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Ali Z. Diabi

Youssef A. Al-Zamil

King Saud University,
El-Qassim Branch
Kingdom of Saudi Arabia

THE RETURN-VOLUME LINK IN THE SAUDI FINANCIAL SECTOR: A GRANGER CAUSALITY TEST

Key Words

Stock Returns; Volumes; Granger Causality; Information Efficiency; Cointegration; Stationarity Randomness.

Abstract

This paper uses weekly data on the Saudi financial sector for the 1990.08 through 1994.03 period, in an attempt to inquire into the issue of information efficiency. It also employs both cointegration analysis and the Granger causality methodology to test the return-volume link. A subsidiary objective of the paper is to examine the statistical properties of both stock return and volume. The results seem to suggest that, when considering the whole sample period (i.e., 1990-1994), information conveyed by volume cannot help predict returns in the financial sector. It is rather the reverse causality (i.e., trading volume in most cases, is Granger causing return) which is more evident. However, when breaking the sample into two subperiods, the results are problematic. Overall, it appears that information efficiency is not yet evident. Perhaps, what Karpoff (1987) suggested for other markets can be also true for the emerging Saudi stock market whose size may be blurring the return-volume link.

Introduction

Numerous authors have been studying the return-volume relationship. Ying (1966), Rogalski (1978), Richardson *et al* (1986), Karpoff (1987), Ariff and Lee, (1993) and Hiemstra and Jhones (1994), among others investigated the stock prices-volume relation.

Within the context of rational expectation theory, a number of papers emphasized the trade size adverse

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selection phenomenon. For example, Copeland (1976) and Glosten and Milgrom (1985) showed that bid-ask spreads serve to capture a possible information-based trading, and therefore work to compensate the market-maker (dealer) for the risk of losing a portion of value due to private information. Easely and O'Hara's (1987) formal model developed a more eclectic rational expectation approach to explain the bid-ask spread within the price-trade size framework. According to their model, inventory, transaction cost and risk aversion factors work consistently along with private information to explain the price-trade size relationship. Therefore, both trade sizes and sequences of trades preceding blocks of sales play simultaneous roles to affect prices.

Other studies have also indicated that stock returns and trading volume are positively related. More specifically, the quantity demanded of an investor with a short position is less responsive to stock returns than the quantity demanded of an investor with a long holding. Jennings et al. (1981) showed that the trading volume, when a previously uniformed trader interprets the news pessimistically, tends to be less than when the trader is optimistic.

More specialized studies, (within the framework of the price-trade size relationship) have been concentrating on the speed levels of information arrival and their consequent impact on prices behavior. The analysis of the speed of adjustment of prices to specific kinds of new information has been playing an increasing role in the literature since the late 1960's. For example, Fama *et al* (1969) examined the speed-degree of splits, and dividends information reflection on prices. Modeling the speed of information in relation to price-trade size has been under focus by several authors. Copeland (1976) formed a model for asset trading under the assumption of sequential information. Smirlock and Starck (1988) found support for the simultaneous and immediate information arrival.

Using data for a small stock market (Helsinki stock exchange), and applying Granger causality as well as GARCH methodology, Teppo Martikainen *et al* (1994) investigated the simultaneous (SIM), versus the sequential (SEQ) hypotheses of speed of information. These two methodologies were used to examine linear and non-linear price-trade size relationship. Their overall results lend support to the SEQ hypothesis.

Reports on trading volume data convey information, which can be exploited by traders. However, it is

not yet clear whether the information arrival is contemporaneous or sequential. The issue of the speed of information arrival has induced research around two main hypotheses.

1. The so-called simultaneous information arrival hypothesis (SIM), whereby the relationship between stocks returns and trading volume is positive and contemporaneous.
2. The sequential information arrival hypothesis (SEQ), where a lead-lag link between stock returns and trading volume occurs, thus implying, that investors receive the information one at a time, and trade after each reception.

To the knowledge of the authors, there has been no attempt aimed at examining the return trading volume link within the context of the Arab stock markets in general, and the Saudi stock market in particular.

This paper attempts to provide additional empirical insight into the issue of informational efficiency. More specifically, the return-volume relation is tested by applying the popular Granger causality test methodology on the data pertaining to the banking segment (eleven banks) of the emerging Saudi stock market. As a by-product, the paper also describes the empirical distributions of stock returns and volumes; and inquires into their presumed random behavior.

The results of the present study can be very insightful and stimulating to both practitioners and researchers who would want to know more about the performance of the emerging Saudi stock market.

The paper is organized as follows: Section 2 offers a brief description of the Saudi stock market. Section 3 examines the empirical distribution of the stock returns and trading volume series, and tests their randomness. Section 4 uses unit roots tests and the Granger causality methodology to investigate the return-trading volume relationship. Finally, section 5 concludes the paper with an account of the main findings and some relevant remarks.

