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Stock Market and Real Activity: An Empirical Study of Several Asian Countries

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ABSTRACT

The objective of this study is to investigate the performance of the stock market as an indicator to real activity. The evidence of this relationship will focus on the sample of data obtained from Malaysia, Japan, Australia, India and Pakistan. The ordinary least square (OLS) and ECM-causality are used to examine the cointegration relationship and causality effect through the sample of data frequency to the related countries. The results show that there is causal-link between stock returns and industrial production index. This particularly exists in Australia, Japan and Malaysia. However, in Pakistan and India, there are no effects traced. Therefore, based on the empirical evidence, it clearly shows that the stock market does not predict the real activity in all Asian countries compared to the developed countries in which their stock markets play an important role in predicting the real activity.

Introduction

Several empiric studies published in the early 1990s found that a large fraction of stock return variation could be explained by real activity (industrial production index as a proxy) in the United States by using data samples from the 1950s to the 1980s. The empiric evidence of these issues is reported by (Barro, 1990; Fama, 1990; Schwert, 1990; Chen, 1991; Lee, 1992). The aim of this study is to investigate the performance of the stock market as an indicator to real activity,

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that is industrial production in Malaysia, Japan, Australia, India and Pakistan with use in-sample cointegration from OLS. Besides that, we also want to examine whether there is a causal-link between real stock returns and the industrial production index. This study will evaluate both variables by each country's frequency.

Studies done by Fama (1990) showed that stock returns were actually significant in explaining future real activity for the whole period from 1953 to 1987.[1] The growth industrial production index was also significant in explaining stock returns. This had been proved in Fama's study (1981) and a similar result obtained by Fama (1990) when the length of period was extended. The subsequent study has been done by Jay Chui, Hauser and Kopecky (1999) of testing the relationship between the growth rate of industrial production and lag real stock returns in G-7 countries, using the Ordinary Least Square technique (OLS) which includes elements of the Error Correction Model (ECM) in that regression. They also tested the cause effect of two variables through the Engle-Granger (1987) test effect and found that five of G-7 countries showed that stock returns had caused the industrial production.

However, in Binswanger's study (2000), he proved that since 1984, stock returns in US cannot predict the real activity. Binswanger gave the reason that the instable situation was due to the existence of positive speculative bubbles. In addition, Binswanger (2001) found the breakdown in the traditional relation between stock returns and real activity in G-7 countries.

The recent research done by Ibrahim, M.H (2003) integrates an analysis of interrelationships between stock prices and macroeconomic variables. The paper applies cointegration and VAR modeling to evaluate the long-run relationship and dynamic interactions between the Malaysian equity market, various economic variables and major equity markets of the US and Japan. From the cointegration relationship, the Malaysian stock price index is positively related to money supply, consumer price index, and industrial production but negatively linked to the exchange rate.

The remainder of the paper is organized as follows. In the next section, we describe the data used in the study. Section 3 describes the methodology of cointegration and the error correction model. Section 4 discusses the estimation results. Lastly, the final section contains a summary of the main findings and policy implication.

Data

The data consists of monthly and quarterly observations of the stock composite index, industrial production index, and consumer price index of Malaysia. The data gathered are from the Quarterly Bulletin Report of the Bank Negara Malaysia (Central Bank of Malaysia). Nevertheless, Japan uses monthly, quarterly, and yearly observations of the aggregate stock price index, industrial production index, and consumer price index. Meanwhile, Australia, India, and Pakistan use only quarterly and yearly data. The data are gathered from the International Financial Statistics of the International Monetary Fund.

The sample period for Malaysia runs from January 1991 until December 2002. For Japan, Australia and Pakistan the sample period runs from April 1973 until December 2000, while India the sample period runs from April 1973 until December 1998. The Industrial production data for Malaysia, Australia and India is from the industrial production index. For Japan, it is from the industrial production index at adjustment seasonals, but the data from Pakistan is gathered from the manufacturing production index.

