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## **ECONOMIC SIGNIFICANCE OF PREDICTABLE RETURNS: THE CASE OF EMERGING ASIAN COUNTRIES**

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### **ABSTRACT**

The aim of this paper is to investigate whether the predictability of stock returns is economically significant, i.e if it can be exploited in practice to earn abnormal returns using various measures of market-timing and investment performance presented by Lo and Mackinlay(1997). The estimated multifactorial model linking yields and macroeconomic variables and the weights of the sector portfolios have been determined and a maximum predictability portfolio (MPP) was constructed. Measuring the economic significance of predictability of returns was done by calculating threshold transaction costs compared to actual cost in providing practical evidence of the existence of investment strategies based on profitable and beneficial predictability market yields Korean and Singaporean.

**Keywords:** Return Predictability, Maximum Predictability Portfolio, Market Timing, Transaction Costs.

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### **INTRODUCTION**

"An efficient market is a market where stock prices fully and instantaneously reflect all available information concerning the securities" (Fama, 1965), in other words, no investor is able to use this information available on the market order to predict future changes in stock prices and thus to derive abnormal profits. In his pioneering work, Fama (1970) has defined the hypothesis of efficient capital markets and in particular the strong form of efficiency as the assumption that all public and private information are fully taken into account by security prices. On the contrary, the evidence of a temporal variation of expected returns by fundamentals was recognized by many researchers to know the pioneer work of Chen, Roll and Ross (1986) in the U.S. market. They found that there is a long-run equilibrium between stock prices and macroeconomic variables. This result is consistent with other research on various international markets and those of Kizys Pierdzioch (2009), Aydemir and Demirhan (2009) and especially the emerging Asian markets namely those of Maysami et al. (2004), Pan et al . (2007), Gay (2008),

Abugre 2008) Shahid (2008), and Brahmaserne Jiranyakul (2009).

Evidence of statistical significance and economic predictability of returns has been shown by various studies on different markets. Lo and Mackinlay (1997) have maximized the predictability of returns by building a portfolio for maximum predictability, MPP, based on a set of groups of segment assets. Using three-sample measures of predictability, they showed the economic significance of predictability in portfolio returns MPP in the U.S. market. This evidence has been found in developed markets namely the studies of Bekaert et al. (2008), Molodtsova and Papell (2009), Jacobsen et al. (2009) as well as emerging markets such as the studies of Lam et al. (2007), Hsu, Hsu and Kuan (2009), Gray (2009).

The purpose of the paper is to investigate whether the predictability of stock returns is economically significant, i.e if it can be exploited in practice to earn abnormal returns using various measures of market-timing and investment performance presented by Lo and Mackinlay(1997). This article is organized as follows: In the first section, we first give a review of the literature on the relationship between macroeconomic variables and stock returns. Section two presents two

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methodologies to maximize predictability of returns ie Principal Component Analysis (PCA) and one Portfolio Predictability Maximum (MPP). The third section presents the measures of market timing and investment performance. The empirical results are summarized in section four.

**Section 1: The relationship between macroeconomic variables and returns: Review of Literature:** The relationship between the stock market and economic theory has been widely studied in literature financial and macroeconomic namely the work of Fama (1981), Friedman (1988), Nelson (1976). Changes in the prices of stock index is extremely sensitive to changes in key economic fundamentals and changes in expectations about future prospects. The relationship between stock returns and macroeconomic variables such as money supply, the interest rate, inflation and industrial production is crucial not only in the analysis yields stock but also in understanding the interactions between expected returns and the real economy. Beginning with the pioneering work of Chen, Roll and Ross (1986) in the U.S. market based on the theory APT. This gave new impetus to the search for macroeconomic determinants of stock returns and focused primarily on the study of the significance of the risk premium attached to each macro-factor, providing considerable evidence that the variables states such as industrial production, yield spread between the good treasure of short and long term are important in explaining equilibrium asset prices. Kizys and Pierdzioch (2009) found that asymmetric shock in interest rates, industrial production, the exchange rate and inflation had no impact on integration yields Canadians, Italians, Great Britain returns with Americans.

The relationship between stock prices and macroeconomic variables has been well documented not only in developed markets but also in emerging economies. Following the methodology of Chen et al. (1986), Goswami and Jung (1997) studied the relationship between the prices of securities in the Korean market and macroeconomic variables, namely the interest rate in the short and long term, inflation, money supply, the industrial production, oil prices, the trade balance and exchange rates. Their results show that the prices of the index are positively correlated with Korean industrial production, inflation and interest rates in the short term while they are negatively correlated with the rate of long-term interest and the

price of oil. Abdalla and Murinde (1997) studied the interactions between exchange rates and stock prices in emerging markets of Korea, India, Pakistan and Philippines. Their results show unidirectional causal relationships between these factors and for all markets except the Philippines. Maysami and Sim (2000, 2001a, 2001b) used the model vector error correction to examine the relationship between macroeconomic variables and stock returns of Hong Kong and Singapore (Maysami and Sim, 2002b), Malaysia and Thailand (Maysami and Sim, 2001a), Japan and Korea (Maysami and Sim, 2001b). Wongbangpo and Sharma (2002) studied the relationship between stock prices and economic factors of five ASEAN countries (Indonesia, Malaysia, Philippines, Singapore and Thailand) and found that in the long run, prices of securities five indices are positively correlated with growth.

