IS THE PRICE-VOLUME RELATION ASYMMETRIC? CROSS SECTIONAL EVIDENCE FROM AN EMERGING STOCK MARKET

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Abstract

Asymmetry in the price-volume relation is investigated using cross-sectional data on the stock prices and trading volume of more than 100 companies listed on the Kuwait Stock Exchange over 11 consecutive weeks. The results show that asymmetry can be concealed by missing variables such as market capitalisation. There is some evidence for asymmetry that takes the form of higher trading volume in a declining market. Some explanations are put forward for the finding of asymmetry.

Key words: Price-Volume Relation, Emerging Stock Markets, Asymmetric Models.
JEL Classification: G14.

Introduction

The price-volume relation has been the subject of a considerable body of research for its rewards as an intellectual exercise and also because volume is considered by at least some traders as an important technical indicator[2]. Karpoff (1987) lists a variety of reasons for interest in the price-volume relation, but an important reason from a practical perspective is that if volume can explain price changes then it is possible to formulate a trading rule that is based on a model relating price to volume, the latter being the explanatory variable. Almuraikhi (2005) shows that such a trading rule can be profitable in the emerging stock market of Kuwait (which is the market under investigation in this paper). For the purpose of formulating the rule, Almuraikhi estimated an ARDL model explaining prices in terms of trading volume.

The problem with most of the work on the price-volume relation (including Almuraikhi's work) is that it is based on models that impose the assumption of symmetry. If we consider the causal effect of price change on volume, symmetry means that volume in a rising market is not significantly different from volume in a declining market, which may or may not be the case. Naturally, a trading rule based on a symmetric model when the relation is asymmetric is bound to be faulty, let alone all of the other implications and interpretations of the price-volume relation. This is why a number of empirical studies have been carried out to investigate asymmetry in the price-volume relation. A number of these studies revealed asymmetry in the relation, which prompted several financial economists to come up with theoretical explanations for this phenomenon.

This work makes a contribution to this strand of research for at least two reasons. The first is that it investigates asymmetry in an emerging stock market, whereas most of the work has been done on developed markets. The second reason is that while most of the work has produced time series evidence on the hypothesis, we are unaware of any piece of work that has produced cross-sectional evidence. This study does this, presenting cross-sectional evidence on the relation in an emerging market using individual stocks as well as pooled data. The paper goes even further by augmenting the price-volume relation with a variable that proves to add some explanatory power to the model, which is company size as measured by capitalisation.

At this stage it is suitable to ask the question: Why Kuwait? To start with, the Kuwait stock market has achieved "international recognition" through the spectacular crash of 1982,

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[2] For recent work, see Gallo and Pacini (2000), Huang and Tang (2001), Bohl and Henke (2003), Ciner (2003), Lee and Rui (2002), Moosa et al. (2003), Moosa and Bollen (2003) and Lucey (2005).

which took place because of a phenomenon called "postdated cheques". In his excellent book on stock market crises, Kindelberger (1996) considered the crash of 1982 as one of the most spectacular in the history of the world alongside the 1929 and the 1987 crashes in Wall Street. Furthermore, the most recent experience shows that the Kuwait stock market is a very interesting case indeed, moving in what seems to be a world of its own. Since early 2003 the Kuwait stock market has been moving upwards in a spectacular manner, propelled by the removal of Saddam Hussein in April 2003 and the rise in oil prices. This has been happening while stock markets in developed countries have been either declining or performing rather sluggishly.

The remainder of the paper is structured as follows. The following section provides a selective review of the relevant literature, followed by an outline of the methodology used to test for asymmetry in the relation between price and volume. Once this has been done, a description of the data used in this study is presented, followed by the presentation and interpretation of the results. The last section provides some concluding remarks.

