

Equity Valuation Process And Price-Volume Relationship On Emerging Stock Markets

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ABSTRACT

This paper examines the stock price-volume relationship in emerging markets throughout the world. Using a vector auto-regression analysis on monthly index data, contrary to evidence reported by Saatcioglu and Starks (1998), we find strong evidence on stock price changes leading trading volume. This finding confirms the evidence reported by studies on many developed markets and the ones recently reported by Moosa et al. (2003) and Chen et al. (2004) on Commodity futures market. However, the lack of strong evidence on the well-documented positive absolute price-volume relation may imply that differences in institutions and information flows in emerging markets are important enough to affect the valuation process of equity securities.

INTRODUCTION

The price-volume relation in financial markets has received considerable attention over the past two decades. Although numerous studies have attempted to establish the empirical and theoretical structure of this relation, a consensus is yet to be reached¹. Given the divergent conclusions of this research, further insights should be obtained through investigations on alternative sets of financial markets. Because of their differences in terms of structure and information flows, emerging markets constitute a good candidate for such an additional investigation into the price-volume relationship. There are theoretical models that hypothesize a stock price-volume relation based on information flows and operational structure of market institutions (see, for example, Copeland, 1976 and Jennings et al., 1981). Given these hypotheses, an empirical study using alternative markets should provide new insights into this relation. By investigating a set of Latin American markets Saatcioglu and Starks (1998) find that there is a positive relation between volume and both the magnitude of price change and price change itself, and that there is no strong evidence on causality relation. Our objective in this study is to find out if their findings hold true in all emerging markets and for a different time frame. As a matter of fact, previous studies have indicated that the price-volume relationship is stronger in small than in large firms. If this were so, one would expect to see even stronger evidence of price volume relationship in emerging markets where markets are less than efficient. The remainder of the paper is organized as follows: an overview of previous research on the relation between price changes and volume is presented in Section II; the emerging markets data used is described in section III; the methodology and the empirical results are presented in section IV; finally, our conclusions appear in Section V.

LITERATURE REVIEW

According to Karpoff (1987), there are many reasons why the understanding of the relation between stock prices and volume is important. First, the empirical relation between returns and volume helps discriminate between competing theories on how information is disseminated in financial markets. Second, for event studies that use combinations of return and volume data to infer the information content of the event in question, the construction of the tests and the validity of the inferences depend on the joint distribution of returns and volume. Third, the return-volume relation is critical in assessing the distribution of returns themselves. For example, the mixture of distributions hypothesis has been employed to view the distribution of price changes (i.e., returns) as a finite-variance

¹ See Granger and Morgenstern, (1963), Rogalski, (1978), Smirlock and Starks, (1988) and Hiemstra and Jones, 1995 for more details. For recent research on emerging markets and discussions of some of the differences between emerging and developed markets, see Barry and Lockwood (1995); Divecha et al. (1992); Errunza (1994); Harvey (1995).

mixture of normal distributions where volume is the mixing variable (e.g., Epps and Epps, 1976). Fourth, a better understanding of the statistical structure of volume and return can help explain technical analysis (see Blume et al, 1994). Beyond these rationales, the price-volume relation can also be used to validate two well-known Wall Street adages: (i) volume is relatively heavy in bull markets and light in bear markets, and (ii) it takes volume to make prices move.

Early empirical research on the stock price-volume relation in financial markets primarily focuses on two of the empirical relations implied by these adages: (i) the correlation between volume (V) and price change (ΔP) and (ii) the correlation between volume (V) and the absolute value of the price change ($|\Delta P|$). A couple of early studies use spectral analysis on weekly index data, and daily and transactions individual stock data. Both studies conclude that prices and volume are virtually unrelated and that price changes follow a random walk (Granger and Morgenstern, 1963; Godfrey et al, 1964). In contrast, using daily and hourly price changes for both market indices and individual stocks Crouch (1970a) (1970b) finds a positive correlation between volume and the magnitude of returns. Examining the relation between volume and returns, a positive contemporaneous correlation has been found by Rogalski (1978) using monthly stock and warrant data and by Epps (1975), (1977) using transactions data. To explain such results, Epps proposes a theoretical framework consistent with his findings and supported by Smirlock and Starks (1985) and by Assogbavi et al. (1995), in the Canadian market. More recent empirical work has investigated the lagged relation between price changes and volume. For example, Smirlock and Starks (1988), employing individual stock transactions data, document a strong positive lagged relation between volume and absolute price changes. Similarly, using daily data, Bhagat and Bhatia (1996) test for causality in both mean and variance and provide evidence that price changes lead volume, but no evidence that volume leads price changes. In addition, Hiemstra and Jones (1995) find a new result through the use of nonlinear Granger causality. They find a significant positive relation going in both directions between returns and volume. Few studies have examined the price-volume relation in markets outside of the North American markets². Given this mix of findings, additional results from other financial markets are needed to better understand the price-volume relationship. The emerging markets are good candidates for such a study. As these markets are becoming popular with institutional investors by offering them the means to better diversify their portfolios and for very attractive risk adjusted returns, it becomes necessary to investigate the price structure in those markets. The benefit of studying those markets is then twofold. First, it will allow improving the understanding of price-volume relation and second, it can help to better comprehend the functioning of emerging markets.

DATA

The data set used is derived from the 2000 Emerging Markets Database (EMDB), prepared and maintained by the International Finance Corporation (IFC). The IFC defines a stock market as "emerging" if it is located in a developing country – as defined by the World Bank's GNP per capita criterion for a developing country. The 2000 EMDB includes data for over 1400 individual stocks in 26 countries. For each of the sample markets, EMDB reports the weekly and monthly value-weighted total return indices in local currency and in U.S. dollars. We use the monthly value-weighted total return index in both U.S. dollars and local currency. However, for comparison purposes, we concentrate on the results obtained using the U.S. dollar return series.

