Stock price determination in Emerging Equity Markets: A study of the Jamaican Stock Market

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Abstract: This research estimates the determinants of stock price in the Jamaican Stock Market using data for the period 1974 – 2010. The results indicate the significant of the variables indicating: (i) turnover ratio, (ii) the volume shares traded, and (iii) the number of transactions. The variables indicating the number of listed companies is not significant. The results indicate potential for improving the liquidity of the market since the three significant variables are measures of market transactions. The high concentration of market transactions by few firms will require drastic policies to increase liquidity and prevent price distortion.

1. Introduction

The growth in World Stock Market has surged in the last decade; Emerging Equity Markets (EEM) have contributed significantly to this growth and have been the focus of much recent research. The relatively better performance of EEM during the recent global financial crisis triggered the "decoupling theory", which suggests that EEM have widened and deepened to extend that no longer depend on USA for growth. Despite the controversy over this theory (Pula and Peltonen, 2009; Lash, 2007; Rathbone, 2010; Kose, 2008; Prasad and Kose, 2009), the current performance of EEM still attracts global investors in terms of risk/return opportunities and policy makers aiming at global financial stability. A plethora of studies on various aspects of the performance of EEM has appeared in recent years; Erb, Harvey and Viskanta (1996a) examining the impact of political, economic, and financial risks; Erb, Harvey and Viskanta (1996b) estimating volatility and expected returns; Henry (2000) estimating the impact of financial liberalization on equity price and cost of capital; Ramcharran (2001) focusing on the determinants of dividend policy; Ramcharran (2004) estimating returns and pricing; and Aggarwal, Inclan, and Leal (1999) measuring volatility. One of the current research areas focuses on market microstructure (Hasbrouck, 2007; Harris, 2003; Madhavan, 2000) which examines the ways in which the working process of the market

affects determinants of prices, volume, transaction costs and trading behavior etc. Emphasis is placed on the "hidden costs" of trading called execution costs which are incurred by buyers who pay higher prices for the shares they receive and by sellers who receive lower prices for the shares they deliver. Execution costs are attributable to three factors: (i) the bid-ask spread, (ii) market impact effects, and (iii) inaccurate price discovery.[1] Empirical application of this theory to EEM is constrained by the publication/availability of micro data. This research attempts to apply a similar methodology to examine the determinants of stock prices in the Jamaican Stock Market (JSM) using market related data from 1974-2010. The variables used are (i) value traded, (ii) volume traded, (iii) number of listed companies, (iv) number of transactions, (v) turnover ratio. The JSM, established in 1968, has experienced rapid growth in recent years, the capitalization value increased from JA$129.656 in 1974 to JA$564,720.705 million in 2010.[2] Figure 1 (Appendix) illustrates the pattern of growth. The number of listed firms has not changed significantly over this period; it averages about 42 with a standard deviation of 5.

The results have important implications on the functioning of the market regarding the price formation/determination/discovery process which impact market maker and investor behavior. Also there are policy ramifications for regulating the trading mechanism to promote the efficiency of the market. This research also extends the literature on the JSM including Ramcharran (1997) that examine seasonality. The rest of the paper includes a review of the literature, research design and data, analysis of regression results, and conclusion.

2. Review of the literature

Early research on EEM focused on analyzing the factors that are beneficial to international investors; they include the determinant of stock prices, returns, market value, risk and

volatility. Studies by Erb, Harvey and Viskanta (1996a), Erb, Harvey and Viskanta (1996b), Aggarwal, Inclan, and Leal (1999), Harvey (1995), Claessens, Dasgupta, and Glen (1998), Ramcharran (2004), and Bekaert and Harvey (2000), and Henry (2000) are some of the most prominent. The findings are supportive of EEM stocks as an "asset class" for international portfolio investors. Several researchers have claimed that some of the research methodology applied to developed markets, are not appropriate for EEM, for example the International Capital Asset Pricing Model (ICAPM) used for measuring regional/country systematic risk. Harvey (1995) also contends that despite financial liberalization EEM returns are more likely determined by local factors than external factors. Later studies, focusing on local factors, examining the contribution of macroeconomic variables (income level, domestic investment, interest rate, banking sector size) and institutional variables (legal system, and corporate governance), studies include Yartey (2008), Durham (2008), and EL-Wassal (2005). They find most of the variables significant. The models used are those applied to the markets of developed countries (Arestis, Demetriades, and Luintel, 2001).