Theory and Empirical Evidence

Ying (1966) was the first economist to bring attention to the concept of asymmetry in the price-volume relation, motivated by the desire to find out whether the absolute price change or the signed price change (the price change *per se*) is the appropriate price variable to be used in the empirical studies of this relation. Ying argued that if the ratio of volume to price change is asymmetric, then what is important is the signed price change rather than the absolute price change. Asymmetry in this sense means that the (absolute) volume to price change ratio depends on whether the price change is positive or negative.

One explanation for asymmetry is the heterogeneity of traders with respect to certain characteristics. For example, Epps (1975) has suggested that bulls consider assets to be more risky than bears do, which makes the bulls' demand function steeper than that of bears. Hence, for the same (absolute) price change, greater volume will be associated with a positive price change than with a negative price change. Copeland (1976) and Jennings et al. (1981) reach the same conclusion by distinguishing between informed and uninformed traders, but in general they argue that uninformed traders react pessimistically (like bears), whereas informed traders react optimistically (like bulls). Jennings et al. postulate that the relation is affected by the mix between optimists and pessimists. Wang (1994) reaches a similar conclusion by viewing traders as being heterogeneous with respect to the availability of information. Thus, uninformed traders demand a higher price discount when they buy assets from informed traders to cover the risk of trading against private information.

Another proposition is related to the short-selling constrains hypothesis, which is normally attributed to Karpoff (1988) and Suominen (1996), although Copeland (1976) examined this factor much earlier. The constrains on short selling may take the form of either a prohibition or differential costs of short and long positions. The underlying argument is that if there are no short-selling constraints, then the relation should be symmetric, implying weak correlation; otherwise correlation would be positive. Asymmetry in this case implies that trading volume in a bear market is smaller than the trading volume in a bull market.

If the short-selling constraints hypothesis is the only explanation for asymmetry, and assuming its validity, the evidence should indicate symmetry in the futures markets, since there are no constraints on short selling in these markets. This proposition is made quite explicit by Kocagil and Shachmurove (1998, p. 405), who assert that "the contemporaneous correlation between signed returns and volume is expected to be either positive, as in the case of the stock market studies, or indistinguishable from zero". The implication of this argument is that volume and price change in the futures market should be uncorrelated, implying symmetry. Kocagil and Shachmurove find no evidence for a significant contemporaneous relation between trading volume and price change, hence confirming symmetry for 16 futures contracts. Foster (1995) finds evidence for symmetry in the crude oil futures market, reaching the conclusion that trading volume is not affected by the direction of price change. He splits his sample into observations associated with price rises and those associated with price falls and finds no statistical significance for the difference in the means of the two sub-samples. Hence, Foster (p. 944) asserts that his finding of "no apparent difference between the volume associated with negative or positive price changes" is "consistent with Karpoff's assertion that the direction of price change and the level of trading volume should not be correlated in futures markets".

Moosa and Korczak (1999) attribute asymmetry in the price-volume relation to differences in expectation formation by traders. In the financial literature it is often stated that expectation (and therefore speculation) is either stabilising or destabilising. In the first case traders sell when the market is high and buy when it is low. In the second case traders buy when the market is high and sell when it is low. The implicit assumption in both cases is symmetric expectation and hence symmetric reaction in both states of the market. In this case the volume-price change ratio will be symmetric. If we allow for asymmetry in expectation and speculative activity, then the relation would be asymmetric. Asymmetry may result if, for example, expectation is stabilising in a bull market and destabilising in a bear market or vice versa. Even if expectation is either stabilising or destabilising in both markets, asymmetry could still arise if the reactions are quantitatively different. For example, when the price rises in a bull market traders may believe that it will not rise any further, and so they sell and dampen the price rise and the subsequent trading volumes. On the other hand, when the price falls in a bear market, traders may believe that it will fall further and so they sell, leading to further price falls and rising trading volumes. This finding, as well as the finding of Moosa et al. (2003), indicate that the volume is higher in a declining than in a rising market. The opposite kind of asymmetry would arise if expectation is destabilising in a bull market and stabilising in a bear market.

