和歌山大学経済学会『研究年報』第14号（2010年）pp.175−186 ISSN 1880−490X

Market Volatility and Financial Regulation

Nabil MAGHREBI

1. Introduction

With the onset of financial crises, there are growing concerns about asset price fluctuations and market volatility expectations. This attention is justified given the important economic role of financial markets in channeling capital savings toward efficient investments. This allocation of resources is impeded by the increased economic uncertainty, which accompanies major shocks such as the ongoing U.S. housing and credit crisis and the European sovereign debt crisis. Arguably, part of the difficulties in managing financial crises stems from the complexities in managing market expectations. The fact that market volatility actually increases with falling asset prices and decreases in bullish markets is rather well-documented and better understood. What renders the understanding of pricing signals conveyed by financial market participants to economic policymakers more difficult to grasp is that asset prices may fluctuate in the absence of new macroeconomic or company-specific information. Indeed, such asset fluctuations are not necessarily associated with the arrival of new information, and they cast doubt on the informational efficiency of financial markets. An increase in market volatility can be caused by several factors including order imbalances, inappropriate market microstructure settings, or sudden shifts in market expectations.

It is important to provide some reliable measures of market anticipations of future economic uncertainty given their potential impact on monetary policies. The formation of volatility expectations plays a crucial role similar to that of expectations about future inflation rates in setting the level of interest rates. One of the objectives of this paper is to introduce a measure of future volatility in the Japanese equity market based on the volatility implicit in options prices. The Volatility Index Japan can be useful in making inferences about future market volatility. It is based on the Nikkei 225 options, and calculated on the basis of the model-free approach followed in computing the new VIX index, which is disseminated by the Chicago Board Options Exchange (CBOE). It is possible to use these volatility indices to better understand the sharp movements in equity prices during financial crises and the level of uncertainty perceived by market participants.

Another objective of this study is to shed light on financial market regulation, as far as market volatility is concerned. The recent advent of financial instruments such as credit default swaps (CDS), and electronic exchanges have not only transformed the financial landscape, but revealed also

some shortcomings in financial market regulation. The increased intraday fluctuations of asset prices and volatility spillovers across markets can be reflective of new trading strategies, new inter-market linkages and new investors behavioural patterns and perceptions of economic policies. These new developments should be taken into consideration in devising new financial market regulation.

The remainder of the paper is organized as follows. The next section discusses the behaviour of market volatility over time. It focuses in particular on the dynamics of volatility expectations during financial crises. Section 3 addresses issues related to market volatility and risk-hedging activities insofar as credit default swaps are concerned. Section 4 examines market microstructure and liquidity problems in relation to market volatility. Section 5 discusses the new challenges posed by recent financial events with respect to financial market regulation. Section 6 concludes the paper.

2. Financial crises and market volatility

It is theoretically possible to derive a measure of future market volatility from the prices of options contracts. Since call (put) options represent the right to buy (sell) the underlying asset at a pre-determined price exercise price before maturity, the market price of the option is also reflective of the expected level of volatility until option expiration. The volatility implicit in equity index options in particular provides an estimate of the anticipated level of economic uncertainty. The focus is made here on market volatility expectations implied by the prices of options on equity benchmarks such as the Nikkei 225 stock average and the S&P 500 index. Based on the daily closing prices of the Nikkei 225 options, which are traded on the Osaka Securities Exchange since June 12, 1989, it is possible to calculate an index of volatility expectations in Japanese equity markets, based on the model-free approach underlying the new VIX index, as detailed in the CBOE documentation. These two volatility indices can be useful in shedding light on the similarities and differences in the perceptions of future economic uncertainty across the Japanese and U.S. markets, especially during the U.S. financial crisis.

It is clear from Figure 1, which exhibits the new VIX index against the underlying S&P 500 equity benchmark, that while stock prices in the U.S. market were increasing over the late 1990s, this measure of volatility expectations remained rather low. It hovered around the annualized volatility level of 20%, with few instances of sudden surges apparently in association with the Asia currency crisis in 1997-78 as well as the Long-Term Capital Management and Russian debt crises of 1998-99.