Some Facts on the Emerging Saudi Stock Market

Before discussing the empirical issues at stake, it is perhaps useful to briefly examine some of the salient features of the emerging Saudi stock market. Indeed, Table 1 provides data on the selected operating characteristics of this market.

Table 1
The Saudi Stock Market Features*

1.a Some financial features as of December 1994

	Market	Banking
# of firms	59	11
Average Price/Earning		13.05
# traded[a]	155	15.1
shares[a]	(3.9)	(0.44)
As a %of Market	100	9.74
Value of	24871	6189
Traded shares[b]	(760)	(182)
As a % of Market	100	24.9
# of	357	67.8
transactions[c]	(7.7)	(1.5)
As a % of Market	100	18.9

MK/GDP = 3.78[d];

1.b Some operational features

Trading Method: (through Banks (Electronic Board)
Settlements: (only cash transaction within one to two days)
Trading Days: (Saturday through Thursday)
Investment Regulation: (foreign investors not allowed, except nationals from GCC)

Source: SAMA (1995). *:Numbers in parentheses are for 1985;(a): in millions;(b): in millions of Saudi riyals; (c): in thousands; and (d): MK denotes market capitalization.

Actually, the Saudi stock market is an emerging market, which has more than one decade of perhaps thin but, continuously growing exchange activity. Individual investors, as opposed to institutional investors, are the major participants in the market. Not only, the number of share companies is small, but also, there are no market makers. The brokerage activity is assumed by the commercial banks. No independent brokerage firms or specialists operate inside the Saudi stock market; and all the transactions are cash transactions made through banks and settled within one to two days. Moreover, the access to the market by foreign investors is very restricted, except for nationals from the Gulf Cooperation Council Members (GCC).

The Saudi stock market has experienced an important growth. In terms of value of the traded shares, the banking sector ranks first with fifty percent of the total market capitalization and second in terms of traded volume with

nearly twenty three percent of the total market traded shares volume. While the total market value increased more than twenty threefold between 1985 and 1993, the banking sector's share increased more than forty sevenfold. Trading volume for the market as a whole was in 1993 more than fifteenfold of what it was in 1985, and thirty onefold for the banking sector.

Statistical Properties of Weekly Returns and Trading Volume

Data Description

The data consists of weekly stock prices and trading volume for the eleven securities forming the banking segment. They are obtained from the various SAMA reports (Saudi Arabian Monetary Agency), and cover the period from 7/2/1441 to 30/9/1414 A H (or 28/08/1990 to 13/03/1994). Weekly returns (i.e., Rit) are computed as logarithmic differences of stock prices, that is Rit = ln(Pit/Pit-1), where Pit is the share price of security i for week t. Trading volume (i.e., Vit), are weekly aggregate volume figures.

The Empirical Distributions

To describe the empirical distributions of stock returns and trading volume, selected statistics such as means, standard deviation, skewness and kurtosis coefficients are computed and reported in Table 2a and 2b.

From Table 2a, we can observe that seven stocks out of eleven exhibit negative average weekly returns. Overall, the mean weekly returns seem negligible, and none of them are statistically significant from zero at 5%. The variances of the weekly returns suggest that while both R_{1t} (Riyadh) and R_{4t} (Saudi-Holland) exhibit relative volatile behavior over the period considered; the remaining stocks show less variability, with R_{11t} (Al-Rajhi) exhibiting the lowest variability. Further, seven stocks out of eleven show negative skewness.

The skewness coefficients for the weekly returns are within the range of -9.99 and 0.05. According to Pearson's criterion for significant skewness (a magnitude greater than 3), it appears that only the negative skewness coefficients are significant (five cases out of eleven). On the other hand, the kurtosis coefficients are predominantly large. They are all greater than 3, thus confirming the leptokurtic tendency of the weekly returns distribution.

Actually, as argued by Ariff and Lee, (1993), several studies have documented the general observation, that individual security returns, particularly daily or weekly series, are more likely to be near normal (see Kon, (1984), Hall et al., (1989), and Agiray and Lamoureux, (1989) among others); or not normally distributed (Praerz, (1972), and Beedles, (1986), and Ariff et al., (1990) among others).

Table 2a
Summary Statistics: Stock Returns

	Mean	Std-Dev	Var	Skewness	Kurtosis
R_{1t}	-0.0097	0.1515	0.023	-9.99	118.02
R_{2t}	-0.0014	0.0553	0.003	0.13	5.70
R_{3t}	0.0063	0.0741	0.006	0.53	20.1
R_{4t}	0.0048	0.2434	0.059	0.05	85.32
R_{5t}	-0.0003	0.0616	0.004	-4.18	38.08
R_{6t}	-0.0002	0.0654	0.004	-6.22	63.66
R_{7t}	-0.0005	0.0673	0.005	2.50	16.33
R_{8t}	-0.0043	0.0805	0.007	-6.77	58.45
R_{9t}	0.00092	0.1088	0.012	-0.65	28.76
R_{10t}	0.00339	0.0692	0.005	-5.44	52.43
R_{11t}	-0.0019	0.0492	0.002	-7.67	87.04

