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Macroeconomic Variables, Firm Characteristics and Stock Returns during Good and Bad Times: Evidence from SEA

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Abstract

This paper investigates the role of macroeconomic factors and firm characteristics in explaining stock return in big four South East Asian (SEA) countries, namely, Malaysia, Indonesia, Singapore and Thailand. The factors model is employed for two time intervals, namely, sub-period A (from July 2003 to June 2007) and sub-period B (from July 2007 to June 2011) to examine the change in relationship between macroeconomic variables and stock returns during pre and post Global Financial Crisis of 2007. Our empirical findings reveal that the significance relationship between macroeconomic variables and portfolio stock returns were not consistent for both sub-periods. The result is highly dependent on portfolio, country and sub-period.

Keywords: Stock Returns; Firm Characteristics, Macroeconomic Variables; Financial Crisis

JEL Classification Codes: G11, G12, G14

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1. Introduction

Over the years, researchers, economists and financial analysts have tried to use different types of information to explain stock market return, for example, the change in economic and financial factors have been commonly used to explain the behaviour of different stock markets around the world. As suggested by economic theory, the stock price should reflect the expectation of corporate performance, while corporate profit should reflect the level of economic activities. If the theory that the stock price reflects all the fundamental economic factors (macroeconomic and financial) is true, then the stock market should be able to be utilized as a leading indicator for current as well as future economic activities. In addition, the stock market has been seen as the major driver for economic growth and plays a significant role in allocation of economic resources into the productive activities of the economy in both emerging and developed countries (Sudhahar & Raja, 2010). So, the role of the stock market has made a significant area of research on the relationship between macroeconomic factor, financial factors and the stock return. Moreover, it is envisaged that this study could be a good reference for policy makers wishing to develop and make decisions regarding their nation's macroeconomics policy without fear of influencing capital formation and the stock trading process.

With regard to the theoretical model for the relationship between macroeconomic factors and stock market return, Capital Asset Pricing Model (CAPM) has been commonly used to describe the link between factors and stock market return. This model emphasizes the positive linear relationship between expected security returns and risk (market betas), which builds on the work of Markowitz (1952) on the mean value mode. This concept was further developed by Sharpe (1964), Lintner (1965) and Mossin (1966). The suitability of the CAPM has been supported by a number of empirical studies such as those by Black, Jensen and Scholes (1972) and Fama and MacBeth (1973). However, its shortcomings have been the subject of intense debate, for example, in relation to the use of the mean-variance model's beta to determine the stock return and the poor market proxy by using the mean-variance efficient concept. The researcher has used firm-specific factors to explain the stock return for instance, the small firm effect (Keim, 1983), leverage effect (Bhandari, 1988), book-to-market effect (Stattman, 1980; Rosenberg et al., 1985) and the PE effect (Ball, 1978; Basu,1983) and the results show that these methods for the estimates are less noisy in comparison with CAPM beta.

As a result of a number of shortcomings in the CAPM, the Arbitrage Pricing Theory (APT) was developed by Ross (1976a) and this development has been treated as the natural successor to the CAPM. Unlike the CAPM, the APT allows for multiple risk factors to be taken into account in the process for generating calculations of asset return. Generally, the factor selection can be streamlined into three main approaches. The first approach for factor selection estimates sample covariance matrices by using statistical techniques such as factor analysis proposed in the studies of Roll and Ross(1980), Chen(1983) and Lehman and Modest(1988) and principal component analysis (PCA) recommended by Chamberlain and Rothschild(1983) and Connor and Korajaczyk (1985, 1986). The second approach suggests the use of macroeconomic variables as factors. For instance, Chen, Roll and Ross (1986) use macroeconomic variables to explain the cross-sectional variations in estimated expected returns. Macroeconomic factors include term structure, inflation rate, money supply, exchange rate, while additional factors have continued to be added by researchers (Maysami, 2004; Humpe & Macmillan, 2007) as risk factors for stock market. The third approach is used the firm characteristics as the portfolio return and this are used to assess firm sensitivity and systematic risk in the economy. Fama and French (1992) sorted firm characteristics such as size, leverage and book-to-market equity into different portfolio structures and determined the interaction between different portfolio structure returns and different betas estimation. Other similar findings exist for this approach, such as those of Rosenberg, Reid and Lanstein (1985), Chan, Hamao and Lakonishok (1991), Fama and French (1993), Charitou and Constantinidis (2004) and Simlai (2009), which observe the interaction between stock return and ratio of book-to-market equity. On the other hand, the study of Ball (1978), Basu (1983), Shen (2000) and Truong (2009) observe the relationship between stock return and ratio of price-to-earning.

Many studies have documented the relationship between macroeconomic variables and stock returns. Some of these studies have examined this relationship for developed markets such as USA, Japan and Europe (Chen, Roll and Ross (1986), Chen (1991), Clare and Thomas (1994), Mukherjee and Naka (1995), Gjerde and Saettem (1999), Flannery and Protopapadakis (2002)). On the other hand, some other studies investigated the situation for developing markets, particularly in the East Asia (Bailey and Chung (1996), Mookerjee and Yu (1997), Kwon and Shin (1999), Ibrahim and Aziz (2003)). There are also studies that compare the phenomenon for group of countries (Cheung and Ng (1998), Bilson, Brailsford and Hooper (2001), Wongbangpo and Sharma (2002)). These studies have provided different results. The results have changed according to the macroeconomic factors used, the research methodology employed and the countries examined. However, the studies were mainly focussed on one time series. There is not too much work done on testing the relationship during pre and post financial crisis period.

In this study, the South East Asia (SEA) countries of Malaysia, Indonesia, Singapore and Thailand (MIST) have been selected for empirical study. The selection of SEA as the test target is based on two main reasons. First, SEA has been recognized as having impressive economic growth and a thriving export sector. Since 2000, MIST countries market capitalization has grown from USD324, 311 billion to USD1, 694 trillion, which is around 431 percent growth in market capitalization in comparison with 392% for the Asia region's growth in market capitalization (WFE, 2011). Second, the high growth in market capitalization shows that investors express interest in this region and the great potential of the firms in SEA is the main attraction for investors that encourages them to invest in this region.