² . Using daily, weekly, and monthly series of different indices in the Tokyo Stock Exchange, Tse (1991) has mixed results for the price-volume relation. He finds significant positive correlation in some series and not in others. He concludes "the relationship between price changes and volumes in the market, if there is any, is weak". Chan and Tse (1993) employ the multiple time series approach of Tiao and Box (1981) and show that "there is implicit positive correlation between price and volume through their residuals."

Table I: Summary Statistics For Emerging Stock Markets

This table provides descriptive statistics for the IFC Global indices, markets, index returns and turnover for twenty-six emerging stock markets over the period January 1989 through October 2000. Turnover is the percentage of total market capitalization traded in a given period. All summary statistics are for monthly data series.

Table I Panel A: Summary Statistics

Country	Number Of Firms In Index	Number Of Firms In Market	% Of Firms In Market Included In Index	Market Capitalization Of Index (\$US)	Market Capitalization Of Whole Market (\$US)	% Of Market Capitalization Included In Index
Argentina	34	149	22.82%	29217.93	51834.4	56.37%
Brazil	86	550	15.64%	105597.25	200228.04	52.74%
Chile	48	292	16.44%	40715.11	75797.79	53.72%
Colombia	26	189	13.76%	11857.23	20076.03	59.06%
Czech Republic	70	274	25.55%	6750.66	13760.47	49.06%
Greece	58	229	25.33%	15199.17	34980.38	43.45%
Hungary	17	46	36.96%	5012.47	10592.49	47.32%
India	129	5842	2.21%	61062.12	144683.62	42.20%
Indonesia	50	276	18.12%	26907.44	52229.61	51.52%
Jordan	50	137	36.50%	3301.33	5376.69	61.40%
Korea	162	775	20.90%	47920.11	91588.57	52.32%
Malaysia	147	688	21.37%	70109.24	139167.16	50.38%
Mexico	74	191	38.74%	91511.45	134229.72	68.18%
Nigeria	35	181	19.34%	2372.33	3424.22	69.28%
Pakistan	63	783	8.05%	6415.3	11839.04	54.19%
Peru	32	259	12.36%	8803.26	18106.28	48.62%
Philippines	52	221	23.53%	21053.32	35504.28	59.30%
Poland	30	134	22.39%	5487.91	12479.97	43.97%
Portugal	32	147	21.77%	24776.63	37683.24	65.75%
South Africa	61	624	9.78%	76097.96	245543.27	30.99%
Sri Lanka	47	235	20.00%	1342.6	2230.9	60.18%
Taiwan, China	90	400	22.50%	138159.87	260742.19	52.99%
Thailand	88	455	19.34%	18499.01	33991.42	54.42%
Turkey	57	253	22.53%	30981.29	55345.42	55.98%
Venezuela	18	89	20.22%	9488.51	15212.9	62.37%
Zimbabwe	22	65	33.85%	2405.89	4864.31	49.46%

The results of Panel A of Table 1 show that from the 26 emerging stock indices, 18 represent at least 50% of market capitalization of the whole market with Nigeria and Mexico representing 69.28% and 68.18% respectively of the total market capitalization. Only South Africa's stock index is in the range of 30% of the whole market capitalization.

The results presented in panel B give statistical summaries of monthly returns of the indices (calculated as $\ln(P_t/P_{t-1})$) using both local currency and U.S. currency over the sampling period. One of the most striking features of these calculations is the volatility of the markets. In general, the standard error (or ratio of the standard deviation to the mean) is very high (between 200% and 800%) and is characteristic of emerging markets risk.

The last two columns of the table contain the mean and standard deviations of the turnover statistic, which is an alternative measure of trading volume. The turnover value is represented by the volume traded for a given time period, divided by the market capitalization for that index.

Examining the indices in each of the individual countries as a proportion of their total markets indicates that although the indices tend to have a low proportion of the number of firms outstanding, the firms they contain are the largest, representing over 50% of the market value in each country. The return distributions do not reflect the generally large returns expected from emerging markets except for Chile, Colombia, Peru and Poland where the monthly mean returns are 2.12%, 2.21%, 1.97% and 3.19% % respectively over the sampling period.

Table I Panel B: Return And Turnover Summary Statistics.