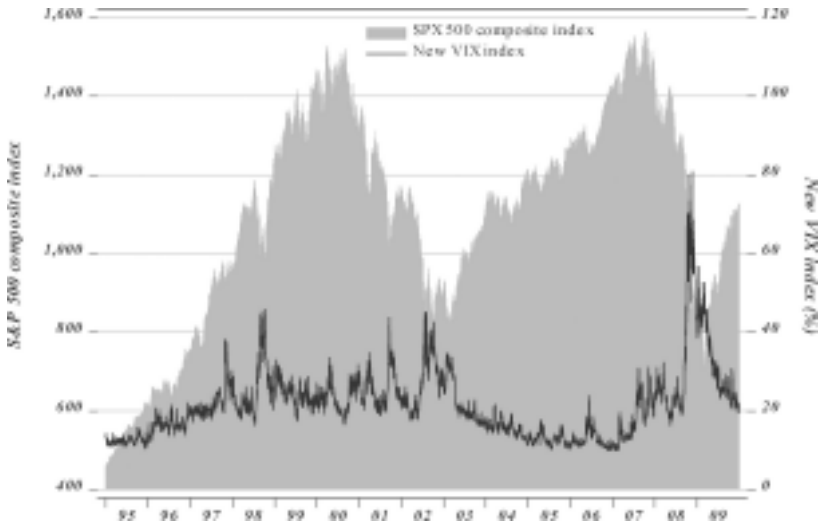

Figure 1. The new VIX implied volatility index and its underlying S&P 500 index

The burst of the information technology bubble in 2000 brought the stock market boom to a halt. The benchmark of stock prices decreased dramatically over the following couple of years, and this was accompanied with an increase in the average level of implied volatility. This interruption was temporary as stock prices rebounded toward higher levels until 2007. This bullish market was also associated with lower volatility expectations. But the onset of the U.S. housing and credit crisis in 2008, which featured the demise of Lehman Brothers, and Bear Stearns, drove this measure of implied volatility toward the historical levels of around 80%. The subsequent increase in stock prices during 2009 should not obscure the fact that despite the accompanying decrease in volatility expectations, the new VIX index has not reverted to pre-crisis levels. Thus, the long-term implications of this crisis are still unclear insofar as the dynamics of volatility expectations are concerned. Judging from the level of market volatility expectations, the impact of the U.S. credit crisis is likely to be long-lived. This volatility index conveys the clear message that the perceived level of economic uncertainty is unprecedented, and it remains high by historical standards.

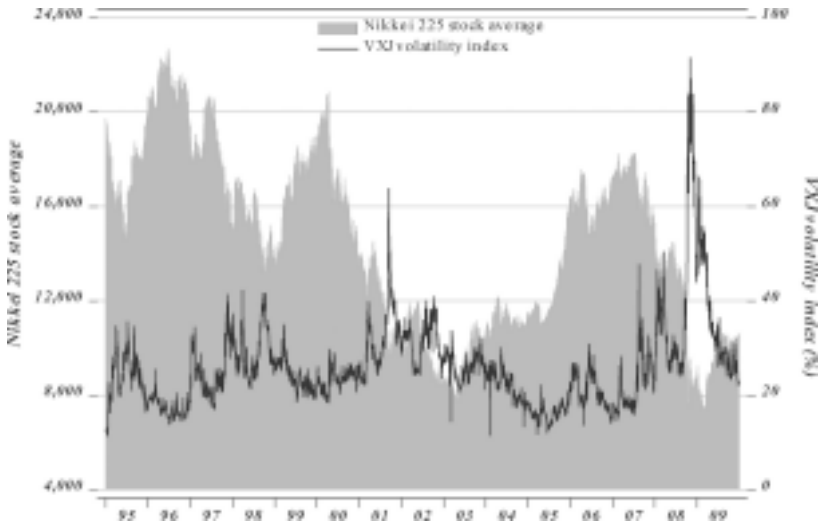

Figure 2. The time-series behaviour of the Volatility Index Japan

Given the inter-dependencies between open economies, some degree of volatility spillover across markets can be anticipated. It is no surprise that perceptions of greater uncertainty are shared among market participants. The behaviour of the Volatility Index Japan (VXJ) is also reflective of the same major economic and financial events.[1] Indeed, Figure 2, clearly indicates that this volatility index is also responsive to international shocks such as the Asian currency crisis, as well as the U.S. financial crisis. Like the new VIX index, the VXJ index reached historical levels at the onset of the U.S. housing and credit crisis. Despite the decrease in economic uncertainty in 2009, this benchmark of volatility expectations remains at levels clearly higher than the long-term mean. This represents additional evidence that the impact of the U.S. financial crisis on investor confidence is not only significant but it is likely to be long-lived as well.