Whereas production cost term, prices indices are based on past and future macroeconomic variables. Tarzi (2000, 2005) attempted to study the relationship between stock prices of the ASEAN countries and five macroeconomic variables namely: Gross domestic product, inflation, money supply, interest rate and exchange rate. Its result shows that in the long term, stock prices of five countries are strongly and positively related to the overall price level. A long-term negative relationship was detected between the prices of securities Thailand, Philippines, Singapore and the interest rate so that the relationship is positive for Indonesia and Malaysia. Islam (2003) showed the equilibrium relationships in the short and long term of four macroeconomic variables (interest rates, inflation, exchange rate and industrial production) and the KLSE index of Singapore. Its result is identical to that of Mookerjee and Yu (1997).

Maysami and Koh (2000) applied the model vector error correction to analyze the relations between the Singaporean market and the exchange rate, inflation, money supply, the rate of good to treasure long-term rate money on a daily basis. They concluded that inflation, money supply, changes in exchange rates form a cointegration relationship with the Singaporean market returns. This has been shown by Mukherjee and Naka (1995) in the Japanese market. The results of Naka et al. (1997) on the Indian market shows a largely positive relationship between industrial production and prices of the index while the Indian inflation is a determinant of large negative price. Ibrahim and Yussoff

(2001) analyzed the dynamics of interactions among three macroeconomic variables (real output, the index of consumer prices, money supply and the Malaysian price index. Based on the cointegration test and the error correction model, their results show that in the short term, the money supply has a positive effect on prices, while a negative long term. The same tests were used on weekly data for the period 1991:1-2007:4 market prices Ghana, Adam and Tweneboah (2008) examined the impact of five macroeconomic variables on these prices. Their results indicate that the lagged values of interest rates, inflation had a significant influence on security prices, while foreign direct investment, oil prices and the exchange rate had little influence.

Using monthly prices from six countries of Asia-Pacific (Malaysia, Korea, Hongkong, Thailand, Japan and Australia) and macroeconomic variables namely the exchange rate, the index of industrial production and the index of consumer prices, and Dinnich Mahmood (2006) showed the existence of an equilibrium relationship of long term and short-term causality between these variables. The Hong Kong shows a relationship between prices and the exchange rate as prices in Thailand reported a significant interaction with industrial production. Pan et al. (2007) have found the one-way causal relationship between exchange rates and prices in Japan, Malaysia and Thailand during the period 1988-1998.

Chen (2008) found that it is easy to predict recessions in the U.S. market using macroeconomic variables and above the inflation rate from an assessment of monthly data for the period 1957-207, series of interest rates, money supply, rate of public funds, debt total unemployment rates, exchange rates, debt. Over the period January 1986 - August 2001, Abugre (2008) showed that the monthly series of exchange rates, interest rates, money supply and industrial production are significant in explaining market returns Latin America (Argentina, Brazil, Chile and Mexico). The aim of the study of Robert Gay (2008) is to study the relationship between macroeconomic variables in the exchange rate and price of oil prices market indices of Brazil, Russia, India and of China. On monthly data and during the period from March 1999 to June 2006, the results indicate a positive relationship between the market index and the exchange rate is negative while the price of oil. The OLS estimation of the empirical

relationship between the monthly macroeconomic variables (industrial production, inflation, money supply, exchange rates, interest rates and oil prices) and market returns of Istanbul executed by Kandir (2008) has provided over the period July 1997-June 2005, a significant relationship between the exchange rate, interest rates, inflation and yields while it is not significant with the money industrial production and oil prices. Brahmasrene Jiranyakul and (2009) examined the relationship between market returns Thailand and four macroeconomic variables during the pre-crisis (Janvier1992-June1997) and post-crisis (July 1997-December 2003). Tests of cointegration and causality indicate the positive effect of money supply on yield, while industrial production, the exchange rate and oil prices had a negative effect during the pre-crisis.

