

The role of designated market makers in the new trading landscape

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Designated market makers (DMMs) have traditionally been a source of liquidity for exchange-traded securities and financial contracts. Recent regulatory and technological developments, however, have changed the environment in which DMMs operate, raising questions about their place in the new trading landscape. This article discusses the role and challenges of DMMs in today's trading venues.

Introduction

A designated market maker (DMM) is an intermediary who has been contracted by a trading venue to stand ready to trade a financial security or contract against its own inventory. While other market participants, known as market makers (MMs), may also carry out this role on a voluntary basis, DMMs do so in a formal capacity and in a contractually agreed way.

Some financial markets, for example the market for foreign exchange and many markets for derivative contracts, rely almost exclusively on dealers to act as MMs. Others — such as the markets for equities — combine DMMs with a 'public limit order book' where any investor can be a liquidity provider. This article is about this latter type of market and the specific role of DMMs.

DMMs contribute to liquidity and price efficiency. Both of these are key ingredients of a well-functioning capital market: in their absence, investors fail to allocate capital to the entrepreneurs who will put it to best use. In extreme instances of illiquidity and price instability, market participants may flee capital markets, potentially compromising those markets over extended periods. To the extent that they help mitigate this risk, DMMs can contribute directly to financial stability.

DMMs have traditionally been an important component of the microstructure of trading venues worldwide.⁽²⁾ Almost all the stock exchanges of the major industrialised countries feature DMMs.⁽³⁾ The widespread and sustained existence of this role and its endurance over time is suggestive of its perceived usefulness in providing liquidity.

In the current trading environment, however, DMMs face various challenges resulting from a number of technological and regulatory changes. For example, many markets have become dominated by computer-based trading, often

executed at high speeds. As a result, DMMs face competition from high-frequency traders who act as *de facto* liquidity providers but have the option to enter and exit the market at will. At the same time, the appearance of new trading venues has dispersed traders and fragmented liquidity.

Market-making requires capital and so it is also impacted by broader changes in the regulatory landscape, including forthcoming changes in banks' capital requirements and proposed restrictions on proprietary trading. These changes will, of course, affect only DMMs and MMs that are subject to prudential capital regulation.

Together, these developments have challenged the business model of DMMs by eroding some of the benefits that they have traditionally enjoyed as a compensation for their services. In turn, this has led many to question whether DMMs are still relevant and necessary. Indeed, some exchanges have been diluting or eliminating some of DMMs' obligations. At the same time, market-making obligations are being built into new European market regulation,⁽⁴⁾ suggesting that the DMM debate is ongoing.

This article starts by discussing the concepts of liquidity and price efficiency and highlights the positive externalities associated with each. The next section describes the basic features of market-making. The article then explains how DMMs can uphold liquidity and price efficiency and discusses

(1) The authors would like to thank William Abel, Satchit Sagade and Filip Žikės for their help in producing this article.

(2) Market makers (also known in the past as 'jobbers') were, for example, active in the last quarter of the 18th century in the market for English government consols, where certain brokers seemed to have been profiting from the difference between the bid and offer prices of these consols (see Attard (2000)). The London Stock Exchange has employed official market makers at least since the beginning of the 19th century (Neal and Davis (2006)).

(3) Only the Tokyo Stock Exchange relies exclusively on public order flow for liquidity in stocks. See Charitou and Panayides (2009).

(4) The issue of DMM obligations is being discussed by European regulators in the context of the revision of the Markets in Financial Instruments Directive.

the risks faced by DMMs. The following sections set out some of the challenges faced by DMMs in today's trading landscape and discuss some possible policy responses to these. The final section concludes.

Liquidity, price efficiency and externalities in financial markets

A well-functioning capital market is one that efficiently allocates resources in the economy: it brings together investors and entrepreneurs so that capital is allocated in a way that balances risks and returns. At the 'micro' level of security trading, this implies that trading costs are moderate⁽¹⁾ and that there is always an option to trade so that market participants need not worry about trade execution delays. Such a market is considered **liquid**. At a more 'macro' level, it implies that prices reflect fundamental values so that capital flows to investments with higher expected returns for a given amount of risk. Such a market is considered **efficient**. A well-functioning market, then, is associated with both liquidity and efficiency.

Both liquidity and price efficiency have positive externalities. Liquidity, for example, is associated with what economists call a 'network externality': the more liquid a market is, the easier it is to trade in that market — and so the more attractive that market becomes to individuals who want to trade. This further increases its liquidity. Price efficiency, on the other hand, has the properties of a public good because prices contain information that is both valuable and freely available to everyone: a trade that contributes to price discovery does not only benefit the counterparties involved but also the rest of the investing public.⁽²⁾ Price efficiency can also be linked to the level of investor participation: the greater the number of informed market participants, the larger the amount of information that prices incorporate.

To the extent, then, that liquidity and efficiency are associated with positive externalities, the private benefit of market participants does not capture the full social benefit of an efficient and liquid market. In other words, market participants are not compensated for the wider benefits that their participation brings about.