The impact of market structure on equity price is another technique using local factors. Ramcharran (2011) applies the structure-conduct-performance (SCP) hypothesis articulated by Caves (1992). According to this hypothesis, prices/profits are relatively higher in market/industries with relatively high concentration because of the possibility of monopolistic/oligopolistic pricing strategies. He finds market concentration ratio (the 10 largest stock share of total market capitalization) to be significant in 19 EEM during the period 1992-2000. This research adds to the current literature within the framework of examining internal factors as determinants of stock price.

3. Research design and data

Based on the available data (derived from Jamaica Stock Exchange Annual Report 2010) we consider different models to explain the variation in stock price. Since some the independent variables are related by measurement, we use different model specification to isolate the specific impact of the variables. The variables used are (i) TOR – stock market turnover ratio, defined as the ratio of the value of shares traded to the average market capitalization value (equivalent to the ratio of the number traded to the average number of shares outstanding). This is the most frequently used measure of market liquidity.[3] The higher this ratio the more liquid is the market or the share of the company, (ii) VOL – the volume (number) of the shares traded; a high volume is also associated with high liquidity, (iii) VAL – the value of shares traded, equivalent to the number of shares traded times the current price of the share, (iv) NOC – the number of companies listed; and (v) NOTRN – the number of transactions. It is expected that (i) TOR will have a negative impact on stock price (PR) since high liquidity indicates low risk and, according to finance theory, low price/returns, and (ii) VOL, VAL, NOC, NOTRN will have positive impact since the measure activities related to increasing market transactions. We have not used some of the variables used in other studies, for example, (i) economic growth, since some analysis are more concerned with individual stocks/industry performance rather than the whole economy, (ii) interest rate, since the undeveloped bond market in Jamaica provides little substitutability for stocks, and (iii) market capitalization value, since it is the value of listed/outstanding shares and, does not suggest that these shares will influence capital allocation and growth as markets are forward looking and anticipate future price changes (Beck and Levine, 2004).

Descriptive statistics of the data are presented on Table 1. There is evidence of non-normality in all the variables except NOC to some degree. Table 2 presents the correlation matrix; there are concern about using VAL and CAP (capitalization value) together as independent variables since $r > 0.8$.

[Table 1 and Table 2 here]

4. Analysis of regression results

The analysis of the regression results of the model is preceded by a discussion of the rationale for using (a) test of unit root, and (b) test of cointegration.

(a) Test of Unit Root

Test of stationarity (or non-stationarity) of data is important for empirical studies using time series data to avoid the problems of "spurious regression". There are several tests discussed in the literature (Gujarati and Porter, 2009; Enders, 1995). The unit root test is very prominent; we conduct the ADF (Augmented Dickey-Fuller) test which corrects for uncorrelated error terms. The results, shown on Table 3, indicate that for the all the variables the null hypothesis of the existence of unit root (non-stationarity of the data) is rejected at the first difference level in all the three cases that allow for (i) an intercept, (ii) an intercept and derministic (linear) trend, and (iii) none.

[Table 3 here]

(b)Test of cointegration:

The importance of a long run stable relationship among the variables used in time series econometric models is widely documented in the literature (Maddala and Kim, 1998; Enders, 1995). Such relationship is crucial for statistical inferences that are used for policy making. If a cointegrating relation among variables does exist it implies a long run stable model over the

period analyzed and the results are valid. Even if a model uses some variables that are non-stationary (presence of unit root), it is important that there exists a combination that is cointegrated. Models with non-stationary data that are not cointegrated yield results that are not valid – 'spurious regression' problem (Engle and Granger, 1987). In multiple regression analysis the test of co-integration can be thought of as a pre-test to avoid the problems of 'spurious regression' (Granger, 1986). A variety of methods for testing cointegration have been proposed (Maddala and Kim, 1998); we utilize the following (i) the "trace" test and (ii) the "maximum eigen" developed by Johansen (1988). The results of the trace test (Table 4) indicate some evidence of cointegrating vectors