This paper investigates the role of macroeconomics and firm specific factors in explaining the stock return for MIST countries in two periods. The first period is before the 2007 global economic crisis (from July 2003 to June 2007) and the second period is during and after the global economic crisis (from July 2007 to June 2011). Ordinary Least Square (OLS) multi-regression models are deployed, following the previous studies by Barrow and Naka (1994), Chen, Kim and Kim (2005), Chiang and Kee (2009). The present study employs growth rate of industrial production, change in consumer price index, growth rate of the money supply, change in the exchange rate, change in term structure and growth rate of international crude oil price as the macroeconomic factors for the time period July 2003 to June 2011. Most of the previous studies investigate the macroeconomic factor and stock return based on the main index. However, our analysis is based on stock portfolio returns rather than the stock indices return. In portfolio construction, three firm characteristics are identified to be the portfolio criteria, namely, price-to-earnings ratio, market equity and book-to-market ratio.

Furthermore, the different portfolios enable us to present a cross-sectional view of the overall stock market in MIST. SEA consists of countries with different market structures, for example, emerging countries (Malaysia, Thailand and Indonesia) and a developed country (Singapore). In addition, the emerging countries comprise countries with different demographics and economic structures which will provide the study with data to analyse the comparative effect of the factors in different countries and their effect in different periods of time. Evidence showed that during the crisis and post crisis period (sub-period B), the stock markets of all four countries are more reactive to the change in oil price. On the other hand, the result of Thailand shows the positive correlation between change in inflation and stock return during crisis and post crisis(sub-period B) while the result of Malaysia and Indonesia show inflation is negatively correlated to stock return before the crisis period(sub-period A).

The rest of the paper is organized as follows. Section 2 reviews the related literature. Section 3 explains the data and the methodology while section 4 provides the empirical results and finally conclusion is presented in Section 5.

2. Literature Review

Due to criticism CAPM in late 1970s and subsequent drawbacks of APT in 1980s led to development of macroeconomic factor model to test the stock market performance. In the macroeconomic factor model, the factors are defined based on economic intuition and external sources information such as macroeconomic variables are used as the factors. The estimated factor loadings are verified by using time series regression whether macroeconomic variables describe the cross-sectional variations in estimated expected return. The APT macroeconomic factors model can be written as follows:

Equation 1

$$E = a + \beta_{Macro1} Macro1 + \beta_{Macro2} Macro2 + \cdots + \beta_{Macro(k)} Macro(k) + e$$

Where E = expected return of the asset

a = constant

$\beta_{Macro(k)}$ = loading on the macroeconomic variables to kth number of factors

$Macro(k)$ = risk premium for the macroeconomic variables

ϵ = idiosyncratic error term

Based on this perspective, Chan, Chen and Hsieh (1985) analysed the macroeconomic variables together with the size effect while Chen, Roll and Ross (1986) attempted to identify the significant macroeconomic variables which influence asset return. Their tests were conducted by using the two-step procedure of Fama and MacBeth (1973), where the factor betas are estimated via time-series regression of asset return relative to the time series factor return. The macroeconomic factor models in both studies utilize number of factors such as industrial production, inflation, real interest rate, term structure, oil price and risk premium. From their studies, industrial production, risk premium and term structure were found to be significant factors influencing stock return, while the inflation effect is rather weak.

Following these initial studies, other researchers proposed various macroeconomic variables for different countries: Japan –Hamao (1988), UK – Priestley (1996), Singapore –Maysami et al. (2004), Malaysia –Ibrahim and Abdul Rahman (2003), Thailand – Tangjitprom (2011), Philippines– Bailey and Chung (1996), and the literature in this area continues to grow.

Several macroeconomic variables were used in past studies and found to have significant impact on stock returns. For instance, studies by Mukherjee and Naka (1995) for Japan, Maysami, Howe and Hamzah (2004) for Singapore, Ratanapakorn and Sharma (2007) for the US S&P500 and Humpe and Macmillan (2007) for US and Japan indicate that industrial production is a significant factor and is positively correlated with stock return. For exchange rate impact, results were mixed. Mukherjee and Naka (1995) and Ratanapakorn and Sharma (2007) show that exchange rate is statistically significant and positively correlated with stock return in both Japan and the US. However, there was evidence of negative correlation for stock price and exchange rate in the case of Indonesia (Rahajeng & Akhsyim, 2010), Malaysia (Ibrahim & Yosoff, 2001), Taiwan (Singh, Mehta and Varsha, 2010) and Turkey (Buyuksalvarci, 2010).

In case of money supply, most of the studies show that there is a positive correlation between money supply and stock return (Maysami, Howe and Hamzah, 2004; Ratanapakorn and Sharma, 2007; Mukherjee and Naka, 1995). Theory always states that inflation negatively related with stock price and most of the studies support the theoretical findings, for instance in the case of Japan (Mukherjee & Naka, 1995; Humpe & Macmillan, 2007), Taiwan (Singh, Mehta & Varsha, 2010), and the US (Humpe & Macmillan, 2007). However, the study by Maysami, Howe and Hamzah (2004) shows a positive relationship in the case of Singapore and the study by Chen, Roll and Ross (1986) found that inflation is weakly significant in their study on the NYSE from 1958 to 1984.

Term structure, which is derived from difference between long-term and short-term interest rate tend to be negatively correlated with stock return. The study of Stock and Watson (1989), Davis and Henry (1994) and Plosser and Rowenhorst (1994) indicates that term structure is more superior in predicting the future real economic activity than short-term interest rate in the US and European countries. The study of Chen, Roll and Ross (1986) indicates that term structure is negatively correlated with stock return in US stock exchange. Hamao (1988) indicates that the same correlation in Japan stock market.

There is no direct theory to describe the effect of oil price on stock price. However, based on the hypothesis, the oil price is a principal factor which could impact the profitability and revenue of a company and subsequently stock returns. The study by Chen, Roll and Ross (1986) found no significant oil price effect on stock return. Moreover, Al-Fayoumi's (2009) study on the oil-importing countries found no significant relationship between oil price and stock return. However, the study by Narayan and Sharma (2011) shows that there are certain effects of the oil price on firm return and the stronger evidence can be found based on different firm size. On the other hand, the study by Le and Chang (2011) shows that for the period from 1986 to 2011 the stock market responds positively in Japan and negatively in Malaysia and an inefficient stock market responds slower to the shock of oil price.