Table 2b
Summary Statistics: Trading Volume

	Mean	Std-Dev	Var	Skewness	Kurtosis
V_{1t}	24285	34408	$0.12x10^{10}$	5.43	46.5
V_{2t}	16005	24548	$0.60x10^{9}$	3.16	26.7
V_{3t}	952	5307	$0.28x10^{8}$	12.13	158.1
V_{4t}	1786	6469	$0.42x10^{8}$	6.53	46.8
V_{5t}	13456	16780	$0.28x10^{9}$	1.55	5.7
V_{6t}	11337	14380	$0.21x10^{9}$	1.88	5.6
V_{7t}	48870	61534	$0.38x10^{10}$	1.83	7.8
V_{8t}	11517	19510	$0.38x10^{9}$	7.61	79.3
V_{9t}	6322	7995	$0.64x10^{8}$	3.10	12.4
V_{10t}	2996	4052	$0.16x10^{8}$	3.21	24.3
V_{11t}	15881	13288	$0.18x10^{8}$	2.43	9.1

As far as weekly volumes (see Table 2b), both V_{1t} (Riyadh Bank) and V_{7t} (Cairo Bank) show a high mean volume. In terms of variance, trading volumes are conspicuously highly volatile. They are also largely positively skewed and leptokurtic. In fact, this seems to be quite in line with a number of previous studies, which found traded volume as being positively skewed and leptokurtic [e.g., Clark, (1973) and Tauchen and Pitts, (1983)].

Indeed, the distributional properties of both stock returns and volume

series suggest departure from normality. The quality of the tests may be affected. However, like a number of researchers, we can simply ignore this difficulty. Ariff *et al* (1990) argue that weekly and daily series are more likely to be non-normally distributed.

Test of Randomness

Whether stock prices follow a random walk or not has great implications in financial theories and statistical modeling. According to the random walk hypothesis (RWH), successive stock price changes are independent and identically distributed random variables. The RWH is regarded as a special case of the so-called weak form efficiency.

If stock prices follow a random walk, the market is said to be efficient in the sense that it discounts all available public information (Fama, 1965). The autocorrelation test is performed here to check the randomness of the weekly returns.

According to Taylor (1986), the RWH can be formulated as follows:

$$\text{Ho: } E(R_{it}) = E(R_{it+\tau});\ \text{Cov}(R_{it}, R_{it+\tau}) = 0$$

Using weekly data on the eleven stocks returns, the autocorrelation test is carried for lags 1-15, and the results (autocorrelation coefficients and the Box Pierce statistics (Q)) are reported below in Table 3.

Table 3
Autocorrelation Test (lag 1-15)

Lags	R1	R2	R3	R4	R5	R6	R7	R8	R9	R10	R11
1	.022	.227	-.22	-.48	.026	.069	.076	.055	-.30	.003	.0293
2	.031	.048	.016	.005	-.09	-.06	.059	.002	-.03	.037	.044
3	.019	.030	.041	-.01	.087	.045	.029	.038	.006	-.02	.066
4	-.033	.053	-.01	.023	-.04	.046	.017	.057	-.01	.049	-.00
5	-.008	.113	-.01	.007	.150	.002	.089	.050	.005	-.08	-.02
6	.007	.119	.008	-.02	.033	.057	.087	.065	.041	.028	.054
7	.029	.067	.011	-.01	.026	-.04	.102	.003	.038	-.02	.020
8	.024	-.09	-.02	.002	.050	-.07	-.04	-.02	.040	.001	.015
9	.002	.067	-.02	.009	.040	.066	.045	-.00	.010	.052	-.12
10	-.123	.099	.035	.001	.152	.052	.037	.024	.016	-.01	-.07
11	-.052	.039	-.05	.000	.069	-.10	-.04	.006	.030	-.01	.009
12	-.002	.023	.002	-.01	-.01	-.03	.083	-.02	.011	-.02	-.04
13	.025	.021	.033	.003	-.00	.024	-.03	.001	-.00	.010	.007
14	.003	.063	-.03	.004	-.02	.105	.015	.011	.038	.052	-.01
15	.002	.076	.026	-.00	.024	.083	.009	.010	.036	-.00	-.08
Qstat	4.26	23	10.9	42	13.9	10.7	9.4	2.91	18.9	3.1	6.9
Ho*	A	A	A	R	A	A	A	A	A	A	A

*($\alpha = 0.05$) A: accepted; R: rejected.

Based on the autocorrelation test, all the series are white noise, except R_{4t} (Saudi Holland Bank). Therefore, we can conclude that the RWH is predominantly evident (ten stocks out eleven).