The asymmetry hypothesis has been tested in a number of empirical studies. Smirlock and Starks (1985) tested the Epps model using a different data set to eliminate the deficiencies associated with the data used by Epps. They found strong evidence for the presence of an asymmetric relation, whereby volume is higher on positive price changes than on negative price changes. Likewise, Jain and Joh (1988), Bessembinder and Seguin (1993), and Brailsford (1996) provided empirical evidence in support of an asymmetric price-volume relation. Cooper et al. (2000) applied Wang's model to the real estate market and reached the same conclusion about asymmetry. Assogbavi et al. (1995) obtained results supporting the presence of an asymmetric price-volume relation (caused partially by costly short sales relative to long sales). By using a simple test of difference between means on data from the Kuwait stock market, Al-Saad (2004) detected asymmetry in the price-volume relation. His results are robust to the choice of the volume variable (number of shares, number of transactions and value of traded shares). But in contrast to the findings of the studies cited so far, Griffin et al. (2004) obtained results supporting the proposition of a symmetric price-volume relation. This is a rather comprehensive piece of work that is based on weekly data drawn from 46 markets. The evidence, therefore, is mixed.

Some Behavioural Finance Explanations of Asymmetry

We may at this stage suggest some explanations for asymmetry in the price-volume relation that are based on the principles of behavioural finance. In behavioural finance theory, irrational behaviour may produce overconfidence, representativeness, confirmation bias, conservatism, anchoring, and availability bias. Asymmetry would arise if behaviour with respect to these characteristics is different in a declining market from what it is in a rising market.

Consider overconfidence first. This characteristic causes investors to trade too aggressively, as they believe that they have better information or forecasting models. If traders are more overconfident in a rising market than in a declining market, or vice versa, then asymmetry would arise. Representativeness means that traders make judgments on an uncertain event by the degree to which it is similar in essential properties to its parent population, reflecting the salient features of the process by which it is generated. This characteristic could then lead to the inference of a pattern from a process on the basis of a small sample, which constitutes a mistake that induces traders to assign too much weight to recent evidence. This then leads to a trend in the price. Again, if traders exhibit this kind of behaviour in a bull market than in a bear market, or vice versa, then asymmetry would arise. The same goes for confirmation bias, which is the tendency to emphasise and believe experiences that support the traders' views and discredit or ignore the evidence that does not. In some cases, traders may change their views in the right direction but the change is inadequate. If traders are slower in modifying their views or revising their valuations in a bear market than in a bull market, or vice versa, then asymmetry would arise. The story is similar for anchoring, which is using the most recently remembered price as an anchor for judging whether a stock is overvalued or undervalued. Asymmetry would arise if the difference between the anchor price and the fair value of the underlying stock is greater in a rising market than in a declining market, or vice versa. Finally, availability bias means that traders make decisions on what information they recall at the time the decision is made. The same reasoning can be applied here to come up with a scenario that produces asymmetry.

The prospect theory of Kahneman and Tversky (1979), which is one of the foundations of behavioural finance, can also be used to explain asymmetry in the price-volume relation. According to this theory, people behave differently according to a reference point that is determined by the subjective impressions of the individuals. Traders' judgement about whether a stock is overvalued or undervalued may depend on the purchase price rather than the fundamental value. Hence, the value function is defined in terms of deviations from the reference point (gains and losses) rather than relative to the final wealth position (as the conventional utility theory postulates). Prospect theory tells us that the impact of losses is greater than the impact of gains in the sense that traders are much more distressed by prospective losses than they are happy by equivalent gains. It is this postulation that explains why traders hold on to losing stocks while selling winning stocks too early to realise their gains quickly. This is indeed asymmetric behaviour.