Thus, it is important to examine not only realized volatility on *ex post* basis, but also market expectations about future price fluctuations during financial crises. The latter can be reflective of rapid shifts in the beliefs of investors and their responses to the arrival of new information during periods of financial turmoil. Changes in market expectations can convey important signals to economic policymakers and market regulators, and have the potential of affecting several aspects of the solution to financial crises.

[1] The time-series of the Volatility Index Japan, based on the Nikkei 225 options is also available from the Center for the Study of Finance and Insurance, Osaka University. Reference can be made to the CSFI website for weekly updates of the volatility series.

3. Credit default swaps

The previous section highlighted the importance of measuring volatility expectations, and their relation with financial crises. Benchmarks of implied volatility such as the VXJ and new VIX indices can be useful in making inferences about the future level of economic uncertainty. These volatility indices are based on options contracts, which constitute important risk-hedging derivatives instruments. The credit default swaps can be seen as new financial derivatives, the trading of which started rather recently. Their exponential growth took place in an environment of low interest rates and weak regulatory framework. There are diverging views on the legal nature of these instruments, as they do differ from other derivative instruments such as interest-rate swaps and from pure insurance contracts.[2] Indeed, as derivative instruments, the value of CDS contracts derives from the bond market itself. They can be used as insurance against the risk of default, especially with respect to non-government bonds. As the European sovereign debt crisis shows however, this default risk is not limited only to corporate bonds only.

Several arguments are advanced either in defense or against CDS trading. On one hand, it can be argued that these instruments allow for the separation of default risk from interest-rate risk and duration risk. They can be thus used for genuine hedging purposes, in order to cover the exposure to default risk. On the other hand, they are also regarded as instruments that allow market participants to speculate on default in the absence of direct exposure, i.e. in the absence of the direct ownership of bonds. Thus, the distinction is made between “covered” swaps where the protection buyer is also long on the underlying bond, and “uncovered” or “naked” swaps with no direct exposure to default risk on bonds. In the midst of debt crises, “uncovered” CDS trades tend to be regarded as, not so much trading of government debt by underlying sovereign bonds, as undermining them by speculating on default. The advocates of stronger financial regulation argue that the explosive growth of CDS trading has the potential of heighten volatility and destabilize financial markets. CDS contracts can thus be used simultaneously for hedging against default risk as well as for speculative purposes.[3]

The failure of Lehman brothers and the demise of American International Group (AIG) in September 2008 highlighted the fact that the unregulated trading of CDS protection entails a significant systemic risk. As a dominant seller of CDS protection on collateralized debt obligations

---

[2] An interesting analysis of the legal properties of credit default swaps and the salient distinguishing features relative to insurance contracts is provided by Schwartz (2007). It is argued that CDS represent fee-based instruments of risk distribution in capital markets and as such, they should not be regulated as pure insurance contracts.

[3] According to statistics from the Bank for International Settlements, the notional amount of CDS contracts in the second half of 2009 continued to decline, but at a lower pace than in the second half of the same year. The gross market values are reduced to 35% of their level at the end of 2008.

including mortgage and corporate debt, AIG accumulated significant exposures to insurance payments should default events occur. The potential default of a major CDS seller thus poses a significant counterparty-risk, in the sense that protection buyers are not guaranteed payments in the event of default by the underlying entity. Thus, the onset of financial crises and the heightened levels of economic uncertainty including the prospects of prolonged recession, increase the risk of protection payments by CDS sellers as the default rate on debt increases dramatically. The rescue of AIG by the Federal Reserve allowed for the compensation of AIG counterparts in relation to their entitlements for CDS payments. As noted by Maghrebi (2009), the rescue with public funds has de facto placed the U.S. government institutions in the implicit position of a large protection seller of last resort, compensating AIG counterparts for payments triggered by the inability of the principal protection seller, AIG itself, to honor its own obligations.