Country	Returns								Turnover	
	Mean (LC)*	Standard Deviation (LC)*	Skewness (LC)*	Kurtosis (LC)*	Mean (USC)*	Standard Deviation (USC)*	Skewness (USC)*	Kurtosis (USC)*	Mean	Std.Dev
Argentina	0.0824	0.2512	2.5217	9.2290	0.0155	0.2024	-0.0170	11.0688	0.0312	0.0209
Brazil	0.0452	1.1437	-11.2390	130.9817	0.0061	0.1863	-0.6021	2.8907	0.0409	0.0201
Chile	0.0270	0.0730	0.0902	-0.0545	0.0212	0.0764	0.0399	-0.0230	0.0090	0.0042
Colombia	0.0362	0.0812	1.1558	2.8403	0.0221	0.0807	1.1359	2.7537	0.0066	0.0038
Czech	-0.0185	0.0733	-0.6110	-0.3964	-0.0205	0.0725	-0.5423	-0.4835	0.0037	0.0018
Greece	0.0155	0.1079	0.9288	2.9824	0.0111	0.1092	0.8560	3.2995	0.0203	0.0246
Hungary	0.0278	0.1105	0.8473	2.8094	0.0129	0.1047	0.9876	3.1614	0.0285	0.0272
India	0.0100	0.0961	0.5033	1.4491	0.0024	0.0929	0.3048	0.7221	0.0436	0.0372
Indonesia	0.0029	0.0933	-0.8160	2.7774	-0.0045	0.1003	-1.3982	6.1113	0.0345	0.0163
Jordan	0.0059	0.0439	0.7276	1.9200	0.0011	0.0444	0.1002	1.5742	0.0135	0.0117
Korea	0.0044	0.0814	0.0207	1.0220	0.0038	0.0851	-0.1888	1.6131	0.0777	0.0389
Malaysia	0.0063	0.0816	-1.0822	3.8210	0.0042	0.0854	-1.3764	4.4561	0.0195	0.0142
Mexico	0.0398	0.1246	-1.0406	5.1551	0.0183	0.1438	-2.5164	13.2490	0.0456	0.0283
Nigeria	0.0294	0.0457	1.3433	5.3821	-0.0018	0.1705	-3.1484	24.4418	0.0008	0.0012
Pakistan	0.0134	0.0744	0.7563	3.0023	0.0062	0.0750	0.8500	3.1207	0.0249	0.0382
Peru	0.0277	0.0895	0.2827	0.9689	0.0197	0.0894	0.3550	1.2690	0.0361	0.0208
Philippines	0.0216	0.1052	0.3267	2.4267	0.0172	0.1059	-0.0521	1.9846	0.0222	0.0129
Poland	0.0455	0.1873	0.7665	2.3891	0.0319	0.1820	0.7710	2.5080	0.0784	0.0482
Portugal	0.0177	0.1060	0.7626	6.2852	0.0168	0.1064	0.9268	5.1085	0.0189	0.0170
SouthAfrica	0.0107	0.0497	-0.2782	3.5920	0.0102	0.0640	0.0208	1.8096	0.0107	0.0056
SriLanka	0.0057	0.0817	0.0624	0.0249	0.0012	0.0817	0.0950	0.0128	0.0137	0.0074
Taiwan	0.0124	0.1359	-0.1705	1.8236	0.0141	0.1389	-0.1308	1.6071	0.2078	0.0966
Thailand	0.0081	0.1024	-0.7402	2.5913	0.0050	0.1035	-1.1992	3.8196	0.0488	0.0314
Turkey	0.0550	0.1711	0.5379	0.3657	0.0124	0.1823	0.4274	0.2208	0.0486	0.0388
Venezuela	0.0399	0.1149	0.0705	0.8440	0.0160	0.1335	-0.6556	3.5381	0.0192	0.0192
Zimbabwe	0.0237	0.0777	-0.2462	1.3798	0.0091	0.0829	-0.2582	1.0477	0.0046	0.0037

* where LC designates local currency returns, and USC designates U.S. currency returns.

EMPIRICAL RESULTS

Positive Relationship Tests

Before conducting the Granger test, we first investigate whether the two Wall Street adages: "volume is relatively heavy in bull markets and light in bear markets" and "it takes volume to make prices move" are relevant for emerging stock markets. To examine whether the contemporaneous relation between price changes and volume is present, we estimate the coefficients of the following two regressions:

$$V = \alpha_0 + \alpha_1 \ln(P_t / P_{t-1}). \quad (1)$$

$$V = \beta_0 + \beta_1 |\ln(P_t / P_{t-1})|. \quad (2)$$

where (V) is volume measured by monthly turnover, and the price change, the natural logarithm of the price relative for a given month.

Table II: Asymmetry Test

This table provides the coefficient estimates from regressions of volume against price changes (returns) for the emerging stock markets over the period January 1989 through October 2000 for U.S. dollar returns. (t-statistics are in parentheses).

Panel A: Regression Results For $V = \alpha_0 + \alpha_1 \ln(P_t / P_{t-1})$

Country	Observations	α_0	α_1	F-Statistic	A.R-Square
Argentina	141	0.0313*** (17.7584)	-0.0081 (-0.9274)	0.8601	-0.0010
Brazil	141	0.0409*** (24.0961)	-0.0017 (-0.1871)	0.0350	-0.0069
Chile	141	0.0090*** (24.7063)	-0.0019 (-0.4159)	0.1730	-0.0059
Colombia	141	0.0066*** (19.7441)	0.0020 (0.5062)	0.2562	-0.0053
Czech	45	0.0034*** (13.3594)	-0.0115*** (-3.3179)	11.0086***	0.1853
Greece	141	0.0203*** (9.6895)	0.0006 (0.0316)	0.0010	-0.0072
Hungary	57	0.0285*** (7.7710)	0.0055 (0.1557)	0.0243	-0.0177
India	141	0.0435*** (13.8895)	0.0391 (1.1544)	1.3326	0.0024
Indonesia	94	0.0345*** (20.5414)	0.0148 (0.8773)	0.7696	-0.0025
Jordan	141	0.0135*** (13.6176)	0.0004 (0.0184)	0.0003	-0.0072
Korea	141	0.0775*** (23.7248)	0.0553 (1.4379)	2.0675	0.0076
Malaysia	141	0.0196*** (16.7398)	-0.0347** (-2.5215)	6.3578**	0.0369
Mexico	141	0.0456*** (18.9117)	-0.0001 (-0.0078)	0.0001	-0.0072
Nigeria	141	0.0008*** (8.2350)	0.0000 (-0.0031)	0.0000	-0.0072
Pakistan	141	0.0253*** (7.8906)	-0.0686 (-1.6037)	2.5720	0.0111
Peru	57	0.0361*** (12.6597)	0.0009 (0.0296)	0.0009	-0.0182
Philippines	141	0.0222*** (20.1281)	-0.0049 (-0.4720)	0.2228	-0.0056
Poland	57	0.0774*** (11.9215)	0.0344 (0.9708)	0.9424	-0.0010
Portugal	141	0.0189*** (12.9817)	0.0000 (0.0013)	0.0000	-0.0072
SouthAfrica	57	0.0110*** (15.1908)	-0.0271** (-2.4039)	5.7788**	0.0786
SriLanka	57	0.0137*** (13.7894)	0.0081 (0.6613)	0.4373	-0.0102
Taiwan	141	0.2083*** (25.4185)	-0.0342 (-0.5806)	0.3371	-0.0048
Thailand	141	0.0487*** (18.3681)	0.0160 (0.6228)	0.3879	-0.0044
Turkey	129	0.0489*** (14.2851)	-0.0211 (-1.1223)	1.2595	0.0020
Venezuela	141	0.0189*** (11.6666)	0.0162 (1.3360)	1.7848	0.0056
Zimbabwe	141	0.0045*** (14.6749)	0.0042 (1.1253)	1.2663	0.0019