The majority of studies have examined the influence of certain macroeconomic variables on the components of the market index. Maysami et al. (2004) studied the cointegration relationships between macroeconomic variables (interest rates, industrial production, price levels, exchange rates and money supply) and prices of the securities of three sector indices (Finance, Real Estate, Hotel manager) of Singapore STI index. Their results on monthly data for the period January 1989 - December 2001, indicate a significant relationship between the different macroeconomic variables and real estate portfolio returns, while the Finance portfolio returns are significantly influenced by changes in the rate of inflation rates exchange and interest rates in the short and long term. A non-significant relationship was detected between the interest rates and yields of hotel portfolio while it is negative and significant with the exchange rate. Maysami et al. (2005) examined the relationship between macroeconomic variables and the prices of individual securities in the Singaporean index (STI) and American (SP500) divided into sectors.

Using the cointegration relationship and the model vector error correction on daily data, they showed that the index SP500 advance the electronics sector the index of Singapore.

Aydemir and Demirhan (2009) studied the Granger causality between prices indices Services, Industry, Finance and Technology market of Turkey and the exchange rate over a period from February 2001 to January 2008. The results reveal bidirectional causality between exchange rates and all these indices, a positive causality are apparent between the index and the

technology exchange rate and negatively with all the clues.

**Section 2: Methodologies of Maximally Predictable Returns:** Lo and Mackinlay (1997) proposed two methods to maximize predictability of returns: the Principal Component Analysis and methodology of a Portfolio of maximum Predictability. In what follows, we present these two methods.

**The Principal Component Analysis:** The most popular approach to study the predictability of returns is to assume the multifactor asset pricing model and then investigate the predictability of individual factors. This is a two-step procedure: First, the linear model yields an estimated representative:  $r_t = \alpha + \delta^T F_t + \varepsilon_t$  (1.1)

$r_t \equiv [r_{1t}, r_{2t}, \dots, r_{nt}]^T$  The vector of return at time t;

$F_t \equiv [F_{1t}, F_{2t}, \dots, F_{pt}]^T$  The vector of factors p in period t;

$\varepsilon_t \equiv [\varepsilon_{1t}, \varepsilon_{2t}, \dots, \varepsilon_{nt}]$  The vector of white noise

$\delta^T$  Is a matrix of coefficients.

When the p factors are known, the system of regression equations (1.1) can be estimated equation by equation by the method of ordinary least squares. If not, the principal component analysis is applied to extract the most important factors generating returns of securities. The first principal component is a linear combination  $\gamma_{PC1}^T r_t$ . Second, we analyze the predictability of the most important factor that is the portfolio given by the first principal component weighted  $\omega_{PC1}^T$ . A simple measure is the square of the first order autocorrelation coefficient of  $\gamma_{PC1}^T r_t$  from the regression:

$$r_{PC1}^T = a + \rho_1 r_{PC1}^T + \varepsilon_t \quad (1.2)$$

Where  $\{\varepsilon_t\}_{t=1}^T$  is the white noise sequence with

$Var[\varepsilon_t] = \sigma_\varepsilon^2$ . Noting that the pattern of autocorrelation  $r_{PC1}^T$  may be more general than that

implied by an autoregressive process of order 1 (AR (1)).

**Maximal Predictability Portfolio:** Lo and Mackinlay (1997) propose an alternative to the principal component analysis. They show that although captures most of variance of the n stock returns, it need not

reflect much of predictability. Instead of maximizing the variance, they built a portfolio by maximizing predictability measured by the coefficient of determination. They assume that returns on lagged values rather than contemporaneous values of factors driving stock returns:

$$r_t = \alpha + \delta^T F_{t-1} + \varepsilon_t \quad (1.3)$$

Each of the n coefficients of determination,  $R_i^2$ ,  $i = 1, 2, 3, \dots, n$ , measures the predictability of individual stock returns securities included in  $r_t$ .

Suppose we form a linear combination  $\gamma^T r_t$  of n shares and consider the coefficient of determination when we regress  $\gamma^T r_t$  on a constant  $F_{t-1}$  and:

$$R^2(\gamma) = \frac{Var[\gamma^T (\delta^T F_{t-1})]}{Var[\gamma^T r_t]} = \frac{\gamma^T var[\delta^T F_{t-1}] \gamma}{\gamma^T Var[r_t] \gamma} = \frac{\gamma^T \Gamma_F \gamma}{\gamma^T \Gamma_r \gamma} \quad (1.4)$$

Where  $Var[\delta^T F_{t-1}] \equiv \Gamma_F$  et  $Var[r_t] \equiv \Gamma_r$ .

To maximize predictability of a portfolio is equivalent to choose  $\gamma$  such that equation (1.4) is maximized and  $\gamma$  is a portfolio. The maximum  $R^2(\gamma)$  is given by the largest eigenvalue  $\gamma_1$  of the matrix  $B \equiv \Gamma_r^{-1} \Gamma_F$  and is achieved

by the vector corresponding to the largest value of B.

