and *E/P* from Bayesian and conditional approach

The table provides the predictive slopes of dividend yield and earnings to price. ‘Jan 1990 – Dec 2005’ represented the whole sample period, omitting July 1997-December 1999. ‘Jan 1990 – Jun 1997’ represented the pre-crisis period. ‘Jan 2000 – Dec 2005’ represented the post-crisis period. For each country, the upper row represents the biased adjusted predictive slope obtained from Stambaugh (1999) Bayesian approach. The lower row represents the biased adjusted predictive slope obtained from Lewellen (2004) conditional approach.

	Dividend yield			*Earnings to price*		
	Jan 1990-Dec 2005	Jan 1990 - Jun 1997	Jan 2000-Dec 2005	Jan 1990-Dec 2005	Jan 1990 - Jun 1997	Jan 2000-Dec 2005
Developed market						
Australia	0.0029	0.0032	0.0753^{C}	-0.0034	-0.0094	0.0742^{B}
	-0.0105	-0.0181	0.0105	-0.0139	-0.0233	0.0386^{C}
New Zealand	-0.0005	0.0048	0.0053	-0.0085	-0.0091	0.0148
	-0.0249	-0.0424	-0.0105	-0.0265	-0.0333	-0.0122
Japan	0.0570^{A}	0.0511^{B}	0.0606^{A}	0.0384^{A}	0.0355	0.0306^{B}
	0.0335^{A}	0.0033	0.0377^{A}	0.0191^{B}	-0.0143	0.0203^{C}
Hong Kong	0.0741^{A}	0.0655^{A}	0.0870^{A}	0.0481^{B}	0.0885^{B}	-0.0200
	0.0360^{A}	0.0139	0.0433^{A}	-0.0065	0.0074	-0.0624
Singapore	0.0630^{A}	0.0535^{B}	0.0780^{A}	0.0248^{B}	0.0221^{C}	0.0158
	0.0343^{A}	0.0250^{C}	0.0387^{B}	0.0121	0.0083	-0.0030
Emerging market						
India	0.0381^{B}	0.0497^{B}	0.1103^{A}	0.0070	-0.0005	0.0924^{B}
	0.0117	0.0075	0.0546^{B}	-0.0195	-0.0314	0.0141
Korea	0.0528^{A}	0.0334	0.0307	0.0273^{c}	0.0017	0.0342
	0.0052	-0.0165	0.0005	0.0012	-0.0265	0.0060
Malaysia	0.0216^{C}	0.0287^{C}	0.0325^{C}	0.0174	0.0736^{B}	0.0340
	0.0049	0.0010	0.0067	-0.0044	-0.0027	-0.0058
Taiwan	0.0464^{A}	0.0804^{B}	0.0533^{A}	0.0432^{B}	0.0774^{B}	0.0468^{B}
	0.0178^{C}	0.0015	0.0329^{B}	0.0085	-0.0097	0.0223
Thailand	0.0327^{B}	0.0370^{B}	0.0291^{B}	0.0395^{B}	0.0522^{B}	0.0808^{B}
	0.0182^{C}	0.0056	0.0173	0.0048	0.0070	0.0093

^{A}Indicates significant at the 99% confidence level
^{B}Indicates significant at the 95% confidence level
^{C}Indicates significant at the 90% confidence level

4.4 Predictability in Asia-Pacific Markets

This section summarizes evidence of *D/P* and *E/P* predictability in 10 Asia-Pacific markets, including both developed markets and emerging markets. The evidence is similar to the U.S. market in that *D/P* does capture some predictable components of stock returns. Consistent forecasting power is demonstrated in seven out of ten markets. Apart from Australia, New Zealand, and Korea, the predictability of *D/P* is found in Japan, Hong Kong, Singapore, India, Malaysia, Taiwan and Thai markets in both pre and post-crisis period. The outcome suggests that it is the country effect rather than the different in sample period that makes *D/P* predictability different among countries.

In contrast to this study, Harvey (1995) shows that local variables including *D/P* play an important role in predicting emerging market returns. It is noticeable that, for developed markets which *D/P* can predict returns, specifically Japan, Hong Kong, and Singapore, *D/P* predictive slopes of those markets are larger than those of emerging markets and having a higher significant level. The evidence suggests that there appears to be certain country-specific effects that have an influence on the predictability of *D/P*.