The results of equation (1) indicate that the contemporaneous correlation between monthly return and volume is significantly positive for only three of the twenty-six emerging markets. This price-volume test that stands also for asymmetry test (trading volume following price increases is higher than that related to price decreases) clearly

indicates that there is no such asymmetry in price-volume relationship in emerging markets. Meaning that trading volume resulting from price increases is not statistically different from trading volume following price decreases. This finding does not lend support to the Wall Street adage: "volume is relatively heavy in bull markets and light in bear markets. While this empirical evidence contradicts most of the US studies, it supports Karpoff (1986 and 1987) and Assogbavi et al. (1995) who relate the observed price-volume asymmetry in developed markets to the higher cost of short sales in relation to margin buying. As short sale trading is not popular, if permitted in most of the emerging markets, the cost of taking a long position is not different from that of taking a short position. Therefore, the absence of such a difference in trading costs in emerging markets is consistent with the results presented in Table II. These results are consistent with empirical tests which reveal that the empirical relation between price change and volume found in stock and bond market data is absent in future market data where the cost of taking a long position is equal to that of a taking a short position.

The results of equation (2), reported in Table III, indicate that the contemporaneous positive relation between volume-absolute price change holds only for five (5) markets (Czech, Mexico, Pakistan, Poland and Srilanka) at a 1% significance level, and four (4) at a 5% significance level. This puzzling evidence of lack of support for the contemporaneous positive correlation between absolute price changes and volume might well be explained in Epps & Epps (1976) and in Karpoff (1986). As Karpoff (1986) would have put it, investors in most of these markets are late in the informational queue, preventing synchronization in price changes and trading volume for a given point in time. The information flow in these markets may well be disseminated sequentially instead of instantaneously as required in the Epps & Epps model. In fact, following Epps & Epps (1976), the justification of the presence of positive correlation between absolute price change and volume comes from the fact that all investors receive information simultaneously. It is quite reasonable that this hypothesis might not hold in developing markets where it is conceivable that the information dissemination is likely to be sequential than simultaneous because of poor operational structure of those markets.

Table III: Positive Price-Volume

This table provides the coefficient estimates from regressions of volume against price changes (returns) for the emerging stock markets over the period January 1989 through October 2000 for U.S. dollar returns (t-statistics are in parentheses).

Panel A: Regression Results For $V = \alpha_0 + \alpha_1 |\ln(P_t / P_{t-1})|$

Country	Observations	α_0	α_1	F-Statistic	A.R-Square
Argentina	141	0.0330*** (14.7945)	-0.0141 (-1.2838)	1.6482	0.0046
Brazil	141	0.0449*** (18.8057)	-0.0298** (-2.3213)	5.3886**	0.0304
Chile	141	0.0091*** (15.4251)	-0.0015 (-0.1976)	0.0390	-0.0069
Colombia	141	0.0064*** (13.8988)	0.0037 (0.6725)	0.4523	-0.0039
Czech	45	0.0027*** (6.9749)	0.0168*** (3.2224)	10.3839***	0.1758
Greece	141	0.0215*** (7.5599)	-0.0159 (-0.6133)	0.3761	-0.0045
Hungary	57	0.0293*** (5.8711)	-0.0109 (-0.2277)	0.0519	-0.0172
India	141	0.0449*** (9.0017)	-0.0187 (-0.3473)	0.1206	-0.0063
Indonesia	94	0.0346*** (14.1587)	-0.0017 (-0.0682)	0.0046	-0.0108
Jordan	141	0.0111*** (7.8499)	0.0735** (2.3036)	5.3064**	0.0298
Korea	141	0.0799*** (15.5501)	-0.0334 (-0.5514)	0.3040	-0.0050
Malaysia	141	0.0178*** (10.3404)	0.0267 (1.3159)	1.7317	0.0052
Mexico	141	0.0396*** (12.7475)	0.0624*** (2.8986)	8.4017***	0.0502
Nigeria	141	0.0009*** (7.5385)	-0.0004 (-0.6004)	0.3605	-0.0046
Pakistan	141	0.0164*** (3.8133)	0.1648*** (2.8707)	8.2411***	0.0492
Peru	57	0.0356*** (8.6337)	0.0077 (0.1701)	0.0289	-0.0176
Philippines	141	0.0217*** (13.6206)	0.0062 (0.4147)	0.1720	-0.0059
Poland	57	0.0589*** (6.9932)	0.1492*** (3.2435)	10.5201***	0.1453
Portugal	141	0.0212*** (11.2316)	-0.0328* (-1.8630)	3.4709*	0.0173
SouthAfrica	57	0.0110*** (9.9881)	-0.0068 (-0.3930)	0.1545	-0.0153
SriLanka	57	0.0105*** (7.4815)	0.0527*** (3.0551)	9.3338***	0.1295
Taiwan	141	0.1899*** (16.3830)	0.1789** (2.1469)	4.6093**	0.0251
Thailand	141	0.0456*** (11.9883)	0.0421 (1.1433)	1.3071	0.0022
Turkey	129	0.0585*** (11.0143)	-0.0701** (-2.4011)	5.7652**	0.0359
Venezuela	141	0.0177*** (7.5739)	0.0152 (0.8731)	0.7623	-0.0017
Zimbabwe	141	0.0045*** (9.5725)	0.0013 (0.2255)	0.0509	-0.0068