[Table 4 here]

(c) Regression results:

The models use independent variables that indicate quantity rather than value to be consistent with economic theory. We have not included (i) the market capitalization value and (ii) the value of shares traded, since they are value concepts whose measurement includes the price of the existing stock which is the dependent variable. We estimate six different models, in double logarithmic specification, to isolate the impact of independent variables that are considered to be linearly related. The results are presented on Table 5; they indicate the significance of three variables (with the expected signs): (i) TOR – the turnover ratio, (ii) VOL – the volume/number of shares traded, a proxy for market size, and (iii) NOTRN – the number of transactions. The variable NOC (the number of listed companies) is not significant. With the adjusted $R^2 > 0.9$, significant F-statistics, and DW values indicating no evidence of first order auto-correlation, the results are reliable. Evidence of stationarity of the data and cointegration are supportive of the results of the estimated models.

The results have several implications. The TOR of the JSM is relatively small and volatile (see Figure 3) this is common in many EEM. As a measure of liquidity, the impact on stock price is very significant as indicated by the value of the coefficient, thus regulatory policies to improve liquidity are mandatory. The reasons for the relatively low liquidity in the JSM are explained by two factors: (i) the NOC has not increased significantly in recent years; Table 1 shows an average of 42 with a maximum of 51, and (ii) the high level of concentration in the market, data for 2010 show that the top ten firms are responsible for 85% of value traded, 88% of volume traded and 81% of market capitalization value. [4]

5. Conclusion:

Several researchers, for example, Madura (2003) and Solnik and McLeavey (2003), have identified several obstacles to investment in EEM. They include the following: (i) transaction cost resulting from illiquid markets due to low turnover ratio and high market concentration, (ii) information cost resulting from the lack of informational transparencies and differences in accounting standards, (iii) execution cost, including high commission and fees, (iv) taxes on capital gains and dividends, and (v) the small number of firms listed in some markets is also viewed as potential for market failure.

This research estimates the determinants of stock price in the Jamaican Stock Market using data for the period 1974 – 2010. The results indicate the significant of the variables indicating: (i) turnover ratio, (ii) the volume shares traded, and (iii) the number of transactions. The variables indicating the number of listed companies is not significant. The results indicate potential for improving the liquidity of the market since the three significant variables are measures of market transactions. The high concentration of market transactions by few firms will

require drastic policies to prevent price distortion. Future studies of the JSM are promising, these should include the impact on financial deepening and the capital structure of domestic firms.

Notes

1. In September 1968 the Jamaica Stick Exchange was incorporated with limited liability under the Companies Act of Jamaica. Its principal objectives are: (i) to promote the orderly development of the stock market and a stock exchange in Jamaica;(ii) to ensure that the stock market and its Broker-members operate at the highest professional standards; (iii) to develop, apply and enforce rules designed to ensure public confidence in the stock market and its Broker-members; (iv) to provide facilities for transaction of stock market business; and (v) to conduct research, disseminate relevant information and maintain local and international relationships that are aimed to enhance the development of the Jamaica stock market.

2. The following definitions are from Schwartz, (1988, p. 36-37) **Depth:** A market has depth if a sufficient number of orders exist at prices above and below the price at which shares are currently traded. **Breadth:** A market has breadth if these orders exist in substantial volume. **Resiliency:** the market has resiliency if temporary price changes due to temporary order imbalances quickly attract new orders to the market. In illiquid markets, traders incur transaction costs above explicit cists, such as commission fees. The hidden costs of trading, called execution costs are incurred by buyers who pay higher prices for the shares they receive and by sellers who receive lower prices for the shares they deliver. Execution costs are attributable to three factors: (i) the bid-ask spread, (ii) market impact effects, and (iii) inaccurate price discovery.

3. "While supply and demand conditions determine liquidity in both cases, the factors that characterize the supply and demand functions for individual assets within a market are different from the factors that characterize the liquidity of a country's equity market. Whereas unique individual security characteristics determine its relative liquidity, the liquidity of a country's equity market is largely determined by macroeconomic factors that are systemic to the economy." Jun, Marathe, Shawky (2003), page 2.