Table 1 reports on the summary statistics of the monthly sample data of Malaysia and Japan. Table 2 reports on the summary statistics of the quarterly sample data of Malaysia, Japan, Australia, India and Pakistan. Table 3 reports on the summary statistics of the yearly sample data of Japan, Australia, Pakistan and India Pakistan. For the ease of comparison across the countries, the statistics are presented on a business cycle frequency for each country.

From the monthly data in Table 1, quarterly data in Table 2 and yearly data in Table 3, an overall comparison of average stocks in growth periods, 18.26%,

Table 1: Summary Statistics of Sample Data[a] - Monthly

Country	Growth periods Business cycle		Annual % change of IP	Recession periods Annual % change stock	Business cycle		Annual % change of IP	Annual % change stock
Malaysia	From	To			From	To		
	1/91	6/91	0.90	20.38	7/91	2/92	-2.03	-3.63
	3/92	10/92	18.65	4.86	11/92	2/93	-3.58	-2.22
	3/93	12/94	30.42	44.50	1/95	2/96	8.46	8.61
	3/96	3/97	16.67	8.55	4/97	10/98	-4.24	-85.00
	11/98	12/00	33.81	61.95	1/01	1/02	-12.24	7.32
	2/02	12/02	11.33	-10.69				
Japan	4/73	2/74	5.19	-27.82	3/74	2/75	-20.37	-26.18
	3/75	2/80	42.69	20.72	3/80	2/83	0.32	12.79
	3/83	6/86	20.39	71.98	7/86	5/87	-0.87	50.64
	6/87	3/89	19.55	20.18	4/89	12/93	-7.66	-39.70
	1/94	5/97	19.41	-1.71	6/97	5/99	-10.60	-8.28
	6/99	12/00	12.33	6.24				
Average			19.28	18.26			-5.28	-8.57

a The duration of the business cycle is determined by the turning points of the industrial production index. The growth rate of real activity over each phase of the cycle is measured by the annualized monthly percentage change of the industrial production index. Similar business cycle calculations are made to obtain the annualized percentage change in real stock prices. IP = industrial production.

Table 2: Summary Statistics of Sample Data[a] - Quarterly

Country	Growth periods Business cycle		Annual % change of IP	Annual % change stock	Recession periods Business cycle		Annual % change of IP	Annual % change stock
Malaysia	From	To			From	To		
	I/91	III/91	11.05	1.13	IV/91	I/92	-0.88	2.82
	II/92	III/92	7.45	0.54	IV/92	I/93	1.18	2.77
	II/93	III/94	21.5	55.25	IV/94	I/96	12.15	-3.72
	II/96	II/97	16.84	-2.76	III/97	IV/98	-8.60	-40.34
	I/99	IV/00	32.19	44.11	I/01	IV/01	-9.62	0.71
	II/02	IV/02	8.81	-12.12				
Japan	II/73	IV/73	6.75	-10.58	I/74	I/75	-21.13	-39.52
	II/75	I/80	39.01	15.90	II/80	IV/82	2.99	3.26
	I/83	II/86	19.66	79.35	III/86	II/87	0.26	55.27
	III/87	I/89	15.79	18.58	II/89	IV/93	-5.40	-41.21
	I/94	I/97	15.34	-11.49	II/97	II/99	-7.88	-7.22
	III/99	IV/00	10.03	14.10				
Australia	III/75	I/77	8.97	-0.32	I/77	II/75	-2.40	-71.42
	I/78	III/80	14.05	57.35	II/77	IV/77	-6.38	-4.31
	II/83	IV/86	25.14	76.68	IV/80	I/83	-11.52	-46.15
	III/87	I/90	21.37	-20.29	I/87	II/87	-11.40	23.22
	III/92	III/96	12.10	22.37	II/90	II/92	-6.47	-3.15
	III/98	IV/00	9.35	11.09	IV/96	II/98	3.64	20.42
India	I/73	I/77	29.97	-20.80	II/77	III/77	-7.50	-2.51
	IV/77	I/79	16.79	24.98	II/79	II/80	-11.58	-5.56
	III/80	I/82	23.64	7.82	II/82	III/82	-6.76	-13.50
	IV/82	I/88	56.95	19.92	II/88	II/89	-1.60	48.49
	III/89	I/96	70.04	80.76	II/96	IV/98	5.05	-43.84
Pakistan	IV/76	IV/82	99.27	7.04	I/73	III/76	-19.10	-45.44
	IV/85	I/88	63.76	34.79	I/83	III/85	4.83	26.04
	IV/89	I/92	64.55	-19.94	II/88	III/89	-19.23	-1.59
	IV/93	I/95	44.36	33.41	II/92	III/93	-19.76	-21.97
	IV/96	I/98	58.50	-17.78	II/95	III/96	-18.67	-51.83
	IV/99	IV/00	30.37	8.96	II/98	III/99	-21.56	-20.21
Average 29.43 17.17 -6.94 -10.39								

