Sellers’ Behaviour in an Informational Efficient Market

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Theoretically, in an informational efficient market, trading activities should have a directorial relationship. Ordinarily, the probability of making high returns should influence sellers to supply more and vice-versa (Karpoff, 1987). One of the basic assumptions of this theory is that information is uniformly interpreted and understood by market players (Akintoye and Asaolu 2008; Pandey, 1999). Where the assumption of uniform interpretation is relaxed and there is the possibility of different interpretations of the same information, seller behaviour may not necessarily follow the directorial postulation; but an inverse relationship may result and this could cause different behaviours in the same market (Barron and Karpoff, 2004). This study, therefore, considers the relationship between trading volume (supply) and the precision of public announcement under uniform and different interpretations. It was recommended that every seller should take enough time to obtain relevant market information and also to strive to understand the exact meaning of such information through attendance at seminars, conferences, training programmes, and other information media, so as to maximize investment returns.

Key words: Efficient market, capital market, information efficiency, optimisation, transaction cost, trading volume, interpretation, supply

Introduction
The general theory of market efficiency states that a market is efficient when information is sufficiently available to effect optimal allocation of monetary resources under the following assumptions:

a. All available information is costless to all market participants
b. No transaction or agency costs
c. All investors take similar views on the implications of available information, leading to same operational behaviour among market participants (Akintoye, 2006; Pandey, 1999).

These assumptions, although simple and reasonable, may be unrealistic and restrictive, as the Nigerian environment has demonstrated that not all information is available to all players and that information is costly, especially where insider practices are frequent. There is also the fact that all investors do not always agree on the implications of available information (Akintoye and Asaolu, 2008). As a result, with respect to an informational efficient market, there is the need to examine the implications of information misinterpretation, as it could lead to inefficiency.

In a dynamic market, such as that in Nigeria, all players, especially sellers, should understand that, ordinarily, market operators should have access to similar information (Pandey, 1999). But the behaviour of one market operator may differ from the other, resulting in different operational behaviours and different interpretation of the same market information; and this ultimately leads to market inefficiency and affects return on investment.

This study shall consider the effect of information misinterpretation and the presence of transaction costs, while examining the relationship between trading volume and the precision in three segments: the effect of uniform interpretation, different interpretations, and the impact of proportional transaction costs. It is expected that comparisons will be established for the models employed in each of the segments highlighted above and the various results obtained. The uniform interpretation of information disseminated to the market will also be determined,
with a view to advising market players, especially sellers.

The study model of an economy, with common interpretation and without transaction cost, may lead to a positive relationship between supply volume and the precision. This positive relation may, however, decrease monotonously. Moreover, whether or not public information is identically interpreted, the effect of transaction cost may dominate the others, such that supply volume increases and then decreases in the precision, which helps reconcile several puzzling empirical results involving trading volume reactions to public announcement and the concept of decision optimization (Akintoye, 2006; Barron and Karpoff, 2004; Dontoh and Ronen, 1993; Beaver, 1968).

**Literature Review**

It has been established that meaningful and relevant information generate sales volume, which is known to be a useful measure of public announcement’s information content. However, most theoretical models (Grundy and McNicholas, 1989; Kim and Verrenchia, 1991) opined that sales volume increases with the precision of public information. Earnings announcements, followed by high trading volume, are interpreted to convey more information to market operators than announcements with low trading volume (Indjejikian, 1991; Bamber, 1986; Morse, 1981).

However, some other empirical studies (Baron, 1995) find that trading volume is negatively related to sales forecast around earnings release. This makes Barron (1991) inconsistent with conventional assumption that trading volume increases with information precision; hence, it casts a doubt on earlier findings and lends credence to new ones, such as is discussed in this paper.

To reconcile these empirical results, a two-period model, in which sellers have uniform and different interpretations of same information, is developed. It is demonstrated that for any given public announcement and a proportional transaction cost, when the precision is high, sales volume decreases in precision. The study then incorporates the different interpretations of public announcements, which are motivated by the fact that they are more descriptive of real market settings. According to Kim and Verrenchia (1991), when private information is exclusively announced, trading volume has a linear relation to absolute value of price changes, with a zero intercept. This relation is contrary to the studies of Kandel and Pearson (1995) and Bamber et al (1999) where it is suggested that trading volume exists without price change. When there are different interpretations, trading volume is independent of absolute value of price change. Most models of trade volume avoid these issues by assuming that traders employ information either in anticipation of or in conjunction with public announcements.