**Section 3: Measures of "Market-Timing" and Investment Performance:** In the previous section, we presented the methodology for maximizing predictability of returns. We will present the measures of "market timing" in order to determine whether predictability of returns is economically significant.

**The evolution of the traditional measures of portfolio performance:** Traditional measures of portfolio performance is three: Treynor, Sharpe and Jensen. The Treynor ratio (1965) is based on the model of the market where yields are holding into account the non-diversifiable or systematic risk represented by beta ( $\beta$ ). The Treynor index is the ratio of the risk premium of the title and the systematic risk. The higher value of  $T_p$  implies a higher performance:

$$T_p = \frac{(R_p - R_f)}{\beta_p} \quad (1.5) \quad \text{where } \beta_p = \frac{\sigma_{pm}}{\sigma_m^2}$$

The Sharpe ratio (1966) uses the method of replacing

( $\beta$ ) measure of risk as the standard deviation of the portfolio's return. A higher value of  $S_p$  implies a higher performance:

$$T_p = \frac{(R_p - R_f)}{\beta_p} \quad (1.5)$$

$$S_p = \frac{(R_p - R_f)}{\sigma_p} \quad (1.6)$$

The third measure of performance, widely used in empirical studies is that of Jensen (1986, 1969). The Jensen index is measured as the constant of regression between fund returns and market returns:

$$R_p - R_f = \alpha_p + \beta_p (R_m - R_f) + \varepsilon_p \quad (1.7)$$

Portfolio Performance ( $\alpha$ ) detects the sensitivity of portfolio returns to market returns.

**Henriksson-Merton approach:** The market-timing model of Henriksson and Merton (1981) is represented as follows:

$\gamma(t)$  Is the predictor with market-timer

$$\gamma(t) = \begin{cases} 1 & \text{si } Z_M(t) > R(t) \\ 0 & \text{si } Z_M(t) \leq R(t) \end{cases} \quad (1.8)$$

With:  $Z_M(t)$  is the market return,  $R(t)$  Is the return on risk-free asset.

Henriksson and Merton (1981) proposed two measures to evaluate the performance of a single transaction strategy. They used measure parametric and nonparametric measures. This is: Let  $p_1$  the probability of a correct forecast in a "down" market and  $p_2$  the probability of a correct forecast in an "up" market. Formally,

$$\begin{aligned} p_1(t) &= \text{Pr ob}[\theta_t = 0 / Z_M(t) \leq R(t)] \\ p_2(t) &= \text{Pr ob}[\theta_t = 1 / Z_M(t) > R(t)] \end{aligned} \quad (1.9)$$

As shown by Merton (1981)  $p_1 + p_2$  that is a sufficient

statistic for assessing predictability. This forecast has no value if  $p_1 + p_2 = 1$

Testing the null hypothesis of no predictability, i.e H0:  $p_1 + p_2 = 1$ , against the alternative H1:  $p_1 + p_2 > 1$ .

**The break-even transaction costs:** A direct measure of the economic significance of stock return

predictability are the break-even transaction costs equating the total return on an active market timing trading strategy with the total return on a passive investment. Lo and Mackinlay (1997) defined the end of period value of a dollar investment over the entire period as:

$$W_T^{passive} \equiv \prod_{t=1}^T (1 + r_t^k)$$

$$W_T^{Active} \equiv \prod_{t=1}^T [\theta_t (1 + r_t^k) + (1 - \theta_t)(1 + r_{ft})]$$

If active strategy requires k switches into or out of the portfolio k aver the entire investment period then the one way break-even transaction costs  $100 \times s$  are a solution to the equation:

$$W_T^{passive} \equiv W_T^{Active} \times (1 - s)^k$$

$$s = 1 - \left( \frac{W_T^{passive}}{W_T^{Active}} \right)^{1/k} \quad (1.11)$$

**Section4. Empirical Applications:** In this section, we evaluate the statistical and economic significance of the predictability of returns based on the methodology of maximum predictability portfolio (MPP) Lo and Mackinlay (1997) and the techniques of market timing.

**Description data:** This section provides a detailed description of our database of four markets: Korea, Hong Kong, Indonesia and Singapore. The analysis of the economic significance of predictability is applied to the monthly returns of more liquid securities in each market. We group these securities in three portfolios following sectors: Financial sector (including all shares of banking institutions, financial, insurance and other financial services ..), industry sector (including securities firms industrial chemicals, food, ... ) and Services sector (including securities of the media, telecommunications, ...). Referring to the results of previous studies and the lack of availability of monthly data, we choose four macroeconomic variables: Interest rate, index of industrial production, the index of consumer prices and money supply (M1).