[a] The duration of the business cycle is determined by the turning points of the industrial production index. The growth rate of real activity over each phase of the cycle is measured by the annualized monthly percentage change of the industrial production index. Similar business cycle calculations are made to obtain the annualized percentage change in real stock prices. IP = industrial production.

17.17%, and 27.27% are higher than those in recession periods, -8.57%, -10.39% and -7.36%. Thus, there is preliminary evidence regarding the positive association between economic growth and real stock price movements in the Asian countries.

Table 3: Summary Statistics of Sample Data[a] - Yearly

Country	Growth periods Business cycle		Annual % change of IP	Annual % change stock	Recession periods Business cycle		Annual % change of IP	Annual % change stock
Japan	From	To			From	To		
	1976	1979	29.00	12.20	1973	1975	-15.00	-40.42
	1983	1984	12.30	38.81	1980	1982	6.09	5.66
	1987	1988	12.95	55.84	1985	1986	3.57	51.71
	1994	1997	11.21	-7.82	1989	1993	1.08	-34.79
					1998	2000	-0.39	14.21
Australia	1978	1979	6.81	27.49	1973	1977	-1.03	-53.73
	1984	1988	24.98	93.19	1980	1983	0.09	36.72
	1992	1996	13.15	39.29	1989	1991	3.29	-4.61
	1999	2000	7.43	19.50	1997	1998	3.90	13.98
Pakistan	1977	1982	59.62	-27.32	1973	1976	0.47	-31.92
	1987	1991	32.24	24.22	1983	1986	29.60	37.74
	1998	2000	11.63	-16.26	1992	1997	15.28	-96.82
India	1973	1978	28.69	-13.26	1979	1980	1.94	5.27
	1981	1987	52.56	28.82	1988	1989	12.80	36.10
	1990	1995	39.49	107.07	1996	1998	17.44	-49.57
Average			24.43	27.27			5.28	-7.36

[a] The duration of the business cycle is determined by the turning points of the industrial production index. The growth rate of real activity over each phase of the cycle is measured by the annualized monthly percentage change of the industrial production index. Similar business cycle calculations are made to obtain the annualized percentage change in real stock prices. IP = industrial production.

Methodology of Cointegration and Error Correction Models (ECM)

The time series analyses that are most complementary to the work of Fama (1990), Schwert (1990) and Jay Chui, Hauser and Kopeckey (1999) are in-sample cointegration and error correction models. The first procedure investigates whether two non-stationary time series exhibit a stable linear relation, while the second can be used to examine the issue of in-sample causality of stock returns to industrial production. To investigate the properties of the data, we use the Augmented Dickey-Fuller (ADF) (1981) and Philips-Peron (PP) (1981) test, according to which a time series X_t is non-stationary if = 1 in the autoregressive, which written as follows:

$$X_t = a_0 + a_1 t + \varphi X_{t-1} + \sum_{j=2}^{p} \gamma_j X_{t-j} + \varepsilon_t \qquad (1)$$

where X_t represents a time series, t is a time trend, ε_t is an error term, and α_0, α_1, φ, and γ_j are parameters. Briefly, a variable is said to be integrated of order d, written I(d), if it requires differencing d times to achieve stationarity. Then, a set of variables is said to be cointegrated of the same order and yet their linear combination is stationary. The variables cointegrated have the characteristics that their time – path is influenced by the deviation from long-term equilibrium. If the system is to return to the long-run equilibrium, the movements of at least some of the variables must respond to the magnitude of the disequilibrium. Therefore, the short-run dynamics must be influenced by the deviation from the long-run relationship (or disequilibrium will be corrected).