In a recent study following a similar line of thinking, Gomez (2005) examined the optimal portfolio allocation behaviour of loss-averse investors and its implications for trading volume under the assumption that the demand function for risky assets is discontinuous and monotonic. He found that as surplus wealth reaches a certain threshold, investors will sell a large part of their stock holdings and follow a generalised portfolio insurance rule to protect themselves against losses (relative to their reference point). If this kind of behaviour and/or the reference price depends on the state of the market, asymmetry will arise.

Model Specification

A cross-sectional model explaining trading volume in a particular time period in terms of price changes during that period can be written as

$$v_{j,t} = \alpha + \beta \Delta p_{j,t} + \varepsilon_{j,t}, \quad (1)$$

where $v_{j,t} = \log(V_{j,t} + 1)$ and $\Delta p_{j,t} = \log(P_t) - \log(P_{t-1})$. In this model, $V_{j,t}$ is volume measured by the number of traded shares of company *j* in a particular period (say a week) falling between points in time *t*-1 and *t*, P_t is the closing price for the period and P_{t-1} is the closing price for the previous period. The volume variable is transformed in such a way for the purpose of scaling and to avoid the problem arising when there is no trading ($V = 0$). This model is symmetric in the sense that it shows positive and negative price changes have the same effect on volume.

The asymmetric model corresponding to equation (1) can be obtained by splitting Δp_j into positive and negative values. Let $\Delta p^+ = \Delta p$ if $\Delta p > 0$ and $\Delta p^+ = 0$ otherwise; $\Delta p^- = \Delta p$ if $\Delta p < 0$ and $\Delta p^- = 0$ otherwise. Therefore, the asymmetric model can be written as

$$v_{j,t} = \alpha + \beta_j^+ \Delta p_{j,t}^+ + \beta_{j,t}^- \Delta p_j^- + u_{j,t}. \quad (2)$$

Once equation (2) has been estimated, the null hypothesis of asymmetry can be tested because it can be represented by the coefficient restriction $\beta_j^+ = -\beta_j^-$. A rejection of the null means that the price-volume relation is asymmetric, such that if $\beta_j^+ > \left|\beta_j^-\right|$, then the volume of trading in a rising market is higher than volume in a declining market, and vice versa.

Both the symmetric and asymmetric models can be augmented by incorporating another explanatory variable that is capable of explaining volume. This variable is the capitalisation of the underlying company, as this is a reflection of the proposition that stocks of large companies are more heavily traded than the stocks of small companies[1]. Thus, the symmetric and asymmetric models can be rewritten as

$$v_{j,t} = \alpha + \beta \Delta p_{j,t} + \gamma c_{j,t} + \varepsilon_{j,t} \quad (3)$$

and

$$v_{j,t} = \alpha + \beta_j^+ \Delta p_{j,t}^+ + \beta_j^- \Delta p_{j,t}^- + \gamma c_{j,t} + u_{j,t}, \quad (4)$$

where $c_{j,t}$ is the logarithm of the capitalisation of compamy *j* at time *t*. Both versions of the symmetric and asymmetric models will be estimated.

Data and Empirical Results

The price-volume relation is tested by estimating equations (1)-(4) using data covering over 100 stocks listed on the Kuwait Stock Exchange and belonging to various sectors. In order to show the robustness of the results, the equations are estimated over 11 consecutive weeks ($t = 1,2....,11$), falling between the week ending on 24 November, 2004 ($t = 1$) and ending with the week ending on 2 February 2005 ($t = 11$). This will also show us whether or not the results are time invariant. The data were obtained from *Global*, a mutual fund.

To start with, Table 1 reports the correlation coefficients between volume (v), on the one hand, and, on the other, the signed price change (Δp) and the absolute price change ($\left|\Delta p\right|$). The underlying idea is that symmetry implies that volume would be more strongly correlated with absolute price changes than the signed price changes. The results show stronger correlation with the absolute price change, but they are not so overwhelming as to take them to imply symmetry. In any case, one cannot derive strong inference on the basis of the correlation results alone.