In another extension of factor model, Fama and French (1992, 1993, 1996) designed a two-stage method to estimate the characteristic-based factor model. In the first stage, the returns of assets are sorted according to the portfolio based on the firm characteristic, such as book-to-market and market capitalization. In the second stage, the factor betas of the portfolio are estimated by time series regression of the asset return.

The Fama and French three-factor model has gained support from a number of empirical studies. For instance, Maroney and Protopapadakis (2002), Faff (2001), Drew and Veeraraghavan (2002, 2003a, 2003b) and Gaunt (2004) show the strong relationship between stock return and book-to-market equity and size in countries with different market structures such as Australia, Canada, Germany, France, Japan, the UK, the US, Malaysia, China, Hong Kong and the Philippines.

The objective of sorting the portfolio return based on firm characteristics such as price-to-earning (PE) ratio, book-to-market (BM) ratio and market equity (ME) is to further evaluate the impact of firm-specific factors on stock return as well as the interaction between different firm-specific factors and macroeconomic factors. As shown in Table 1, there are evidence of relationship between the firm-specific factor and stock return. In general, the small size portfolio (low ME) outperform large size portfolio (high ME) in term of stock return; High BM portfolio outperform low BM portfolio in term of stock return; Low PE portfolio outperform high PE portfolio in term of stock return.

Table 1. Previous findings of the relationship between firm-specific factor and stock return

Firm Specific Factor	Previous Literature	Observation
Price-to-Earning(PE) Ratio	Basu (1977)	Low PE portfolio outperform high PE portfolio
	Ball (1978)	Low PE portfolio is associated to higher risks and expected return.
	Basu (1983)	Low PE portfolio has higher risk adjusted return even.
	Truong (2009)	Low PE portfolio outperform high PE portfolio in New Zealand
Book-to-Market(BM) Ratio	Stattman (1980)	High BM portfolios ratio outperform low BM portfolio in US stock market
	Chan, Hamao and Lakonishok (1991)	High BM portfolios ratio outperform low BM portfolio in Japan stock market
	Chui and Wei(1998)	High BM portfolios ratio outperform low BM portfolio in Hong Kong, Korea and Malaysia.
	Daniel, Titman and Wei (2001)	High BM portfolios ratio outperform low BM portfolio in Japan stock market
Market Equity(Size Effect)	Banz (1981)	Small size firms(low ME) have higher average stock return than large size firms(high ME) - Small size effect
	Reinganum (1981)	Small size firms(low ME) have higher average stock return than large size firms(high ME) – Small size effect
	Reinganum (1992)	The size effect is not stable over time

3. Data & Methodology

In this paper, the analysis is conducted based on monthly time series data from July 2003 to June 2011. The data is divided into two categories. The first data set consists of macroeconomic variables while the second data set consists of stock market data.

In the first data set, seven macroeconomic variables namely growth rate of industrial production, changes in money supply (M1 and M2), change in consumer price index as the proxy of inflation, change in exchange rate, change in term structure, and growth rate of crude oil price were obtained on monthly basis from the International Financial Statistics (IFS) in International Monetary Fund (IMF) website. The monthly oil price data is obtained from the Organization of Petroleum Exporting Countries (OPEC). The short-term and long-term interest rates for Indonesia are not available in IFS. Accordingly, the 30-day Bank Indonesia Certificate (SBI) is used in place of the short-term interest rate, while the 90-day

SBI is used as the proxy for the long-term interest rate; both of these SBIs are obtained from the CEIC database.

In the second dataset, book-to-market equity and market capitalization are used to establish the portfolio for the stock return by grouping them into low, medium and high equity firm-specific factors. To match the variables of firms' characteristics with stock returns, we match the accounting data for fiscal year end t-1 with the stock return of July of year t to June of year t+1. The objective in choosing a six months' gap between fiscal year-end is to provide a conservative time for firm to release their accounting information to the public after fiscal year end t-1. The sorted stock returns are grouped into a stock portfolio based on firm characteristics. To avoid missing observations and any biases in the data sets which could potentially affect the study results, we established three criteria for stock selection. (i) The stock should not have negative book equity at fiscal year-end t-1 (Fama & French, 1995), (ii) Any stock without a trading record for more than one month will be excluded from the study and (iii) To keep the portfolio consistent, the portfolio only includes stock which was consistently traded during the eight-year period under study.

For all firms by country in the sampling period, three equal groups of portfolio are formed according the firm characteristics of Price-earnings (PE) ratio, book-to-market (BM) ratio and market equity (ME). The portfolios are grouped into high, medium and low based on the rank in each firm characteristic. Eventually, nine portfolios (3 portfolios x 3 firm-specific criteria) are established for each country for the time interval July 2003 to June 2011. The data definition, symbol, source of the basic series and derived series of data and portfolio construction are illustrated in Table 2.

Table 2. Glossary and definition of macroeconomic variables and Portfolio Construction

Symbol	**Variable**	**Definition**
	Basic Series	
IP	Industrial Production	Monthly Industrial Production Index
INF	Inflation	Monthly Consumer Price
ER	Exchange Rate	Monthly National Currency per SDR rate
STIR	Short term interest rate	Monthly Treasury Bill interest rate
LTIR*	Long term interest rate	Monthly Long term Government Bond Rate
MS	Money Supply	Monthly Money Supply M1 and M2
OP	Oil Price	Monthly Oil Price – OPEC
	Derived Time Series Economic Data	
ΔIP(t)	Monthly growth rate of industrial production	$lnIP(t) - lnIP(t-1)$
ΔINF(t)	Monthly Change in Consumer Price Index	$lnINF(t) - lnINF(t-1)$