GRANGER CAUSALITY TESTS

The causality tests allow investors to know which variable causes the other. The tests are normally conducted by testing whether there is a relation between the lagged values of the two series. Consequently, to test whether volume leads return or return leads volume, we employ Granger causality tests, as has been done in previous research on developed markets (e.g., Smirlock and Starks, (1988), and Assogbavi et al. (1992). By controlling for any serial correlation in the dependent variable itself, the Granger causality regressions are as follows:

$$Vol_t = \alpha_0 + \sum_{i=1-12} \alpha_i Vol_{t-i} + \sum_{j=1-12} \beta_j |Ret_{t-j}| \tag{3}$$

$$|Ret_t| = \gamma_0 + \sum_{i=1-12} \gamma_i |Ret_{t-i}| + \sum_{j=1-12} \delta_j Vol_{t-j} \tag{4}$$

where (Vol) is the turnover ratio, and (Ret_t) is the natural logarithm of the month t price relative. The Granger causality test is in effect an F-test for block exogeneity, and as such is vulnerable to serial correlation (see, for example, Kennedy, 1993, p. 68). Therefore, before running the Granger causality tests, we correct the data series for first-order autocorrelation. Summary results of Eqs. (3) and (4) are shown in Table IV. The table provides the intercept and the first two lags of the volume, and return variables along with an F-statistic for block exogeneity and the adjusted R-square statistic. In the bivariate case, the F-test for block exogeneity is equivalent to a test for Granger causality.

The results for Eq. (3) indicate that under a test of the null hypothesis that return does not Granger cause trading volume, the F-statistic is significant at the 1% level for 22 emerging markets and at the 5% level for 2 markets. Only 2 emerging markets do not reject the null hypothesis. Overall, these results constitute a strong evidence of returns causing trading volume. This means that the trading desire created by price changes is not immediately cleared. An explanation of such a finding is that most investors in these markets are late in the informational queue and only trade some time after new information hits the market. This explanation is easily conceivable in most emerging markets where the state of their development might not allow spontaneous information dissemination. In general, the information arrival in these markets is likely to be sequential. Empirical research indicates that price adjustment to new information is “very quick”. But according to Jennings and Barry (1983 and 1984), “very quick” can be interpreted as nearly instantaneous or as supporting gradual information dissemination. Smirlock and Starks (1984) find support for sequential over simultaneous information arrival.

The most puzzling evidence found in this study is that high volume persists for some time (a month) after the price change which might be due to market frictions that keep all demands from instantaneously clearing. Whether the operational structure of those markets prevent investors to quickly react at new information arrival warrants further study of the structure of emerging markets.

The results for Eq. (4) are quite different from those of Eq. (3). In this case, the F-statistic is significant at the 1% level for only 2 markets (Mexico and Pakistan), at 5% level for 3 markets, and at 10% for 2 markets. Based on these results, our findings do not support the hypothesis that trading volume causes price change in emerging markets. These findings are quite different from the ones presented by Saatcioglu and Starks (1998) which indicate the contrary³. While the evidence presented in this paper is consistent with previous causality tests on price-volume relation as most of those studies have documented “a price change causing trading volume,” it however failed to lend support to the well documented positive correlation between volume and absolute price change.

³ We also run our Granger causality tests using local currency returns. Those results are not materially different than the results obtained using U.S. dollar returns and are therefore omitted.

Table IV: Granger Causality Test Results

This table provides summary results for a vector autoregression (VAR) analysis of the relation between price changes (returns) and volume for the twenty-six emerging stock markets over the period January 1989 through October 2000. Only the parameters for the first two lags are reported here. Panels A and B present the results for the regressions testing price changes (returns) Granger causing volume for U.S. dollar returns. The data series have been corrected for first-order autocorrelation before running the tests in either panel (t-statistics are in parentheses).

Panel A: $Vol_t = \alpha_0 + \sum_{i=1,2} \alpha_i Vol_{t-i} + \sum_{j=1,2} \beta_j |Ret_{t-j}|$ in U.S. Currency