In examining and comparing models, with the Nigerian market in mind, this study hopes to identify the effect of uniform and different interpretations of market information on supply volume and also recommend ways to ensuring that the Nigerian market operators, especially sellers, are properly orientated and re-positioned to interpret information appropriately and, therefore, maximize market information in investment decisions and optimize the wealth of investors.

**Model Presentation and Examination¹**

*Barron and Karpoff’s Model of trading volume*

According to Barron and Karpoff (2004), trading volume is:

\[
V_{BK} = \max(w[y+z] - x, 0)
\]

where:

- \( V \) = Volume
- \( W = \frac{(K_{s.1} - K_{s.})p_{w}}{K_{s.2} + K_{s.1}} \)
- \( Y = \frac{Y_{2} - K_{s.1}Y_{s.1} + K_{s.1}Y_{s.1}}{K_{s.1} + K_{s.1}} \)

¹ The reader should note “...” at the end of an equation and “...” at the beginning of the next line, connotes a continuation of the equation line.
1. R. Akintoye: Sellers' Behaviour in An Informational Efficient Market

The comparison of the trading volume above with those below is highly impressive, as they do not include the equilibrium price and the information sets in the second period and, therefore, do not include the equilibrium price in the first period. Trading volume in the model becomes:

\[ \frac{X}{K_{1} - K_{h,2}} \]

\[ \frac{Y}{K_{2} + K_{h,2}} \]

\[ Z = \frac{Y}{K_{2} - K_{1}} \]

Barron and Karpoff (2004) argued that when information surprise is positive (\( y > 0 \)), investor \( b \) is the buyer at date 2, because his precision is higher (\( K_{b,1} > K_{s,1} \)), implying that \( W \) also is positive. Conversely, when the information surprise is negative (\( y < 0 \)), investor \( b \) is the buyer because his precision is lower (\( K_{b,1} < K_{s,1} \)). Thus, \( W \) and \( Y \) always have the same signs. From the analysis below, in the second period when the information surprise is positive (\( Y_{2} > Y-up \)), traders with higher precision (\( K_{1,1} > K_{2,1} \)) are sellers, but when it is negative (\( Y_{2} < Y-down \)), traders with higher precision (\( K_{1,1} < K_{2,1} \)) are buyers.

In the first period, when information is positive, traders with the higher precision buy, while those with lower precision sell, in general. In the second period, when information surprise is negative, traders with lower precision will not want to sell (buy) again, even though traders with higher precision want to sell and those with lower precision want to buy. This analysis also shows that \( W(Y + Z) \), which is, \( \lambda (y_{2} - P_{2}) \), \( (P_{1} - P_{2}) \) is always non-negative; and that the situation when \( W \) and \( Y \) are negative and \( Z > (Y) \) does not exist. The partial derivative of trading volume, with respect to the precision in Barron and Karpoff (2004), is:

\[ \frac{K_{b,1} + K_{s,1}}{(K_{2})^{2}} \left[ \left( \frac{Y + Z}{(1 + \mu)} \right) - 2c(K_{2,1})^{2} + (K_{2,2})^{2} \right] \]

Barron and Karpoff argue that the first term on the right hand side is positive, while the second term on the right hand side is negative. The latter increases in magnitude with the size of transaction costs. Although this present study showed similar results, Barron and Karpoff's analysis is not quite rigorous, as it does not study the equilibrium price and, thus, cannot get the relation between equilibrium price and common information.

a. Uniform interpretation by suppliers - 'No noisy supply'

Sellers' equilibrium

Based on some common expectations and individual information, each trader maximizes his wealth at the end of the second period. The demand of each trader in the first period is:

\[ d_{i}^{1} = P_{0}(\alpha - P_{1}) + P_{1}(Y_{1}^{1} - P_{1}) \]

where: \( d = \) demand
\( P = \) price

By the market clearing condition, the equilibrium price in the first period can be easily calculated as:

\[ P_{1} = \frac{P_{0}(\mu P_{1} + (1 - \mu) P_{2})}{P_{0} + P_{0} + (1 - \mu) P_{2}} \]

\[ = \frac{P_{0}(\mu P_{1} + (1 - \mu) P_{2})^{\alpha - n}}{K_{1}} \]

where: \( K_{1} \) is the weighted precision of all traders at date 1.
Due to the uncertainty of the ‘noisy supply’, the equilibrium price in the first period is not revealing. As in the first period, each trader maximizes his expected wealth at the end of the second period. For buyers at date 2:

\[ W_0 = d_{2,i}(\alpha - p_2) + d_{i}'(P_2 - P_i) + Z_0 - (d_{2,i}' - d_{i}'i)C \]

