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Price Discovery and Volatility: A theoretical Approach

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Abstract

In this paper we analyse and show how price discovery process influence the volatility of stocks. Using a theoretical approach, our initial analysis revealed that stocks experience 'normal' volatility as the price move from one equilibrium price to another as part of the price discovery process. Our further analysis revealed that, due to the inefficiency of financial markets, stocks also experience transitionary volatility which occurs when the price transition from one equilibrium price to another. The implication of these analytical findings means that the price discovery volatility effects can only be reduced by improving the efficiency of financial markets. Thus, we recommended that the financial microstructure be designed in a manner that promotes the efficiency of financial markets.

Key Words: Price discovery, volatility, stocks, financial markets

JEL classification: G21; G28; G35

Introduction

Volatility, which is simply defined as the variability in returns is a common phenomenon in financial markets. Whilst in most cases volatility in financial markets has remained normal and acceptable levels, there has been instances in which it has become extremely frightening. In most periods volatility generally falls within a band of 10% to 20% volatility, but there have been periods when volatility was unusually high and periods when it was unusually low (Easterling, 2017). For example in 2008, stock markets in the United States and Europe experienced high levels of volatility which resulted in investors incurring huge losses. From the perspective of the investors, volatility is a measure of risk which influences their investment and portfolio decisions (Edwards and Lazzara, 2016). Thus, understanding the dynamics of volatility is of paramount importance in the field of investment and portfolio management.

Volatility is defined as variability of returns of a security. An important component of the returns of a security return is the capital gain or loss. Capital gains or losses on a stock are earned/incurred when the prices of stocks change. This means that price changes influence the variability of returns. Unlike the dividend payments which are paid periodically, the price of a stock changes on a daily basis as trading occurs. This means that daily changes in volatility are largely determined by the daily changes in stock prices. In fact, volatility in stock markets is observable through changes in prices of stocks. A security displaying large and intense price swings is regarded as being volatile. Conversely, a stock displaying small and less frequent price changes is said to be less volatile. Thus, volatility is a largely a consequence of the changes in the prices of securities.

There is a consensus in financial literature that stock prices are stochastic and follow a random walk (Mittermayer, 2004). This means that stock prices are rarely constant and continuously change over time. This stochastic behavior of prices of securities is attributed to information flow. More specifically, the general view is that quoted or traded price of an asset changes in response to the arrival of new information (Bellia et al, 2016). This means that changes in information flow explains the changes in volatility of stock that is observed in financial markets. Though, the fact that prices can vary is interpreted as sign of information flow, the high variability in prices is often attributed to pronounced uncertainty in the market (Strohsal and Weber, 2015). Information uncertainty mean ambiguity with respect to the implications of new information for a firm's value, which potentially stems from two sources: the volatility of a firm's underlying fundamentals and poor information (Zhang, 2006). Excess volatility in the stock market is interpreted as evidence of insufficient information in the market which causes market participants' price securities based on incomplete information (Sterne, 2012). Thus it is an acceptable view that volatility is closely related to information.

According to the Efficient Market Hypothesis, the current market price of a security reflects fully all the information available. As new information flows into the markets, prices of securities adjust or change to reflect the new information. This means that in any trading day prices continuously change as new information arrives thereby causing volatility of securities. This dynamic process by which prices of securities adjust to new information is regarded as the price discovery process. This means that the attempts by a security to discover an equilibrium price as investors' trade on new information will result in a security experiencing some price movements. Thus, the price discovery process can also be a possible reason why stocks experience volatility.

The subject of the price discovery process is one of the most studied topics in the field of financial economics. They are several studies have focused on the nature of price discovery for related assets traded in multiple markets. Other studies have been much concerned about the efficiency of price discovery processes in financial markets. However, to the best of our knowledge none has attempted to examine the possible contribution of the price discovery process to volatility. Financial literature actually overlooks the possible role that price discovery process play in influencing volatility of stocks in financial markets. In this paper, we examine the relationship between price discovery and volatility using a theoretical approach. The objective is to analyse and show how the price discovery process contributes to volatility of stocks in financial markets. The paper is laid out as follows: Section 2 discusses the effect of the

price discovery process on volatility, Section 3 discusses the implications of price discovery volatility effect on the financial microstructure and Section 4 concludes the paper.