**Empirical results:** Several previous studies have used the multifactor model for forecasting returns by fundamentals:

$$r_t = \alpha + \beta_1 LDR_{t-1} + \beta_2 LIP_{t-1} + \beta_3 LCP_{t-1} + \beta_4 LM1_{t-1} + \varepsilon_t \quad (1.15)$$

With:  $r_t$  Is the vector (3 × 1) yields three sector portfolios.

$\beta_i$  is the sensitivity of returns to changes in factors.

$LDR_t$  Logarithm of the discount rate (discount rate) to the end of the corresponding index.

$LIP_t$  Logarithm of the index of industrial production at the end of the corresponding index.

$LCP_t$  Logarithm of the price index for the consumption of the corresponding index.

$LM1_t$  Logarithm of the money supply (M1) to the end of the corresponding index.

This section reports the results of analysis of the economic significance of predictability of returns on emerging Asian markets. We start with a principal component analysis. Then we give the results of the analysis of portfolio Maximum Predictability in the context of a multifactor model for forecasting macroeconomic variables where four factors are considered our study period from 01/01/2003 to 02/10/2008.

Table 1.1: Weights of the first Principal Component of each index ( $\gamma_{PC}^1$ ).

Indices	Weights	Variance Explained	Indices	Weights	Variance Explained
KS11	0,0769	42.0820%	JKSE	0,2827	29.2368%
	0,0419			0,2801	
	0,0992			0,3911	
	0,9656			0,2970	
	0,1411			0,4081	
	0,1209			0,3532	
	0,0777			0,2639	
	0,0027			0,1912	
	0,0737			0,3359	
	0,0623			0,2998	
HSI	0,0136	69.14%	STI	-0,2246	29.2368%
	0,1143			-0,4053	
	0,3593			-0,2319	
	0,1023			-0,1549	
	0,3624			-0,1549	
	0,2797			-0,4512	
	0,3858			-0,5834	
	0,6114			-0,2866	
	0,2602			-0,1694	
	0,2168			-0,1689	

Table 1.2: Autocorrelation functions of each ( $\gamma_{PC}^1$ ) index.

Indices	Order	2003:02–2008:10	Confidence Interval
KS11	$\hat{\rho}(1)$	-0.2871	
	$\hat{\rho}(2)$	0.1421	
	$\hat{\rho}(3)$	-0.1463	
	$\hat{\rho}(4)$	0.0504	
	$\hat{\rho}(5)$	0.0118	0.2604
	$\hat{\rho}(6)$	-0.0121	-0.2604
	$\hat{\rho}(7)$	0.0707	
HSI	$\hat{\rho}(1)$	0.3417	
	$\hat{\rho}(2)$	0.0241	
	$\hat{\rho}(3)$	0.0727	
	$\hat{\rho}(4)$	-0.0168	
	$\hat{\rho}(5)$	0.0010	0.2604
	$\hat{\rho}(6)$	0.0226	-0.2604
	$\hat{\rho}(7)$	0.1615	
JKSE	$\hat{\rho}(1)$	0.1494	
	$\hat{\rho}(2)$	0.0458	
	$\hat{\rho}(3)$	0.0421	
	$\hat{\rho}(4)$	-0.0656	
	$\hat{\rho}(5)$	0.1416	0.2604
	$\hat{\rho}(6)$	0.0713	-0.2604
	$\hat{\rho}(7)$	0.2400	
STI	$\hat{\rho}(1)$	0.3313	
	$\hat{\rho}(2)$	0.2492	
	$\hat{\rho}(3)$	0.1951	
	$\hat{\rho}(4)$	0.0297	
	$\hat{\rho}(5)$	0.1237	0.2604
	$\hat{\rho}(6)$	0.0226	-0.2604
	$\hat{\rho}(7)$	-0.0114	

Based on MPP portfolio, we present the dynamic investment strategy and evaluate its performance outside the sample using several measures market

timing. We applied the two stages of the Principal Component Analysis to see if the portfolio of the first principal component is predictable or not. The empirical results of the ten most liquid shares of each index of Korea (KS11), Hong Kong (HSI), Indonesia (JKSE) and Singapore (STI) are summarized in Table 1.1 and 1.2.

– The autocorrelation coefficients of the first order of the first principal component indices KS11, HSI, STI and JKSE are outside the range of 95% and therefore are all significant at the 5% d: a first-order autocorrelation positive and significant for the weights of the main component indices HSI and STI while it is negative for the index of Korea KS11,

– The portfolio returns of the first principal component indices KS11, HSI and STI are predictable during the period 2003:02 to 2008:10 and therefore

– Ability to construct active strategy and the possibility attaining abnormal returns of these four markets—the gains from market timing and active strategy are no

value in the Indonesian market since returns are unpredictable.