ΔER(t)	Monthly Change in Exchange rate	$lnEX(t) - lnEX(t-1)$
TS(t)	Term Structure	$LTIR(t) - STIR(t)$
ΔTS(t)	Monthly Change in term structure	$TS(t) - TS(t-1)$
ΔMS(t)	Monthly growth rate of money supply	$lnMS(t) - lnMS(t-1)$
ΔOP(t)	Monthly growth rate of oil price	$lnOP(t) - lnOP(t-1)$
	Portfolio Construction	
PEH	Price-earnings ratio(high) market equity divided by annual net income of firm at the end of December in year t-1	The highest 33.33% of stock sort by price-earnings ratio
PEM	Price-earnings ratio(medium)	The medium range 33.33% to 66.66% of stock sort by price-earnings ratio
PEL	Price-earnings ratio(low)	The lowest 33.33% of stock sort by price-earnings ratio
MEH	Market equity (high) Price times number of shares outstanding at the end of fiscal year t-1.	The highest 33.33% of stock sort by market equity
MEM	Market equity (medium)	The medium range 33.33% to 66.66% of stock sort by market equity-Bloomberg
MEL	Market equity (low)	The lowest 33.33% of stock sort by market equity - Bloomberg
BML	Book-to-market (low)	The lowest 33% of stock sort by book-to-market ratio– Bloomberg
BMM	Book-to-market (medium)	The medium range 33.33% to 66.66% of stock sort by book-to-market ratio –Bloomberg
BMH	Book-to-market (high) Book equity at the end of fiscal year t-1 divided by market equity at the end of fiscal year t-1.	The highest 66% to 100% of stock sort by book-to-market ratio-Bloomberg

Source: IFS - IMF International Financial Statistic, CEIC & OPEC - Organisation of the Petroleum Exporting Countries, Bloomberg. All variables are converted into logarithm and Δ denotes the first difference for the variables.

*Long-term and short-term interest rate for Indonesia is obtained from CEIC

The numbers of stocks for each country that meet the criteria for stock selection, and which are distributed into high, medium and low portfolios, are shown in the following table 3.

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Table 3. Number of Eligible Firms for Each Country over the sample period

Country	Number of Firms	Distribution Number of Firms into High, Medium and Low portfolio
Malaysia	222	High – 74, Medium – 74, Low – 74
Indonesia	57	High – 19, Medium – 19, Low – 19
Singapore	111	High – 37, Medium – 37, Low – 37
Thailand	123	High – 41, Medium – 41, Low – 41

The economic variables are transformed into natural logarithms and their first differences to achieve stationary in data to prevent spurious regression (Mukherjee & Naka, 1995; Maysami & Koh, 2004). Moreover, a natural logarithm helps in reducing the heteroscedasticity in the model. Using the state variable as derived above, the stock portfolio return model can be formed as follows:

Equation 2

$$E = a + \beta_{\Delta IP}\Delta IP + \beta_{\Delta INF}\Delta INF + \beta_{\Delta ER}\Delta ER + \beta_{\Delta STIR}\Delta STIR + \beta_{\Delta LTIR}\Delta LTIR + \beta_{\Delta MS}\Delta MS + \beta_{\Delta OP}\Delta OP + e$$

where the betas (β) are the loading coefficient for the state variables, E represents the stock portfolio return, a represents the constant term and e represents the error term.

In order to estimate the regression models stated above, stationarity of the series should be examined. In this study, Augmented Dickey-Fuller (ADF) (Dickey and Fuller, 1979) test is used for testing the presence of unit roots. Two assumptions should be checked when estimating a regression model. These assumptions are independency and homoscedasticity of residual errors. Existence of serial correlation is checked by Breusch-Godfrey Langrange Multiplier test (Breusch, 1978; Godfrey, 1978). Presence of heteroscedasticity is tested by White General Heteroscedasticity Test (White, 1980). The regressions are performed by ordinary least squares (OLS) method.

4. Empirical Results

First we examined the descriptive statistics for each variable and portfolio in all given countries. Each country summary statistics are divided into two sub-periods, pre-crisis period (from July 2003 to June 2007) as sub-period A and during and after the crisis period (from July 2007 to June 2011) as sub-period B.

Table 4. Descriptive Statistics for Malaysia, Indonesia, Singapore & Thailand

Malaysia								Indonesia							
Sub-period A - July 2003 to June 2007)				Sub-period B - July 2007 to June 2011)				Sub-period A - July 2003 to June 2007)				Sub-period B - July 2007 to June 2011)			
	N	Mean	Std. Deviation		N	Mean	Std. Deviation		N	Mean	Std. Deviation		N	Mean	Std. Deviation
ΔINF	48	0.0020	0.0030	ΔINF	48	0.0023	0.0065	ΔINF	48	0.0072	0.0121	ΔINF	48	0.0051	0.0054
ΔIPI	48	0.0055	0.0505	ΔIPI	48	0.0005	0.0492	ΔIPI	48	0.0015	0.0680	ΔIPI	48	0.0026	0.0273
ΔTS	48	-0.0090	0.3237	ΔTS	48	0.0144	0.2315	ΔTS	48	-0.0275	0.4414	ΔTS	48	0.0161	0.1947
ΔMS	48	0.0126	0.0130	ΔMS	48	0.0088	0.0110	ΔMS	48	0.0108	0.0145	ΔMS	48	0.0114	0.0236
ΔER	48	-0.0003	0.0137	ΔER	48	-0.0017	0.0152	ΔER	48	0.0035	0.0243	ΔER	48	0.0001	0.0323
ΔOP	48	0.0216	0.0775	ΔOP	48	0.0087	0.1262	ΔOP	48	0.0216	0.0775	ΔOP	48	0.0087	0.1262
PEH	48	0.624%	2.610%	PEH	48	0.503%	3.450%	PEH	48	1.813%	5.172%	PEH	48	1.199%	8.872%
PEM	48	1.437%	3.472%	PEM	48	0.604%	4.310%	PEM	48	2.837%	6.265%	PEM	48	2.230%	8.970%
PEL	48	1.288%	3.687%	PEL	48	0.879%	5.048%	PEL	48	4.691%	5.822%	PEL	48	3.590%	10.783%
BMH	48	1.479%	4.630%	BMH	48	0.885%	4.667%	BMH	48	4.074%	7.606%	BMH	48	4.188%	10.449%
BMM	48	1.133%	3.511%	BMM	48	0.540%	4.727%	BMM	48	3.494%	5.730%	BMM	48	2.146%	8.681%
BML	48	0.886%	2.568%	BML	48	0.600%	3.521%	BML	48	2.448%	5.599%	BML	48	1.833%	9.243%
MEH	48	1.143%	2.679%	MEH	48	0.686%	3.594%	MEH	48	2.578%	5.383%	MEH	48	2.092%	9.192%
MEM	48	0.881%	3.472%	MEM	48	0.359%	4.884%	MEM	48	3.935%	6.431%	MEM	48	2.339%	9.140%
MEL	48	0.851%	4.629%	MEL	48	0.765%	4.360%	MEL	48	3.224%	6.771%	MEL	48	2.466%	9.733%
Singapore								Thailand							
ΔINF	48	0.0009	0.0049	ΔINF	48	0.0032	0.0065	ΔINF	48	0.0030	0.0045	ΔINF	48	0.0024	0.0081
ΔIPI	48	0.0078	0.1171	ΔIPI	48	0.0065	0.1239	ΔIPI	48	0.0067	0.0707	ΔIPI	48	0.0038	0.0735
ΔTS	48	-0.0233	0.2623	ΔTS	48	0.0281	0.2999	ΔTS	48	0.0059	0.3385	ΔTS	48	-0.0104	0.3316
ΔMS	48	0.0097	0.0101	ΔMS	48	0.0091	0.0086	ΔMS	48	0.0057	0.0082	ΔMS	48	0.0074	0.0227
ΔER	48	-0.0012	0.0091	ΔER	48	-0.0035	0.0109	ΔER	48	-0.0024	0.0131	ΔER	48	-0.0013	0.0166
ΔOP	48	0.0216	0.0775	ΔOP	48	0.0087	0.1262	ΔOP	48	0.0216	0.0775	ΔOP	48	0.0087	0.1262
PEH	48	2.334%	2.850%	PEH	48	0.047%	7.337%	PEH	48	0.945%	3.496%	PEH	48	0.464%	5.004%
PEM	48	2.298%	3.218%	PEM	48	-0.39%	7.618%	PEM	48	1.585%	3.928%	PEM	48	1.171%	5.800%
PEL	48	1.809%	3.975%	PEL	48	1.170%	7.840%	PEL	48	0.941%	4.272%	PEL	48	1.268%	6.021%
BMH	48	2.498%	4.053%	BMH	48	0.882%	7.138%	BMH	48	0.775%	2.753%	BMH	48	1.578%	5.708%
BMM	48	2.162%	3.292%	BMM	48	-0.09%	8.249%	BMM	48	1.075%	4.313%	BMM	48	0.872%	4.214%
BML	48	2.083%	2.698%	BML	48	0.046%	7.358%	BML	48	1.265%	4.182%	BML	48	0.742%	6.132%
MEH	48	2.091%	2.657%	MEH	48	0.287%	7.100%	MEH	48	1.306%	4.268%	MEH	48	0.842%	7.152%
MEM	48	2.455%	4.198%	MEM	48	-0.04%	8.476%	MEM	48	1.094%	3.812%	MEM	48	0.769%	3.793%
MEL	48	2.688%	5.422%	MEL	48	-0.18%	7.760%	MEL	48	0.722%	3.600%	MEL	48	1.425%	3.973%