4. Calculated from Jamaican Stock Exchange Year Book, pp. 30 and 46.

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Table 1: Descriptive Statistics of Variables

	CAP	IND	NOC	NOTRN	PR	TOR	VAL	VOL
Mean	1.87E+08	27514.4	42	20428.9	8.24	5.87	8908019	1729284
Median	41879310	13099.7	43	13892	9.48	4.11	2046243	395606
Maximum	8.79E+08	112656	51	86875	11.63	22.78	67026871	24433488
Minimum	89776	46.99	32	420	3.85	1.44	1293	2185
Std. Dev.	2.92E+08	37113.3	5.126	21660.3	2.77	4.81	15162539	4153599
Skewness	1.44	1.22	-0.428	1.32	-0.37	1.95	2.19	4.61
Kurtosis	3.54	2.99	2.705	4.31	1.65	6.79	7.53	25.55
Jarque-Bera	13.25	9.23	1.263	13.33	3.66	45.64	61.21	914.88
Probability	0.00	0.01	0.532	0.00	0.16	0	0	0
Observations	37	37	37	37	37	37	37	37

Cap = Capitalization value (JA$000), IND = Year end price index, NOC = Number of listed companies, NOTRN = Number of transactions, PR = Log of price index, TOR = Turnover ratio, VAL = Value traded (JA$000), VOL = Volume traded (000)

Table 2: Correlation Matrix

	CAP	NOC	NOTRN	TOR	VAL	VOL
CAP	1.000000	0.126605	0.679430	-0.151819	0.862238	0.673761
NOC	0.126605	1.000000	0.431336	0.333889	0.192798	0.150058
NOTRN	0.679430	0.431336	1.000000	0.281117	0.650781	0.386601
TOR	-0.151819	0.333889	0.281117	1.000000	0.105060	-0.048789
VAL	0.862238	0.192798	0.650781	0.105060	1.000000	0.496205
VOL	0.673761	0.150058	0.386601	-0.048789	0.496205	1.000000

Table 3: Results of ADF Test of Unit Roots

Variables	Test in	Included in test	Coefficient	T(tau) Value	Prob	Decision*
PR	1st Difference	Constant	-0.817	-4.77	0.00	Reject H_0
		Constant & Trend	-0.834	-4.81	0.00	Reject H_0
		None	-0.623	-3.92	0.004	Reject H_0
NOC	1st Difference	Constant	-0.864	-5.501	0.00	Reject H_0
		Constant & Trend	-0.864	-4.985	0.00	Reject H_0
		None	-0.861	-5.11	0.00	Reject H_0
VOL	1st Difference	Constant	-4.183	-5.353	0.00	Reject H_0
		Constant & Trend	-5.274	-5.892	0.00	Reject H_0
		None	-3.75	-5.126	0.00	Reject H_0
NOTRN	1st Difference	Constant	-0.846	-4.917	0.00	Reject H_0
		Constant & Trend	-0.852	-4.87	0.00	Reject H_0
		None	-0.845	-4.986	0.00	Reject H_0
TOR	1st Difference	Constant	-1.586	-11.34	0.00	Reject H_0
		Constant & Trend	-1.587	-11.185	0.00	Reject H_0
		None	-1.586	-11.511	0.00	Reject H_0
CAP	1st Difference	Constant	-0.907	-3.51	0.0116	Reject H_0
		Constant & Trend	-1.045	-3.599	0.0013	Reject H_0
		None	-0.790	-3.317	0.0025	Reject H_0
VAL	1st Difference	Constant	-3.156	-1.30	0.2096	Do not reject H_0
		Constant & Trend	-10.28	-5.69	0.000	Reject H_0
		None	-1.248	-0.628	0.5378	Do not reject H_0
IND	1st Difference	Constant	-0.918	-5.29	0.00	Reject H_0
		Constant & Trend	-0.937	-5.305	0.00	Reject H_0
		None	-0.873	-5.133	0.00	Reject H_0

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*H_0: Unit root exists. Decision is bases on Augmented Dickey-Fuller test statistic, Mac Kinnon (1996).