In what follows, we present the results of the analysis and evaluation of MPP's economic significance of predictability of returns on emerging Asian markets. For each index, our study period from February 2003 to October 2008 is divided into two periods: in the sample period from 2003 to 2005 and out-of the sample from 2006 to 2008.

**The Korea market:** Using monthly data on the period from February 2003 until October 2008, we consider 50 most liquid shares traded on the Korea grouped into three portfolios: Finance, Industry and Services. The estimation results of the empirical relationship between the returns of three portfolios and four sectoral macroeconomic factors taking into account the Heteroskedasticity of errors are presented in Table 1.3

Table 1.3: OLS estimates for sector-grouped portfolio returns of the KS11 index.

	<b>Constant</b>	<b>LDR</b>	<b>LIP</b>	<b>LCP</b>	<b>LM1</b>	<b>R<sup>2</sup></b>
<b>Finance</b>	0.008	0.1927	-0.017	-1.019	0.009	0.040
<b>Industry</b>	0.009	0.07	-0.204	-1.278	0.320	0.047
<b>Services</b>	0.011	-0.015	0.227	-0.320	-0.413	0.039

The results show a low explanatory power efficiency of Finance and Industry by the macroeconomic variables. After estimating the model prediction is made, the portfolio weights (MPP) are determined for the first 35 months in our sample (2003:02-2005:12).

Table 1.4: MPP weights

<b>Finance</b>	0.575
<b>Industry</b>	0.186
<b>Services</b>	0.239

The weights for Industry and Services portfolio are lower than the Finance portfolio. It helps to maximize the predictability of portfolio MPP. The weights are the eigenvectors corresponding to the largest eigenvalue of the matrix. Table 1.5 contains the results of OLS estimation of the forecast model of MPP returns, taking into account the Heteroskedasticity of errors: From the below table, we find that maximum  $R^2$  of MPP is larger but weaker than  $R^2$  individual sector portfolios.

Table 1.5: OLS estimates for the MPP portfolio

	<b>Constant</b>	<b>LDR</b>	<b>LIP</b>	<b>LCP</b>	<b>LM1</b>	<b>R<sup>2</sup></b>
$r_t^{MPP}$	0.009	0.120	0.007	-0.89	-0.038	0.081

Hence an increase in the predictability of returns by combining the three MPP sector portfolios.

After all, this result does not imply a lack of predictability of returns due to variability of returns of securities and data mining data in the sample and hence the statistical significance of the predictability of returns.

A true predictability of returns is apparent in the MPP of the sample forecasts (Lo and Mackinlay, 1997).

The forecast a month ahead is generated on a monthly basis starting from January 2006 and ending in October 2008. The process rolling is adopted as the first observation of the sample is left for a new will be added by keeping the sample size constant at 34 months. In addition, the coefficients of the forecasting model of returns and the portfolio weights MPP updated monthly. Our strategy is built active and naive: at the end of each month, the expected returns of MPP are

compared to risk-free rate. As the expected rate of return exceeds the risk-free rate, all funds will be invested in MPP and in the opposite case, all funds are

invested in the risk-free asset. The monthly average yields, the monthly volatility and the terminal value of three strategies are shown in Table 1.6.

Table 1.6: Performance of trading strategies of KS11 index.

	<b>ACTIVE</b>	<b>MPP</b>	<b>Risk-Free</b>
<b>Mean returns (%)</b>	5.98	2.99	1.83
<b>Volatility(%)</b>	11.8	12.92	3.25
<b>Terminal Value (Won)</b>	2496.28	1456.5	1124.28

The terminal value is the value for October 2008 to 1000 Korean Won invested in the corresponding strategy in January 2006. We note that the active strategy was the superior performance over the period 2006:01 to 2008:10, and it yields higher mean average return with lower volatility than the passive strategy MPP. However, the volatility of the first two strategies increases this implies that these investments are very risky. To assess the predictability of the MPP passive strategy, we calculate the break-even transaction costs. The active strategy requires two switches into and out of the MPP strategy:

$$c = \left[ 1 - \left( \frac{1456.5}{2496.28} \right)^{\frac{1}{2}} \right] \times 100 \approx 23.61\%$$

This break-even transaction costs is greater than this incurred in reality. The implications that our strategy is beneficial and can beat the market and have earnings via abnormal returns of the strategy MPP. Therefore, the economically significant of predictability on the Korean stocks and during the period from January 2006 until October 2008.

**The Hong Kong market:** This market and the HSI index, we considered the same sample period and out of sample on the Korean market, the monthly returns of 33 most liquid shares and three macroeconomic variables (interest rate, inflation rate and the supply of money). Taking into account the Heteroskedasticity of the errors, the estimation of equation (1.1) gives us the following results:

Table1.7: OLS estimates for sector-grouped portfolio returns of the HSI index.