Apart from providing information on the long-run relationship among variables, integration and cointegration tests also give guidance on proper specification. Cointegration necessitates that the variables integrate of the same order. If the variables integrate of different orders, it is possible to conclude that they are not cointegrated.[2] To test for cointegration, we employ the Engle and Granger's (1987) and Johansen's approach. Given the non-stationarity of the log levels of industrial production and real stock prices, the cointegration of these time series is addressed by estimating the following regression:

$$lnY_t = \alpha + \beta lnS_t + \hat{e}_t \quad (2)$$

$$\Delta\hat{e}_t = a\hat{e}_{t-1} + \o_t \quad (3)$$

where *lnYt* and *lnSt* represent the log levels of industrial production and real stock prices, respectively, and $\hat{e}_t$ and $\o_t$ are error terms. Equation (2) is estimated with an OLS estimation to estimate the residual ($\hat{e}t$) in order to obtain the equation (3), then Dickey-Fuller test will be used on these residuals to determine their order of integration. Based on the equation (3), if we cannot reject the null hyphothesis a = 0, it can be concluded that the residual series contain a unit root. Hence, we conclude that the lnY_t and lnS_t sequences are not cointegrated. If it is possible to reject the null hypothesis a = 0, it implies that the residual sequence is stationary and we can conclude that the series are cointegrated.

We also employ the VAR-based approach of Johansen (1988), as alternative in cointegration. Johansen (1988) and Stock and Watson (1988) maximum likelihood estimators circumvent the use of two-step estimators and can estimate and test for the presence of multiple cointegrating vectors.

If both lnY_t and lnS_t are cointegrated, we estimate an error correction model (ECM) in two ways: First, industrial production (lnY_t) has caused to real stock returns (lnS_t). Second, real stock returns (lnS_t) has caused to industrial production (lnY_t). This model expresses the growth rate of industrial production (lnY_t) in terms of lagged industrial production growth rates, lagged real stock returns (lnS_t) and lagged cointegration error term ($\hat{e}_t$):

The error correction model (ECM) can be written as follows:

$$DlnYt = a_0 + \sum_{i=1}^{m} a_{1i} DlnY_{t-i} + \sum_{j=1}^{m} a_{2j} DlnS_{t-j} + a_3 \hat{e}_{t-1} + \theta_{yt} \quad (4)$$

$$DlnSt = b_0 + \sum_{i=1}^{n} b_{1i} DlnY_{t-j} + \sum_{j=1}^{n} b_{2j} DlnS_{t-j} + b_3 \hat{e}_{t-1} + \theta_{zt} \quad (5)$$

where D is a first difference and $\hat{e}_{t-1}$ is a residual error-correction or cointegrating vector from equation (3). θ_{yt} and θ_{zt} are white-noise disturbances which may be correlated to each other, m and n are the choose length lag which are based on AIC. The real stock return has caused industrial production if the total of a_{2j} or a_3 in equation (4) is significant. On the other hand, industrial production has caused to real stock return if total of b_{1i} or b_3 is significant in equation (5). Bi-directional causality exists if both total of a_{2j} or a_3 and b_{1i} or b_3 is significant.

Estimation Results

Stationary Test Results

The results of the ADF and PP tests are reported in Table 4 and 5 respectively. Based on ADF stationarity test, we found that most of the series are stationary on first difference I(1) for each country. Japan and India on yearly stock variable has shown nonstationarity on I(1). Pakistan has shown nonstationarity on I(1) on the yearly industrial production. Relatively on the PP stationary test, we found that the stock and industrial production variables respectively for monthly, quarterly and yearly data are stationary in all series for related countries with an