Table 1

Price-Volume Correlations

Week	$r(v, \Delta p)$	t Statistic	$r(v, \left|\Delta p\right|)$	t Statistic
1	0.19	2.12	0.36	4.23
2	0.19	2.16	0.36	4.31
3	0.26	2.89	0.27	3.01
4	0.10	1.09	0.10	1.09
5	-0.02	-0.22	0.18	2.00
6	-0.24	-2.74	-0.15	-1.68
7	0.21	2.38	0.35	4.14
8	-0.03	-0.33	0.03	0.33
9	0.13	1.47	0.35	4.18
10	0.25	2.89	0.27	3.14
11	-0.08	-0.90	0.29	3.39

[1] Market capitalisation is not the only variable that can be used to augment the model. Other variables, such as momentum, the PE ratio and past trading, can be used for the same purpose. Since it is not the objective of this paper to come up with a full-fledged model of the trading volume, we believe that the use of one explanatory variable (market capitalisation) suffices for the purpose of detecting asymmetry in the price-volume relation.

The results of estimating equations (1)-(4) are presented in Tables 2-5. Table 2 reports the results of estimating the symmetric model represented by equation (1). The table reports the number of observations, *n*, the estimated coefficients with their t statistics (placed in parentheses) as well as the coefficient of determination. The results show weak evidence for the price-volume relation: in only three out of the eleven cases we do get a significantly positive relation, whereas most of the regressions show insignificant effect of the price change on volume. The significance of the constant term and the low values of the coefficient of determination give some indication of missing variables, which is to be expected because volume is determined by more than what happens to prices.

Table 2

Results of Estimating Equation (1)

Week	*n*	α	β	R^2
1	122	6.671 (25.69)	-0.011 (-0.18)	0.003
2	127	6.574 (28.03)	-0.005 (-0.09)	0.006
3	117	7.064 (26.53)	0.171 (2.89)	0.067
4	119	6.825 (26.45)	0.078 (1.06)	0.009
5	122	6.671 (25.69)	-0.011 (-0.18)	0.0002
6	125	6.854 (32.05)	-0.059 (-2.73)	0.057
7	125	6.346 (25.00)	0.124 (2.35)	0.043
8	126	6.449 (25.65)	-0.008 (-0.33)	0.00009
9	127	5.942 (23.24)	0.113 (1.46)	0.016
10	127	5.532 (21.66)	0.207 (2.86)	0.061
11	127	6.574 (28.03)	-0.005 (-0.009)	0.0006

One reason for the absence of a significant price-volume relation is perhaps the distortion created by imposing the assumption of symmetry. This proposition can be verified by examining the results of estimating the asymmetric model represented by equation (2), which are reported in Table 3 including the χ^2 test statistic for the null $\beta^+ = -\beta^-$. The price-volume relation seems stronger, as positive price changes affect volume in seven out eleven cases, whereas negative price changes affect volume in four cases. We may take these differences to imply asymmetry in general terms but the formal test shows a significant test statistic in two cases only. This is not really strong evidence for asymmetry.

Table 3

Results of Estimating Equation (2)

Week	n	α	β^+	β^-	R^2	$\chi^2(\beta^+ = -\beta^-)$
1	122	6.299 (20.24)	0.107 (1.31)	-0.195 (-1.84)	0.04	0.53
2	127	5.861 (18.23)	0.258 (2.74)	-0.252 (-2.79)	0.09	0.003
3	117	6.649 (18.74)	0.266 (3.33)	-0.059 (-0.41)	0.09	2.16
4	119	6.606 (19.28)	0.165 (1.42)	-0.023 (-0.18)	0.02	2.92
5	122	6.299 (20.25)	0.107 (1.31)	-0.195 (-1.85)	0.04	0.52
6	125	6.649 (26.17)	-0.046 (-2.00)	-0.188 (-2.11)	0.07	6.92
7	125	5.476 (17.77)	0.416 (5.05)	-0.417 (-1.87)	0.17	7.56
8	126	6.122 (18.65)	0.005 (0.18)	-0.211 (-1.57)	0.02	2.42
9	127	5.110 (15.81)	0.406 (3.84)	-0.408 (-2.66)	0.12	0.0002
10	127	5.220 (16.10)	0.287 (3.24)	-0.094 (-0.46)	0.08	0.91
11	127	5.807 (18.23)	0.258 (2.74)	-0.251 (-2.79)	0.09	0.003

