

A Cointegration Analysis between Malaysian and Developed Markets

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Abstract. In this paper, we examine the linkages of stock prices and benefits of diversification between the Malaysian equity market and the developed equity markets from Malaysian perspective. We use econometric methodology and utilize standard cointegration analysis. In addition, the influence of financial crisis is also analysed by contrasting different periods from 1996-2007. Our findings imply that Malaysian investors would have little scope to include stock of US, Japan or Hong Kong as it has minimal benefits of diversification, as the markets move towards a greater integration. Furthermore, for policymaking, any sensations in the United State, Japan and Hong Kong equity markets should be taken into consideration by the Malaysian authorities in designing Malaysian policies.

Keywords: stock market integration; diversification benefits; Granger causality; Malaysia

1. Introduction

Although a considerable amount has been written about the Malaysian market, limited research has been found in the literature of economics and finance on the topic of stock market integration. The motivation behind this study is that although considerable research has focused on stock market integration, the emphasis has been mostly on developed markets. Stock market between the Malaysian stock market and other countries integration has not been investigated deeply enough. Nevertheless, they are equally important in understanding the relationship of stock market integration between Malaysia and other countries. The recent studies by Yusof and Majid (2006) provide empirical evidence on the impact of the introduction of the Malaysian stock market^[1]. However, these studies remain in complete and have the following shortcomings. They are confined to stock market changes up to 2000 and only cover selected developed countries, namely, the US and Japan. The paper examines long run comovement and seeks to investigate which market actually led the Malaysian stock market before, during, and after the 1997 Asian financial crisis periods. Thus, longer term, post-financial crisis impacts on international stock markets from the Malaysian perspective are neither well documented nor understood. The integration between Malaysian and the developed markets has never been fully assessed. It is not even clear to what extent the impacts of financial crises have changed the integration process of Malaysian stock markets.

Ibrahim (2006) investigates the relationship in the equity markets of the US, Japan and four ASEAN countries, namely, Indonesia, Philippines, Singapore and Thailand. He finds that there is no long run relationship among share prices in all systems of share prices before the Asian crisis and after the imposition of capital control^[2]. Girard and Ferreira (2004) examined cointegration in the stock markets of Middle East and North Africa (MENA)^[3]. Their findings suggest that most MENA markets are segmented and confirm there is a potential in risk reduction in any of the MENA equity markets. Similarly, Kanas (1998) investigated cointegration among the US, the UK and the six largest European markets, namely, Germany, France, Switzerland, Italy and Netherlands on monthly data from 1983-1996^[4]. They found that US stock market was not cointegrated with all of the European markets under analysis. Therefore, they suggest there is maximal

benefit in risk reduction from diversifying in US stocks and stocks in any of the major European markets under consideration. Kazi (2008) investigated the cointegration among seven markets, namely, Australia, the UK, the US, Canada, Germany, France and Japan from 1945 to 2002 on annual data ^[5]. In contrast with Kanas (1998), and Girard and Ferreira (2004), the researcher's analyses confirm that the Australian stock market is cointegrated with overseas equity markets ^[3,4]. The significant overseas markets for Australia are the UK, Canada and Germany. Therefore, Australian investors would have little scope to include the stock of the UK, Canada or Germany as it has minimal benefits of diversification. In a more recent study, Majid et al. (2009) empirically explored the dynamic linkages among ASEAN countries equity markets. By using two-step estimation, cointegration and Generalized Method of Moments (GMM), they found that the stock markets in the ASEAN region were cointegrated not only in pre and in post 1997 financial crisis but have been moving towards greater integration after the post financial crisis.

This study intends to fill the research gap by investigating the integration using more recent data, and including almost all major markets. Compared to the existing literature, several aspects of our data are worth noting. The literature is obviously insufficient in providing up to date insight into the linkages of Malaysia with other global markets. Moreover, for investor in small, developing countries like Malaysia, global diversification may be very important. Therefore, it is worth investigating the benefits of international diversification from a Malaysian standpoint. Moreover, the literature reviews above have shown that there are divergent conclusions for potential global stock market linkages. The empirical results differ, depending on the option of equity markets, the sample time selected, the frequency of observations whether it is daily, weekly or monthly, and the different methodologies used to investigate the relationship of stock markets and the benefits of international diversification. Hence, this subject matter needs further analysis. Therefore, the emphasis on this paper is to study the international linkage in one of the emerging markets, namely, Malaysia. This study adds to our understanding of the linkages of the Malaysian market with global markets, which has received little attention. Furthermore, given the conflicting evidence of the research in this field, empirical study is required.