Granger Causality Testing Methodology

Integration Tests

Prior to causality testing, we first need to test for non-stationarity of the data. The familiar augmented Dickey-Fuller (ADF) test is usually used. However, in dealing with serial correlation and heteroskedasticity, the ADF test draws from a parametric approach, and this may reduce its power. Therefore, the testing procedure devised by Phillips and Perron (1988) (PP hereafter) is applied instead. This test is viewed as robust in that it allows for a wide variety of heterogeneously distributed and dependent innovations. It involves a correction of the t-statistic from the unit root model using a non-parametric procedure along the following equations:

$$R_{it} = \beta R_{it-1} + e_{it} \quad (1)$$

$$R_{it} = \mu + \beta' R_{it-1} + e'_{it} \quad (1')$$

$$R_{it} = \mu' + \delta(t\text{-}T/2) + \beta'' R_{it} + e''_{it} \quad (1'')$$

where μ is the drift term, δ tests for the presence of a trend, and e_{it} (e'_{it}, e''_{it}) are random error terms. The estimated statistics, $Z(t\beta)$, $Z(t\beta')$ and $Z(t\beta'')$, are the standard t-statistics for testing, whether respectively, $\beta = 1$, $\beta' = 1$, and $\beta'' = 1$. $Z(\phi_1)$ tests the null hypothesis that $(\mu, \beta') = (0,1)$ in equation (1′); $Z(\phi_2)$ tests the null hypothesis that $(\mu', \delta, \beta'') = (0,0,1)$ in equation (1″). If it happens that the variables involved are nonstationary, their inclusion may become problematic. This is because the distribution of the estimates cannot be determined. Typically, this problem can be overcome by differencing the data to induce stationarity.

Nonstationarity is deemed to be a necessary condition for cointegration. Accordingly, if the series of interest are stationary (i.e., R_{it} and $V_{it} \sim I(0)$), we do not need to test for cointegration.

Granger Causality Tests

The statistically testable notion of causality introduced by Granger led to the development of four major causality tests: the Granger test, the Sims test, the modified Sims test and the Haugh-Pierce test. The Granger test involves regressing a variable (X_1) on lagged values of itself and on lagged values of the other variable of interest (X_2) such that:

$$X_{1t} = a + \sum_{i=1}^{m} c_i X_{1t-i} + \sum_{j=0}^{n} d_j X_{2t-j} + U_t \quad (2)$$

where

a : intercept

c's and d's : regression coefficients and

U_t : error term

The assumption of the error term requires that the variables are stationary or that the presence of serial correlation is removed through prefiltering. The null hypothesis that X_{2t} does not cause X_{1t} is tested using an F test calculated from the residuals of the restricted and unrestricted forms of equation 2.

This paper uses the Granger-causality (GC hereafter) concept to inquire into the link between stock returns $\{R_{it}\}$ and trading volume $\{V_{it}\}$ with reference to the Saudi stock market (banking segment). The GC examines whether past values in stock return, help to explain current values in traded volume, over and above the explanation provided by past changes in traded volume. To ascertain the direction of causality, the test is repeated by interchanging R and V. More specifically, V_{it} $\{R_{it}\}$ is said to Granger cause R_{it} $\{V_{it}\}$ if $d_h\{ch\}$ is not zero in Equation 2′ {2″}.

i. Hypothesis 1: Rit is not Granger-caused by Vit

$$R_{it} = a + \sum_{i=1}^{m} a_i R_{it-i} + \sum_{h=o}^{n} d_h V_{it-h} + U_t \qquad (2')$$

ii. Hypothesis 2: Vit is not Granger-caused by Rit

$$V_{it} = a + \sum_{i=1}^{m} b_i V_{it-i} + \sum_{h=o}^{n} c_h R_{it-h} + E_t \qquad (2'')$$

The right-hand side of both equations represent the usual distributed lag. The test of statistical significance of the set of a's and d's {b's and c's} is given by the usual F test computed as follows:

$$F = \frac{[(ESSr-ESSu)/m]}{[ESSu/(T-2m-k-1)]} \qquad (3)$$

where ESSr, ESSu are the residuals sum squares of the restricted (i's excluded) and unrestricted (both i's and h's included), respectively, T the total number of observations and m and n the number of lags. The length of lag is chosen on the basis of Akaike's information criterion (AIC). Moreover, the GC test assumes that both variables (i.e., R_{it} and V_{it}) are time stationary.

The Empirical Results

Integration Tests

The results reported in Table 4 show that the PP tests could not accept the null hypothesis of unit roots (i.e., non-stationarity). All the return and volume variables are stationary, or in other words, integrated of order zero, I(0).