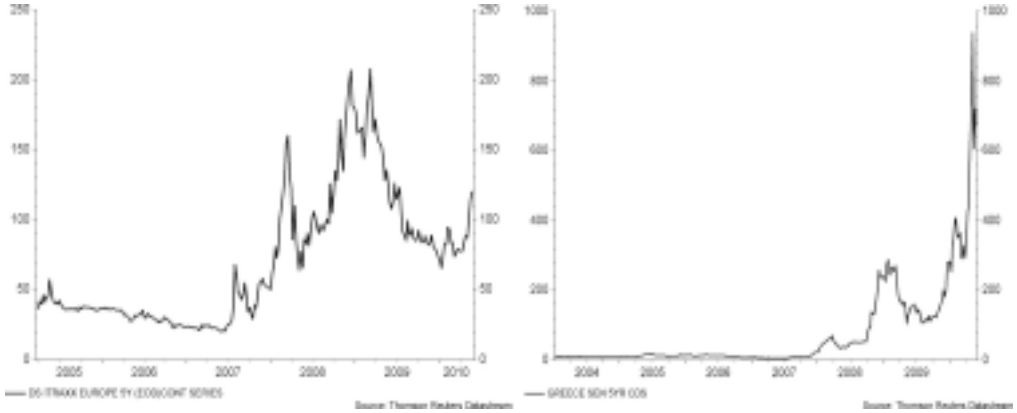

Figure 3. Credit default swaps spreads for iTraxx Europe index and Greece sovereign 5-year bonds

The downgrades of Greece's long-term and short-term sovereign debts to non-investment status by the rating agencies Fitch and Standard and Poor's in April 2010 have similar implications for CDS sellers. They have the potential of generating contagion effects to other European countries sovereign debts. The probability of default increases as bad news accompanied with further concerns about mounting debt. Figure 3 describes the CDS spread on the European iTraxx index and Greece 5-year sovereign bonds over the sample period of about five years ending in May 2010. The CDS premium represents the cost of insurance protection against default, and it is expressed in basis points (0.01%), as a percentage of the notional amount of debt. It is clear that the cost of insurance in the European debt market started to increase toward the end of 2007, in association with the onset of the U.S. credit crisis. The fears of Greek debt problems can be traced to a later date, in early 2008, when the CDS spread started to depart from near-zero values. It increased significantly toward the

beginning of 2009 before receding thereafter. However, the sharp surge toward April 2010 is clearly unprecedented.

It can be argued that higher CDS spreads can cause wider spreads in the underlying bond market. This would result in higher borrowing costs and increase the prospects of debt default. The force of this argument reposes on the premise that the CDS market leads the bond market. Whether this proposition is valid or not is an intrinsically empirical question. Therefore, evidence from empirical tests of the lead-lag relation between bonds and CDSs is needed in order to address this important issue, which has significant implications for the regulation of the CDS market.

Thus, the CDS spreads provide some measure of the fragility of Greece's public finances. The statistical evidence indeed supports these perceptions as the budget deficit amounted to as much as 12.7% of GDP in 2009. These fragile debt structure is shared however with a number of other Euro-zone countries. These debt problems place significant constraints on the European monetary policy making decisions. But, drawing parallels with the U.S. structural budget deficit, which is bound to exceed that of any other OECD member, is hard to avoid. The spending path is obviously unsustainable, despite the relatively lower pressures from financial markets given the unique role played by the U.S. dollar as the principal international currency, and lower yields on treasury bonds. Lower yields on sovereign debt are partly due to a weaker private demand for capital. The important question remains as to how fast can firms deleverage and reconstruct their balance sheets and how fast can households improve their savings positions, leading to higher investment demand.

The increase in CDS spreads and the ensuing surge in bond spreads may have precipitated the downgrade of Greece sovereign debt. There is no single trigger event to the crisis however. As with the U.S. mortgage crisis, part of the blame is being laid at the door of ratings companies. There is an inherent conflict of interest in the ratings industry, which emanates from the crucial role in advising issuers of structured debt on how to achieve investment grades. The reasons for the crisis of credibility in ratings agencies are clear with respect to the U.S. mortgage crisis. But, a direct role with respect to sovereign debt is less obvious. Together with the source of financial shocks and the role of financial institutions, the compounding effects of shocks and their impact on market volatility are also important from the perspective of financial regulators. As wil be discussed in the next section, such shocks have the potential of altering the beliefs of investors, and causing abrupt shifts in market expectations. This can be conducive to significant and sudden order imbalances, and excessive market volatility.

4. Issues in market microstructure

The above evidence of increasing market volatility during financial crises is based on closing market

prices. Market volatility is however the result of intraday trading. This is itself driven by the dynamics of buy and sell orders. In the presence of large order imbalances, market prices can be subject to increased buying or selling pressures. The asymmetric pressures may hinder the price discovery process and generate large fluctuations in market prices. The movements in market prices in response to selling pressures for instance, can be short-lived but have significant effects on market volatility. The historical level of market volatility observed on May 6, 2010, as the Dow Jones Industrial Average dropped about 1000 points during the trading session shortly before recovering, is indeed unprecedented. Whereas the index ended with less significant losses, the instantaneous drop raises a number of important regulatory questions.