Table 4 provides the summary statistics for the state variables and stock returns of each portfolio in all four countries. For Malaysia, the results for the mean and standard deviation show that the change in the macroeconomic variables between the two different sub-periods is consistent, except for ΔTS and ΔOP. ΔTS shows a higher standard deviation in sub-period A (0.3237) than in sub-period B (0.23147). The standard deviation for ΔOP is found to be higher in sub-period B (0.126). The overall summary of portfolio returns shows that the average monthly stock return for all portfolios in the sub-period A (ranging from 0.85% to 1.48%) is higher than sub-period B (ranging from 0.36% to 0.88%). The high BM portfolio outperforms the low and medium BM portfolios in both sub-periods. As for market equity, the high ME portfolio outperforms the low and medium market equity portfolios in sub-period A, but the low ME portfolio shows a better average return in sub-period B.

In case of Indonesia, the result for the mean and standard deviation shows that the changes in the macroeconomics variables are consistent, except for ΔTS, in both sub-periods. The overall portfolio return shows that the mean monthly stock return for all portfolios in sub-period A (ranging from 1.81% to 4.69%) is comparable with that of sub-period B (ranging from 1.20% to 4.19%). The high BM portfolio outperforms the low and medium BM portfolios in both sub-periods.

For Singapore, the mean and standard deviation for ΔTS show significant changes from -0.02333 to 0.02813 and from 0.2623 to 0.2999 for sub-period A and sub-period B, respectively. The overall portfolio return shows that the mean monthly stock return for all portfolios in sub-period A (ranging from 1.81% to 2.69%) is higher than in sub-period B (ranging from -0.4% to 1.17%). The high BM portfolio outperforms the low and medium BM portfolios in both sub-periods. The result for Thailand shows that changes in macroeconomics variables are consistent in both sub-periods despite there being a change in ΔTS from 0.00592 to -1.043. The overall portfolio return shows that the mean monthly stock return for all portfolios in sub-period A (ranging from 0.72% to 1.31%) is comparable with that in sub-period B (ranging from 0.46% to 1.58%).

Our findings consistently show that, on average, stock returns with high BM outperform those with low and medium BM in both sub-periods in all countries in the analysis. This result is consistent with the findings in the literature, for instance Fama and French (1992) and Barber and Lyon (1997), provided evidence that a high BM portfolio outperforms in term of the average stock return relative to the low BM portfolio in the US stock market, while Cotter and Donnellt (2006) show the same correlation in the UK stock market. Likewise, in the Asia region, Chui and Wei's (1998) study indicates the same correlation for Hong Kong, South Korea and Malaysia, and Chan, Hamao and Lakonishok (1991) obtain the same findings in their study on Japan.

The PE portfolio provides mixed findings on average stock return during our study period. The low PE portfolio shows higher average return in Indonesia for both sub-periods and during sub-periods B in Malaysia, Singapore and Thailand. This result is similar to that of Basu (1977) and Ball (1978). Truong (2009) suggested that part of this phenomenon can be explained by investors' erroneous extrapolation of their past performance and that the market corrects itself with new information that sheds light on incorrect expectations. Moreover, Truong (2009) suggests that low PE stock is low risk and low beta, but this stock more attractive than bonds. This could explain why low PE stocks become more attractive during crisis periods because other than bonds, the low PE portfolio is characterized as a "safe haven" during crisis periods. In contrast, medium and high PE portfolios shows higher average return than low PE portfolios for Malaysia, Singapore and Thailand during sub-period A, which is in line with the findings of Lakonishok et al. (1994), who suggest that the high PE portfolios outperform in the past and are expected to continue to perform well and, vice versa, for low PE portfolios. This phenomenon occurred in Malaysia, Singapore and Thailand during the economic boom period before the economic crisis of 2007.