To deal with the issue of missing variables, the model is augmented by adding market capitalisation as an explanatory variable. Thus, the symmetric and asymmetric models are now represented by equations (3) and (4), respectively. The results of estimating equation (3), which are shown in Table 4, indicate that capitalisation is a more important determinant of trading volume than the price change, as it is significant in all cases. As a result of introducing capitalisation as an explanatory variable, the constant term becomes insignificant while the explanatory power of the model rises. However, no improvement is shown over equation (1) as far as the price-volume relation is concerned. Again, it may be that the imposition of symmetry is the culprit, a proposition that can be verified by examining the results of estimating equation (4). The results, which are reported in Table 5, show evidence for the price-volume relation, as positive price changes affect volume in nine out of 11 cases, whereas negative changes affect volume in eight cases. In four cases, the null $\beta^+ = -\beta^-$ is rejected, implying asymmetry. In three out of these cases, volume is greater in a declining market than in a rising market.

Table 4

Results of Estimating Equation (3)

Week	n	α	β	γ	R^2
1	115	-0.186 (-0.31)	0.122 (1.89)	0.667 (2.97)	0.10
2	117	-0.957 (-0.38)	0.060 (1.32)	0.716 (0.22)	0.16
3	117	-4.048 (-1.70)	0.173 (3.21)	0.917 (4.69)	0.22
4	120	-4.057 (-1.68)	0.017 (0.25)	0.952 (4.53)	0.16
5	122	-1.881 (-0.77)	-0.037 (-0.66)	0.750 (3.52)	0.09
6	125	-0.620 (-0.31)	-0.052 (-2.53)	0.657 (3.79)	0.16
7	125	-1.431 (-0.59)	0.098 (1.92)	0.685 (3.27)	0.12
8	126	-0.131 (-0.06)	-0.012 (-0.42)	0.581 (2.92)	0.05
9	127	-4.548 (-2.06)	0.089 (1.23)	0.928 (4.79)	0.16
10	127	-3.563 (-1.61)	0.151 (2.19)	0.807 (4.13)	0.16
11	127	-4.368 (-2.24)	-0.077 (-1.48)	0.959 (5.66)	0.19

Table 5

Results of Estimating Equation (4)

Week	n	α	β^+	β^-	γ	R^2	$\chi^2(\beta^+ = -\beta^-)$
1	115	-0.624 (-0.25)	0.336 (3.78)	-0.312 (-2.16)	0.578 (2.66)	0.19	0.03
2	117	-0.403 (-0.17)	0.186 (3.15)	-0.297 (-2.45)	0.602 (2.78)	0.19	0.95
3	117	-4.001 (-1.70)	0.244 (3.31)	0.002 (0.02)	0.941 (4.54)	0.23	3.96
4	120	-4.018 (-1.66)	0.262 (2.56)	-0.033 (-0.28)	0.939 (4.43)	0.16	0.04
5	122	-3.055 (-1.26)	0.201 (2.31)	-0.262 (-2.58)	0.814 (3.89)	0.16	1.89
6	125	-0.769 (-0.39)	-0.040 (-1.81)	-0.176 (-2.07)	0.654 (3.78)	0.17	6.49
7	125	-3.047 (-1.73)	0.405 (5.18)	-0.189 (-2.51)	0.746 (3.87)	0.27	5.29

Table 5 (continuous)