Standard economic thinking would suggest, then, that a *laissez-faire* regime will fail to provide the right incentives for market participants to contribute to liquidity and efficiency at a level that maximises social welfare.⁽³⁾ This justifies some kind of policy intervention to ensure that markets remain liquid and efficient at a socially optimal level. This holds under 'normal' market conditions, but becomes more obvious in 'abnormal' (or 'stressed') market conditions where liquidity dries up and efficiency is compromised.

Such liquidity dry-ups and price dislocations can result from a number of factors. Some of these are listed below. In all cases, markets become one-sided: sellers fail to find buyers unless they accept unusually large price discounts, and the liquidity dry-up brings about a price dislocation.

- (a) **Asynchronous trading needs:** A standard friction inherent with trading is that counterparties do not always arrive at the market at the same time. This means that they may not be able to find each other and conclude a trade. This cause of illiquidity is typical for thinly traded assets, for example, small-capitalisation stocks.
- (b) **Investor sentiment:** In some cases, large price dislocations reflect a major revision of the fundamental value of assets. In other cases, however, they can result from order imbalances caused by changes in investor sentiment. An example of this was the burst of the 'dotcom' bubble in March 2000.⁽⁴⁾
- (c) **Price feedback loops:** There are also various ways through which price pressures can become self-reinforcing. And, depending on the mechanism that generates them, these feedback loops can affect a single or multiple markets.⁽⁵⁾ Here we give an example of each case.

Risk feedback loop: This feedback loop may occur when institutions with acute funding needs hold similar tradable assets. If they sell these assets at the same time — as they attempt to satisfy their funding needs — the market for these assets may become one-sided and the value of the assets will drop. This, in turn, may force the institutions to sell even more of these assets thus creating a feedback loop by further exacerbating market illiquidity and the initial funding liquidity problem.⁽⁶⁾ **Figure 1** illustrates this feedback loop.

Cross-market feedback loop: This is a type of feedback loop that involves multiple related markets (for example derivatives and underlying securities or indices and individual index components): an initial liquidity shock — an order imbalance — in market A causes a price dislocation in that market, rendering prices less

(1) Trading costs include broker and transaction fees, the bid-ask spread as well as the potential price impact of a given trade.

(2) An illustration of the value of information produced by trades is the usage of interest rate swap prices to construct the term structure of interest rates which in turn is used to price corporate bonds, mortgage-backed securities and other credit instruments. See Fleming (2000).

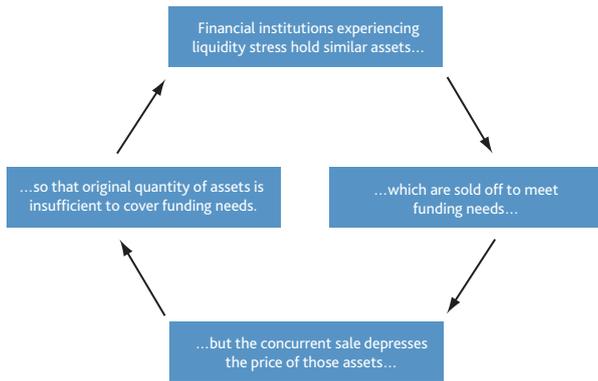
(3) See Dodd (2002) for a comprehensive discussion of the various externalities and the rationale for regulation in financial markets in general.

(4) The 'dotcom' bubble was a speculative bubble that occurred between 1997 and 2000 in the stock markets of most industrialised nations and was primarily driven by the communications, technology and internet sectors. In the United States, the NASDAQ composite index peaked on 10 March 2000 before falling by around 10% in the following ten days.

(5) For a detailed description of the types of price feedback loops that may arise, see Zigrand, Cliff and Hendershott (2012).

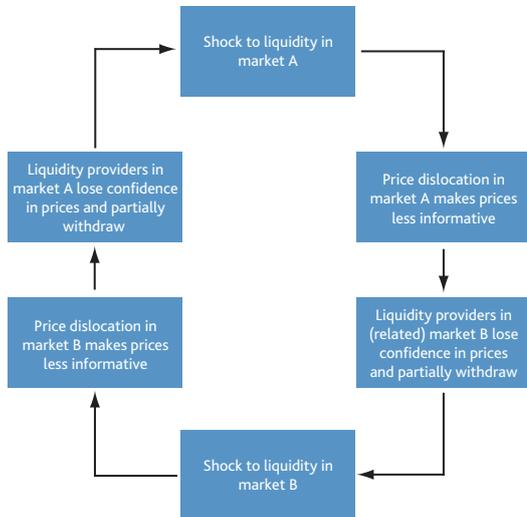
(6) See Brunnermeier and Pedersen (2009) for a theoretical exposition. Khandani and Lo (2011) find evidence of such a risk feedback loop among professional US investors in the summer of 2007.

Figure 1 A 'risk' feedback loop



informative. This causes liquidity providers of a related market B to be less certain about the prices they should be quoting in market B and, as a result, to withdraw partially from that market. This makes market B vulnerable to price dislocations and its prices less informative. This then feeds back into market A, where liquidity providers become more uncertain about prices and further reduce liquidity provision.⁽¹⁾ Figure 2 illustrates this feedback loop.

