Chapter 2  Literature Review

2.0 Introduction

This chapter describes the literature review and survey of previous empirical work done in the area of share-price to volume relationship and Efficient Market Hypothesis (EMH) in different capital markets. The empirical results between price and volume can help to infer hypothesis about the market structure, to provide an insight into the structure of information in the financial markets and the empirical distribution of speculative prices. The price to volume relationship depends on the rate of information flow to the market, how information is disseminated, the extent to which market prices convey information, the size of the market and the existence of short sales constraints. Peter Bernstein(1983) postulated that "if you can predict volume, you can predict the moment of the stock market".

2.1 Early Empirical Study

The earliest empirical work of a price volume relation was conducted since 1959. According to Osborne's study (1959) in stock price change as a diffusion process with variance dependent on the number of transactions has imply a positive correlation between absolute price change and trading volumes.

An early empirical test of the volume price relation was conducted by Granger and Morgenstern (1963), used spectral analysis of weekly data from 1939-1961, reviewed that there was no relation between improvements in a securities and exchange commission composite price index $|\Delta p|$ and the aggregate level of volume (V) on the New York Stock Exchange.
In a subsequent paper by Godfrey, Granger and Morgenstern (1964), they extended their previous investigation. They found that the volume series tends to be quarter cycle out of phase with the series of lows, the corresponding coherence was too low to attach any significance to this result. Hence, they concluded that there was no correlation between prices of the absolute values and volume of transaction.

Ying (1966) was the first to document both price-volume correlation in the same data set. Ying applied a series of Chi Squared Tests, analyses of variance, cross-spectral methods, daily series of price and volume data of share traded on New York Stock Exchange (NYSE) over the six years period. The price is measured by the Standard and Poor 500 composite index, and volume by the proportion of outstanding shares traded on the exchange. His findings were:

- A small volume is usually accompanied by a fall in price
- A large volume is usually accompanied by a rise in price
- If the volume has been decreasing consecutively for a period of five trading days, then there will be a tendency for the price to fall over the next four trading days
- If the volume has been increasing consecutively for a period of five trading days, then there will be a tendency for the price to rise over the next four trading days

2.2 Volume and the Absolute Value of the Price Change

It is an old Wall Street adage that "It takes volume to make prices move" (Karpoff, 1987). Although one can question the asserted causality, numerous other studied have confirmed that there is a "positive correlation between the volume trade and the absolute value of price change". Crouch (1970) found that there was positive correlation between the absolute values of daily price change and daily volumes for both market indices and individual stocks. Whereas, Clark
(1973) found a positive relation between the squared of a measure of the price change and aggregated volume using daily data from the cotton future markets. In Morgan (1976) research, he concluded that the variance of price change was positively related to trading volume.

Epps (1976) developed tests, which indicated that the positive correlation between volume and change of price was not symmetrical. He used daily price and volume data for 20 common stocks traded in the New York Stock Exchange in this empirical research. He found the ratio of volume to price change was greater for transactions in which the price ticks up than for transactions on down ticks. This is the asymmetrical relationship of price changes and volume changes.

Westerfield (1977) found the same relation in a sample of daily price changes and volume in common stocks, whereas, in the empirical research conducted by Cornell (1981), resulted a positive relation between changes in the volume and changes in the variability of prices measured over two months interval for 17 commodities. Rutledge (1984) yield similar results for 113 out of 136 future contracts analyzed.

Harris (1983) concluded that there was positive correlation between the volume and the squared of the price changes using daily data from 479 common stocks. Comiskey, Walkling and Weeks (1984) found a similar correlation using yearly data on individual common stocks. Epps and Epps (1976) and Wood, Mclnish and Ord (1988) also reported a positive correlation between volume and the magnitude of price change using transactions data. Tauchen and Pitts (1983) found the same result for daily data from Treasury bills. Grammatikos and Saunders (1986) postulated that volume to be positively correlated with price variability but it is only applicable to foreign currencies futures contacts.
Gallant, Rossi and Tauchen (1992) reviewed that more can be learned about the stock market through studying the joint dynamics of stock prices and trading volume than by focusing only on the univariate dynamics of stock prices.

As cited from Karprof's (1987) observations, the strength of correlation varied across securities, some tests indicate that the correlation is extremely weak even though the almost universal findings documented a positive correlation. For example, the average squared correlation coefficient obtained by Crouch (1970) was 0.20 among the stock indices and 0.23 among individual stocks. This was argued by Karprof (1987) that this stems from heteroskedastic error terms that are generated when a straight line is fit to data from markets in which short sales are relatively costly. These empirical results are summarized in Table 1 (appendix 1).

There are several explanations on the occurrence of correlation between volume and the absolute value of price changes. The "sequential arrival of information" model constructed by Copeland suggests that information is disseminated to only one trader at a time and that implies a positive correlation between $V$ and $|\Delta p|$. The information causes a one time upward shift in each "optimist's" demands curve and downward shift in each pessimist's demand curve. Trading occurs after each trader receives the information, but uninformed traders do not infer the content of the information from informed traders' actions.

