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 reached[1]. 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.

LITTERATURE 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 ct 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 (**ΔP**). 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 markets[2]. 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.

	Returns								Turnover	
Country	**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:

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

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

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 $V = \alpha_O + \alpha_1 Ln(P_t / P_{T-1})$

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

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 $V = \alpha_O + \alpha_1 \left| Ln(P_t / P_{T-1}) \right|$

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

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:

$$Vol_t = \alpha_o + \Sigma_{i=1-12}\alpha_i Vol_{t-i} + \Sigma_{j=1-12}\beta_j |Ret_{t-j}|. \quad (3)$$

$$|Ret_t| = \gamma_0 + \Sigma_{I=1-12}\gamma_i |Ret_{ti}| + \Sigma_{j=1-12}\delta_j Vol_{t-j} \quad (4)$$

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 contrary[3]. 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: $Vol_t = \alpha_o + \Sigma_{i=1-12}\alpha_i Vol_{t-i} + \Sigma_{j=1-12}\beta_j |Ret_{t-j}|$ in U.S. Currency

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

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

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

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.

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