Figure 2 A 'cross-market' feedback loop



(d) **Technological mishaps:** The rise in the use of computers and algorithms in the trade process means that trading is increasingly prone to algorithmic or other so-called 'fat finger' errors. In practice, this means that large quantities of a security or financial contract may be traded within a very short period of time, causing the market to become one-sided and prices to move sharply.

Importantly, the factors listed above can reinforce each other. Indeed, the 6 May 2010 'Flash Crash' in the US markets — when the Dow Jones index dropped by around 9% and then

recovered these losses in the space of a few minutes — has become the archetypal example of what can go wrong in the modern trading environment. There are a number of potential explanations for the Flash Crash, involving different kinds of technological failures that may have triggered different types of feedback loops.⁽²⁾ The increasing number of 'mini crashes' in equity markets as well as foreign exchange and commodity futures markets, where trading is becoming increasingly computerised, suggests that technological mishaps combined with other factors are a genuine source of liquidity dry-ups.⁽³⁾

The 'microstructural' arrangements that trading venues have in place can play a role in reducing the loss of liquidity and the resulting mispricing of assets. These arrangements may include circuit breakers, price limits, call auctions and designated market-making schemes. The rest of the article focuses on the efficacy and usefulness of the latter.

What is a designated market maker?

Market makers (MMs) are intermediaries, with an inventory in a given security or financial contract, who continuously provide price quotes at which they are willing to buy and sell that security or contract. They make money by buying low (at the 'bid' price) and selling high (at the 'ask' price). In other words, MMs are rewarded for giving investors the option to trade against them on a continuous basis; that is, they are a source of liquidity.

MMs provide liquidity by posting *limit orders* — commitments to buy or sell a certain amount of financial securities or contracts at a specific, quoted, price. By listing these orders on the so-called 'public limit order book', they *supply* liquidity by giving investors the option to trade. MMs may also use *market orders*. These are executed against standing limit orders with a price priority, meaning that the limit orders with the best quoted prices are executed first. By being executed against standing limit orders, market orders effectively decrease the available trading options and, as such, *consume* liquidity.⁽⁴⁾

MMs are active in stock exchanges and various other markets, including those for futures and options, government and corporate bonds, over-the-counter derivatives and foreign exchange products. They may be the only sources of liquidity, or they may complement a public limit order book on which anyone can provide liquidity.

(1) See Cespa and Foucault (2012) for a theoretical exposition.
 (2) For the official account of the 6 May 2010 Flash Crash, see CFTC-SEC (2010). For an alternative account, see Nanex (2010).
 (3) See, for example, Hwang, Kisling and Mehta (2012) for a description of recent mini crashes in the shares of IBM and Coca Cola, and Meyer (2011) for a description of a crash in ICE-traded cocoa futures.
 (4) In markets with a public limit order book public investors, alongside MMs, can submit limit orders and market orders.

In some markets, MMs act voluntarily, attracted by the opportunity to profit. But in many cases, market-making is institutionalised: MMs enter into a formal agreement either with the trading venue or with the firm whose securities MMs are to trade. These designated market makers (DMMs) undertake to provide their services in a continuous and consistent manner in exchange for certain benefits and rewards. Their obligations may vary from one market to another, but several basic obligations are common. These are:

- **Trade continuity:** obligation to quote prices for a fixed part of the trading day.
- **Maximum spread:** obligation to maintain a bid-ask spread that does not exceed a pre-specified limit. In equity markets, the maximum spread is often a fixed percentage of the stock price.
- **Price continuity:** obligation to avoid large quote revisions.⁽¹⁾
- **Minimum quoted size:** obligation for quoted price to be valid for a minimum number of shares/contracts.

These obligations are intended to enhance the liquidity and efficiency of the market and the next section explains in more detail how this is achieved. By observing these rules, however, DMMs lose money under certain market conditions. Therefore, in return for fulfilling their obligations, DMMs are typically rewarded in one or more of the following ways:

- **Monetary rewards:** they might be excused from trading fees and/or earn a stipend.
- **Market power:** they might be granted market power in the sense that there is a limited number of DMMs active in each security or contract.
- **Other benefits:** they might be allowed to have an advance look at all incoming orders on the limit order book. This benefit enables them to better assess demand and supply, in the immediate future, and extract useful information about the market before posting their own quotes.⁽²⁾

As an illustration, the box on page 347 lists the obligations and benefits of DMMs on the various London Stock Exchange platforms.

In economic terms, then, a DMM scheme effectively provides **intertemporal liquidity insurance:** market participants pay DMMs an insurance premium in good times in return for some degree of trade and price continuity in bad times. This means that DMMs will usually be making money from the bid-ask spread and the various benefits listed above. At times of high price volatility, however, their obligations are likely to bind and these are times when they are likely to lose money.⁽³⁾ Provided, however, that the present value of their expected income exceeds the present value of their losses, being a DMM will be a profitable and viable business activity.

Why are DMMs useful and what risks do they take?