Therefore, the main purpose of this study is to investigate the potential benefits of investing overseas, to examine long run and short-run linkages between Malaysian stock market and developed countries by utilizing cointegration analysis.

2. DATA AND DESCRIPTIVE STATISTICS

2.1 .Data description

This study contains data for the stage of July 1996 to June 2007. The study comprises daily closing Morgan Stanley Composite Index (MSCI) indices as collected from Bloomberg. MSCI is used because it provides standardization, which facilitates cross-country comparisons. The comparison is standardized because all the countries indices are dividend adjusted. Developed countries are grouped in line with the classification of International Finance Corporation (IFC). The choice of the countries was based on large market capitalization of MSCI indices for developed countries. These indices are expressed in terms of Malaysian returns for all countries and indices. The Malaysian Ringgit denominated returns are calculated based as log price relatives based on the Malaysian Ringgit for all the developed countries. To facilitate a more comprehensive investigation, this study is divided into four sub periods to capture the effects on Malaysian markets of various stages. The rationale for the timing of these sub periods is based on key economic events. Sub period 1: July 1996 to June 1997 involving the entire period. Sub period 2: July 1996 to June 1997 involving the period of before financial crisis. Sub period 3: July 1997 to June 1998 involving the period of financial crisis. Finally sub period 4: July 1998 to June 2007 involving the period of after financial crisis.

2.2. Descriptive statistics

We report descriptive statistics results in Table 1.

TABLE I. DESCRIPTIVE STATISTICS

Index returns(Percent)				
Equity Markets	Mean	Standard Deviation	Skewness	Kurtosis
(a) Entire Period (July 1996 – June 2007)				
MAL	0.008	1.884	-1.725	82.339
US	0.039	1.233	0.019	8.402
JPN	0.010	1.490	0.294	7.077
UK	0.040	1.220	-0.203	9.953
FRN	0.051	1.399	-0.107	6.051
HK	0.024	1.630	0.000	14.169
GER	0.046	1.558	-0.125	5.863
CAN	0.060	1.305	-0.442	8.858
SWZ	0.045	1.248	-0.024	8.998
AUS	0.049	1.202	-0.120	9.385
SPN	0.061	1.455	0.066	6.176
(b) Pre-Crisis (July 1996 – June 1997)				
MAL	-0.017	0.864	-0.448	5.154
US	0.111	0.868	-0.266	3.497
JPN	-0.033	1.139	0.057	4.265
UK	0.108	0.728	-0.370	3.749
FRN	0.068	0.900	-0.672	5.487
HK	0.094	1.078	0.016	5.149
GER	0.092	0.862	-0.613	5.075
CAN	0.102	0.783	-0.484	5.346
SWZ	0.099	0.833	-0.483	5.103
AUS	0.052	0.891	-0.330	4.022
SPN	0.146	0.962	-0.022	2.850
(c) Crisis (July 1997 – June 1998)				
MAL	-0.356	3.246	1.228	9.278
US	0.291	2.055	-0.094	6.725
JPN	0.033	2.321	0.388	4.997
UK	0.281	2.073	-0.322	8.717
FRN	0.318	2.119	-0.090	5.043
HK	-0.077	3.173	0.123	7.629
GER	0.332	2.257	-0.222	4.997
CAN	0.231	2.011	-0.231	7.199
SWZ	0.296	2.089	-0.059	6.605
AUS	0.107	2.086	0.104	7.251
SPN	0.341	2.295	0.012	4.501
(d) Post-Crisis (July 1998 – June 2007)				
MAL	0.048	1.752	-3.310	123.329
US	0.003	1.139	-0.054	6.077
JPN	0.010	1.401	0.209	6.664
UK	0.005	1.129	-0.240	5.680
FRN	0.018	1.339	-0.185	5.150
HK	0.027	1.418	-0.051	9.138
GER	0.010	1.521	-0.141	5.170
CAN	0.037	1.250	-0.561	7.464
SWZ	0.010	1.157	-0.135	6.980
AUS	0.040	1.093	-0.304	5.999
SPN	0.021	1.376	-0.019	5.466

