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Intraday trading activities and volatility in round-the-clock futures markets ☆

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ABSTRACT

In this paper we examine the relationship between intraday return volatility and volume of trading for Japanese yen futures, euro FX futures, and E-mini S&P 500 futures traded on a 24-hour GLOBEX trading system in six time zones. The results support the mixture-of-distribution hypothesis (MDH), which endorses a significant contemporaneous relationship between volume and volatility, and the sequential-arrival-of-information hypothesis (SAIH), which advocates significant lagged volatility–volume relations. The net effect of trading number is positive, supporting the dispersed belief hypothesis, while the net effect of trading imbalance is negative, supporting the asymmetrical information hypothesis. Our results suggest that the four theories of volume–volatility relations are complementary, not competing. In addition, the largest effect of the trading imbalance on volatility is found during American regular trading hours, rather than the home asset market of the futures contracts, thus supporting the trading place bias.

1. Introduction

The relationship between return volatility and volume of a financial asset is of enduring interest in financial research. A large number of studies have documented a positive relationship between return volatility and volume (Karpoff, 1987). Four different theories appear to explain well the volatility–volume relationship. First, the mixture-of-distribution hypothesis (MDH) relates trading volume to the number of new information arrivals (e.g., Clark, 1973; Epps & Epps, 1976; Tauchen & Pitt, 1983). Second, the sequential-arrival-of-information hypothesis (SAIH) indicates that information arrives to traders at different times; the volatility is potentially predictable with knowledge of trading volume (e.g., Foster, 1995; Wang & Yau, 2000). Third, the dispersed belief hypothesis suggests that informed and uninformed traders interpret and react to the same information in different ways (e.g., Harris & Raviv, 1993; Shalen, 1993). Finally, the asymmetrical information hypothesis suggests that informed traders, using private information, often cluster on one side of a market, resulting in lower price volatility (e.g., Daigler & Wiley, 1999; Downing & Zhang, 2004).

Apparently, information is the key factor affecting volatility–volume relations. Black (1986) argued that noise traders who trade either on noisy information or simply for the sake of trading will bring additional risk into stock prices by increases in

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volatility. When a certain trading activity variable is used to proxy information, it may be too noisy. Thus, the use of trading volume to proxy for a certain type of information is not always appropriate. Indeed, Kyle (1985) and Admati and Pfleiderer (1988) point out that in a microstructure finance model, the order imbalance/trade imbalance variable is a critical variable that can signal informed trades. The trading imbalance can convey information about the degree of information asymmetry or difference in traders' opinion that is not directly revealed from the trading volume. Informed traders such as floor traders and brokers have superior information because of their ability to observe sources of trades and short-term price deviations. Their orders are often clustered to trade on one side of the market because these traders are confident of the information, inducing a subsequent change in prices. Hence, the extent of the order imbalance or trading imbalance could reflect the quality of private information affecting volatility.

Jones, Kaul, and Lipson (1994) find that trading number explains volatility well while the trade size variable plays only a minor role. Unlike Jones et al. (1994), Chan and Fong (2000) find that the volatility–volume relationship becomes much weaker after controlling for the return effect of order imbalance, implying that the order imbalance drives the result. However, Xu and Wu (1999) and Chan and Fong (2006) confirm the results of Jones et al. (1994) that the trading number is a dominant factor behind the volume–volatility relation. Moreover, Wu and Xu (2000) suggest that the trading imbalance contains a rich content of private information, and find that the trading imbalance contains incremental information content in the trading behavior of agents over and beyond the trading number. In another word, the trading number or order (trading) imbalance plays an important role on volatility. Our study sheds light on the relative importance of the role played by the trading number and the trading imbalance on volatility.