The role that DMMs fulfil

DMMs' **trade continuity** obligation solves the problem of asynchronous trading needs, highlighted in the first section of this article. They solve this matching problem by allowing buyers and sellers to trade against the DMMs' inventory.⁽⁴⁾ In equity markets, synchronisation is mostly a problem with small-capitalisation stocks which may have only a few trades per day. It is for this reason that, in many exchanges, trading in 'small-cap' stocks is almost exclusively facilitated by DMMs.

In addition to providing liquidity on a continuous basis to 'chronically' illiquid securities or contracts, DMMs can also be useful in markets for securities or contracts that have a large, liquid, order book. This is because, as explained above, even markets that are usually liquid can experience episodes of acute order imbalances and extreme price dislocations. In these circumstances, DMMs can contribute to maintaining price efficiency through their **price continuity** obligation. In case of a sizable intraday price swing, this means that DMMs will have to trade against the price trend and take losses. This, in turn, implies that they may delay the price change and thus reduce intraday volatility.

But is this 'volatility dampening' a good thing? On the one hand, one could argue that it hinders price discovery whenever prices move in response to changes in fundamentals, such as news about a company's future profitability. On the other hand, as mentioned in the second section, large price swings may also result from changes in investor sentiment, from some unintended feedback loop or from an algorithmic error. In these instances, volatility dampening effectively puts the breaks on the market and gives more time to investors trading on economic fundamentals to step in and correct the mispricing before a large price dislocation can materialise. Reducing the frequency and severity of price dislocations that are not justified by fundamentals can then boost investor confidence and translate into higher participation rates and increased liquidity and efficiency over a longer time horizon. **Figure 3** illustrates this beneficial impact of DMMs on liquidity and price efficiency. Overall, *properly calibrated* DMM schemes can help prevent the virtuous circle of efficiency and liquidity from degrading into a vicious circle of mispricing and illiquidity.

(1) For example, if the price of a stock is to drop from £4.00 to £3.85 and the minimum amount by which the price can change (the 'tick size') is £0.05, this rule would require the DMM to buy a minimum amount of shares at £3.95 and £3.90. This would effectively slow down the price movement.

(2) For example this is a benefit that New York Stock Exchange (NYSE) 'specialists' (the old name of NYSE DMMs) used to have until 2008.

(3) The 'price continuity' rule requires that a DMM trades for some time against the price trend (for example, being required to buy when the price is falling). If the price trend ends up being significant and persistent then the DMM will lose money on these trades. More generally, DMMs lose money when they are constrained by their market-making obligations (Panayides (2007)).

(4) See Demsetz (1968).

Designated market-making on the London Stock Exchange

Becoming a DMM

Any London Stock Exchange (LSE) member who can commit to the DMM obligations described below can apply and be admitted as a DMM. The DMM suitability criteria are otherwise the same as the exchange membership criteria.

Obligations

The LSE consists of multiple market structures. Most of them feature DMMs whose obligations vary depending on which market structure they are present in.

- **Hybrid SETS market:**⁽¹⁾ A DMM must maintain an executable quote, in each security for which it is registered, for at least 90% of the time every day and for the duration of the closing auction until market close, including any extensions. DMMs do not have to maintain a quote during the opening auction or if continuous trading has been suspended. The 10% of the time when the DMM has the right to stop providing quotes is of the DMM's choosing. DMMs are also subject to maximum spread and minimum quote size rules, the parameters of which vary across stocks.

- **Quote-driven SETSx and SEAQ markets:**⁽²⁾ A DMM must always maintain a firm quote in each security for which it is registered. However, DMMs are not subject to maximum spread rules.
- In all cases, a DMM may not de-register from a security within three months of its initial registration or re-register within three months of de-registration with respect to the same security. This is to prevent DMMs from withdrawing when markets are stressed.

Benefits

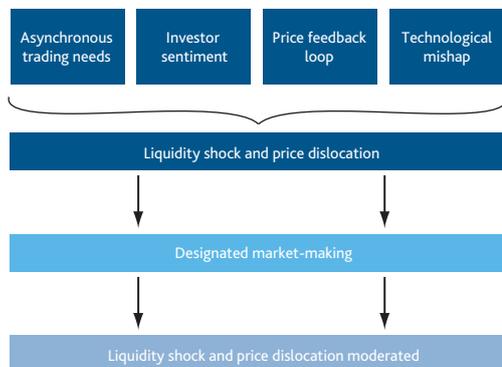
LSE DMMs have the following benefits:

- They incur no trading fees.
- On the request of a DMM, the exchange may suspend or vary market-making obligations (relax spreads) when prices are volatile.

(1) SETS is the main electronic order book of the LSE. It is where the FTSE 100 and FTSE 250 stocks, among others, are traded.

(2) SETSx is an LSE trading service for stocks less liquid than those traded on SETS. It features a periodic electronic auction book along with DMMs. SEAQ is the LSE's venue for trading stocks of smaller market capitalisation. It does not have a public limit order book and instead liquidity is exclusively provided by DMMs.