Jennings, Stark and Fellingham (1981) who derives from the sequential arrival of information process the hypothesis that trading volume will be abnormally high during the same periods in which the absolute values of returns are serially correlated.

Jennings and Barry (1983) have extended the sequential information arrival model by permitting informed traders to take speculative positions. Speculation causes prices to adjust more quickly to new information but the effect on trading
volume is ambiguous. This model implies a positive correlation between \( V \) and \( |\Delta p| \) for a given investor's trade, but this correlation can get obscured with data sampled over time intervals as long as a day.

Another explanation for the positive correlation between \( V \) and \( |\Delta p| \) comes from the mixed distribution models of speculative prices constructed by Epps and Epps (1976) and Clark (1973), the variance of price change on a single transaction is dependent upon the volume of the transaction. In a separate research by Tauchen and Pitts (1983), his mixture of distribution models provide some explanations for the leptokurtosis in the distributions of speculative security prices. The mixed distribution model did predict that volume is positively related to the magnitude of the corresponding price change over fixed time intervals or on a given transaction.

Another explanations on the positive correlation between \( V \) and \( |\Delta p| \) is implied by Pfleiderer (1984) who considers price and volume in a noisy rational expectations equilibrium. The magnitude of price change is not correlated with trading by speculators with private information but positively related to trading by liquidity-motivated investors. Thus, the correlation between \( V \) and \( |\Delta p| \) is negatively related to the existence of private information, so it was argued.

2.3 Volume and the Price Change Per Se

Another Wall Street adage is that "volume is relatively heavy in bull markets and light in bear markets" (Karpoff, 1987). As tested by Epps, first using 20 NYSE bonds from the bond market (1975), then from the stock market (1977) with 20 common stocks, indicated that ratio of trading volume to absolute price changes is greater when the price ticks up than the transactions on downticks.
Jain and Joh (1986) found that volume is positively related to the magnitude of price change, but that volume is more sensitive to positive than negative price changes. Such asymmetric volume and price change relationship may be due to the difference in costs of going long and short (Shamser, Annuar and Jamaluddin, 1995).

In Karpoff (1987) reviews the studies done by Morgan (1976), Harris (1984, 1986) and Richardson, Sefcik and Thompson (1987), showed a positive correlation between the volume and price changes even though it appears that they were not looking for one. The findings of Hanna (1978), Rogalski (1978), parts of Smirlock and Starks (1985) implied the similar correlation as reported.

The empirical evidence compiled by Karpoff (1987) is summarized in Table 2 (appendix 2). Karpoff (1987) found two features from the empirical evidence that he gathered. First, unlike the empirical correlation between \( V \) and \( |\Delta p| \), these findings are all reported from stock or bond market data. The correlation has not been reported in the futures markets. Second, like some of the findings reported in the correlation between \( V \) and \( |\Delta p| \), many of the statistical results are weak.

In the trading volume and price change relationship model constructed by Epps (1975) he assumes two groups of investors - "bulls" and "bears". "Bulls" are the optimist, they are more optimistic about the value of the asset at the end of the trading period, and they react only to positive information about the asset's value. Whereas, the pessimistic "bears" react only to negative information. It is assumed that the transaction demand curve in this market consists only of the demand prices of "bulls", while "bears" comprise of the transaction supply curve. Epps has demonstrated that the relative optimism of the "bulls", combined with appropriate assumptions about investors' utility functions, implies the market demand curve is steeper than the supply curve. Thus, the sensitivity of the
trading volume towards a positive price change (when "bulls" demands increase) is greater than a negative price change (when "bears" demands decrease).

In an extension of Copeland's sequential information arrival model, Jennings, Starks, and Fellingham (1981) has incorporated real world margin constraints and short selling (costly short sale hypothesis) into the model to prove the correlation between \( V \) and \( |\Delta p| \). The short position is more costly than the long position, which implies quantity demanded of an investor with long position is more responsive to price changes than short position. Hence, the optimists (who buy) are more than the pessimists (who sells) because it is cheaper to buy. Since price increases with an optimist and decrease with pessimist, it is argued that volume is relatively high when price increases and low when price decreases. Thus, this model is consistent with the empirical correlation between \( V \) and \( |\Delta p| \).

In Karpoff study related return and volatility with volume traded, it has resulted in an asymmetric relationship between volume and price change. However, in Karpoff's (1987) finding revealed that share price are linearly related with the volume of trade in developed markets. He identified two "stylized facts" about the relationship between trading volume and changes in security prices:

- The correlation between volume and absolute value of the price change is positive in both equity and future markets.
- The correlation between volume and the price change per se is positive in equity market.

In view of no general consensus about empirical studies on the volume-price relationship, hence, this studies will employ local empirical findings to enrich the understanding of this dynamic relationship in the local context.
2.4 Local Empirical Findings

There is not much published evidence on the relationship between stock price changes and trading volume of firms listed on the Malaysian share market. The study of stock price volatility and factors associated with price volatility in the Kuala Lumpur Stock Exchange (KLSE) by Annuar and Shamsher (1993, 1995) is considered as the pioneer research in the local context.