Country	Observation	α_0	α_1	α_2	β_1	β_2	F-statistic	A.R-square
Argentina	129	0.0044 (1.5018)	0.6644*** (6.8718)	0.0721 (0.6194)	0.0131** (2.0181)	0.0255*** (3.8547)	9.097***	0.603
Brazil	129	-0.0016 (-0.5055)	0.3973*** (4.0918)	0.4189*** (3.9171)	0.0143*** (2.6879)	0.0265*** (4.8681)	17.935***	0.76
Chile	129	0.0017 (1.3362)	0.4107*** (4.3336)	0.0421 (0.4158)	0.0016 (0.3806)	0.0093** (2.1375)	4.443***	0.392
Colombia	129	0.0007 (0.8849)	0.2012** (2.0333)	0.2050** (2.0267)	0.0070* (1.7601)	0.0057 (1.3243)	4.193***	0.374
Czech	33	0.0027 (0.9423)	0.5643* (1.8995)	-0.1370 (-0.5249)	0.0015 (0.3248)	0.0019 (0.4447)	1.657	0.33
Greece	129	-0.0028 (-0.8495)	0.2613*** (2.6679)	-0.0832 (-0.8207)	0.0237 (1.5389)	0.0495*** (3.1759)	7.041***	0.531
Hungary	45	-0.0033 (-0.3289)	0.3905* (1.8241)	0.2547 (0.9529)	0.1107*** (3.2251)	0.0067 (0.1637)	2.227**	0.401
India	129	0.0049 (1.4620)	0.3370*** (3.5036)	0.2937*** (2.9636)	-0.0162 (-0.7300)	0.0597*** (2.6813)	11.819***	0.67
Indonesia	82	0.0116 (1.4240)	0.5247*** (4.0289)	0.2946* (1.9167)	-0.0078 (-0.5563)	0.0073 (0.5332)	1.824**	0.196
Jordan	129	0.0023 (1.5196)	0.4490*** (4.5890)	-0.0160 (-0.1510)	0.0864*** (5.2822)	0.0473** (2.5056)	10.808***	0.648
Korea	129	0.0186** (2.2725)	0.3226*** (3.2855)	0.1785* (1.7348)	0.1962*** (7.4649)	0.2034*** (6.2474)	12.843***	0.689
Malaysia	129	0.0016 (0.9634)	0.5819*** (5.8315)	-0.0435 (-0.3785)	0.0016 (0.1566)	0.0166* (1.6666)	10.798***	0.648
Mexico	129	0.0071** (2.0056)	0.5131*** (5.3986)	-0.0484 (-0.4524)	-0.0051 (-0.4185)	0.0127 (0.9781)	7.307***	0.542
Nigeria	129	0.0002 (1.2731)	0.0696 (0.7200)	0.0121 (0.1186)	0.0000 (0.0489)	-0.0002 (-0.3052)	5.776***	0.472
Pakistan	129	-0.0017 (-0.8955)	0.4912*** (5.1685)	0.0830 (0.7856)	0.0036 (0.1683)	0.0079 (0.3447)	35.964***	0.868
Peru	45	0.0068 (0.3008)	-0.2227 (-0.9909)	-0.0785 (-0.3471)	0.0530 (0.6982)	0.0693 (1.0595)	0.561	-0.314
Philippines	129	0.0032* (1.7874)	0.4666*** (4.6817)	0.1193 (1.0867)	0.0075 (0.9730)	0.0181** (2.2364)	8.131***	0.572
Poland	45	0.0098 (1.0409)	0.1221 (0.5747)	0.3735 (1.6830)	0.0509 (1.4858)	0.1006*** (2.8540)	6.985***	0.766
Portugal	129	0.0002 (0.0799)	0.3019*** (3.1275)	0.0587 (0.5803)	0.0123 (1.0060)	0.0150 (1.1895)	4.797***	0.416
Southafrica	45	-0.0016 (-0.7464)	0.3596 (1.6395)	0.4931** (2.1332)	-0.0047 (-0.4905)	0.0064 (0.8209)	8.452***	0.803
Srilanka	45	0.0005 (0.1447)	0.3352 (1.5005)	0.1995 (0.9110)	0.0261** (2.1953)	0.0194 (1.4929)	4.640***	0.665
Taiwan	129	0.0264 (1.3657)	0.6089*** (6.3406)	-0.0107 (-0.0951)	0.1823*** (4.1712)	0.1828*** (3.9156)	8.870***	0.596
Thailand	129	0.0110* (1.8074)	0.5999*** (6.2176)	0.0817 (0.7345)	0.0446* (1.9434)	0.0725*** (3.1829)	6.206***	0.494
Turkey	117	0.0057 (1.5470)	0.3099*** (2.9699)	0.5053*** (4.5253)	0.0344*** (2.8601)	0.0295** (2.3787)	11.682***	0.688
Venezuela	129	0.0034 (1.4455)	0.4177*** (4.2462)	0.1168 (1.1115)	0.0231** (2.3294)	0.0158 (1.5588)	6.619***	0.513
Zimbabwe	129	0.0013* (1.8104)	0.2203** (2.2535)	0.2512** (2.4875)	-0.0017 (-0.4401)	0.0122*** (3.1092)	2.954***	0.268

Panel B: $|Ret_t| = \alpha_0 + \sum_{i=1-12} \alpha_i Vol_{t-i} + \sum_{j=1-12} \beta_j |Ret_{t-j}|$ in U.S. Currency