Figure 3 Illustration of the role of DMMs in upholding liquidity and price efficiency



It is perhaps not surprising, then, that the empirical evidence suggests that the introduction of DMMs in various exchanges has been associated with significant reductions in liquidity premia (defined as the additional return demanded by investors for holding a less liquid asset), especially in less liquid securities or contracts. The box on page 348 briefly reviews this evidence.

While DMM schemes improve market quality, market-making can only be a viable business if it is profitable. One problem in assessing this, however, is that DMM profits and losses can be volatile and difficult to predict, especially at times of stress. The next subsection discusses the risks associated with market-making.

Risks that DMMs take

Market-making is an inherently risky business. Principally, there are two types of risks that DMMs face: the first is **adverse selection risk** — the risk of trading against informed investors. Informed investors can more accurately predict how prices will move in the immediate future. Thus, following a trade, prices usually move in the opposite direction from that which DMMs would like (for example, prices drop after a DMM buys a financial contract from an informed trader). This forces DMMs effectively to trade at a negative spread — buy 'high' and sell 'low' — which loses them money. It is for this reason that DMMs prefer, whenever possible, not to trade with informed traders.

The second type of risk — which is more relevant for this article — is **inventory risk**. When prices fluctuate, so does the value of the DMM inventory — and the larger the inventory, the larger the value at risk for the DMM. It is therefore not surprising that in stressed market conditions, DMMs may avoid taking on additional risk and instead try to minimise their activity and market exposure. Nevertheless, despite reducing their activity, DMMs will often continue to play an important role in providing liquidity. This is also illustrated in the box on pages 350–51, which shows the risks borne by a group of DMMs during a period of market stress and how these risks affect their market-making behaviour.

Occasional but severe market swings in DMMs' profits can deplete their capital and drive them out of business. Trading

Evidence on the impact of introducing DMMs into a stock market

What happens to stock prices and liquidity when a DMM is introduced into a stock market? Over the years, exchanges around the world have introduced various types of DMMs and these changes have been used by academics as natural experiments for assessing the impact of DMMs on market conditions.

Overall, the academic evidence suggests that the market perceives DMMs as 'liquidity enhancing', especially for less liquid stocks. Several studies confirm that upon the introduction of some kind of DMM regime, there is a positive price reaction. Since this is usually accompanied by an improvement in liquidity measures, the price reaction is interpreted as a reduction in the liquidity premium that the market was demanding under the previous trading regime.

For example, Venkataraman and Waisburd (2007) empirically test the impact of introducing a DMM to a number of less actively traded stocks in the Paris Bourse between 1992 and 1998. Prior to the introduction of a DMM, these stocks traded exclusively on the limit order book. The authors find that upon the announcement of the DMM introduction, stocks experienced both a cumulative abnormal return⁽¹⁾ of 5% and a significant decline in order book imbalances.

Menkveld and Wang (2009) examine the stock price reaction of 74 Euronext-traded, small, Dutch firms which contracted with DMMs that, in turn, committed to supply liquidity throughout the trading day. Contracting with a DMM was introduced for small-cap stocks after the trading model of the Paris Bourse was adopted by the Amsterdam Stock Exchange in October 2001. The stocks in their sample experienced an average abnormal return of about 3.5% in a fifteen-day window around the announcement or effective day of a DMM introduction. Furthermore, the authors find that the DMMs participate in more trades and suffer losses when their contractual obligations are binding. This corroborates the fact that the observed price reaction around the announcement and effective dates reflects a reduction in the liquidity premium.

Similarly, Anand, Tanggaard and Weaver (2009) study the effect of liquidity providers (LPs) on the Stockholm Stock Exchange. They find that LPs are contracted for stocks that experience low volumes, wide spreads and higher information asymmetries. LPs trade against market movements and when spreads are wider. Firms that announce the introduction of an LP experience a cumulative abnormal return of about 7% in the ten days after the announcement of the LP contract. Similar conclusions are reached by Anand and Venkataraman

(2012) who find that DMMs on the Toronto Stock Exchange tend to stabilise prices and lower execution uncertainty.

Interestingly, however, increasing the number of DMMs beyond some level, for a given stock, may bring about only marginal improvements in liquidity. Using a sample of stocks traded on the Xetra trading platform of the Deutsche Börse, Hengelbrock (2008) finds that increasing the number of DMMs beyond two has limited impact on liquidity.

Finally, the academic evidence suggests that listed companies themselves also perceive DMMs to be liquidity enhancing and thus to be contributing to a lower cost of capital. Using data from the Oslo Stock Exchange, Skjeltorp and Ødegaard (2010) analyse the reasons why listed firms pay a DMM to maintain an orderly market in the firm's stock. They find that the decision to hire a DMM is related to the probability that the firm will interact with the capital market in the future. In particular, since a DMM improves the stock's liquidity and therefore reduces the cost of capital, firms who plan to go to the market in the future have an incentive to hire a DMM. Consistent with this explanation, the authors find that firms which hire DMMs have better investment opportunities and they indeed tend to issue equity within a year after the DMM deal.