Size effect (ME) plays an important role in the value of stock return. Based on the findings of Banz (1981) and Reinganum (1981), low ME portfolio should outperform the high ME portfolio. Our study shows mixed findings in the two different sub-periods as well as in different countries. Our findings shows that high and medium ME portfolios are more lucrative than low portfolios in emerging countries (Indonesia, Malaysia and Thailand) in sub-period A, but that the low ME portfolio outperforms the medium and high ME portfolios during sub-period B. In Singapore, a developed economy, the low ME portfolio outperforms the high and medium portfolios during sub-period A, but the high ME portfolio has higher average return than the medium and low ME portfolios during sub-period B. The study of Brown, Kleidon and Marsh (1983) acknowledges that size effect is not stable over time periods. This phenomenon can be found in our study in the cases of Indonesia, Malaysia, Singapore and Thailand, where the ME portfolio reacts differently in both sub-periods. As explained by Reilly and Brown (2006), size effect is an important factor in the capital market which cannot be explained by established theory so far.

ADF test concluded that all of the series are stationary; the effect of macroeconomic variables on the portfolio returns is then examined by OLS estimation. OLS estimation results are reported in Table 5-8.

Table 5 summarizes the relationship between different PE, MB and ME and the hypothesized macroeconomic variables for Malaysia in both sub-periods. In sub-period A, the result of our analysis show that the change in consumer price index, ΔINF shows a significance effect in regard to the stock return in portfolios PEH, PEM, BML and MEH, with a negative relationship. The result is consistent with the studies of Naka, Mukherjee and Tufte (1998), Maghayereh (2002), Nishat and Shaheen (2004) and Al-Sharkas (2004) in the emerging countries. The negative correlation between stock returns and ΔINF implies that the stock portfolios with PEH, PEM, BML and MEH are not a good hedge against inflation. If we now look at the results for sub-period B, a MEH portfolio has significance and positive effect to change in oil price, ΔOP. The positive correlation might be due to the fact that Malaysia is an oil exporting country and this result is in line with that of the study of Park and Ratti (2008), which investigated another oil exporting country, Norway, and found positive oil price shock with stock return. Moreover, the same effect was found by Abdelaziz, Chortareas and Cipollini (2008) for the Middle East oil exporting countries.

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Table 5. Relationship between Stock Portfolio and Macroeconomic variables for Malaysia

	Sub-period A July 2003 to June 2008						Adj R^2	Sub-period BJuly 2007 to June 2011						Adj R^2
	ΔINF	ΔIPI	ΔTS	ΔMS	ΔER	ΔOP		ΔINF	ΔIPI	ΔTS	ΔMS	ΔER	ΔOP	
PEH	**-0.27***	0.05	0.00	0.07	-0.04	0.12	3.3%	-0.13	0.06	-0.04	0.13	-0.12	0.25	3.7%
PEM	**-0.32****	-0.01	0.13	0.14	-0.06	0.05	2.3%	-0.11	0.10	0.03	0.08	-0.15	0.17	1.1%
PEL	-0.09	-0.02	0.13	0.06	-0.04	0.15	7.9%	-0.07	0.17	-0.06	0.02	-0.16	0.17	1.0%
BMH	-0.16	-0.03	0.07	0.02	-0.08	0.08	9.2%	-0.10	0.16	0.01	0.06	-0.19	0.06	2.6%
BMM	-0.18	-0.06	0.10	0.10	-0.02	0.17	4.1%	-0.09	0.08	0.01	0.10	-0.17	0.19	1.1%
BML	**-0.31****	0.06	0.07	0.12	-0.04	0.09	0.3%	-0.14	0.11	-0.05	0.09	-0.12	0.26	4.6%
MEH	**-0.27***	0.02	0.05	0.12	-0.09	0.09	2.9%	-0.13	0.10	-0.06	0.09	-0.12	**0.27***	5.1%
MEM	-0.23	0.00	0.13	0.06	-0.01	0.13	3.1%	-0.08	0.09	0.04	0.09	-0.20	0.14	1.6%
MEL	-0.17	-0.05	0.07	0.01	0.04	0.13	7.0%	-0.14	0.19	-0.01	0.04	-0.11	0.03	4.5%

*Notes: ** and * denote significance at the 5% and 10%, level respectively.*

Table 6 highlights the relationship between different PE, MB and ME and the hypothesized macroeconomic variables for Indonesia in both sub-periods. Based on the results for sub-period A, change in CPI (ΔINF) is negatively correlated with PEM, PEL, BMM, MEH and MEM portfolios. Change in oil price (ΔOP) is significant and positively correlated with PEH, BMM, MEH and MEM portfolios. Change in exchange rate (ΔER) is significant and negatively correlated with BMH, BML and MEM portfolios. Change in term structure is only significantly correlated with the MEM portfolio. This shows that all portfolios, except the MEL portfolio, are strongly affected by the macroeconomic variables ΔINF, ΔOP and ΔER.

Table 6. Relationship between Stock Portfolio and Macroeconomic variables for Indonesia

	Sub-period A July 2003 to June 2007						Adj R^2	Sub-period BJuly 2007 to June 2011						Adj R^2
	ΔINF	ΔIPI	ΔTS	ΔMS	ΔER	ΔOP		ΔINF	ΔIPI	ΔTS	ΔMS	ΔER	ΔOP	
PEH	-0.11	0.05	0.09	-0.2	-0.282	**0.27***	0.11%	-0.1	0	-0.04	0.02	-0.45**	**0.32****	0.24%
PEM	**-0.43****	-0.2	0.29	-0.1	-0.241	0.2304	0.13%	0	0	-0.07	0.01	**-0.46****	0.1592	0.12%
PEL	**-0.32****	-0.1	0.12	-0.2	-0.213	0.1956	0.07%	-0.1	0	**-0.30****	0.08	**-0.56****	**0.33****	0.35%
BMH	-0.31	-0.2	0.12	-0.1	**-0.29***	0.1929	0.08%	-0.1	0.09	-0.24	0.03	**-0.45****	0.1567	0.16%
BMM	**-0.45****	0	0.26	-0.2	-0.19	**0.31****	0.19%	-0.1	-0.1	-0.04	0.14	**-0.53****	0.0871	0.22%
BML	-0.28	-0.1	0.17	-0.1	**-0.29***	0.2288	0.08%	-0.1	0	-0.09	0.01	**-0.46****	**0.30****	0.21%
MEH	**-0.31***	0	0.18	-0.1	-0.262	**0.26***	0.10%	-0.1	-0.1	-0.11	0.02	**-0.50****	**0.28****	0.25%
MEM	**-0.48****	-0.2	**0.35****	0	**-0.38****	**0.25***	0.26%	0	0.12	-0.07	0.13	**-0.52****	**0.24****	0.23%
MEL	-0.2	0	0	-0.2	-0.251	0.1287	0.03%	0.05	0.13	0.017	0.03	**-0.39****	-0.013	0.05%