Table 4: ADF Unit Root Tests

		Level		First difference	
Country	Data	Stock	IP	Stock	IP
Malaysia	Monthly	-1.9432	-2.5999	-5.7803***	-6.0623***
	Quarterly	-1.7544	-4.7608***	-3.3375*	-7.8435***
Japan	Monthly	-2.3368	-1.5837	-7.4162***	-8.2073***
	Quarterly	-1.4075	-1.8020	-4.6623***	-5.5410***
	Yearly	-1.6995	-1.9154	-2.5923	-5.7659***
Australia	Quarterly	-4.8958***	-3.7920**	-4.7584***	-5.2662***
	Yearly	-3.1034	-3.9293**	-4.2935***	-4.5798***
India	Quarterly	-1.9554	-2.1831	-5.2818***	-3.7959**
	Yearly	-1.8541	-2.3147	-2.5365	-3.3283*
Pakistan	Quarterly	-1.3427	-0.6964	-5.1943***	-4.5240***
	Yearly	-1.5358	-0.9933	-4.5629***	-2.9486

*, **, *** indicates significance at 10%, 5% and 1% level. Lag-length is choosing based on Akaike Information Criteria (AIC).

Table 5: PP Unit Root Tests

		Level		First difference	
Country	Data	Stock	IP	Stock	IP
Malaysia	Monthly	-2.3675	-4.0499***	-10.8440***	-20.9511***
	Quarterly	-2.1788	-6.7524***	-8.2777***	-14.8971***
Japan	Monthly	-2.0746	-1.6413	-13.1358***	-20.6576***
	Quarterly	-1.6076	-1.6529	-7.2531***	-7.2822***
	Yearly	-1.8869	-1.6847	-3.7250**	-4.0376**
Australia	Quarterly	-4.1349***	-3.1135	-8.0194***	-10.5385***
	Yearly	-4.3324***	-2.9717	-5.2604***	-5.9305***
India	Quarterly	-1.9869	-6.9612***	-7.6562***	-19.8434***
	Yearly	-2.2400	-2.3402	-4.6477***	-4.0452**
Pakistan	Quarterly	-1.3994	-7.4413***	-10.8345***	-14.9919***
	Yearly	-1.3885	-0.9589	-5.2254***	-2.0699

*, **, *** indicates significance at 10%, 5% and 1% level. Lag-length is choosing based on Akaike Information Criteria (AIC).

exception for Pakistan on the industrial production variable. Since almost all variable are stationary in thebfirst differenced series, we conclude that they are integrated of order 1, I(1).

Cointegration Test Results

After examining the stationary properties of the data, the cointegration tests are now conducted through Engle-Granger approach and Johansen approach. In Table 5, the null hypothesis of no cointegration is rejected if it is found that the residuals are stationary process. There are eleven cointegrating estimation that are subject to analysis. In this study, both Augmented Dickey-Fuller (ADF) and Phillips-Peron (PP) tests statistics are tested.

Table 6 shows the result of cointegration test using Engle-Granger and Johansen approach. Based on Engle-Granger test of ADF statistics, we found that industrial production (lnYt) and stock (lnSt) are significant cointegrated in Malaysia and Australia on quarterly data at 5% and 1% level of significance respectively. Meanwhile based on PP test statistics, lnYt and lnSt for quarterly data of Malaysia, Australia and yearly data of Australia are respectively found to be cointegrated at 1% level of significance. The last two columns report the results of lnYt and lnSt, which are based on Trace Test. They are cointegrated statistically in Japan (monthly) and Australia (quarterly).

From the cointegration result (Engle-Granger and Johansen approach), we found that real stock returns in Malaysia (monthly), Japan (quarterly and yearly), India and Pakistan (quarterly and yearly) are considered as inappropriate long-