(1) Abnormal returns are returns in excess of what would be expected for the amount of risk that a given security has.

venues therefore do not typically require their DMMs to quote firm prices at *all* times. Instead, the expectation is that, at times of extreme stress, DMMs will withdraw to protect their capital base. For this reason, exchanges usually mandate that DMMs should provide firm quotes for a pre-specified portion of the trading day; and it is up to DMMs to decide which portion of the day they will abstain from their market-making function. Exchanges may also specify that DMM obligations do not apply during a trading halt.

Overall, DMMs cannot guarantee liquidity provision in *all* circumstances and in extremely stressed market conditions they may have no option but to withdraw from a given market altogether. This means that trading venues need additional tools to cope with extreme market stress. Some examples of these are listed in **Table A**. But by contributing to greater liquidity in most circumstances — including times of moderate stress — DMMs can *ex-ante* minimise the frequency and severity of liquidity dry-ups and price dislocations thus improving the overall quality of the market.

Table A Tools used by exchanges to manage market stress

Tool	Description
Cap on the cancellation to order ratio	<i>Ex-ante</i> tool; market participants cannot exceed a certain ratio of orders cancelled to orders executed. Imposes a limit on message traffic.
Message traffic fee	<i>Ex-ante</i> tool; market participants incur a cost if/when they exceed an upper limit on message traffic. Discourages excessive order submissions and cancellations.
Price limit	<i>Ex-ante</i> tool; constrains trading to within a pre-specified, dynamically adjusted price band. Rejects any trades that would result in prices outside of that band.
Short-sale restrictions	<i>Ex-ante</i> tool; exchanges may prohibit or constrain short sales under various circumstances. For instance, long-sellers may be given priority over short-sellers or short-selling may be prohibited unless executed at a price higher than the most recent price.
Trade halt	<i>Ex-post</i> tool; suspends trading when prices move outside a pre-specified price band within a pre-specified time period.

On top of the traditional risks associated with market-making, the emergence of the new trading landscape — characterised by high-frequency and fragmented trading — has brought about new challenges to DMMs. These are discussed in the next section.

What are the challenges to DMMs in the new trading landscape?

Over the past decade, financial markets have changed in profound and important ways. Regulation ‘National Market System’ (or ‘Reg NMS’) of 2005 in the United States and the ‘Markets in Financial Instruments Directive’ (or ‘MiFID’) of 2004 in Europe paved the way for the emergence of new trading venues. These led to increased competition in terms of the number of trading venues, but this has also had the effect of fragmenting liquidity. In addition, technological developments have made it possible to trade automatically using algorithms at ever-increasing speeds.

These regulatory and technological developments have eroded the relative value of the privileges that DMMs have traditionally enjoyed. This has happened in a number of ways:

- (a) **Trading fees and stipends:** Many exchanges now employ ‘maker-taker’ pricing schemes that reward any participants who *provide* liquidity by posting limit orders and tax those who *consume* liquidity by executing market orders. Thus, the benefit of having trading fees waived and/or receiving stipends — that DMMs had uniquely enjoyed in the past — has, in relative terms, diminished.
- (b) **Market power:** The market power that DMMs have traditionally enjoyed, both across and within venues, has also been eroded. Fragmentation in trading has brought about competition for market-making *across* venues, shrinking DMM profit opportunities in the traditional venues. Furthermore, technological improvements have made it possible for a wide range of market participants to execute market-making strategies easily and cheaply, increasing market-making competition *within* venues. This has been reflected in the steadily decreasing bid-ask spreads over the past ten years in the world’s largest equity markets.⁽¹⁾ Both fragmentation and unofficial market-making have meant that exchanges can no longer guarantee the protection from competition that they had afforded DMMs in the past as part of the contractual arrangement.
- (c) **Access to limit order book information:** Fragmentation of markets has reduced the value of having exclusive access to order flow information of a given market that some DMMs have traditionally enjoyed. In the fragmented modern landscape, a significant fraction of order flow has moved to alternative exchanges thus becoming invisible to DMMs in the primary exchanges.

Together, these developments have rendered designated market-making less attractive as a business activity. Corroborating this view, there is evidence that, in some markets, DMMs are less profitable than in the past and that their trading activity has diminished in relative terms.⁽²⁾

Moreover, the *de facto* high-frequency market makers that have entered markets following technological advances are free to enter or exit the market at will. This allows them to compete with DMMs when market-making is profitable but withdraw altogether from the market when it is not, leaving DMMs to bear the brunt of market-making obligations in a stressed market.

(1) See, for example, Angel, Harris and Spatt (2010), who show that effective spreads on NYSE and NASDAQ-listed stocks have fallen on average by around 50% over the past ten years.

(2) See, for example, Hendershott and Moulton (2010).

Designated market-making in liquid stocks during market stress

Using actual transactions data, this box examines and compares the behaviour of a group of DMMs under different market conditions. In particular, the charts in this box show how a group of stock market DMMs behaves during a 'volatile' and a 'calm' week, in their trading of six otherwise liquid stocks. The two weeks are labelled 'volatile' and 'calm' based on the standard deviation of a broad market index. For confidentiality reasons, we report figures aggregated over multiple DMMs and stocks. Furthermore, we do not report the venues, the names of the stocks, the DMMs or the exact dates on which these charts are based.