Annuar and Shamsher (1995) stated that the most notable relationship between price changes and trading volume is that absolute price changes and price change *per se* are positively corrected with trading volume though it is recognized that this relationship is generally weak for latter. This is probably due to the asymmetric volume and price change relationship in the sense that the ratio of trading volume to absolute price change is greater when the price moves up compared to when prices decline.

Empirical findings in their research also indicated absolute price changes are found to have a strong relationship with trading volume compared to price change *per se*. Days with high volume are associated with greater price changes compare to days with low volume. Flow of information is possible reason for the large volume and large price changes (both positive and negative) effect.

Share price and volume relation studies in Malaysian share market is similar to other empirical findings of developed countries because transaction volume on price increases was found on average greater than the transaction volume on price down-turns.
2.5 Causality Between Stock Prices and Trading Volume


In causality study, no causal relationship was found in the direction of volume cause price change contrary to the technical school of investing. Technicians suggest that volume is the confirmatory signal for trading, and therefore causes prices to change. However, significant causal relationship was found at lag 1 and 2 in the direction of price change cause volume. Due to high cost in selling short, they expect asymmetric relationship between price changes and volume in the KLSE.

The causality study proved the results are consistent with other evidence (Annuar, Ariff and Shamsher, 1991) that the share market in Malaysia is in the weak form efficient and the value of past information including price and volume data is already fully reflected in the present price. Therefore, it is not economically viable to design trading strategy to beat the market.

In the study conducted by Izani Ibrahim and Yacob Othman (2000), they have reviewed an empirical analysis of the relationship between volume, returns and volatility on the main board of KLSE. The study supported the hypothesis that the negative slope in volume-return relationship is less than non negative slope. This is consistent with the asymmetric relationship that exist due to the differential cost of taking long and short position as discussed by Karpoff (1987). The relationship between trading volume and return was also extended to conditional frame work where volume traded was used as proxy for the rate of information arrival and overnight return on the KLSE for expected “news”.

16
In the recent study conducted by Cheah (2001), he uses Granger causality test to analyze the relationship between volatility in the trading volume and the closing price of the Syarikat Telekom Malaysia Berhad as a proxy to the telecommunication industry. His study reveals that the volatility in the trading volume does cause the twice-differenced share price in the Granger sense, implying the market is inefficient in the weak form.

2.6 Empirical Evidence on Efficient Market Hypothesis

According to the Efficient Markets Hypothesis (EMH) theory, stocks are always in equilibrium and that it is impossible to for an investor to consistently “beat the market”. Fama, Fisher, Jensen and Roll (1969) defined EMH as a market that adjusts rapidly to new information and stock prices is rapidly reflect all available information. There are three forms of market efficiency, namely, strong, semi-strong and weak forms.

The market is efficient in the strong form if stock price fully reflected all information, that is public and private information not yet publicly available. Strong form efficiency implies that no group of investors has monopolistic access to information relevant to the information of stock prices. Even an insider cannot profit from his/her privileged position.

The market is efficient in the semi strong form if stock price adjust rapidly and without bias to newly released information. The semi strong form of hypothesis encompasses the weak form because all public information include current as well as past market information. The direct implication of the hypothesis is that investors, acting on important new public information after it is made public cannot, on average, derive excess risk which leaves no economic value other than the first marginal investor possessing the information.
The market is efficient in the weak form if current prices fully reflect all past market information such as price changes from one period to another approximate a random walk. If there is a significant relationship between closing stock price and volatility of volume, then past volume data will be useful in predicting current stock price. The implication of this hypothesis is that current price changes and future price changes are unrelated or price changes are independent. Hence, trading rules using past price changes to predict future prices or price changes should have little economic value.

The developed securities markets generally conform to the expectations of Efficient Market Hypothesis and are characterized by active trading, a large turnover, a large number of utility maximizing investors, no entry barrier and efficient dissemination of relevant information. The KLSE is relatively small in size and thinly traded compared to the developed markets (Ang and Pohlman, 1978; Hong, 1978, Yong 1987, Neoh, 1986), the most importantly, being liquidity as proxied by volume of trading (Arif and Johnson, 1990). There is also a growing body of literature suggesting that thinness of trading may predispose the efficiency proposition to be erroneously rejected (Lo and Mckinlay, 1989).

In the research conducted by Ang and Pohlman (1978) by using serial correlation of price changes over two week period between 1967 and 1974, explained that Hong Kong stock market was efficient in weak form. Other researchers, namely Wong and Kwong (1984) also found that Hong Kong stock market was weak form of efficiencies by using serial correlation test and run tests. His study covered the daily prices of 28 stocks for the period of 4 years (1977 –1980).

In year 1986, Laurance has conducted research on KLSE and Singapore stock market, by testing the distribution of daily stock returns. He concluded that the KLSE is in the weak form of efficiency.