What caused this precipitous fall in stock prices and exacerbated market volatility is still unclear, and documented evidence on market linkages is needed. The increasing uncertainty over the mechanics of the European rescue plans with respect to Greece's debt problems may partly explain the observed intraday gyrations. Another possible explanation is a large sell order in the stock futures market, where prices tend to lead the spot market. While clear empirical evidence has yet to emerge, these potential explanations may not be compelling. It is more likely to be a combination of factors, where technological advances may have contributed to the occurrence of these events. Arguably, such a large drop in prices within a short time interval may not take place in the absence of a trading environment where orders can be placed and executed almost instantly. Technology should not be regarded as the culprit however. It is rather the slower speed of financial market regulation that may explain the inability of markets to cope with increasingly sophisticated trading techniques and electronic trading platforms.

High-frequency trading has indeed increased dramatically, and automated trading accounts for about two-thirds of daily volumes. One of the merits of program trading is the provision of liquidity under normal market conditions. However, independent of the initial triggers of intraday jumps and drops in market prices, trading programs are likely to issue similar buy or sell orders, which have the potential of further accelerating price movements in one direction or another. At some point, program trading may be halted in order to avoid transactions at erroneous prices, which are bound to be canceled by stock exchanges. Program halts can be conducive to a further dearth in liquidity. These conditions are reminiscent of the stock market crash in October 1987, where program trading was held responsible for exacerbating market conditions and increasing volatility. If high-frequency trading is to be blamed for exacerbating the recent fall in prices, then part of the blame should be also apportioned for the uninterrupted surge in prices since March 2009.[4] Program trading should not be

[4] According to statistics from the New York Stock Exchange, program trading for the week May 3-7, 2010 accounted for 23.5% of NYSE average daily volume, which is rather close to the reported averages for previous weeks.

held responsible for extreme movements in market prices in one deirection and not the other.

The arguments for high-frequency trading, electronic exchanges and program trading are rather simple. Indeed, they constitute natural developments in the increasingly complex financial landscape. As new technologies are embraced to facilitate trading, it is undeniable that electronic exchanges have the merits of faster execution and lower transactions costs. Based on pre-defined trading patterns, high-frequency trading can also benefit sophisticated traders such as hedge funds, but it has also the potential of exacerbating losses. Trading programs are actually devised by traders, and as such, they can be fallible and subject to human errors of judgment. When similar errors are embedded in trading programs and multiplied across a large population of traders, increases in prices can be exponential and falls can be precipitous. To the extent that there are built-in benefits from high-frequency trading and electronic exchanges, there should be also obligations and responsibilities attached with them. It is the sharp declines in prices and increases in volatility that are of more concern for market regulators, not least because of the ensuing losses in firm valuations and difficulties in matching financing instruments with capital expenditure. It is clear that market volatility is closely related to important issues in market structure, and it is essential that financial regulation evolves with new developments in the trading environment.

5. Financial market regulation

The ultimate objective of market regulation is to ensure that financial markets are orderly and fair. Market integrity is essential to the promotion of investor protection and confidence. Fairness and orderliness are however difficult to maintain during periods of increased uncertainty, lower investors' confidence, falling prices and higher volatility. Given a significant decline in prices, circuit breakers are triggered in order to allow for liquidity to rebuild. The NYSE trading rules for instance, allow for the suspension of trading for a pre-determined time period in the event of a sharp decline in the Dow Jones index by a pre-defined percentage. While the aim of such circuit breakers is to reduce market volatility, and provide room for traders to digest new information, there was no trading halt in association with the trading events on May 6, 2010. Despite the large drop in the prices of some individual stocks, exceeding one-third of opening prices in some cases, circuit breakers were not triggered because they do not apply to single stocks.

Such trading events pose therefore new regulatory challenges. In order to prevent a recurrence, the new rules adopted by the Securities and Exchange Commission allow for industry-wide single-stock circuit breakers to be triggered in the event of sharp falls in stock valuations. From the regulatory perspective, the issue seems to cast in terms of price versus speed. This characterization of the problem is arguably premature in the absence of clear evidence on the

underlying causes, which may vary from high-frequency trading to increasing economic uncertainty. Whether there is a tradeoff between the speed of execution and price discovery is an intrinsically empirical issue, which needs further examination.