In comparison to *D/P*, *E/P* is a less successful predictive variable. The result of *E/P* predictability test from pre and post-crisis shows that the *E/P* predictability levels vary among countries. Therefore, interpretation of *E/P* predictability is rather difficult. The variations of *E/P* predictability among countries possibly come from the different meanings of earning in different countries. Differences of each country's earning can come from differences in accounting conventions, dividend policies, etc.

In addition to the countries specific factors, *E/P* predictability is also sensitive to sample periods.

Testing *E/P* predictability using a full sample provides an additional perspective. For developed markets, apart from Australia, testing on the full sample period provides evidence that *E/P* predictability become stronger comparing to the test on pre and post-crisis periods. On the other hands, it provides evidence that weakens the *E/P* predictability for most emerging markets. It is possible that earnings of developed markets are more reliable than earnings of emerging markets. Therefore, *E/P* of developed markets captures more predictable components of stock returns than *E/P* of emerging markets.

Comparing *D/P* predictability to *E/P* predictability, for developed markets, most of *D/P* predictive slopes estimated either from Bayesian approach and conditional approach are larger than those of *E/P*. However, this is not true for emerging markets. In comparison to developed markets, there are many young companies that do not pay out dividend in emerging markets. Therefore, *D/P* predictive slopes in some emerging markets are not as strong as those of developed markets and have a tendency to be weaker than *E/P* predictive slopes.

CHAPTER V

Conclusion and Areas for Future Research

5.1 Conclusion

Testing predictability of stock returns using lagged regressors, such as *D/P* and *E/P*, is probably one of the most commonly researched empirical topics in finance. Even with this much interest in the topic, there is not much research done using international data. Almost all conclusions are based more or less on the U.S. evidence. In this paper, I consider a large international data set, which contains a balance mix of 10 different markets in the Asia-Pacific region covering both developed and emerging markets. Since the *D/P* and *E/P* are likely to be endogenous and nearly persistent variables, two sets of econometric tests, specifically Stambaugh (1999) Bayesian approach and Lewellen (2004) conditional method, are invoked to find the statistical relationship between *D/P*, *E/P*, and returns.

Using international data, those two tests provide different results. It is likely that differences in the predictability come from differences of the assumption of each test. The conditional approach gives a favorable result to the U.S. market, but it is not appropriate for Asia-Pacific markets. It is due to the fact that the values of r in both developed and emerging markets in Asia-Pacific are varies and much lower than one unlike those of the U.S. market. Insisting on using this conservative assumption will make the values of predictive slopes come close to zero or become negative, lowering predictability of conditional approach. On the other hand, Bayesian approach uses more general assumption in developing a conclusion by assuming that the value $|r|$ is not greater than one. Consequently, Bayesian approach gives more significant values of the predictive slopes of *D/P* and *E/P* than conditional approach. Thus, Bayesian approach is considered to be more suitable for testing return predictability of the markets in Asia-Pacific than conditional approach.

New evidence of testing *D/P* and *E/P* predictability of Asia-Pacific markets are provided in this study. The international results for the *D/P* variables are similar to those of the U.S. while the finding for *E/P* is substantially weaker. In summary, this paper provides strong evidence that there is a predictable component in stock returns, which is captured at least partially by *D/P*.

5.2 Areas for Future Research

Apart from the U.S market, it appears that there has been no other study applying the Stambaugh (1999) Bayesian approach to test return predictability of the *D/P* ratio. It is wise to apply this approach to other markets in order to gain more out-of-sample evidence. For example, testing return predictability in European markets, Latin America, the Mideast, and South Africa can also be interesting to investigate. In this study, the *D/P*'s and *E/P*'s predictability of Asia-Pacific markets are investigated. The evidence shows that in several markets the ability to predict return of *D/P* and *E/P* has been found. In the case of *D/P*, consistent predictability is found. However, that is just for certain countries. There still remains the question with no answers: why predictability is found only in certain countries? It is possible that the way investors perceive and interpret fundamental information that is publicly available such as *D/P* differs among countries or due to certain country-specific effects. Therefore, in order to find out which factor affects the predictability of *D/P*, test of cross-sectional return predictability should be studied further.

Another fascinating area which is not covered in this study is profitability of return predictability or a trading rule based on predictability. Since the conclusion of the predictability is solely based on the statistical view, not on the economical examination, I suggest that, in order to gain economic perspective, it is wise to perform further investigation on the predictability from the economic point of view. For example, asset-allocation problems of investors who use Bayesian specifications to perceive the distribution of future returns should be examined.

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