*Notes: ** and * denote significance at the 5% and 10%, level respectively.*

In sub-period A, the positive significant relationship between stock return and ΔOP in Indonesia is in line with a number of previous empirical studies (Nandha and Hammoudeh, 2006; Ghorbel and Younes, 2011). Indonesia is a net exporter of oil, but the country has been pulling out from OPEC and became self-sufficient during 2008. In sub-period B, ΔER is negatively correlated with all portfolios in Indonesia. This further emphasizes the crucial role of the exchange rate with respect to stock return during the crisis and post-crisis period. While for ΔOP, the result shows that ΔOP is positively correlated with PEH, PEL, BML, MEH and MEM. ΔTS shows a negative correlation, which is different to the result for sub-period A. The negative correlation of ΔTS is in line with the Chen, Roll and Ross (1986) and with our present findings for Thailand for sub-period B.

Table 7 results shows that for Singapore in sub-period A, change in exchange rate, ΔER, has a significant effect on a number of portfolios in our analysis. From our regression results, it can be seen that ΔER shows significant negative correlation for the PEM, PEL, BMM and MEH portfolios. The negative correlation indicates that the appreciation in the Singapore dollar leads to a positive effect on stock return. This result is in line with the findings of Maysami and Koh (2000) and Maysami, Howe and Hamzah (2004). They explain that Singapore is a high import and export country and appreciation in the currency enables the country to access lower-priced imported raw material, which allows domestic producers to be more competitive in the international arena in turn attract more investor and thus increase in stock price. Sub-period A further highlight that MEL portfolio is positively correlated to term structure, ΔTS. This positive correlation finding is different from Chen, Roll and Ross (1986). However, Canova and DeNicolo (2000) explain that term structure is related to the future development of the economy and a steeper term structure curve is associated with higher growth of the industrial sector and lower inflation. High growth of the industrial sector and low inflation are perceived as favourable news in the stock market and thus generate a positive shock to the stock market return.

Table 7. Relationship between Stock Portfolio and Macroeconomic variables for Singapore

	Sub-period A July 2003 to June 2008						Adj R^2	Sub-period BJuly 2007 to June 2011						Adj R^2
	ΔINF	ΔIPI	ΔTS	ΔMS	ΔER	ΔOP		ΔINF	ΔIPI	ΔTS	ΔMS	ΔER	ΔOP	
PEH	0.12	0.04	0.18	0.15	-0.17	-0.08	3.2%	-0.17	0.10	0.01	-0.17	-0.17	**0.30***	5.6%
PEM	0.01	0.10	0.16	0.13	**-0.31****	0.19	4.5%	-0.19	0.11	-0.05	-0.11	-0.13	**0.28***	1.3%
PEL	0.01	-0.03	0.21	0.09	**-0.30***	0.06	1.1%	-0.12	0.06	0.09	-0.08	-0.14	0.285	1.0%
BMH	-0.04	0.03	0.16	0.20	-0.129	0.06	4.4%	-0.20	0.10	0.08	-0.04	-0.18	**0.27****	3.5%
BMM	0.09	0.09	0.22	0.12	**-0.36****	-0.01	7.2%	-0.13	0.09	0.00	-0.11	-0.11	0.267	1.9%
BML	0.09	0.05	0.18	0.15	-0.24	0.12	0.1%	-0.18	0.09	-0.01	-0.20	-0.17	**0.32***	6.9%
MEH	0.10	0.09	0.18	0.16	**-0.32****	0.05	3.9%	-0.16	0.08	0.03	-0.12	-0.17	0.283	2.0%
MEM	-0.01	-0.10	0.24	0.11	-0.164	0.00	3.1%	-0.17	0.11	-0.02	-0.22	-0.16	**0.33***	8.2%

*Notes: ** and * denote significance at the 5% and 10%, level respectively.*

In the case of sub-period B, change in oil price, ΔOP has significant effect on most of the portfolios in Singapore. Portfolios PEH, PEM, BMH, BML, MEM and MEL are positively correlated with ΔOP which further substantiate that the overall Singapore market is more responsive to the effect of ΔOP than Malaysia. Singapore is not an oil-exporting country so the reasons for our findings cannot be explained in the same way as for Malaysia. From the analysis, it is observed that ΔOP became significant during the crisis and post-crisis period.

Le and Chang (2011) explain that the rising crude oil price is reflected in the stronger business performance which results in increasing oil demand, and that this normally happens when the economy is recovering from recession – when there is high demand for oil for economic expansion. In their study of the situation in Japan, based on monthly data from 1986 to 2011, they found that the Japanese stock market responds positively in these circumstances. Furthermore, Mohan and Harminder (2011) show the same correlation for China which they state is due to the aggregate demand side for oil, which increased the oil price, during economic expansion. The aggregate demand for oil could be due to a combination of economic stimulus events in most countries, as well as in Singapore, during and post crisis. A stimulus event is denoted as favourable news because it is perceived as being a positive move to encourage real economic activities. Hence, there is a consequent increase in stock return. Assuming that past trend continues, the positive correlation between oil price and stock return may provide an effective hedge during oil price hikes.

Table 8 summarizes the relationship between different PE, MB and ME and the hypothesized macroeconomic variables for Thailand in both sub-periods. In sub-period A, change in exchange rate, ΔER, and change in term structure, ΔTS, have significant effects on the portfolios in Thailand. In this analysis, ΔER has a negative correlation with PEH, BMH, MEM and MEL portfolios. The currency is stronger compared to other currencies when the required face value to exchange for other currencies is lower or vice versa. In this case, the negative relationship suggests that depreciation of currency may depress the stock market. This phenomenon is in line with a number of previous empirical studies. For instance, Dimitrova (2005) finds that depreciation of currency can depress the stock market or vice versa.