Table 4: Johanson's Unrestricted Conintegration Rank Test

Trend assumption: No deterministic trend
Series: PR LTOR LNOTRN LVOL LNOC
Lags interval (in first differences): 1 to 1

Unrestricted Cointegration Rank Test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.483561	60.52207	60.06141	0.0457
At most 1	0.406439	37.39415	40.17493	0.0927
At most 2	0.247637	19.13759	24.27596	0.1940
At most 3	0.225217	9.178799	12.32090	0.1589
At most 4	0.007054	0.247775	4.129906	0.6777

Trace test indicates 1 cointegrating eqn(s) at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None	0.483561	23.12792	30.43961	0.3069
At most 1	0.406439	18.25656	24.15921	0.2572
At most 2	0.247637	9.958794	17.79730	0.4896
At most 3	0.225217	8.931024	11.22480	0.1232
At most 4	0.007054	0.247775	4.129906	0.6777

Max-eigenvalue test indicates no cointegration at the 0.05 level
* denotes rejection of the hypothesis at the 0.05 level
**MacKinnon-Haug-Michelis (1999) p-values

Table 5: Regression Results

Variables	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	-6.127	-5.67	-5.67	-1.54	-5.25	-3.08
	(-7.50)	(-8.34)	(-10.036)	(-0.407)	(-1.11)	-0.958
lnTOR	-0.963		-0.644		-0.958	-0.627
	(-4.34)***		(-4.01)***		(-4.24)***	(-3.85)***
lnNOTRN	1.744	0.638	0.899	0.688	1.756	0.9236
	(18.409)***	(3.92)***	(5.98)***	(4.208)***	(15.45)***	(6.006)***
lnVOL		0.667	0.554	0.6728		0.5605
		(6.604)***	(6.24)***	(6.67)***		(6.264)***
lnNOC				-1.242	-0.26	-0.78
				(-1.10)	(-0.188)	(-0.82)
R-Sq	0.901	0.938	0.958	0.94	0.91	0.959
Adj R-Sq	0.904	0.935	0.955	0.935	0.90	0.954
F-Stat	172.18	260.5	256.2	175.2	111.54	190.4
Prob (F-Stat)	0.00	0.00	0.00	0.00	0.00	0.00
DW	0.599	1.2	1.076	1.32	0.64	1.153

***significant at 0.01 level

Figure 1: Capitalization value (mil$JAM)