The effect of the price discovery process on volatility

The price discovery simply refers to the determination of prices. Schreiber and Schwartz (1986) defines price discovery as the search of equilibrium price. The process involves the incorporation of information into price. Hence Baille et al. (2002) defines the price discovery process as the incorporation of the information implicit in investor trading into market prices. An element of incorporating new information implies that the price discovery is a process which is dynamic in nature. Essentially, it relies on a dynamic information flow process that eventually triggers price movements.

For the price discovery process to have an impact on volatility there should be a link between the information flow process that influence both price discovery and volatility. In other words, there should be a link between information flow that occurs in the price discovery process and volatility. Generally prices of stock change when investors buy or sell securities (Gusev et al, 2014). Investors' decision to buy or sell securities depends on the information they possess about a particular stock. When investors receive significant information about a particular stock, they revise their trading positions thereby resulting in a change in prices. The arrival of new information influences investors' opinions about a particular security thereby causing price changes. Thus, volatility is closely related to information and as such can be thought as nothing more than a manifestation of information in the markets (Gusev et al, 2014; Bookstaber and Pomerantz, 1989).

The prices of securities in financial markets are determined when the quantity of demand which buyers wish to buy and the quantity of supply seller wish to supply (Yoon, 2013; Larsen, 2010). In other words, price of a security is determined when there is balance between demand and supply for that security. This means that financial markets operate like any other economic market where the fundamental principles of demand and supply determine the price (Hanousek and Kočenda, 2009). In economic terms, the price that balances supply and demand is referred to as the equilibrium price. This means that in a stock market, the observed price can be taken as the equilibrium price that balances demand supply. When the market shifts away from an equilibrium price, the market mechanism will ensure that the security price reverts back to an equilibrium price.

According to the efficient market hypothesis, prices of securities fully reflect the available information. This means that the last price of a security contains all the relevant information (Darolles et al, 2000). The implication of this hypothesis is that the stock prices only change when new information about a security is revealed. It is therefore plausible to assume that the current market stock price which is based on all past information represents an equilibrium relationship between buyers and sellers (Zhang and Jaffry, 2015). Essentially, the current equilibrium price fully reflects all the available information. Once new information flows into the market, the old equilibrium will break and the price moves to a new equilibrium level (Zhang and Jaffry, 2015).

The movement of the price from one equilibrium point to another is basically a consequence of the security's price discovery process. When new information arrives, a price discovery process is initiated. In other words, when new information arrives the market automatically begins a process of searching a new price for the security. A market constantly receives new information and therefore over a period of time, a security equilibrium price constantly moves from one point to another.

The movement of price from one equilibrium point can be viewed as a step movement. When it is viewed as a step movement, it means the price jumps from one equilibrium point to another. Over a period of time, a series of price jumps can be observed. The diagram below illustrates normal volatility the movement of the equilibrium price from one point to another over time. The price starts at equilibrium point E1, then moves to equilibrium point E2, E3 and finally to E4.

Figure 1: Normal Volatility

As we can observe from the diagram above the movement of the stock price from one point to another generate price swings which we observe in the markets as volatility. This type of volatility (shown above) can be regarded as normal volatility. This is because it arises due to normal changes in stock prices that occur as a result of a security's price discovery process. Since the price discovery process is a natural process that occurs as a security adjusts to a new price due to the arrival of new information, normal volatility is unavoidable.

Though normal volatility is unavoidable, it should be less-concerning to investors. This is because it indicates the efficiency of the price discovery process of a market. If a market is efficient, the price discovery process will be characterized by the fast adjustment of market prices from the old equilibrium to the new equilibrium as new information arrives (Yan and Zivot, 2007). As a result, such a market in which prices of securities adjust rapidly to the arrival of new information reflects market efficiency. An efficient market tends to communicate information to the market efficiently (Sterne, 2012). When the market display normal price swings, investors will quickly interpret such volatility changes as merely revealing the efficiency of the market. Thus normal volatility is therefore less likely to be amplified by investors, thereby resulting in volatility remaining at low levels.

Earlier, we observed that normal volatility is characterized by a step movement of prices from one equilibrium point to another. It is important to note that step movement of prices occurs when there is instantaneous movement from one equilibrium price to another. If we assume that a market is efficient and that information is absorbed instantaneously, a step movement of equilibrium prices is possible. However, practically this is unlikely as markets do not absorb information instantly and as a result the prices of securities do not reach a new equilibrium instantaneously. In reality, markets do not agree on a particular price of a security instantaneously. Market analysts tend to make different valuations of stock when new information arrives and as such the movement towards a new equilibrium is not instantaneous. When new information arrives, it is initially analysed by the market. Sometimes traders halt trading in order to allow investors to react to new information and adjust their orders (Phylaktis and Korczak, 2007). In other words, when there is significant new information investors tend to take time to analyze information and then adjust their trading positions in line with the new information. This process generates fluctuations until a new equilibrium is reached (Strohsal and Weber, 2015).