Financial market regulation is also faced with the new challenges from credit default swaps, which take place entirely as over-the-counter trades. It can be argued that rather than causing the Greek debt problems, CDS trading provided early signals about their degree of gravity. Even if credit swaps may not constitute the direct cause of such debt problems, they have the potential of accelerating the sequence of events. At the same time that CDS contracts provide protection against default risk, CDS spreads can be useful in conveying warning signals of looming debt crises. However, CDS trading can also be conducive to departures from market discipline and market transparency. Indeed, the CDS positions entitle the seller to insurance premium, under little transparency requirements given the absence of obligations to provide such information on balance sheets. Also, from the perspective of protection buyers, credit derivatives provide banks, a noted by Ashraft and Santos (2009), with "an opaque means to sever links to their borrowers, thus reducing lender incentives to screen and monitor." Thus, the CDS trades can indirectly promote complacency, and represent an enticing alternative to the conduct of prudent risk assessment, as the incentive for market discipline is arguably diminished.

There are increasing concerns that stronger regulation is likely to lead toward sluggish demand in the underlying bond market and weaker appetite for sovereign and corporate bonds. Potential buyers may refrain from financing government debt if CDS trading is significantly restricted. This argument rests on the premise that CDS trading is used essentially for risk-hedging purposes, which is not the case. Also, the supervision of CDS trades is shared between the Securities and Exchange Commission (CDSs on individual securities) and the Commodity Futures and Trading Commission (CDSs on indexes). Part of the regulatory uncertainty is also due to the absence of central clearing and settlements entity. The complexity of the regulatory issues in CDS trading intensifies as the debt crisis evolves with ramifications across the sovereign and corporate bond markets. Evidence that CDS spreads increase in association with the short-selling of the underlying stocks raise suspicions of market manipulation. Speculation over the creditworthiness of companies and the sustainability of government debt is not new. In order to contain these speculative activities, there is a tendency for regulatory authorities to prohibit short-sales. But, similar arguments to the asymmetric application of circuit-breakers can be also raised with respect to the prohibition of short-selling. From a long-term perspective, it is important to avoid reactive regulation and promote investor education as well as market integrity through the devise of tighter rules for transparency and information-sharing.

6. Conclusion

The adoption of new trading technologies, participation into new trading exchanges, and transactions of new financial instruments are essentially driven by the desire to gain competitive advantage. The new developments in the financial landscape tend also to be associated with higher market volatility. Indeed, market information about trading volumes, bid-ask quotes and order imbalances, can add to the level of uncertainty stemming from the arrival of new information about macroeconomic fundamentals or firm prospects. Under a fragmented marketplace, opaque trading structure, limited and filtered access to the best quotes, and inadequate supervision, there is arguably a stronger likelihood for market volatility to increase.

These new developments in the trading environment can thus pose new challenges for financial market regulation. Better technology has increased the speed of trading in financial markets, but it is financial regulation that seems to lag behind. There is a need for the regulatory framework to evolve in order to avoid the recurrence of sudden jumps in market volatility and market contagion. Technology has certainly provided the means for faster movements in prices and adjustments of quotes in both directions of the market. Thus, if market-wide and industry-wide single-stock circuit breakers are justified in bearish markets, then the same argument should apply for bullish markets as well. Arguably, a rapid increase in securities prices can itself provide an important signal of impending crisis. In this sense, circuit-breakers against rising prices may constitute preemptive means, useful in precluding the recourse to circuit-breakers against falling prices. The regulatory treatment of fast price movements is asymmetric, and market fairness would dictate that circuit-breakers apply in both directions.

There is a need to examine the impact of high-frequency trading on financial markets and individual investors, including issues related to trading patterns, trading programs, and investor's behaviour. A deeper understanding of the dearth of market liquidity and its replenishment process is useful in promoting the stability of financial markets. Given the fact that regulatory uncertainty adds to economic uncertainty, and affects thereby the beliefs and behaviour of investors, it is important that the regulatory environment serves the interests of all market participants on equitable basis, and ensures market transparency and market discipline. This is, in turn, naturally conducive to more orderly and less volatile markets.

References

Ashcraft, Adam B. and Santos, Joao, A.C. 2009, "Has the CDS market lowered the cost of corporate debt?" Journal of Monetary Economics, Vol. 56, No. 4, (May 2009), pp. 514-523.

Bank for International Settlements, Regular OTC Derivatives Market Statistics, May 2010.

Maghrebi, Nabil, 2009, "Reflections on the U.S. housing and credit crisis," Wakayama Economic Review, No. 351, (September 2009), pp. 23-41.

Schwartz, Robert, 2007, "Risk distribution in the capital markets: credit default swaps, insurance and a theory of demarcation," Fordham Journal of Corporate & Financial Law, Vol. 12, pp. 167-201.