Table 6: Cointegration Test Results

		EG - Tests		JJ - Tests		
Country	Data	ADF Statistics	PP Statistics	r : cointegrating vectors (null hypothesis)	Trace Test L.R.	Number Lags
Malaysia	Monthly	-1.9109	-1.7290	r = 0	12.3065	8
				r ≤ 1	2.5773	
	Quarterly	-3.6395**	-5.2792***	r = 0	13.4951	4
				r ≤ 1	0.9219	
Japan	Monthly	-1.7971	-2.4554	r = 0	33.4043**	8
				r ≤ 1	5.2426	
	Quarterly	-1.4473	-2.1068	r = 0	4.7552	4
				r ≤ 1	1.5929	
	Yearly	-1.5826	-2.1825	r = 0	7.0327	1
				r ≤ 1	2.6613	
Australia	Quarterly	-4.2083***	-4.3752***	r = 0	17.1288*	4
				r ≤ 1	0.0189	
	Yearly	-2.8564	-4.8798***	r = 0	9.5006	1
				r ≤ 1	0.1870	
India	Quarterly	-2.1551	-1.7190	r = 0	4.1070	4
				r ≤ 1	0.1002	
	Yearly	-1.7506	-2.0172	r = 0	5.8195	1
				r ≤ 1	0.0560	
Pakistan	Quarterly	-1.3768	-1.7437	r = 0	4.9363	4
				r ≤ 1	1.8919	
	Yearly	-1.7265	-1.3257	r = 0	5.3596	1
				r ≤ 1	1.2563	

Note: *, **, *** indicates significance at 10%, 5% and 1% level.

run determinant of real activity (industrial production) function as evident by equation (2) in Table 6. These variables are ignored for further analysis.

Error Correction Models (ECM)

After identifying the cointegrating test for the variables, we analyse the causality between these variables. The analysis includes the error correction terms. We use first differences ($DlnY_t$ and $DlnS_t$) in causality test. By using first differences can prevent the spurious regression. According Granger, cointegration test can be called as preliminary test for prevent spurious regression.[3] We use the vector error-correction model (VECM) to test the relation between real stock returns and industrial production for each frequency.

Table 7 shows the result of the causality test using the VECM. In Malaysia on the quarterly data, the result shows a value of t-statistics $DlnY_t$ (-2.7164) and $DlnS_t$ (-0.9525). It is clearly shown that a real stock return has caused industrial production. In Japan, from the monthly data, the hypothesis is confirmed that a real stock return has caused industrial production. The result shows with value of t-statistics $DlnY_t$ (-2.7598) and $DlnS_t$ (0.0193). There is a causal-link between the two variables and supports the hypothesis that real stock returns have caused industrial production. Meanwhile, the result in Australia on quarterly data shows that there is a bi-directional causality of t-statistics value for $DlnY_t$ (-2.0482) and $DlnS_t$ (3.1259), but when the yearly series data were used onlyon the industrial production (2.0956), it caused real stock returns.

Table 7: Vector Error Correction Model (VECM)

		Industrial Production (lnY_t)			Stock (lnS_t)		
Country	Data	Var.	Coefisien	t-statistics	Var.	Coefisien	t-statistics
Malaysia	Quarter	C	0.0363	0.5849	C	0.0049	0.4738
		$DlnY_{t-1}$	-0.2525	-1.2591	$DlnY_{t-1}$	-0.0724	-2.1512
		$DlnY_{t-2}$	-0.1345	-0.8213	$DlnY_{t-2}$	-0.0612	-2.2262
		$DlnS_{t-1}$	-0.4877	-0.5327	$DlnS_{t-1}$	-0.0755	-0.4912
		$DlnS_{t-2}$	-0.4189	-0.4575	$DlnS_{t-2}$	0.3884	2.5266
		$\hat{e}_{t-1}$		-2.7164**	$\hat{e}_{t-1}$		-0.9525
		RSS	6.2585		RSS	0.1764	
Japan	Month	C	0.0039	3.2208	C	0.0033	0.9259
		$DlnY_{t-1}$	-0.1494	-2.6707	$DlnY_{t-1}$	-0.1066	-0.6401
		$DlnY_{t-2}$	0.0178	0.3183	$DlnY_{t-2}$	-0.0852	-0.5116
		$DlnS_{t-1}$	0.0138	0.7265	$DlnS_{t-1}$	0.3310	5.8495
		$DlnS_{t-2}$	0.0205	1.0737	$DlnS_{t-2}$	-0.1243	-2.1818
		$\hat{e}_{t-1}$	-0.0243	-2.7598**	$\hat{e}_{t-1}$	0.0005	0.0193
		RSS	0.1392		RSS	1.2325	
Australia	Quarter	C	0.0051	2.1598	C	0.0062	0.7648
		$DlnY_{t-1}$	-0.0664	-0.7317	$DlnY_{t-1}$	-0.3631	-1.1508
		$DlnY_{t-2}$	-0.1517	-1.6695	$DlnY_{t-2}$	-0.3769	-1.1928
		$DlnS_{t-1}$	0.0058	0.2149	$DlnS_{t-1}$	0.3222	3.3864
		$DlnS_{t-2}$	0.0743	2.6929	$DlnS_{t-2}$	0.0368	0.3831
		$\hat{e}_{t-1}$	-0.0606	-2.0482*	$\hat{e}_{t-1}$	0.3216	3.1259**
		RSS	0.0575		RSS	0.6958	
	Year	C	0.0299	3.8355	C	0.0292	0.6941
		$DlnY_{t-1}$	-0.1867	-0.8499	$DlnY_{t-1}$	-0.4697	-0.3972
		$DlnY_{t-2}$	-0.1560	-0.9275	$DlnY_{t-2}$	0.1374	1.5003
		$DlnS_{t-1}$	0.0280	0.5678	$DlnS_{t-1}$	0.4312	1.6239
		$DlnS_{t-2}$	-0.0129	-0.3031	$DlnS_{t-2}$	0.0369	0.1614
		$\hat{e}_{t-1}$	-0.2900	-1.7740	$\hat{e}_{t-1}$	1.8439	2.0956*
		RSS	0.0135		RSS	0.3922	