Table 4
Phillips-Perron Test for stationarity*

	Returns										
	R1	**R2**	**R3**	**R4**	**R5**	**R6**	**R7**	**R8**	**R9**	**R10**	**R11**
Z(tβ) (n/i/t)	186	158	232	231	175	171	184	181	225	191	191
Z(tβ′) (i/n/t)	185	157	229	230	175	171	184	181	225	190	191
Z(tβ″) (i/t)	186	153	226	228	172	170	180	181	214	185	191
	Volume										
	V1	**V2**	**V3**	**V4**	**V5**	**V6**	**V7**	**V8**	**V9**	**V10**	**V11**
Z(tβ) (n/i/t)	71	30	167	242	64	51	20	150	91	53	46
Z(tβ′) (i/n/t)	127	49	166	226	116	105	43	139	153	92	121
Z(tβ″) (i/t)	151	76	165	224	133	149	88	127	153	94	120

* Entries are the absolute values of the estimated statistics, Z(tβ), Z(tβ′) and Z(tβ″), which are the standard t-statistics for testing whether $\beta = 1$, $\beta' = 1$, and $\beta'' = 1$, calculated with a lag length equal to thirteen. n/i/t stands for no intercept no trend; i/n/t stand for intercept and no trend; and i/t stands for intercept and trend.

Since the returns and the volume series are found to be stationary, (i.e., R_{it} and V_{it} ~I(0)), there is no need to run a test for cointegration. The rejection of the null hypothesis that there is no cointegration goes without any question. Any linear combination of two stationary variables is bound to be stationary. More formally, since R_{it} ~I(0) and V_{it} ~I(0), it follows that a R_{it} + b V_{it} ~I(0), where a and b are constants. Therefore, we can confidently proceed with the GC test using the specification of equations (2′) and (2″).

The Granger causality tests are reported in Table 5. From the computed F-statistics, it appears that, for the whole sample period, returns are Granger causing volume in eight cases out of eleven cases (i.e., R_{1t}, R_{2t}, R_{3t}, R_{6t}, R_{7t}, R_{8t} , R_{10t}, and R_{11t}). Also worth noting, is that for the same period, only in one case (i.e., R_{4t}), volume is Granger causing returns,

while bi-directional causality (or feedback effects) is evident in only one case (i.e. R_{9t}). The hypothesis of no causality is accepted only in one case (i.e., R_{5t}).

The GC results changed materially, when the data sample was split into two subsamples and estimates re-run over the two subperiods.

For the first subperiod, volume are Granger causing returns in two cases (i.e., R_{2t} and R_{3t}), while reverse causality is evident only in two cases (i.e., R_{7t} and R_{11t}). Bi directional causality (or feedback effects) is evident in four cases (i.e., R_{1t}, R_{6t}, R_{9t} and R_{10t}), and the lack of causality appears in three cases (i.e., R_{4t}, R_{5t} and R_{8t}).

For the second subperiod, volume is Granger causing returns only in two cases (i.e., R_{1t} and R_{4t}), while the reverse causality is evident in four cases out of eleven cases (i.e., R_{2t}, R_{5t}, R_{9t} and R_{11t}). For the same subperiod, bi-directional causality appears only in two cases (i.e. R_{7t} and R_{10t}), and the lack of causality is found in three cases (i.e., R_{3t}, R_{6t} and R_{8t}).

What seems to be predominantly the case is that, for the whole sample period, stock returns seem to have some predictive power for trading volume. In contrast, information conveyed by trading volume cannot, in most cases, help predict stock returns. However, when breaking up the sample into two distinct subsamples, the results are rather mixed. For the first subperiod, reverse causality dominates, while for the second one, causality stemming from returns prevails. The latter feature is seemingly in line with the finding for the whole sample period.

What could the rationale for such mixed results be? One may argue that data, which reflect possible shifts in trading activity, could be a possible source. Accordingly, the quantity of traded shares reached more than 13 and 15 million in 1993 and 1994 respectively, compared to 2.45, 3.1 and 6 million in 1990 and 1991 and 1992. Moreover, the number of transactions amounted to 114370 in 1994 compared to 30000 and 23100 transactions in 1990 and 1991 respectively. Clearly, trading was relatively low during the first subperiod.

Further, it could also be true that the test shows some sensitivity to the estimation period, and perhaps to its length. Apart from the data, the difficulty associated with the use of polynomial distributed lag, particularly when choosing the lag length or the degree of the polynomial, may also be contributing to yielding such mixed results.

Overall, because the findings are generally mixed, it becomes difficult to have a clear-cut verdict on the issue of information efficiency as regards the financial side of the Saudi Stock market.