3. ECONOMETRIC METHODOLOGY

TABLE II. UNIT ROOT TESTS

(a) Entire Period (July 1996 – June 2007)				
Equity Markets	Level			
	ADF		PP	
	No Trend	Trend	No Trend	Trend
US	1.589	-2.445	1.717	-2.449
JPN	0.334	-1.812	0.372	-1.671
UK	1.678	-2.305	1.920	-2.249
FRN	1.856	-1.919	2.048	-1.841
HK	0.760	-2.224	0.754	-2.262
GER	1.528	-1.688	1.604	-1.645
CAN	2.258	-1.987	2.362	-1.943
SWZ	1.754	-2.003	1.883	-1.950
AUS	2.186	-1.682	2.234	-1.648
SPN	2.151	-1.967	2.151	-1.987
MAL	0.160	-2.062	0.163	-2.016

	First Difference			
	ADF		PP	
	No Trend	Trend	No Trend	Trend
US	-53.822***	-53.911***	-53.915***	-54.131***
JPN	-53.495***	-53.482***	-53.701***	-53.693***
UK	-53.839***	-53.895***	-54.192***	-54.393***
FRN	-52.226***	-52.284***	-52.364***	-52.507***
HK	-27.584***	-27.589***	-53.886***	-53.881***
GER	-53.471***	-53.501***	-53.506***	-53.557***
CAN	-50.519***	-50.605***	-50.471***	-50.535***
SWZ	-50.696***	-50.749***	-50.621***	-50.677***
AUS	-27.275***	-27.390***	-53.515***	-53.602***
SPN	-51.063***	-51.143***	-51.058***	-51.123***
MAL	-23.324***	-23.375***	-51.338***	-51.355***
(b) Pre-Crisis (July 1996 – June 1997)				
	Level			
	ADF		PP	
	No Trend	Trend	No Trend	Trend
US	2.065	-2.624	2.065	-2.737
JPN	-0.483	0.001	-0.453	-0.058
UK	2.377	-2.587	2.402	-2.710
FRN	1.213	-3.208*	1.182	-3.282*
HK	1.399	-1.361	1.291	-1.542
GER	2.070	-2.887	2.276	-2.655
CAN	1.631	-1.863	1.893	-1.673
SWZ	1.937	-0.357	1.893	-0.366
AUS	0.939	-2.741	1.034	-2.749
SPN	2.089	-2.487	2.296	-2.410
MAL	-0.325	-0.896	-0.308	-0.990
	First Difference			
	ADF		PP	
	No Trend	Trend	No Trend	Trend
US	-14.460***	-14.671***	-14.461***	-14.663***
JPN	-15.288***	-15.509***	-15.305***	-15.504***
UK	-15.250***	-15.508***	-15.273***	-15.496***
FRN	-9.586***	-9.639***	-15.519***	-15.556***
HK	-14.921***	-14.990***	-14.968***	-15.020***
GER	-19.162***	-19.406***	-19.137***	-19.791***
CAN	-12.590***	-12.713***	-12.403***	-12.515***
SWZ	-15.799***	-16.305***	-15.850***	-16.311***
AUS	-16.292***	-16.308***	-16.327***	-16.371***
SPN	-13.349***	-13.664***	-13.283***	-13.473***
MAL	-14.619***	-14.636***	-14.558***	-14.566***
(c) Crisis (July 1997 – June 1998)				
	Level			
	ADF		PP	
	No Trend	Trend	No Trend	Trend
US	2.241	-2.546	2.589	-2.545
JPN	0.210	-2.676	0.210	-2.676
UK	2.136	-2.182	2.570	-2.065
FRN	2.402	-3.556**	2.931	-3.807**
HK	-0.305	-3.093	-0.471	-2.775