Table 8. Relationship between Stock Portfolio and Macroeconomic variables for Thailand

	Sub-period A July 2003 to June 2008						Adj R^2	Sub-period BJuly 2007 to June 2011						Adj R^2
	ΔINF	ΔIPI	ΔTS	ΔMS	ΔER	ΔOP	Adj R^2	ΔINF	ΔIPI	ΔTS	ΔMS	ΔER	ΔOP	Adj R^2
PEH	-0.01	-0.04	0.19	0.21	**-0.35***	0.10	1.2%	**0.36****	0.14	**-0.29***	**0.31***	0.07	**0.51****	14.6%
PEM	-0.15	0.09	0.25	0.11	-0.16	-0.01	0.6%	**0.36****	0.22	-0.26	**0.41***	0.02	**0.42****	11.3%
PEL	-0.09	0.08	**0.34***	0.11	-0.23	0.16	9.3%	0.37	0.15	-0.19	0.4	0.06	0.34	6.0%
BMH	-0.05	0.18	0.14	0.10	**-0.38***	0.12	7.3%	0.11	0.13	-0.08	0.25	-0.03	0.23	5.3%
BMM	-0.18	0.07	**0.32***	0.16	-0.23	0.07	10.7%	**0.33***	**0.27****	**-0.30***	**0.38****	-0.07	**0.53****	21.8%
BML	-0.05	-0.03	0.24	0.16	-0.21	0.08	2.1%	**0.40****	0.15	**-0.30***	**0.38****	0.1	**0.46****	14.1%
MEH	-0.10	0.00	**0.27****	0.16	-0.20	0.02	3.0%	**0.38****	0.14	**-0.29***	**0.38****	0.07	**0.49****	14.1%
MEM	0.05	0.05	**0.33***	0.10	**-0.25****	0.22	10.5%	0.19	0.13	-0.17	0.19	0.04	0.25	6.5%

*Notes: ** and * denote significance at the 5% and 10%, level respectively.*

For term structure, ΔTS shows a positive correlation with PEL, BMM, MEH and MEM portfolios. However, the analysis shows ΔTS has a bigger spread over the portfolios than in the case of Singapore during sub-period A. This positive correlation finding is different from Chen, Roll and Ross (1986). This shows that the overall Thailand stock market is more responsive to the effect of ΔTS with the positive correlation whereby the narrower or negative magnitude in the term structure is related to the gloomy economic future outlook thus depressing the stock market. In contrast, a wider term structure is associated with a booming economic future outlook and thus increases the stock price.

In sub-period B, all macroeconomic variables except for ΔER in our analysis shows significance effect on number of portfolios, namely, PEH, PEM, PEL, BMM, BML, MEH and MEL. From Table 8, ΔINF, ΔIPI, ΔMS and ΔOP show a significant positive correlation with stock return, while ΔTS shows a significant negative correlation with stock return. In this case, the Thailand stimulus package seems to have made a strong contribution to the correlation of macroeconomic variables such as ΔINF, ΔIPI, ΔMS and ΔOP with stock return during sub-period B. The study of Chirathivat and Malikamas (2010) explains that Thailand instituted a few economic stimulus plans to stimulate the gloomy economy during the crisis and post-crisis period. An increase in money supply was required during this stimulus period and in the meantime real economic activities were expanding through this economic stimulus event. The oil price seems to have followed the aggregate demand side during the economic expansion period after the crisis when most countries were instituting economic stimulus events to boost the economic outlook. An economic stimulus event seems to be favourable event for the stock market during the crisis and post-crisis period. In addition, the escalation of the oil price could lead to higher inflation (Wurzel et al., 2009). This is because oil is major commodity in the economy and acts as an input or cost of production in most industries.

5. Conclusion

A large number of previous studies show that there is a relationship between macroeconomic variables and stock return. These studies have provided different findings due to the different periods covered, time spans, macroeconomic factors, methodologies and countries examined. This paper extends the literature by considering the effect of firm characteristics to examine a cross-sectional view of the stock markets in Malaysia, Indonesia, Singapore and Thailand. Moreover, two sub-periods were analysed to examine the relationship between macroeconomic variables and different portfolios in different sub-periods. As mentioned in the study of Erdogan and Ozlale (2005), the relationship between macroeconomic variables and stock return has not been consistent over time due to structural change.

Our empirical findings showed that the significance relationship between macroeconomic variables and portfolio stock returns were not consistent for both sub-periods. Results are highly dependent on portfolio, country and sub-period in our analysis. During pre-crisis period (sub-period A), portfolios in Malaysia showed a significant relationship with ΔINF; portfolios in Singapore showed a significant relationship with ΔTS and ΔER; portfolios in Thailand showed a significant relationship with ΔTS and ΔER; and portfolios in Indonesia showed a significant relationship with ΔOP, ΔINF and ΔER. On the other hand, during crisis and post crisis period (sub-period B), portfolios in Malaysia showed a significant relationship with ΔOP; portfolios in Singapore showed a significant relationship with ΔOP; portfolios in Thailand showed a significant relationship with ΔOP,ΔINF, ΔMS, ΔIPI,ΔTS and ΔER; and portfolios in Indonesia showed a significant relationship with ΔOP ,ΔTS and ΔER.

In conclusion, the results indicate macroeconomic factors have significance effect in Malaysia, Indonesia, Singapore and Thailand stock market. However, each factor may react differently based on different portfolios, different sub-periods and different countries in our analysis. For instance, the result shows that appreciate in currency in Indonesia and Singapore provides better stock return in return; During the crisis and post crisis period(sub-period B), the stock markets of MIST are more reactive to the change in oil price; On the other hand, the result of Thailand shows the positive correlation between change in inflation and stock return during crisis and post crisis(sub-period B) while the result of Malaysia and Indonesia show inflation is negatively correlated to stock return before the crisis period(sub-period A). All these findings can be served as good reference for the researchers in their future development in the asset valuation area.

Based on the findings presented here, there are a number of future research directions that could be taken. For instance, further studies could consider other macroeconomic variables such as balance of trade account and government budget (budget surplus or deficit) as well as firm characteristics such as volatility factor and cash flow to price ratio to further evaluate the situation in Malaysia, Singapore, Thailand and Indonesia by using the same model. In conclusion, it is hoped that this paper will be of benefit to policy maker, stock investors and contribute to the financial literature.

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