	<b>Constant</b>	<b>LDR</b>	<b>LIP</b>	<b>LCP</b>	<b>LM1</b>
<b>Finance</b>	-0.017	-0.080	-1.367*	0.012	0.286
<b>Industry</b>	0.002	0.109	-1.097*	0.055*	0.284
<b>Services</b>	-0.014	0.095	-1.013*	0.029	0.221

We note the strong predictive power of returns by macroeconomic variables via the coefficients of determination. Using the first 35 months of our sample period 2003:02 to 2005:12, we determined the different weights of the portfolio sector portfolios MPP. The weights of Finance and Industry portfolios are higher than that of Portfolio Services. Therefore, the first portfolios maximize the predictability of portfolio returns MPP Hong Kong market.

Table 1.8: MPP weights

<b>Finance</b>	0.405
<b>Industry</b>	0.349
<b>Services</b>	0.246

The estimation results of the forecasting model yields MPP portfolio, taking into account the Heteroskedasticity of the errors, are summarized in the following table:

Table1.9: OLS estimates for the MPP portfolio

	<b>Constant</b>	<b>LDR</b>	<b>LIP</b>	<b>LCP</b>	<b>LM1</b>
$r_t^{MPP}$	-0.015	0.094	-1.185*	0.042	0.294

The maximum R<sup>2</sup> of MPP is greater, equal to 29.42%, compared with those of sector portfolios and therefore a statistically significant predictability of returns MPP.

Procedure "Rolling" out-of-sample from January 2006 until October 2008 is adopted at each end of the month and the performance of three strategies (Table 1.10).



Table 1.10: Performance of trading strategies of HSI index.

	Active strategy	Passive strategy	Artisans risk
<b>Mean returns (%)</b>	21.33	12.13	6.08
<b>Volatility (%)</b>	33.06	43.44	16.5
<b>Terminal Value (dollar Honkong)</b>	3993.37	3586.3	1862.89

The terminal value is the value for 1000 in October 2008 Hong Kong dollar invested in the corresponding strategy in January 2006. We find that the performance of the active strategy is superior to the passive strategy. It generates the mean return and lower volatility than the passive strategy. We calculated break-even transaction costs to assess the predictability of the MPP passive strategy. The active strategy requires seven changes in the passive strategy:

$$c = \left[ 1 - \left( \frac{3586.3}{3993.73} \right)^{\frac{1}{7}} \right] \times 100 \approx 1.52\%$$

This break-even transaction costs cannot be exceeded by the actual costs and therefore our strategy is not

beneficial and the difficulty of beat the market and to have abnormal gains. These results are evidence of a predictable statistically and economically insignificant returns on the Hong Kong market over the period January 2006 to October 2008.

**The Singapore market:** We considered 17 most liquid securities in the STI index grouped into three portfolios and four macroeconomic variables: interest rate, the index of industrial production, the index of consumer prices and the supply of money. The OLS estimation of the empirical relationship between these variables taking into account the Heteroskedasticity of errors is shown in the following table:

Table 1.11: OLS estimates for sector-grouped portfolio returns of the HSI index.

	Constant	LDR	LIP	LCP	LM1	R <sup>2</sup>
<b>Finance</b>	0.009*	-0.006	0.063	-0.317	-0.062	0.068
<b>Industry</b>	0.007*	0.012	-0.027	-0.373	0.465	0.075
<b>Services</b>	0.009*	-0.129	-0.186*	-0.480	0.062	0.072

A period from February 2003 to December 2005, MPP portfolio weights are reported and suggest the contribution of industry in maximizing predictability of portfolio returns as MPP has great weight.

Table 1.12: weights MPP

<b>Finance</b>	0.405
<b>Industry</b>	0.349
<b>Services</b>	0.246

Table 1.12 contains the estimation results of the forecasting model. We note that the maximum R2 is greater than the sector portfolios and the coefficients are no significant which suggests the existence of a low predictability of returns MPP statistically significant.

The evaluation economic significance of predictability is determined in out-of sample. The performance of several strategies is synthesized in the table 1.14.

Table 1.13: OLS estimates for the MPP portfolio.

	Constant	LDR	LIP	LCP	LM1	R <sup>2</sup>
$r_t^{MPP}$	0.0078*	0.0124	0.016	-0.347	0.286	0.171

Table 1.14: Performance of trading strategies of STI index.

	Active strategy	Passive strategy	Artisans risk
<b>Mean returns (%)</b>	9.1	1.18	0.14
<b>Volatility (%)</b>	2.5	5.1	0.4
<b>Terminal Value (dollar Honkong)</b>	2614.34	1196.5	1091.25

The terminal value is the value for 1000 in October 2008 Singaporean dollar invested in the corresponding

strategy in January 2006. We find that the performance of the active strategy is superior to the passive strategy.