GER	2.345	-3.388*	2.791	-3.577**
CAN	1.809	-2.942	1.778	-2.997
SWZ	2.250	-2.122	2.676	-2.078
AUS	0.794	-2.136	0.800	-2.105
SPN	2.361	-2.848	2.257	-2.848
MAL	-1.805	-1.866	-1.705*	-2.023
First Difference				
	ADF		PP	
	No Trend	Trend	No Trend	Trend
US	-16.029***	-16.301***	-16.029***	-16.378***
JPN	-15.854***	-15.801***	-15.853***	-15.798***
UK	-16.033***	-16.312***	-16.034***	-16.637***
FRN	-15.264***	-15.557***	-15.244***	-15.901***
HK	-8.125***	-8.137***	-18.840***	-18.842***
GER	-16.241***	-16.540***	-16.247***	-16.662***
CAN	-15.422***	-15.571***	-15.445***	-15.561***
SWZ	-14.476***	-14.704***	-14.397***	-14.939***
AUS	-16.688***	-16.682***	-16.688***	-16.673***
SPN	-15.100***	-15.352***	-15.124***	-15.349***
MAL	-14.709***	-14.818***	-14.727***	-14.817***
Post-Crisis (July 1998 – June 2007)				
	Level			
	ADF		PP	
	No Trend	Trend	No Trend	Trend
US	0.085	-1.700	0.099	-1.532
JPN	0.317	-1.382	0.351	-1.267
UK	0.194	-1.531	0.229	-1.329
FRN	0.635	-1.367	0.721	-1.168
HK	0.762	-1.787	0.877	-1.746
GER	0.277	-1.066	0.285	-1.041
CAN	1.439	-1.605	1.421	-1.521
SWZ	0.418	-1.964	0.434	-1.917
AUS	1.815	-1.696	1.841	-1.673
SPN	0.710	-1.606	0.723	-1.581
MAL	1.543	-2.031	1.231	-2.089
First Difference				
	ADF		PP	
	No Trend	Trend	No Trend	Trend
US	-48.939***	-48.928***	-49.148***	-49.146***
JPN	-48.843***	-48.830***	-49.015***	-49.006***
UK	-31.173***	-31.246***	-49.141***	-49.235***
FRN	-47.327***	-47.348***	-47.606***	-47.685***
HK	-45.105***	-45.100***	-45.018***	-45.004***
GER	-47.800***	-47.855***	-47.798***	-47.852***
CAN	-45.629***	-45.680***	-45.561***	-45.608***
SWZ	-46.361***	-46.408***	-46.341***	-46.409***
AUS	-47.822***	-47.929***	-47.819***	-47.930***
SPN	-46.563***	-46.617***	-46.529***	-46.591***
MAL	-12.865***	-12.966***	-47.404***	-47.396***

Note: ***, ** denote significance at the 1 percent, 5 percent and 10 percent levels, respectively. The lag lengths included in the models are based on the Akaike Information Criteria (AIC). The test of Augmented Dickey-Fuller (ADF) and Phillips-Perron (PP) are based on two models (1) Without constant and trend; and (2) with constant and trend.

3.1. Unit root test

Table II reports the ADF and PP tests statistics, which examine the existence of unit roots for the log levels of the series and test statistics results for their first differences. As may be noted, the study finds that all log MSCI indices hold a unit root. The log MSCI indices are found to be non-stationary at levels; consequently, we proceed with the first differences for entire models. Accordingly, the same tests are applied to the first differences of the log MSCI indices. However, the results indicate that all log MSCI indices for all countries are stationary in first difference, suggesting the MSCI indices are integrated of order 1 or they are $I(1)$. Overall, the verification from the PP tests with and without the time trend strongly holds up the stationarity of the MSCI indices when they are first differencing.

TABLE III. COINTEGRATION TESTS

Null hypothesis	Entire Period		Pre-Crisis	
	Lag =2		Lag =1	
	TS	MES	TS	MES
$r \leq 0$	335.408**	74.268**	317.188**	71.123**
$r \leq 1$	261.140**	58.212	246.065**	51.204
$r \leq 2$	202.928**	45.120	194.861	44.926
$r \leq 3$	157.808	38.856	149.935	36.048
$r \leq 4$	118.952	36.844	113.886	29.838
$r \leq 5$	82.108	32.019	84.049	25.521
$r \leq 6$	50.089	22.586	58.527	21.954
$r \leq 7$	27.502	12.829	36.573	18.173
$r \leq 8$	14.673	8.701	18.400	12.458
$r \leq 9$	5.973	5.356	5.942	5.162
$r \leq 10$	0.616	0.616	0.780	0.780
Null hypothesis	Crisis		Post-Crisis	
	Lag = 1		Lag =2	
	TS	MES	TS	MES
$r \leq 0$	287.221* *	60.846	364.519 **	90.832**
$r \leq 1$	226.376	50.623	273.687 **	63.738
$r \leq 2$	175.753	37.104	209.949 **	48.714
$r \leq 3$	138.649	32.328	161.235 **	40.249
$r \leq 4$	106.321	25.564	120.986	35.440
$r \leq 5$	80.756	23.044	85.546	27.981
$r \leq 6$	57.712	21.407	57.565	21.474
$r \leq 7$	36.306	18.812	36.091	19.729
$r \leq 8$	17.493	10.744	16.363	11.582
$r \leq 9$	6.749	6.666	4.781	4.534
$r \leq 10$	0.083	0.083	0.246	0.246

Note: ** denotes significance at the 5 percent level.