With negative exponential utility, the demand of each trader in the second period is:

\[ d_{2,i}' = \frac{d(L - P_2)}{(L - P_2)} \]

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Where there is no transaction cost, the terms in square brackets do not depend on the precision of common information. Trading volume is always a monotonic function of the precision. Assuming that the equilibrium price was not available or that traders could not infer information contained in the equilibrium price in the first period, then the term \( (P_1 - q) \) would not be included. It has been shown that when \( Y_2 > P_1 \), \( 1 = 1 \) and \( Y < P_1 \), \( 1 = -1 \), trading volume increases in the precision of common information, which is consistent with Kim and Verrenchia (1999) model.

If traders can infer information contained in the equilibrium price in the first period, \( (Y_2 - P_1) \) and \( (P_1 - q) \) may have different signs and trading volume may be monotonically decreasing in the precision of common information.

When there are transaction costs, the second term is always negative and it increases in magnitude with the size of transaction costs. At the first source, the first term seems to be independent of the precision of common information \( (P_1) \). The common information disseminated the first term is positive if transaction costs are high enough to cause trading volume to decrease in the precision of common information.

\[ \frac{\partial}{\partial p_2} = \mu^\prime \frac{(P_1 - P_2)(y_2 - P_1)K_2 - P_2 + ...}{(K_2)} - (P_1 - q) - 2C[\mu(K_2,2) + (1-\mu)K_2,2] \]

\[ > \frac{(1-\mu)}{\bar{K}_2} \frac{\lambda(P_1 - P_2)(1(P_1 - q)K_2 - 2C\mu(K_2,2) + ...}{\bar{K}_2} - 2C[\mu(K_2,2) + ... + (1-\mu)K_2,2]^2 \]

b. Identical or Different Interpretation – ‘Noisy supply’

While holding all other assumptions constant, it is herein assumed that traders interpret the same public announcement in different ways and that there is no distortion (noisy supply) in the second period. The change of information environment does not influence the equilibrium in the first period and all the analysis about the period applies. It was found that due to
different interpretations, traders in the same group no
longer have the same demand; hence, there are
different equilibrium prices and trading volumes.

\[ \frac{P_2 - P_1}{K_2^2} V_0 (P - P_1) + \ldots \]

\[ \ldots \frac{t(q - P_1)}{G^2} (K_1 (P_1 - \theta)) + \frac{t(q - \theta)}{G^2} \]

The equilibrium price in the second period is:

\[ P_2 = \frac{B \cdot \frac{P_{0.2}}{G} - C + D + E P_1}{A} \]

Where:
\[ A = U K_2 [1 - a(m_1) + a(n_1) + (1 - \mu) K_2 (1 - a)(m_2) + a(n_2)] \]
\[ B = \mu [1 - a(1 - a(m_1) + e(n_1)(1 - \mu)(m_2) + a(n_2))] \]
\[ C = \mu K_1 t (1 - a(m_1) + a(n_1)) + [1 - \mu] K_2 (1 - a)(m_2) - a(n_2)] \]
\[ D = \mu \frac{P_e n}{n} [a(m_1) - a(n_1) + (1 - \mu) \frac{P_0 n}{n} - a(n_2)] \]
\[ E = \mu K_1 t (1 - a(m_1) + a(n_1)) + (1 - \mu) K_2 (1 - a)(m_2) + a(n_2)] \]
\[ n = \frac{P_e n}{p} [K_1 t (P_2 - P_1) + P (P_2 - \theta) - C + \frac{(P_0 - C - q)}{G} \]

Given the trading volume in the second period is
presented below.