In essence, the price adjustment that occurs as stock price move towards a new equilibrium is not a step movement, but is characterized by price swings until a new equilibrium is reached. The price fluctuations

that occur as the stock price transition to a new equilibrium price generate volatility beyond the normal volatility we discussed earlier. This type of volatility caused by the price discovery process can be regarded as transitional volatility. This is because it occurs as the price transition from an old equilibrium price to a new equilibrium price. The diagram below illustrates the nature of transitional volatility that occurs during the price discovery process.

Figure 2: Transitional Volatility

On the diagram, we can observe that the movement is not a step movement (or price jump). The price of a stock fluctuates rapidly as it moves between equilibrium points E1, E2, E3 and E4. The extent of the volatility depends on the intensity of the price swings generated by the movement towards a new equilibrium price.

From this analysis it is clear that the price discovery process can generate more volatility beyond the normal volatility that occurs when prices jump from one equilibrium price to another. When stocks experience beyond normal levels of short-term volatility, there is a possibility that it may be due to transitional price movements caused by the price discovery process. In fact, there is a likelihood that transitional volatility may be amplified by investors. According to Brogaard et al (2013) transitional price movements make it difficult for unsophisticated investors to determine the true price, causing them to buy when they should be selling or sell when they should be buying. Thus, the fact that transitional volatility can easily be amplified by investors implies that it can be of much concern to investors.

The implications of the price discovery volatility effects on financial microstructure

The proper functioning of financial markets is premised on efficient markets. Consistent with the Efficient Market Hypothesis, informational efficiency is at the core of efficient markets. This means that an efficient market is one in which information is quickly incorporated and reflected in prices of securities. In other words, an efficient market is one in which there is efficient price discovery of price of securities. The ideal is to have financial markets that are designed in a manner that enhances the efficiency of the price discovery process. Thus, the need to promote efficient price discovery processes in financial markets has been the basis of any efforts towards developing and designing efficient financial microstructures around the world.

Since the analysis revealed that the price discovery process contributes to volatility, does this mean that efforts being made towards creating much more efficient markets are unwise? Firstly, our analysis revealed that securities experience normal volatility as the equilibrium changes from one point to another. We referred to this kind of volatility effect as the normal volatility as it occurs during the natural process of the markets trying to find a price. We earlier argued that normal volatility usually remains at low levels as it is less likely amplified by investors who view it as a consequence of the efficient price discovery process. The fact that normal volatility is usually low makes its impact less significant. Thus, normal volatility does not deter efforts aimed at designing efficient financial markets that promote efficient price discovery.

Our analysis further revealed that securities experience transitional volatility beyond the normal volatility levels. This transitional volatility is a consequence of price swings that occur as the price moves from one equilibrium point to another. We argued that this transitional volatility occurs due to the inefficiency of financial markets. Specifically we argued that the inefficiency of the financial markets results in a gradual, rather than instantaneous price movement towards a new equilibrium, generating price fluctuations that may greatly increase the volatility of securities beyond the normal volatility levels. This magnitude of the transitional volatility depends on the extent of the efficiency of the financial markets. Thus, highly inefficient financial markets are likely to experience greater transitional volatility.

On the other hand, we also argued that normal volatility reflects the efficiency of the price discovery process. This means that securities traded in highly efficient financial markets should experience more of normal volatility than transitional volatility. This means that in order to reduce transitional volatility effect of the price discovery process on stocks, efforts should be put towards making stock markets as efficient as possible. The efficiency of a market largely depends on the nature of the trading mechanisms in a financial market. Thus, in order to promote the efficiency of financial markets and reduce the transitional volatility effect of the price discovery process, it is wise for authorities to promote and design more efficient financial microstructures for the trading of stocks.