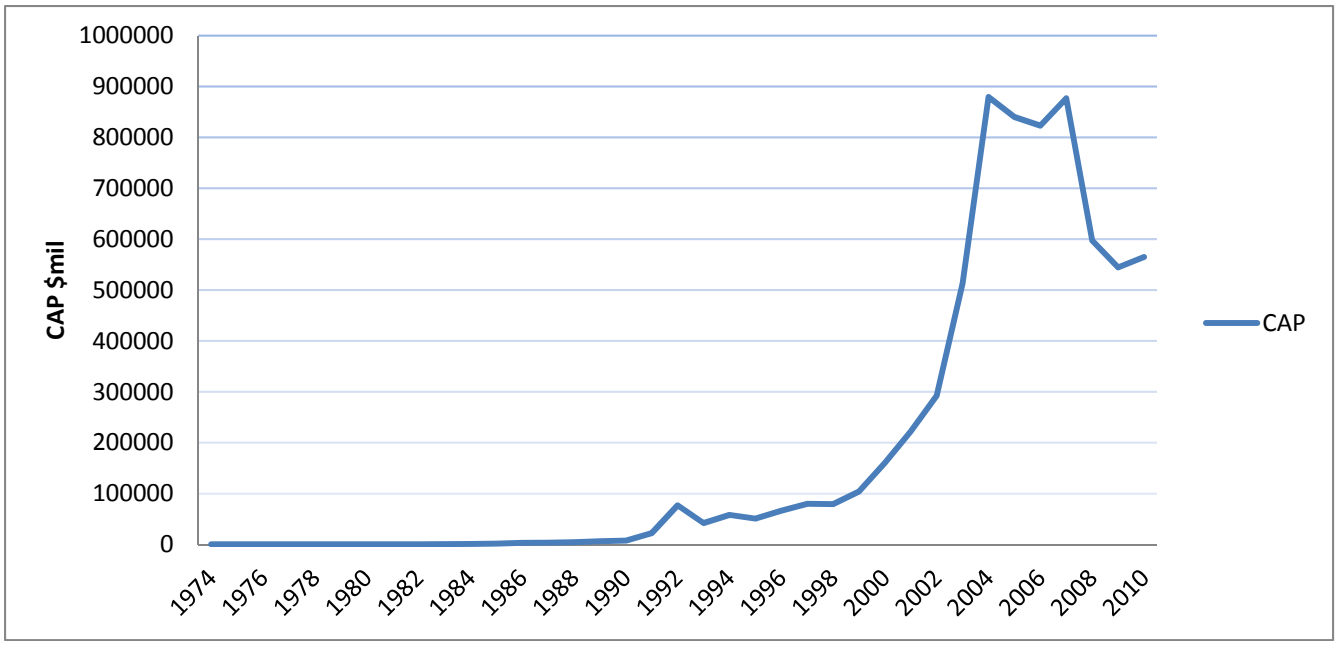

Figure 2: Value traded (JA$mil)

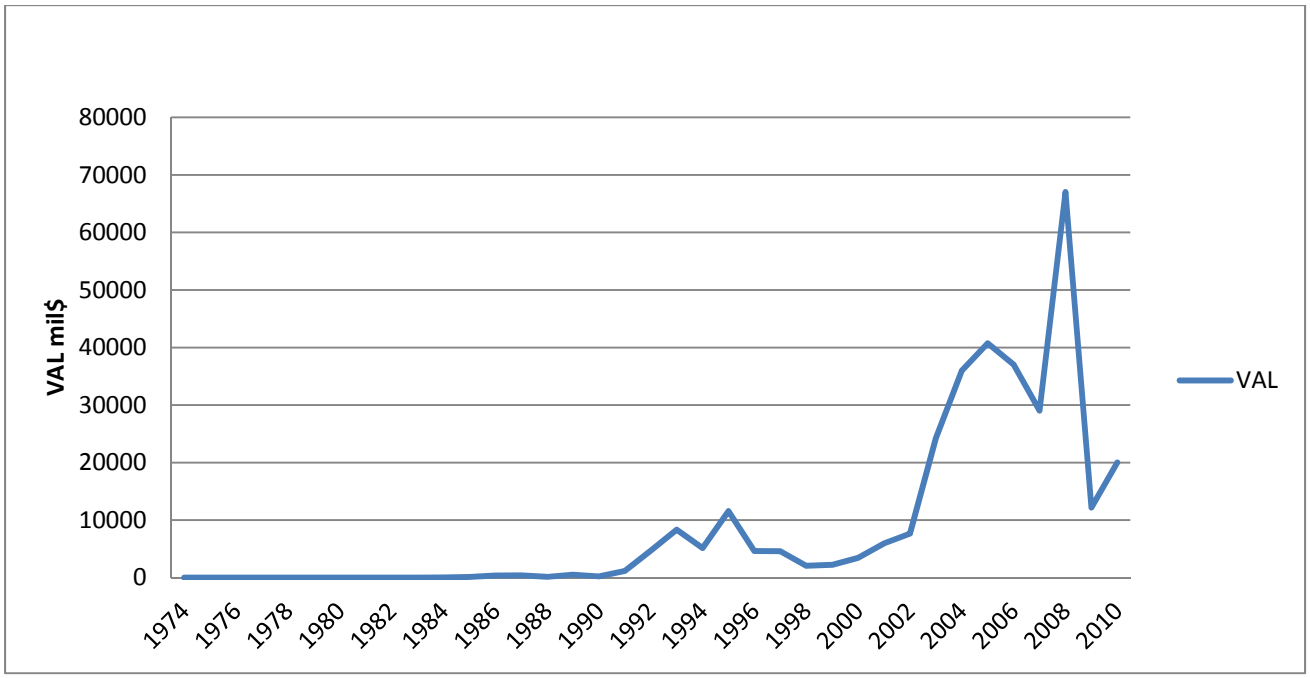

Figure 3: Turnover ratio (%)