The optimal lag length incorporated in the model based on the Akaike Information Criteria (AIC). TS and MES refer to Trace Statistic and Max-Eigen Statistic, respectively.

3.2. Cointegration test

Accordingly, we proceed to the Johansen (1988) and Johansen Juselius (1990) cointegration test^[7, 8]. One universal conclusion from this finding is that the developed stock markets are moving in the direction of

a greater integration either among themselves or with the Malaysian market. The results from table III provide some evidence for the impact of the crisis on Malaysian stock market. There are thirteen cointegrating vectors. In each sub episode sample there is cointegrating vectors. Four cointegrating vectors in entire period, three cointegrating vectors in pre-crisis period, one cointegrating vector in crisis period and five cointegrating vectors in post period.

3.3. Granger causality tests

To get a better understanding of the direction of the relationship, this study performs Granger causality tests. These results are not reported to preserve space. However, there are available from the writer upon request. In sum, some of the broad conclusions of the relationships are: 1) During entire period, there is a “developed markets Granger cause Malaysia market” pattern and it is a unidirectional causality and 2) Malaysian market having either unidirectional or bidirectional Granger causality with the US, Japan and Hong Kong in all sub periods.

4. CONCLUSION

This paper attempts to explore the benefits of international diversification and to investigate the relationship of the Malaysian stock market on the ten most developed equity markets around the globe, namely, the United States, Japan, the United Kingdom, China, France, Hong Kong, Germany, Canada, Switzerland, Australia and Spain. Taking into account entire periods, pre-crisis, crisis and post-crisis period, some of the collective findings of the short run and long run elementary affect, which can be summarized.

In sum, the results from Johansen test are forceful and reliable in signifying that the Malaysian equity market and the equity markets in the developed markets are cointegrated during the entire period as well as pre-crisis, crisis and post-crisis periods. These results are similar with Arshanapalli and Doukas (1993), who found confirmation of comovement between the US and France, and the US and the UK for the period from January 1980 to May 1990, as well as for the post-crash period from November 1987 to May 1990^[9]. Moreover, the results propose that long run relationship among the markets under consideration were modified by the crisis and were essentially strengthened. These findings are parallel to the case of Asia, where long run relationships are found to be stronger after a stock market crisis (Yang et al., 2003)^[10]. In addition, these results are also in sequence with many preceding findings that documented that world equity markets have been increasingly integrated and that comovements among them have been growing (Billio and Pelizon, 2003; Chelley-Steely, 2004)^[11, 12].

In addition, the Malaysian market has either unidirectional or bidirectional Granger causality with the U.S. Japan and Hong Kong in all sub periods. There are less bidirectional relationships among developed and Malaysian markets during pre-crisis and crisis period in contrast to the post- crisis period. We also found that developed countries (larger economies) are in higher degree Granger cause than developing (smaller economies) countries. The highly significant Granger cause from the US and Japan to Malaysia can be clarified by the time zone factor and the “leading” market factor. The overall highly United States Granger-causality of all the other markets are documented in several previous papers studying different geographic areas (Sheng and Tu (2000); Yang et al. (2003); Ibrahim (2006)^[13, 10, 2]. They realized that the United States is not only leading in the ASEAN region, but is the most significant equity market in the world.

Improved trade between countries may explain the evolution of stock market integration between Hong Kong market and Malaysian market. This finding appears to be consistent with the study that the stronger the bilateral trade ties between two countries, the higher the degree of comovements (Masih and Masih 1999, Ibrahim 2003, Kearney and Lucey 2004)^[14, 15, and 16]. According to Pretorius (2002), apart from trade bilateral dependencies and financial factors, the geographic distance between different stock markets can also be an important factor contributing to a greater extent of market integration^[17]. In the case of the Malaysian and Hong Kong stock markets, the greater degree of integration after the financial crisis could also be due to the geographic distance as compared to other developed stock markets.

The findings of this paper have vital implications for both investors and policy makers. These findings confirm that the Malaysian stock market has a long run relationship with developed markets. The significant

developed markets for Malaysia are the US, Japan and Hong Kong. Therefore, Malaysian investors would have little scope to include stock of the US, Japan and Hong Kong as it has minimal benefits of diversification, as the markets move towards a greater integration. Therefore, for policymaking, any jolts in the United States, Japan and Hong Kong stock markets should be taken into deliberation by the Malaysian authorities in designing Malaysian policies.

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