Table 5
Estimation Results for the Granger Causality Tests*
1-187:(28/8/90-13/3/94);1-86: (28/8/90-28/6/92): 87-187:(5/7/92-13/3/94)

		Information flow from volume on returns Ho: R_{it} is not Granger Caused by V_{it}	Information flow from returns on volume Ho: V_{it} is not Granger Caused R_{it}
R_{1t}	1-187	0.294(8,8)(-)	3.03*(6,6)(-)
	1-86	11.81*(3,3)(-)	5.39*(4,3)(-)
	87-187	4.38*(9,9)(-)	1.24(5,3)(-)
R_{2t}	1-187	0.796(7,8)(-)	5.02*),8)(-)
	1-86	2.12**(10,4)(+)	0.92(8,4)(+)
	87-187	0.604(8,8)(+)	2.56**(8,8)(-)
R_{3t}	1-187	0.523(5,7)(+)	1.4***(8,14)(-)
	1-86	2.38(7,8)(+)	0.631(7,8)(-)
	87-187	0.975(4,6)(-)	0.159(6,5)(+)
R_{4t}	1-187	4.281*8,8)(+)	1.264(9,8)(+)
	1-86	1.53(5,5)(-)	1.39(5,5)(+)
	87-187	7.58*(5,5)(+)	0.969(5,5)(-)
R_{5t}	1-187	0.87(9,8)(+)	1.124(8,8)(-)
	1-86	1.64(8,8)(+)	1.81(4,5)(+)
	87-187	1.35(6,8(+)	3.26*(6,8)(-)
R_{6t}	1-187	0.581(9,9)(+)	2.03**(7,7)(-)
	1-86	2.63*(9,7)(+)	3.37*(9,7)(-)
	87-187	0.26(13,6)(+)	0.69(10,5)(-)
R_{7t}	1-187	1.01(7,7)(-)	2.28*(7,7)(-)
	1-86	1.36(6,8)(-)	2.58*(6,6)(-)
	87-187	2.13(9,12)(+)	2.12**(10,9)(+)
R_{8t}	1-187	0.68(6,6)(+)	1.8***(6,6)(+)
	1-86	1.58(6,6)(-)	1.08(6,6)(+)
	87-187	1.27(6,9)(+)	1.34(6,6)(+)
R_{9t}	1-187	3.63*(4,4)(-)	5.85*(4,4)(-)
	1-86	2.40**(6,4)(+)	5.36**(4,4)(+)
	87-187	0.68(6,6)(+)	2.26**(8,4)(+)
R_{10t}	1-187	0.621(5,5)(-)	4.45*(7,7)(-)
	1-86	5.46*(6,9)(+)	3.77*(8,6)(+)
	87-187	2.00**(6,6)(+)	2.71**(6,6)(+)
R_{11t}	1-187	0.198(5,5)(-)	5.83*(5,5)(-)
	1-86	0.129(6,6)(+)	3.52*(6,6)(-)
	87-187	0.874(6,6)(+)	2.22**(6,6)(-)

[a]F(n,m) (`ign);*(**)(***):significant at 1%,5%,10% respectively.

The most plausible explanation for our finding, linking volume and stock returns, is that trading volume is rather endogenous (see Lamoureux and Lastrapes, 1994); and that stock returns, which may proxy for firm specific information, tend to lead trading volume. One can also argue that changes in security specific information are likely to induce agents to trade in individual securities. This naturally casts doubt on information efficiency of the financial sector of the Saudi Stock market.

Summary and Discussions

Section two explored the distributional characteristics of the two variables: stock returns and trading volume. Both variables exhibit a skewed and leptorkurtic distribution. The random walk hypothesis was also tested, using the autocorrelation test. The first test reveals that stocks' returns follow a random walk, which implies that there is no persistence in stock returns. In contrast, the second test yields rather inconclusive results for the RWH. Section three investigated the integration properties of both stock returns and trading volumes. Both series were found to be level stationary (i.e., I (0)). A cointegration test was also carried out, using both the CRDW and the PP statistics. The null hypothesis of no cointegration could not be accepted, thus suggesting that the long run movements of stock returns and trading volume are determined by some common driving fundamentals. This may also imply that causality might be evident at least in one direction, thus casting doubt on the information efficiency hypothesis.

The Granger causality test, based on the F-statistic, was instead used to inquire into the link between stock returns and volumes. In the process of carrying such a test, the polynomial distributed lag procedure was applied. For the whole sample period, feedback effects between stock returns and trading volume are almost completely absent. However, causality running from volume to returns is weakly evident (only in two cases), while reverse causality emerges in most cases. The evidence of reverse causality implies that stock returns, in most cases, do have some predictive power for trading volume. This finding cast doubt on the information efficiency of the financial side of the Saudi stock market. Furthermore, when two subsample periods were considered, bidirectional causality is evident in four cases for the first subperiod, while causality running from returns to volume appears in four cases for the second subperiod.

Consequently, the null hypothesis of information efficiency in the Saudi financial sector is not fully evident. It is however, worth observing that information inefficiency is not an unexpected result to be found in a such small emerging stock market, in

which, information is highly dependent on a number of market microstructure factors such as: the number of traders, shares outstanding, intensity of information and perhaps, social relations which constitute a standard avenue to make the most of the economic information, and therefore, the economic opportunities.

Nevertheless, if it is possible to introduce in stocks dealing, among other things, some important Islamic rules, market efficiency could be enhanced. Two important rules are in order: first, the exchange of money for shares should be immediate. Second, shares prices should reflect the real value of the security at the time of the transaction. These rules would help reduce unproductive speculation and thus prevent any negative impact on full information efficiency in the financial sector of the Saudi stock market.