Week	n	α	β^+	β^-	γ	R^2	$\chi^2(\beta^+ = -\beta^-)$
8	126	-1.215 (-0.53)	0.005 (0.21)	-0.275 (-2.10)	0.639 (3.21)	0.10	4.31
9	127	-5.479 (-2.64)	0.385 (4.00)	-0.439 (-3.14)	0.397 (5.17)	0.28	0.13
10	127	-4.262 (-1.92)	0.246 (2.95)	-0.211 (-1.07)	0.386 (4.32)	0.200	0.03
11	127	-4.438 (-2.36)	0.253 (2.76)	-0.284 (-3.50)	0.907 (5.53)	0.27	1.75

We can also look at the evidence provided by estimating the models using pooled data, comprising 1347 observations. The pooled sample produces correlation coefficients of 0.06 with the signed price change and 0.14 with the absolute price change (both being statistically significant). By estimating the augmented symmetric and asymmetric models, we obtain the following results:

$$v_j = -2.596 + 0.013\Delta p_j + 0.810 c_j$$

(-3.73) (1.08) (13.28) $R^2 = 0.12$

$$v_j = -3.093 + 0.0614\,\Delta p_j^+ - 0.173\,\Delta p_j^- + 0.826\,c_j$$

(-1.47) (4.22) (-5.25) (13.71) $R^2 = 0.24$

The results leave no doubt whatsoever about the importance of capitalisation as an explanatory variable. As far as the price-volume relation is concerned, the symmetric model shows no significant effect of price on volume, but the asymmetric model shows very strong price-volume relation. The null $\beta^+ = -\beta^-$ is rejected as the test statistic turns out to be 11.09. The results clearly show that volume is higher in a declining market than in a rising market.

If we assign greater weight to the results based on pooled data, the results obviously support the notion of asymmetry in the price-volume relation. One explanation for this result is the proposition that bears are quick in reacting to negative price changes, motivated by the desire to cut losses, whereas bulls are "greedy", preferring to wait for further price rises before they sell. This explanation seems to fit well the Kuwaiti market, which was very strong during the period under study. Whenever the market rises, traders think that it will rise further, so they maintain their long positions. When the market declines, traders react quickly by selling, hoping to re-take long positions soon afterwards, just before the market reverses direction. This kind of behaviour is also consistent with the proposition that expectations are extrapolative in a bull market and regressive in a bear market.

Concluding Remarks

Based on cross sectional and pooled data covering more than 100 companies listed on the Kuwait Stock Exchange, the results presented in this study suggest some evidence for asymmetry in the price-volume relation. It was found that imposing the assumption of symmetry could conceal evidence for the price-volume relation and that omitting some variables, such as market capitalisation, distorts the evidence for asymmetry. The finding of asymmetry can be explained in terms of the difference in the behaviour of bulls and bears and the difference in expectation formation in rising and declining markets, both of which can be shown to produce more trading in a bear market. It may also be possible to explain this kind of behaviour in terms of the principles of behavioural finance.

It may be useful at this stage to put forwartd two caveats, which are relevant to studies of the price-volume relation at large. The first caveat is that volume may be deceptive because it can run at different speeds depending on season, trend and other factors. It is arguable that volume does not only depend on whether the market is rising or falling but also on a variety of market conditions. Volume behaves differently in markets characterised by upward trend, downward trend, consolidating movement, continuation rally, counter-trend rally, etc. The second caveat is that it is not the sign of the price change but rather the sign of the trading volume that matters. The proponents of the microstructure approach to financial markets argue that volume can be high in both markets, but what makes high volume associated with a rising market or a declining market is who initiates the deal: buyers or sellers. If it is buyers we will have a high volume and a rising market, and if it is sellers we will have a high volume and declining market. This is what the proponents of the microstructure approach call the "order flow" or the "signed volume". For them, volume as presented in this study is meaningless. Needless to say, this view is not universally acceptable.

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