This study examines intraday volume–volatility relations for three internationally traded assets (Japanese yen futures, euro FX futures, and E-mini S&P 500 futures) traded on GLOBEX (the Chicago Mercantile Exchange's platform) to shed light on several interesting issues. First, our paper uses the high-frequency data to shed light on the four hypotheses related to volatility–volume relations, which differ from other studies using the daily data. To this end, we use the trading number to proxy for the uninformed trades and the trading imbalance for informed traders. The intraday data allow us to reach more precise empirical conclusions on the role of trading number and trading imbalance on volatility and enable us to compare volatility–volume relations in different time zones.

Second, this paper examines the joint effects of trading number and trading imbalance on volatility for contemporaneous and different lagged periods. In so doing, we can adequately assess evidence supporting the four theories behind the volatility–volume relationship. Specifically, we can also test to see whether the trading number or trading imbalance plays a complementary or dominant role in explaining volatility (see Chan & Fong, 2000, 2006; Jones et al., 1994).

Finally, our study investigates the home bias or trading place bias hypothesis in volatility–volume relations. The underlying assets of the three futures contract are traded in three major trading areas (centered in Tokyo, London, and New York). We are interested in the extent to which underlying assets (which are supposed to be offshore) influence the volatility and trading activities of the U.S. futures assets. Because GLOBEX is a 24-hour trading system, based on futures underlying assets' home market, we can divide our data into six time zones: Asian zone, Gap1 (Japanese Closed–European Not Yet Open), European zone, European–American zone, American zone, and Gap2 (American Closed–Japanese Not Yet Open). Tse (1999), in examining how round-the-clock information is processed between ten-year Japanese government bond (JGB) futures traded on the Tokyo Stock Exchange (TSE) and the London International Financial Futures and Options Exchange (LIFFE), finds that more information is revealed during the trading hours of the TSE, which supports the home bias in international investment, while Chan, Hameed, and Lau (2003) suggest that the geographical proximity of trading affects investor interests and trading behavior. Cheng, Fung, and Tse (2008) find that securities listed and traded in offshore can be influenced more strongly by the trading place than by the home market. Therefore, we examine volatility–volume relations in different time zones to understand whether home bias or the trading place bias exists during regular and nonregular trading periods.

Our results show that both trading number and trading imbalances have a significant positive contemporaneous effect on volatility, although the trading number is the dominant factor in volatility–volume relations, consistent with Jones et al. (1994) and Chan and Fong (2006). However, we do find that trading imbalance has a nontrivial role on price volatility. The result of a significant contemporaneous relationship supports MDH. We also find that the lagged coefficients of trading number and trading imbalance, respectively, are negative and significant in explaining volatility. This result is consistent with Foster (1995) and Wang and Yau (2000), who believe that volatility has a negative relationship with the lagged volume. The significant lagged effects of the trading variables (TNR and TIBR) on volatility support the SAIH.

When the effect of the estimated coefficients of trading variables on volatility is taken as a whole, the result is interesting. The sum of the trading number coefficients turns out to be positive, while the sum of the estimated coefficients of the trading imbalance is negative. We conjecture that the trading number variable is a proxy for uninformed trades and the trading imbalance variable is a proxy for informed trades. Our result is consistent with Hellwig (1980) and Wang (1994) in that informed traders generally reduce volatility while uninformed traders generally increase volatility. Similarly, in the recent studies by Avramov, Chordia, and Goyal (2006) and Kittiakaraskun, Tse, and Wang (2009), they further confirm that uninformed (herding) trades increase volatility and informed (contrarian) trades reduce volatility. Our result using the trading number is also consistent with the dispersed belief hypothesis (Harris & Raviv, 1993; Shalen, 1993), supporting the idea that the trading number is a proxy for uninformed traders, who have different beliefs. The negative sum of trading imbalance on volatility is consistent with the implication of the asymmetry information hypothesis, because the trading imbalance, which can be thought to be a proxy for homogeneous informed traders who cluster to trade on one side of the market actually, can reduce volatility.

When we examine volatility–volume relations in different time zones, the greatest impact of the trading imbalance on volatility is found in the European–American and American zones. The result implies that the effects of trading location on futures contracts appear to dominate the home market effects of the futures' underlying assets, supporting the trading place bias