Country	Observation	α_0	α_1	α_2	β_1	β_2	F-Statistic	AR-Square
Argentina	129	0.0480 (1.0810)	0.6563 (0.4490)	-1.7128 (-0.9730)	-0.1593 (-1.6227)	-0.1378 (-1.3776)	1.262	0.047
Brazil	129	0.0193 (0.3341)	-3.8678** (-2.1736)	2.3218 (1.1846)	-0.0286 (-0.2927)	0.0581 (0.5829)	0.970	-0.006
Chile	129	0.0662** (2.1920)	0.0854 (0.0389)	-3.4086 (-1.4545)	0.2956*** (3.0132)	-0.1983* (-1.9749)	1.589*	0.1
Colombia	129	0.0368* (1.9103)	-0.0346 (-0.0143)	-1.2447 (-0.5036)	0.4414*** (4.5108)	-0.0954 (-0.9046)	1.889**	0.143
Czech	33	0.1585 (0.8137)	-5.5876 (-0.2725)	10.5299 (0.5847)	0.1744 (0.5534)	0.0225 (0.0746)	0.873	-0.106
Greece	129	0.0113 (0.5609)	-0.3269 (-0.5386)	1.4098** (2.2447)	0.1181 (1.2358)	0.2278** (2.3595)	1.259	0.046
Hungary	45	-0.0192 (-0.3545)	0.4800 (0.4192)	-1.2180 (-0.8521)	-0.0274 (-0.1490)	0.0476 (0.2161)	4.700	-0.407
India	129	-0.0048 (-0.3286)	0.6200 (1.4791)	0.2972 (0.6883)	0.1082 (1.1182)	0.0736 (0.7586)	1.343	0.06
Indonesia	82	0.0717 (0.8912)	-1.5232 (-1.1876)	1.7404 (1.1498)	0.1459 (1.0516)	0.0982 (0.7287)	0.939	-0.018
Jordan	129	-0.0041 (-0.4627)	0.0636 (0.1115)	-0.2633 (-0.4254)	-0.1147 (-1.2020)	-0.0989 (-0.8981)	1.846**	0.137
Korea	129	-0.0029 (-0.0891)	0.2735 (0.6989)	-0.3610 (-0.8803)	0.0827 (0.7900)	0.0834 (0.6430)	1.233	0.042
Malaysia	129	0.0230 (1.4039)	-1.5398 (-1.5666)	0.6373 (0.5629)	0.1014 (1.0386)	0.2361** (2.4109)	1.193	0.035
Mexico	129	0.0216 (0.7268)	1.2778 (1.5955)	1.7437* (1.9327)	0.3727*** (3.6478)	-0.0532 (-0.4855)	4.423***	0.391
Nigeria	129	-0.0093 (-0.3159)	-2.4332 (-0.1327)	11.5900 (0.5990)	-0.0576 (-0.5839)	-0.0628 (-0.6409)	0.376	-0.132
Pakistan	129	0.0096 (1.1143)	0.8164* (1.8882)	-0.2947 (-0.6128)	0.3363*** (3.4091)	-0.1933* (-1.8588)	3.077***	0.28
Peru	45	0.0073 (0.1098)	0.2132 (0.3206)	0.2380 (0.3555)	0.1991 (0.8869)	-0.2775 (-1.4331)	1.225	0.109
Philippines	129	0.0195 (0.8514)	-1.9492 (-1.5419)	-0.1493 (-0.1072)	0.3000*** (3.0716)	-0.0008 (-0.0073)	1.118	0.022
Poland	45	0.0940 (1.5569)	-1.7999 (-1.3238)	-1.5882 (-1.1183)	-0.1330 (-0.6070)	-0.0682 (-0.3025)	1.684	0.272
Portugal	129	0.0103 (0.5417)	-0.0042 (-0.0056)	0.2952 (0.3735)	0.2399** (2.5221)	-0.0322 (-0.3261)	1.028	0.005
Southafrica	45	0.0655 (1.3576)	-3.0639 (-0.6170)	-8.8819 (-1.6974)	0.0237 (0.1100)	-0.3130* (-1.7837)	1.078	0.041
Srilanka	45	0.0570 (0.8794)	-5.8190 (-1.3025)	4.9395 (1.1280)	0.0364 (0.1535)	0.1286 (0.4956)	0.977	-0.013
Taiwan	129	0.0583 (1.3656)	0.0917 (0.4325)	-0.4060 (-1.6268)	0.0522 (0.5407)	0.0609 (0.5901)	1.364	0.064
Thailand	129	-0.0336 (-1.2620)	0.3132 (0.7415)	-0.8189* (-1.6825)	-0.0097 (-0.0962)	0.1278 (1.2816)	1.741**	0.122
Turkey	117	-0.0009 (-0.0277)	1.1876 (1.3247)	0.0352 (0.0367)	0.1107 (1.0714)	-0.0099 (-0.0927)	0.585	-0.094
Venezuela	129	0.0406* (1.6981)	0.3973 (0.4032)	-1.0571 (-1.0042)	0.0434 (0.4368)	0.1197 (1.1774)	0.946	-0.01
Zimbabwe	129	0.0005 (0.0306)	0.9843 (0.4051)	-4.1337 (-1.6470)	0.1081 (1.1201)	0.1348 (1.3835)	1.592*	0.1

CONCLUSIONS

Using monthly index data for emerging markets, we find weak evidence supporting a positive correlation between volume and returns. The absence of a positive relation between volume and price change per se is explained by the absence of asymmetry in transaction costs. We also present strong evidence that returns lead volume in these markets that is consistent with previous studies indicating a similar stock price-volume lead-lag relation to the preponderance of studies employing U.S. data. However, the lack of strong evidence of the well-documented positive absolute price-volume relation may imply that differences in institutions and information flows in emerging markets are important enough to affect the valuation process of equity securities. In fact, according to Karpoff (1987) the way the information is disseminated in financial markets might have an impact on the price-volume relationship. For instance, sequential information dissemination may be responsible for the lack of evidence of positive correlation between volume and absolute price change. In cases where most investors are late in the information queue, the well documented positive correlation can only be present with a certain lag and cannot be found using the volume and price changes of the same date.