Where:
\[ V = \frac{P}{P} V_1 + \frac{(P - P_1)}{P} V_2 \]

In general terms, the partial derivative of trading
volume, with respect to precision, can be written as:

\[ \frac{\delta V}{\delta P_0} = D V_1 \frac{1}{A} \delta \]

Where:
\[ D V_1 = - \mu [1 - \sigma] K_2 \frac{1}{2} \theta (m_1) \theta (n_1) (1 - \theta) (m_2)] \]
\[ + \mu (1 - \mu K_2) \frac{1}{2} \theta (m_1) \theta (n_1) (1 - \theta) (m_2)] \]
\[ + K_2 \mu \frac{1}{2} \theta (m_1) \theta (n_1) + \theta (n_1) (1 - \theta) (m_2)] \]

In analyzing this formula, two special cases will be
employed to understand the relationship between trading volume and precision.

8 Nil Transaction Cost under Different Interpretations

In this special case, where traders follow different
information in the first period, the precision of
information is same to all traders (that is, \( P_1 = P_2 \)). The partial derivative is then simplified as:

\[ \frac{\delta V}{\delta P_0} = \frac{1}{A V n} \frac{\delta P}{\delta P_0} \theta (m_1) \]

Where \( P = \) precision of information; 1, 2 ... =
different market operators. This reveals the traditional result: that trading volume monotonically increases in
the precision.

With the consideration that the previous
information and precision were different (that is, \( P_1 > P_2 \)), the second term is adapted to the partial
derivative, and thus is expressed as:

\[ \frac{\delta V}{\delta P_0} = (\mu \theta (m_1) + 1 - \mu) \theta (m_2) \frac{1}{A V n} \frac{\delta P}{\delta P_0} \ldots \]

\[ \ldots (P_2 - \theta) (P_1 - P_2) \]

The second term, therefore, presents the influence of
the previous precision of the private information on the relation. From the equilibrium price with zero
transaction cost, that is: \( \frac{P_2}{P_0} = \frac{1}{C_0} (P Q + \frac{P_0}{q_0} + K_1 P_1) \)
there is, \( (n_2 - n_1)(P_2 - \theta) \)
It is important to note that in an economy where traders interpret common information in the same way, trading volume is always a monotonic function of the precision. However, where traders can infer from information of the previous period, even though transaction cost is less, trading volume would not be a monotonic function of the precision. While the second term does not depend on the precision, the first term may change signs whenever $q - P_1$ and $q - P_I$ have different signs. Also, $q - P_I > 0$ means that the equilibrium price in the first period is higher than the expectation before the period; on the other hand, $q - P_1 < 0$ means that the equilibrium price in the first period is lower than the expectation before the period. Thus, $0 - P_I < 0$ means that $P_2 < P_1$.

Proportional Transaction Costs under Different Interpretations
Assuming there are proportional transaction costs, as earlier expressed, DV1 would mean the influence of differential interpretations, while DV2 would mean the influence of the different precision of previous individual information, and DV3, the influence of transaction costs on sales volume, with respect to the large economy. The relationship between precision of public announcement and trading volume can be categorised into three parts:

The initial part, which denotes the contribution of differential interpretations; this is always positive.
The next part, which denotes the effect of different precision of previous individual/private information; this could be negative or positive.
The last part, which denotes the contribution of proportional transaction cost; it is usually negative.
The determination of the increase or decrease in total trading volume, therefore, depends on which of the above effects that is dominating.

Conclusion
This study has examined the relationship between trading volume and public announcements under proportional transaction cost using a two-period model. In an economy with uniform interpretation, without cost, it was found that there is a positive relationship between trading volume and the precision. Similarly, it was also discovered that in an economy with different interpretations, traders in the same group do not have the same demands; and this results in different equilibrium prices and trading volumes.

Furthermore, the relationship between the precision of public announcement and trading volume was divided into three: the part which denotes the contribution of the differential interpretations; that which denotes the effect of different precision of previous private information; and that which denotes the impact of proportional transaction cost. The first was found to be always positive, the second, positive or negative, while the third, mostly negative. Finally, whether total trading volume increases in the precision or not, depends on which effect dominates.

Recommendation
Whether public information is identically interpreted or not, the effect of transaction cost may dominate the others, such that supply volume increases and then decreases in the precision, to help reconcile several puzzling empirical studies involving trading volume reactions to public announcement and the concept of decision optimization (Akintoye, 2006). It is, therefore, recommended that sellers should take enough time to collect relevant market information and, especially, strive to understand the exact meaning of such information through attendance at seminars, conferences, training programmes and other mediums, so as to maximize investment returns.

References


**Biographical Note**

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