Charts A and B show the collective cumulative intraday profits and losses of this group of DMMs during the 'volatile' (Chart A) and the 'calm' (Chart B) week. Each of the five lines represents a different day of the week. The differences between the two weeks are clear and sizable: market volatility exacerbates both DMM profits and losses, suggesting that market-making can become a lot riskier during times of market stress. Furthermore, the fact that DMMs register larger losses during the 'volatile' week suggests that DMMs trade against the price trend and help dampen volatility even in liquid stocks like the ones in our sample.

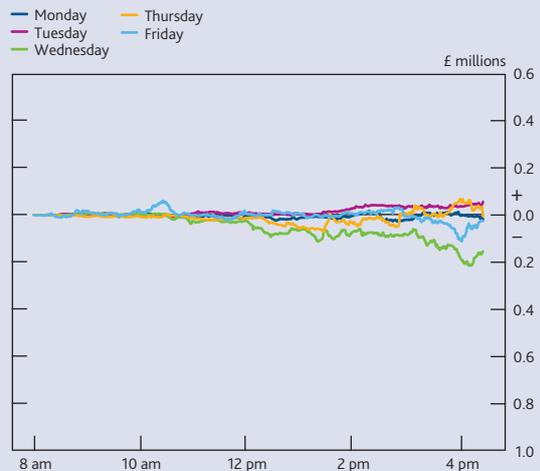
Chart A Intraday profits and losses of DMMs during a 'volatile' week



Sources: Financial market data and Bank calculations. For confidentiality reasons, the trading venues, names of the stocks and exact dates for the data on which these charts are based are not reported. Figures are aggregated over multiple DMMs and stocks.

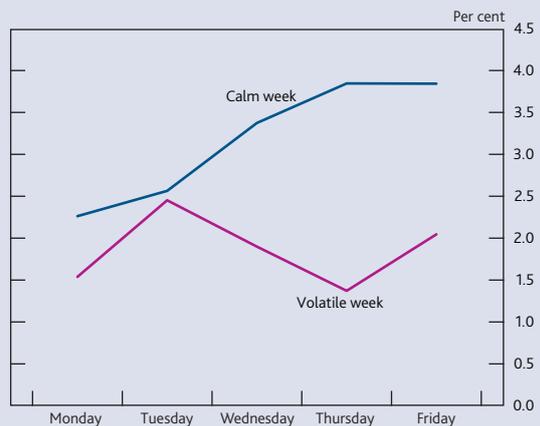
It is perhaps not surprising, then, that the DMMs scale down their liquidity provision during times of stress. DMMs provide liquidity by posting limit orders — that is, by posting orders that rest on the order book for other market participants to trade against. Limit orders are matched with incoming market orders which are executed immediately at the best available price. Chart C shows that the amount of passively executed

Chart B Intraday profits and losses of DMMs during a 'calm' week



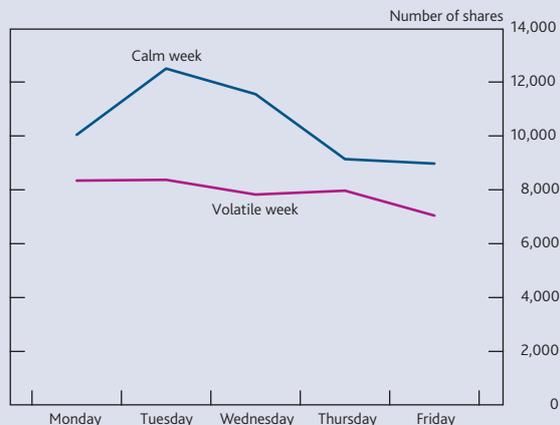
Sources: See Chart A.

Chart C Passively executed volume by DMMs as a percentage of total trading volume (executed by all market participants), during a 'calm' and a 'volatile' week



Sources: See Chart A.

Chart D Average trade size (in number of shares) of DMMs during a 'calm' and a 'volatile' week



Sources: See Chart A.

volume (ie the volume traded via limit orders), attributable to DMMs, drops, relative to total trading volume, during the 'volatile' week. This is partly driven by the fact that DMMs

trade in smaller-sized orders during the 'volatile' week (Chart D).

DMMs may themselves use market orders when they want to make quick adjustments to their inventory. The need to do so will most likely arise in stressed market conditions. This is confirmed in our data: Chart E shows that the DMMs in our sample tend to carry out an increased fraction of their trading via market orders (which shows up as a decreased fraction of passively traded volume) during the 'volatile' week, thus shifting to an extent from pure liquidity provision to active inventory management. This is another reason why the share of passively executed volume attributable to the DMMs drops during the 'volatile' week.