It is hoped that this paper would add further insights into the issue of information efficiency in the context of the emerging Saudi stock market. Indeed, the paper's findings are in line with a previous study (e.g., Diabi and Al Bazaie, 1996) which investigated the relation between stock returns and money supply and found results at odds with the notion of information efficiency.

At last, we believe that further research is warranted on identifying the main determinants of trading volumes in the Saudi stock market, perhaps by concentrating more on traders' liquidity needs; information flows, both private and public; differences in agents' assessment of intrinsic value; and interactions between informed and liquidity traders. Moreover, any attempt to remedy to the series departure from the normality assumption would certainly lead to robust estimates and tests. Perhaps, using monthly series instead of weekly series would circumvent this difficulty.

References

Agiray, V. and Lamoureux, C.G. 1989. Estimation of Stable Law Parametrics, A Comparative study. *Journal of Business Statistics*, 7 (1):85-93.

Andersen, Torben, G. 1996. Return Volatility and Trading Volume, An Information flow Interpretation of Stochastic Volatility. *The Journal of Finance*, 51(1):169-204.

Arif, M. and Chuen Lee, D.K. 1993. *Share Price Changes Volume Relation in the Singapore Equity Market.* Applied Financial Economics, 3(2):339-348.

Arif, M. Lim K.G. and Johnson, L.W. 1990. Normal Distribution. *Assumption in Applied Finance*, 1(1):147-155.

Beedles, W.L. 1986. Asymmetry in Australian Equity Returns. *Australian Journal of Management*, 11(1):1-12.

Clark, E.K. 1973. *A Subordinated Stochastic Process Model with Variance*

for Speculative Prices. Econometrica, 42(1):135-155.

Comiskey, E.; Walking, R.; and Meeks, M. 1987. Dispersion of Expectations and Trading Volume. *Journal of Business Finance and Accounting*, 14(2):229-239.

Copeland, T. 1976. A Model for Asset Trading Under the Assumption of Sequential Information Arrival. *The Journal of Finance*, 31(4):1149-1168.

Diabi, A. and Al Bazaie. *The Money Stock Return Link, An Application of the Cointegration and Error Correction Model Using Saudi Arabian Data, Savings and Development* (forthcoming).

Dickey, D. and Fuller, W. 1879. Distribution of the Estimators for Autoregressive Time Series with a Unit Root. *Journal of the American Statistical Association*, 74(3):427-431.

Easely, D. and O'Hara, M. 1987. Price, Quantity, and Information in Securities Markets. *Journal of Financial Economics*, 19(1):69-90.

Engle, R.F. and Clive W.J. Granger, 1987. *Cointegration and Error Correction: Representation, Estimation and Testing*. Econometrica, 55(2):251-276.

Fama, E.F. 1965. The Behaviour of Stock Prices. *Journal of Business*, 38(1):34-105.

Fama, E.F.; Fisher, L.; Jensen, M.C. and Roll, R. 1969. The Adjustment of Stock Prices to New Information. *International Economic Review*, 10(1):1-21.

Fuller, W. A. 1976. *Introduction to Statistical Time Series*, New York: John Wiley.

Gallan, A. R.; Rossi, P.E.; and G.E Tauchen, 1992. *Stock Prices and Volume. Review of Financial Studies*, 5(1):199-242.

Golsten, L.R. and P.R. Milgrom, 1985. Bid Ask and Transaction Prices in a Specialist Market with Heterogeneously Informed Traders. *Journal of Financial Economics*, 14(1):71-100.

Granger, C.W.J. 1969. *Investigating Causal Relations by Econometric Models and Cross-Spectral Methods*. Econometrica, 37(2):424-438.

Granger, C.W.J. 1986. Developments in the Study of Cointegrated Economic Variables. *Oxford Bulletin of Economics and Statistics*, 48(3):213-228.

Hall, J.A.; Brorsen, B.W. and Irwin, S.H. 1989. The Distribution of Future Prices: A Test of the Stable Paretian and Mixture of Distribution Hypothesis. *Journal of Financial and Quantitative Analysis*, 21(1):39-46.

Hiemstra, C. and J. D. Jones. 1994. Testing for Linear and Nonlinear Granger Causality in the Stock Price Volume Relation. Journal of Finance, (49): 1639-1665.

Harris, L. 1986. Cross-Security Tests of the Mixture of Distribution Hypothesis. *Journal of Financial and Quantitative Analysis*, 21(1):39-46.

Hakkio, G.S. and Mark, Rush, 1989. Market Efficiency and Cointegration: An Application to the Sterling and Deutschemark Exchange Markets. *Journal of International Money and Finance*, 8(4):75-88.

Karpoff, J.M. 1987. The Relation Between Price Changes and Trading Volume: A Survey. *Journal of Financial and Quantitative Analysis*, 22(1):109-126.