Note: *(**) is significant at 5%(1%) level. Var. is variable, RSS = sum of squared residual, e_t = cointegrating vector D = first difference.

Compared to Malaysia, the quarterly data shows a direct cause effect that real stock returns has caused industrial production. The same cause effect exists in Japan on the monthly data. However, the yearly data of Australia shows a direct effect that industrial production has caused real stock returns with value of statistics equal to 2.0956; significant at 5% level.

Conclusion and Policy Implication

From this study, it is clearly shown that not all Asian countries which are being investigated, have their real stock returns as an indicator to economic activity. Based on the empiric evidence for Malaysia and Japan ,it reveals that real stock returns has caused industrial production. The results show that there is a causal-link between real stock returns and industrial production and this particularly exists in Australia, Japan and Malaysia. However, in Pakistan and India,the empiric evidence reveals that there is no causal-link between real stock returns and industrial production because they are not cointegrated statistically. Therefore, the stock market index in Pakistan and India does not play an important role in predicting the industrial production for the future.

By using real stock returns as an indicator to industrial production in Malaysia and Japan, the implication is to suggest to the authorities to implement rules, which can strengthen the stock market because these countries are depended on the stock market strength. Rules on the reduction of interest rates can be compelled. In fact, fiscal policy such as a tax decline also gives additional revenue to individuals and firms.

Lastly, it is clearly shown that there is a causal-link between real stock returns and industrial production. Bi-directional actually effects the economic cycle for a particular country and due to this situation, there is a fluctuation risk in real stock returns and industrial production. However, this scenario depends on the policymakers to regulate the economic policy because economic and regulatory policies are different between developed and developing countries.

Endnotes

1 Binswanger (1999) explained again the result found by Fama (1990).

2 With three or more variables, varies subsets may be cointegrated. For example, a group of $I(2)$ variables may be $CI(2,1)$ or $CI(2,2)$ or a subset of $I(1)$ variables may be $CI(1,1)$. Moreover, a set of $CI(2,1)$ variables may be cointegrated with a set of $I(1)$ variables. Form the $CI(2,1)$ relation and determine whether the result is cointegrated with the $I(1)$ variables.

3 C.W.J. Granger, Developments in The Study of Cointegrated Economic Variables, Oxford Bulletin of Economic and Statistics, Vol. 48, 1986, pg. 226.

References

Abdullah, N. and Majid, A.M.S. (2003). Real stock prices and the long-run money demand function in Malaysia: Evidence from error correction model. *Proceeding of the National Seminar on Managing Malaysia in the New Millennium: Economics and Business Challenges*, UiTM Malacca, 203-214.