Conclusion

The price discovery process is one of the most important elements of financial markets mechanisms. The fact that it causes price swings as securities respond to the arrival of information shows that it contributes to volatility dynamics. The intention of this paper was to analyse and show how the price discovery process contributes to volatility. Firstly, we identified that there is 'normal' volatility can occur when prices move from one equilibrium price to another in response to the arrival of information as part of the price discovery process. We further identified that, due to the inefficiency of markets, there is also transitional volatility that occur as the price moves from one equilibrium point to another. This analysis shows that markets due to inefficiency, financial markets experience volatility which is beyond the normal volatility. The implication of this revelation is that, in order to reduce volatility of stocks, responsible authorities should work towards developing more efficient stock markets. Further research should focus on empirically modelling the effect of the price discovery process on volatility of stocks and other securities.

References

- Baillie, R. T., Geoffrey Booth, G., Tse, Y., and Zobotina, T. (2002). Price discovery and common factor models. *Journal of Financial Markets*, 5(3). DOI: 309-321 DOI: 10.1016/S1386-4181(02)00027-7
- Bellia, M; Pelizzon, L and Subrahmanyam, Ma. G; Uno, J and Yuferova, D(2016).Low-Latency Trading and Price Discovery: Evidence from the Tokyo Stock Exchange in the Pre-Opening and Opening Periods(September 20, 2016). SAFE Working Paper No. 144. Available at SSRN: <https://ssrn.com/abstract=2841242> or <http://dx.doi.org/10.2139/ssrn.2841242>
- Bookstaber, R.M and Pomerantz, S(1989). An Information Based Model of Market Volatility. *Financial Analysts Journal* Vol. 45, No. 6 (Nov. - Dec., 1989), pp. 37-46
- Brogaard, J ; Hendershott,T and Ryan Riordan, R(2013). High Frequency Trading and Price Discovery. ECB Publications. Working Paper Series No 1602 / November 2013

- Darolles, S and Gouriéroux, C and Le Fol, G (2000). Intraday Transaction Price Dynamics. *Annals of Economics and Statistics*, GENES, issue 60, pp 207-238.
- Easterling, E (2017). Volatility In Perspective. Crestmont Research. January 4, 2017.
- Edwards, T and Lazzara, C.J (2016). Realized Volatility Indices: Measuring Market Risk. CFA S&P Dow Jones Indices McGraw Hill Financial, January 2016
- Gusev, M; Kroujiline, D ; Govorkov, B; Sharov, S.V ; Ushanov, D and Zhilyaev, M (2014). Predictable markets? A news-driven model of the stock market. Munich Personal RePEc Archive
- Hanousek, J and Kocenda, E (2009). Intraday Price Discovery in Emerging European Stock Markets. CERGE-EI Working Papers wp 382. The Center for Economic Research and Graduate Education - Economics Institute, Prague
- Larsen, J.I (2010). Predicting Stock Prices Using Technical Analysis and Machine Learning Norwegian University of Science and Technology
- Mittermayer, M (2004). Forecasting Intraday Stock Price Trends with Text Mining Techniques. Proceedings of the 37th Hawaii International Conference on System Sciences, 10 pp..10.1109/HICSS.2004.1265201
- Phylaktis, K and Korczak, P (2007). Specialist Trading and the Price Discovery Process of NYSE-Listed Non-US Stocks .Working Paper. Available at SSRN: <http://ssrn.com/abstract=567104>
- Schreiber, P.S and Schwartz, R.A (1986). Price discovery in securities markets. *The Journal of Portfolio Management*, Vol 12(4) pp43-48. DOI: 10.3905/jpm.1986.409071
- Strohsal, T and Weber, E (2015). Time-Varying International Stock Market Interaction and the Identification of Volatility Signals. *Journal of Banking & Finance* .Vol 56, July 2015, pp 28–36. <http://dx.doi.org/10.1016/j.jbankfin.2015.01.020>
- Sterne, P (2012). An Alternative Stock Market Structure that Provides Automatic Liquidity and Reduced Volatility. Frankfurt Institute for Advanced Studies, July 11, 2012
- Yan, B. and Zivot, E. (2007). The Dynamics of Price Discovery. University of Washington Working Paper Series.
- Yoon, H (2013). A Change of Order Balance Implies Intraday Price Trend in Japanese Stock Market. IPSJ SIG Technical Report. Vol.2013-MPS-94 No 12
- Zhang, Q and Jaffry, S (2015) . High frequency volatility spillover effect based on the Shanghai-Hong Kong Stock Connect Program. *Investment Management and Financial Innovations*, Volume 12, Issue 2, 2015 pp 8-15
- Zhang, X.F (2006). Information Uncertainty and Stock Returns. *Journal of Finance*, vol. 61, issue 1, pp 105-137