Kon, S.J. 1984. Models of Stock Returns: A Comparison.*Journal of Finance*, 39(1):147-165.

Meimstra, C. and Jones, J.D. 1994. Testing for Linear and Non Linear Granger Causality in the Stock Price Volume Relation. *Journal of Finance*, 49(4):1639-1664.

Jennings, R.; Starks, L. and Fellingham, J. 1981. An Equilibrium Model of Asset Pricing with Sequential Information. *Journal of Finance*, 36(1):143-161.

Lamoureux, C.G. and William D. Lastrapes, 1994. Endogenous Trading Volume and Momentum in Stock Return Volatility. *Journal of Business and Economic Statistics*, 12(2):253-260.

Martikainen, T.; V. Puttonen; M. Luoma. and T. Rothovius., 1994. *Dependence of Stock Returns and Trading Volume in the Finish Stock Market*. Applied Economics, (1):159-169.

Phillips, P.C.B. and Perron P. 1988. *Testing for Unit Root in Time Series Regression*. Biometrika, 75(3):335-346.

Praetz, P.D. 1972. Distribution of Share Price Changes. *Journal of Business*, 45(1):49-55.

Richardson, G.; Sefcik, S. E. and Thompson, R. 1986. A Test of Dividend Irrelevance Using Volume Reaction to a Change in Dividend Policy. *Journal of Financial Economics*, 17(3):313-333.

Rogalski, R.J. 1978. The Dependence of Prices and Volume. *Review of Economics Statistics*, 36(2):268-274.

Saudi Arabian Monetary Agency. Financial Report. Riyadh, Saudi Arabia, *Various Issues*.

Sargan, J.D. and Bhagarva A, 1983. *Testing Residuals from Random Walk*. Econometrica, 51(1):153-174.

Sims, C. A. 1982. Policy Analysis with Econometric Models. *Brookings Papers on Economic Activity*, (1):107-52.

Smirlock, M. and Starks, L. 1989. An Empirical Analysis of the Stock Price-Volume Relationship. *Journal of Banking and Finance*, 44(1):1-17.

Tauchen, G. and Pitts, M. 1983. *The Price Variability-Volume Relationship on Speculative Markets*. Econometrica, 51(1):485-505.

Taylor, S.I. 1986. *Modeling Financial Time Series*. John Wiley and Sons, Chichester.

Ying, C. C. 1966. *Stock Market Prices and Volume of Sales*. Econometrica, 34(4):676-686.

الملخص

علاقة العائد بالحجم في القطاع المالي: اختبار العلاقة السببية بمفهوم «جرنجر»

علي زاوي ديابي
يوسف عبدالله الزامل
جامعة الملك سعود، فرع القصيم

استخدم البحث بيانات أسبوعية عن عوائد أسهم المصارف وحجم التداول (من أغسطس ١٩٩٠ إلى مارس ١٩٩٤)، وأجري اختباري التكامل والعلاقة السببية بمفهوم «جرنجر» (Granger causality)، وذلك في محاولة فحص الكفاءة المعلوماتية لسوق الأسهم السعودي. وعلى هامش هذه الإشكالية البحثية المهمة، تناول البحث مناقشة الخصائص الإحصائية للعوائد والحجم. وتوحي النتائج التي تم التوصل إليها أنه عند أخذ الفترة الزمنية الكلية لا يمكن الاعتماد على المعلومات المتضمنة في حجم التداول للتنبؤ بعوائد أسهم المصارف. ولكن يبدو أن العكس صحيح في أغلب الحالات، حيث تؤكد النتائج أن العلاقة السببية تجري من العوائد إلى الحجم. وتجدر الإشارة إلى أنه عند أخذ فترات زمنية جزئية فإن النتائج السببية تصبح غير واضحة. وبصورة إجمالية يتبين أن الكفاءة المعلوماتية في سوق الأسهم السعودي غير مؤكدة إحصائياً.

Ali Z. Diabi (Ph.D. in Economics with Concentration in Applied Monetary Economics and International Finance, The Claremont University Center, U.S.A, 1987), Associate Professor, College of Business and Economics, King Saud University, El-Qassim, Saudi Arabia. Presently He is Senior Economist at the UAE Central Bank. His Area of Interest Including, Applied Monetary Economics, Macro Economic Policy Analysis, Econometric Modeling and Forecasting, Modern Financial Economics, Banking, and International Finance.

Youssef A. Al-Zamel (Ph.D. in Economics, University of Colorado, U.S.A, 1987), Associate Professor, College of Business and Economics, King Saud University El-Qassim, Saudi Arabia. His Area of Interest Including, Islamic Economy, Financial Economics, Money and Bankings, Econometrics, and Economic Development.

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هاتف: 4817689 - 4815453 - فاكس: 4812514
e-mail: ajh@kuc01.kuniv.edu.kw

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