Ariff, M., Mohamad, S. and Md. Nassir, A. (1998). Stock Pricing In Malaysia, Corporate financial & Investment Management. *UPM Press*.

Bank Negara Malaysia, *Quarterly Bulletin Report*, Kuala Lumpur: 1990-2001.

Barro, R.J. (1990). The stock market and investment. *Review of Financial Studies*, 3, 115-131.

Binswanger, M. (2000). Stock returns and real activity: is there still a connection? *Applied Financial Economics*, 10, 379-387.

Binswanger, M. (2001). Does Stock Markets Still Lead Real Activity? – An Investigation for the G-7 Countries? *Solothurn University of Applied Science Northwestern Switzerland.* Series A Discussion Paper 2001-04.

Chauvet, M. (1999). Stock market fluctuations and the business cycle. *Journal of Economic and Social Measurement*, 25 (3), 4.

Chen, N. (1981). Financial investment opportunities and the macroeconomy. *Journal of Finance*, 46, 529-554.

Dickey, D.A. and Fuller, W.A. (1979). Distribution of the Estimators for Autogressive Time Series with a unit root. *Journal of the American Statistical Association*, 74, 427-431.

Dickey, D.A. and Fuller, W.A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Econometrica*, 49, 1057-1072.

Enders, W. (1995). *Applied Econometric Time Series*. John Wiley & Sons, Inc. First Edition.

F. Engle, R. and Granger, W.J. (1987). Co-integration and error correction: Representation, estimation and testing, *Econometrica*, 55 (2), 251-276.

Fama, E. (1981). Stock returns, real activity, inflation and money. *American Economic Review*, 71, 545-565.

Fama, E. (1990). Stock returns expected returns and real activity. *Journal of Finance*, 45, 1089-1098.

Granger, C.W.J. (1980). Testing for causality: A personal viewpoint. *Journal of Economic Dynamics and Control*, 2, 329-352.

Granger, C.W.J. (1986). Development in The Study of Cointegrated Economic Variables. *Oxford Bulletin of Economics and Statistics*, 48, 226.

Granger, C.W.J. and Newbold, P. (1974). Spurious Regression in Econometrics. *Journal of Econometrics*, 2, 111-120.

Gujarati, D.N. (1995). *Basic Econometrics*. Mc. Graw-Hill, Inc.Third Edition.

Ibrahim, M.H. (2003). Macroeconomic Forces And Capital Market Integration, A VAR analysis for Malaysia. *Journal of the Asia Pacific Economy*, 8 (1), 19-40.

James, C., S. Koreisha and M. Partch (1985). A VARMA analysis of the causal relations among stock returns, real output and nominal interest rates. *Journal of Finance*, 40, 1375-1384.

Jay Choi, J., Hauser, S. and J. Kopecky, Kenneth (1999). Does the stock market predict real activity ? Time series evidence from the G-7 countries. *Journal of Banking and Finance*, 23, 1771-1792.

Johansen, S. (1991). Estimation and Hyphothesis Testing of Cointegration Vectors in Gaussian vector autoregressive models. *Econometrica*, 59 (6), 1551-1580.

Karim, Z.A., Zaidi, S.M.A. and Kefeli, Z. (2003). Financial sector development, government size, trade openess and economic growth: An empirical analysis in ASEAN-4 countries. *Proceeding of the National Seminar on Managing Malaysia in the New Millennium: Economics and Business Challenges*, UiTM Malacca, 307-320.

Lee, B.S. (1992). Causal relations among stock returns, interest rates, real activity and inflation. *Journal of Finance*, 47, 1591-1603.

Phillips, P.C.B. (1987). Time series regression with a unit unit root. *Econometrica*, 55 (2), 277-301.

Quantitative Micro Software (1998). *Eviews User's Guide*. USA. Second edition.

Sadorsky, P. (2001). Broken trend output in a model of stock returns and economic activity. *Applied Financial Economics*, 11, 17-21.

Schwert, G.W. (1990). Stock returns and real economic activity : A century of evidence. *Journal of Finance*, 45, 1237-1257.