It generates the mean return and lower volatility than the passive strategy. We calculated break-even transaction costs to assess the predictability of the MPP passive strategy. The active strategy requires seven changes in the passive strategy:

$$c = \left[ 1 - \left( \frac{1196.5}{2614.34} \right)^{\frac{1}{5}} \right] \times 100 \approx 14.47\%$$

This break-even transaction costs is greater than this incurred in reality. The implications that our strategy is beneficial and can beat the market and have earnings via abnormal returns of the strategy MPP. Therefore, the economically significant of predictability on the Singaporean stocks and during the period from January 2006 until October 2008.

**Financial Analysis of the results:** The economic significance of predictability of returns can be traced at least three distinct sources (i) the consequences of economic fluctuations are transmitted to financial markets, (ii) its implications on investment policies and (iii) the implications the efficiency of financial markets. Throughout this chapter, we tried to maximize the predictability of returns by building a portfolio of predictable (MPP). The economic significance of predictability of returns of four emerging Asian markets was evaluated. Test the hypothesis that this predictability is exploited to derive statistically significant abnormal profits was made.

The results of the portfolio analysis of the first principal component provided us with a convincing conclusion that the returns to Korea, Hong Kong and Singapore are predictable and therefore the possibility to implement active management in these markets. For the index JKSE Indonesia, the portfolio returns of the first principal component are unpredictable throughout the study period. The best forecast yields JKSE are unconditional averages. As a result, gains in market timing and active strategy of no value in the Indonesian market. Although this analysis is widely used in the analysis of temporal variation in expected returns, but the analysis of maximum predictability is interesting because it explicitly captures the predictability of returns by their historical and fundamentals. The evaluation of the predictability of returns requires the adoption of an active strategy or naive this brings us to perform the procedure MPP. The empirical relationship between portfolio returns MPP was estimated and the maximum is determined. For each market studied, we find that the

maximum is broader than individual portfolios (Finance, Industry and Services) the implications of these three portfolios help maximize the predictability of returns MPP. Referring to the pioneering work of Lo and Mackinlay (1997), this maximum value cannot be compared to a critical value under the null hypothesis of no predictability tabulated by these authors since we used only four proxy variables and three portfolios. This result does not imply the absence of predictability of returns in MPP as the maximum value does not take into account the variability of returns and data mining, and therefore a real MPP is apparent predictability in-sample forecasts. The procedure "Rolling" is adopted and construction of an active strategy is executed by comparing the expected rate of return on a risk-free rate and that for each month of the period runs from January 2006 to October 2008. In each market studied, we obtained a superiority of the active strategy and represents the rate of return as high and low volatility. Since the total yield of the active strategy does not include transaction costs can be substantial and significant, we determined the importance of such costs. Reducing the number of changes (switches) in the passive strategy generates an increase in the level of transaction costs. It is between 1.52% for the Hong Kong market and 23.61% in the Korean market for an active strategy generates the same total returns of a passive strategy. The empirical results suggest a statistically and economically significant predictability of Korean and Singaporean markets while it is insignificant on the Hong Kong market. These results contradicted the serial autocorrelation detected in yields of Hong Kong and Indonesia (in the first chapter): it appears that this is partly spurious autocorrelation induced by infrequent trading of less liquid securities included in the index HSI of Hong Kong and Indonesia JKSE.

The existence of profitable gains in the markets of Singapore and Indonesia, we can see the inefficiency of these markets. The observation of abnormal returns has led us to advance several explanations: first, these positive gains can be caused by the difference in risk between the different strategies. Second, the autocorrelation detected at the level of index returns is able to explain the abnormal gains. Then, a proportion of these abnormal returns can be explained by the transaction cost and the time variation of expected returns. Finally, the integration between these two

markets can explain the existence of profitable gains. This latter explanation is stated by Lam, Cheung and Yeung (2007) Hong Kong market.

#### CONCLUSION

This paper is intended to evaluate the economic significance of predictability of returns of four emerging Asian markets (Korea, Hong Kong, Indonesia and Singapore). Such predictability is economically significant if and only if it is operated to draw statistically significant abnormal gains. This hypothesis was tested on a number of more liquid securities (ranging from one index to another) of the relevant index and grouped into three sector portfolios (Finance, Industry and Services) for a period-sample from January 2006 until 'in October 2008. The estimated multifactorial model linking yields and macroeconomic variables and the weights of the sector portfolios have been determined and a maximum predictability portfolio (MPP) was constructed. Measuring the economic significance of predictability of returns was done by calculating threshold transaction costs compared to actual cost in providing practical evidence of the existence of investment strategies based on profitable and beneficial predictability market yields Korean and Singaporean.

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