REFERENCES

1. Assogbavi, T., Khoury, N., and Yourougou, P., 1995. Short interest and the asymmetry of the price-volume relationship in the Canadian Stock market. *Journal of Banking & Finance* 19, 1341-1358.
2. Assogbavi, T., Khoury, N., and Yourougou, P. *La Causalité du Lien Volume-Prix de l'indice Toronto 35 Et Son Marché à Terme*, Co-authored by Khoury and Yourougou, *FINECO*, vol 2, sept. 1992, pp.55-65.
3. Barry, C. and Lockwood, L., 1995. New directions in research on emerging capital markets. *Financial Markets, Instituti and Instruments* 4, 15-36.
4. Bhagat S. and Bhatia. S.,1996. Trading Volume and Price Variability: Evidence on Lead-Lag Relations for Granger-Causality Tests. Wkg paper, U. of Colorado at Boulder.
5. Blume, L., Easley, D., and O'Hara, M., 1994. Market statistics and technical analysis: the role of volume. *Journal Finance* 49 (1), 153-181.
6. Chan, W.S. and Tse, Y.K., 1993. Price-volume relation in stocks: a multiple time series analysis on the Singapore market, *Asia Pacific Journal of Management* 10 (1), 39-56.
7. Chen, G., Firth, M., Xin, Y. 2004, The Price-Volume Relationship in China's Commodity Futures Markets. *The Chinese Economy. Armonk*, Vol. 37, Iss. 3; p. 87.
8. Copeland, T.E., 1976. A model of asset trading under the assumption of sequential information arrival. *Journal of Finance* 31, 1149-1168.
9. Crouch, R.L., 1970a. A nonlinear test of the random walk hypothesis. *American Economic Review* 60 (1), 199-202.
10. Crouch, R.L., 1970b. The volume of transactions and price changes on the New York Stock Exchange. *Financial Analysts Journal* 26 (4), 104-109.
11. Moosa, I., Silvapulle, P., and Silvapulle, M., 2003, Testing for temporal asymmetry in the price-volume relationship. *Bulletin of Economic Research*. Oxford. Vol. 55, Iss. 4; p. 373 (17 pages).
12. Divecha, A.B., Drach, J., and Stefek, D., 1992. Emerging markets: a quantitative perspective, *Journal of Portfolio Management* 19 (1), 41-50.
13. Epps, T.W., 1975. Security price changes and transaction volumes: theory and evidence. *American Economic Review* 65 (4), 586-597.
14. Epps, T.W., 1977. Security price changes and transaction volumes: some additional evidence. *Journal of Financial Quantitative Analysis* 12 (1), 141-146.
15. Epps, T.W., Epps, M.L., 1976. The stochastic dependence of security price changes and transaction volume implications for the mixture-of-distributions hypothesis. *Econometrica* 44 (2), 305-321.
16. Errunza. V.R., 1994. Emerging markets: some new concepts. *Journal of Portfolio Management* 20, 82-87.
17. Gallant, A.R., Rossi, P.E., and Tauchen, G.. 1992. Stock prices and volume. *Review of Financial Studies* 5 (2), 199-24.
18. Godfrey, M.D., Granger, C.W.J., and Morgenstern, O., 1964. The random-walk hypothesis of stock market behavior *Kyklos* 17 (1), 1-30.

19. Granger, CW.J. and Morgenstern, O., 1963. Spectral analysis of New York stock market prices. *Kyklos* 16 (1), 1-27.
20. Harvey, C.R., 1995. Predictable risk and returns in emerging markets. *Review of Financial Studies* 8 (3), 773-816.
21. Hiemstra, C. and Jones, J.D., 1995. Testing for linear and nonlinear Granger causality in the stock price-volume relationship. *Journal of Finance* 49, 1639-1664.
22. Jennings, R., Starks, L., and Fellingham, J. 1981. An equilibrium model of asset trading with sequential information arrival. *Journal of Finance* 36, 143-161.
23. Jennings, Robert H. and Barry, Christopher B. 1983. Information Dissemination and Portfolio Choice. *Journal of Financial and Quantitative Analysis*. Seattle; Vol. 18, Iss. 1; p. 1 (19 pages).
24. Jennings, Robert H. and Barry, Christopher B. 1984. Information Dissemination and Portfolio Choice. *Journal of Financial and Quantitative Analysis*. Seattle; Vol. 19, Iss. 4; p. 395 (8 pages).
25. Karpoff, J.M., 1986, A Theory of Trading Volume. *Journal of Financial*, 41(5); p1069-1088.
26. Karpoff, J.M., 1987, The relation between price changes and trading volume: a survey. *Journal of Financial Quantitative Analysis* 22 (1), 109-126.
27. Kennedy, P., 1993. *A Guide to Econometrics*, 3rd ed. MIT Press, Cambridge MA.
28. Rogalski, R.J., 1978. The dependence of prices and volume. *Review of Economics and Statistics* 60 (2), 268-274.
29. Saatcioglu, Kemal and Starks, Laura T. 1998. The stock price-volume relationship in emerging stock markets: The case of Latin America, *International Journal of Forecasting*. Amsterdam, Vol. 14, Issue 2; p. 215 (11 pages).
30. Smirlock, M. and Starks, L.T., 1985. A further examination of stock price changes and transactions volume. *Journal of Financial Research* 8 (3), 217-225.
31. Smirlock, M. and Starks, L.T., 1988. An empirical analysis of the stock price-volume relationship. *Journal of Banking Finance* 12 (1), 31-41.
32. Tiao, G.C. and Box, G.E.P., 1981. Modeling multiple time series with applications. *Journal of the American Statis Association* 76 (376), 802-816.
33. Tsc, Y.K. 1991. Price and volume in the Tokyo stock exchange. In: Ziemba, W.T., Bailey, W., and Hamao, Y. *E Japanese Financial Market Research*. North Holland, Amsterdam, pp. 91-119.