But the figures also show that although DMMs face large risks during the 'volatile' week and although they do (to some extent) scale down their activity, they largely remain active in the market and continue to provide liquidity.⁽¹⁾

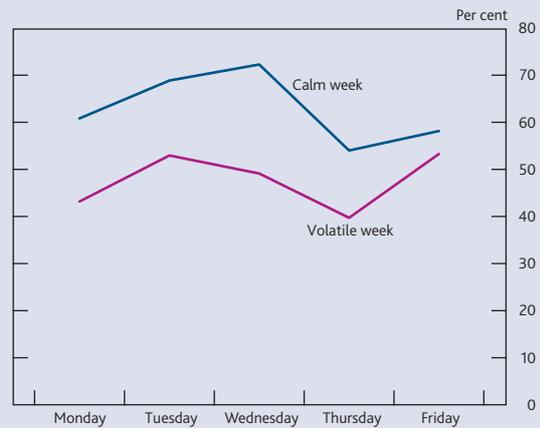
Looking ahead, incentives to offer market-making services in general, and designated market-making in particular, may be further affected by upcoming regulatory changes. Banks will face new capital requirements on market and counterparty credit risk. These requirements are likely to lower the return on equity from market-making for banks that engage in such activities. However, the increased capital should also enhance banks' ability to withstand price moves and to provide liquidity to markets during periods of stress. Proposed changes in the structure of the banking sector, aimed at reducing proprietary trading activities, may also affect the ability of banks to act as market makers.⁽¹⁾

Policy implications: what is the way ahead?

Policymakers are actively debating the role of market-making obligations. On the one hand, the value of DMM privileges has been eroded, raising questions about their ability to provide liquidity, particularly during times of market stress. On the other hand, the social benefits associated with market-making remain valid — perhaps even more so in markets where high-frequency traders act as informal market makers. What, then, are the policy options?

One potential response to the increased set of challenges that DMMs now face is to ease their obligations. This approach was followed by the New York Stock Exchange in 2008, when it ceased having traditional 'specialists' and replaced them with DMMs that had both fewer obligations and fewer privileges. But the drawbacks of this approach became apparent during the 6 May 2010 Flash Crash when DMMs posted 'stub' quotes

Chart E Passively executed volume as a fraction of total DMM trading volume during a 'calm' and a 'volatile' week



Sources: See Chart A.

(1) Since we do not observe the DMMs' quoting behaviour we cannot directly assess DMMs' liquidity contribution and presence in the market. Instead, we infer DMM activity from the actual transactions in which DMMs participate.

that were never meant to be executed, thus effectively withdrawing from the market.⁽²⁾

An alternative solution is to upgrade the benefits of DMMs — for example by increasing DMM compensation or by giving priority to their orders — while keeping their obligations intact. Proponents of this option point to the improvements in market quality that DMMs can bring about in both normal and stressed market conditions and the positive externalities associated with these improvements.

In designing DMM arrangements, it is important to recognise the risks associated with market-making. This can be achieved by aligning and co-ordinating DMM obligations and benefits with other microstructural features of the exchange in which they operate. For instance, exchanges can specify what DMMs can or cannot do during trade halts and during the auctions that follow such halts. They can also specify what fraction of their orders DMMs can cancel and how quickly they are allowed to do that.

Existing DMM contracts acknowledge that DMMs are unlikely to be present at times of extreme market stress. Yet this is precisely the time when their liquidity contribution would be most needed. Exchanges therefore need to use additional tools during such periods in order to manage stress.

(1) See page 37 of the December 2011 *Financial Stability Report*.

(2) During the Flash Crash some DMMs posted bid prices as low as US\$0.01 and ask prices as high as US\$99,999.99. Thus, DMMs fulfilled their 'trade continuity' obligation without effectively being present in the market. The 'price continuity' and 'maximum spread' obligations that would have likely prevented this from happening had been removed in 2008. Following the Flash Crash, however, the Securities and Exchange Commission reinstated the maximum spread rule.

A related policy question surrounds *who* should pay for DMMs' benefits. Conceptually, the following (non-exclusive) options are available:

- **Market participants:** Market participants benefit directly from the improvements in liquidity and efficiency that DMMs bring about. They could therefore bear some of the cost of a DMM (effectively in the form of wider spreads).
- **Listed firms:** In the case of equities, the introduction of a DMM has been shown to improve liquidity significantly and therefore reduce the premium that investors demand from a firm's stock. This lowers the firm's cost of capital and increases its value. Therefore, listed firms could also bear some of the cost of supporting a DMM. This is a model that has been successfully tested in the Swedish and Norwegian stock markets.⁽¹⁾

Conclusion

This article has explained that DMMs with well-designed obligations can play an important role in supporting liquidity and price efficiency in order-driven markets. By committing to buy and sell using their own inventory, DMMs allow market participants to trade in a timely manner and resolve the synchronisation problem that arises in less liquid markets. And by providing price continuity during times of stress, DMMs can also help to make markets that are normally liquid more resilient, efficient and ultimately more attractive to investors. In other words, they can act as the first line of defence when liquidity and price efficiency are challenged.

Today, DMMs face particular challenges, resulting from changes in the trading environment and from regulatory changes. If correctly and fairly designed, market-making schemes can incentivise DMMs to commit to their obligations, while limiting risks to the DMMs in extremely stressful market conditions. Economic rationale suggests that this will also be welfare enhancing.

(1) See Anand, Tanggaard and Weaver (2009) and Skjeltorp and Ødegaard (2010).

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