The Microstructure of Multiple-Dealer Equity and Government Securities Markets: How They Differ*

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Until recently, much of the research concerned with the microstructure of securities markets had focused on equity markets. It should therefore come as no surprise that market microstructure research has been heavily weighted towards the development of *asymmetric information models*, in which a subset of market participants have private information about the expected value of an asset. The preponderance of asymmetric information models results from the bias in market microstructure research towards the price-discovery process in equity markets. That a stock's fundamental value will likely depend on factors that are idiosyncratic to the firm, and that changes in these factors are not disseminated to the public on a continual basis, guarantees a dominant role for asymmetric information in the trading process.

Across developed economies, one observes two predominant types of equity markets: order-driven, auction-agency markets and dealership markets. Order-driven markets or order-book markets, such as the Paris Bourse, are structured as (two-sided) auctions in which there is no intermediary. Incoming orders submitted to the market are either "matched up" with offsetting standing orders previously submitted to the market and placed in an electronic order book, or they are placed in the book until an offsetting order is submitted. Although a considerable amount of research has examined

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both types of equity market structures, much of the equity *dealership* models have focused on a particular equity market, the New York Stock Exchange (NYSE).[1] Because the NYSE is a specialist (single-dealer) market, most of the dealership models in the market microstructure literature assume a single-dealer equity market rather than a competitive *multiple*-dealer market such as Nasdaq in the United States and the London Stock Exchange (LSE). Unlike single-dealer markets such as the NYSE, market-makers in multiple-dealer markets must compete directly for their share of the order flow.[2] Moreover, competing dealers have the option of laying off unwanted inventory positions by trading with other dealers. In this way, they are able to share their inventory risks across the market-maker community, rather than being forced to rebalance their inventories by waiting for the arrival of public investor orders, as is usually the case for the NYSE specialist.

The dearth of microstructure research on multiple-dealer markets has been reversed recently with the work of Lyons (1995, 1996, 2001); Saporta (1997); Vogler (1997); Hansch, Naik, and Viswanathan (1998); Reiss and Werner (1998); and Viswanathan and Wang (2000, 2002). An interesting result of this recent work is that the inventory management behaviour of dealers plays an important role in these markets, both in terms of the price-discovery process and in the provision of market liquidity. And this result revives a second strand of microstructure research known as *inventory models*, where dealers adjust their quote and trading behaviour to restore inventories to a desired level. The innovations brought forward by this line of research assume that dealers are risk-averse and that they trade in a strategic manner to extract information from other dealers.

What is striking in the field of market microstructure research is how little work has been done on the microstructure of bond markets. This lack has persisted in spite of the size and importance of sovereign government securities (GS) markets, which are usually the largest segment of a developed country's fixed-income or bond market. Fortunately, GS markets in most developed countries are structured as multiple-dealer markets, and they function in many ways like multiple-dealer equity markets, which recent research has examined. However, there remain several important differences between GS and equity dealership markets that may make

1. The NYSE is, in fact, a hybrid market combining order-driven and (single) dealership structures into one trading system.
2. Specialists on the NYSE also face competition of a similar nature. They must compete with the order book, which lists all standing limit orders. However, the competition is, to some extent, on the specialist's terms. That is, since the specialist observes all the order flow for the stock (including that flowing to the order book), the specialist can set the bid and ask price based on this knowledge.

results garnered from the recent research inapplicable to GS markets. One purpose of this paper is to examine the differences between equity dealership markets and GS markets in order to better understand the factors affecting the liquidity and efficiency of GS markets. As discussed in Gravelle (1999) and Bank for International Settlements (2001), well-functioning GS markets play a key role in the maintenance of a stable financial system.

The paper begins by examining the differences between intrinsic features of equity and GS securities, such as the predominance of public versus private information, maturity characteristics, and hedgeability. Although it is natural to assume an asymmetric information trading environment for equity markets, this cannot be assumed with GS markets. Prices for GS form the term structure of the underlying risk-free interest rates. These rates, in turn, depend on macroeconomic factors about which investors will not have private information. In GS markets, private information about the asset's (expected "fundamental") value, what Cao and Lyons (1999) define as payoff-relevant private information, is likely to play a relatively minor role in the trading behaviour of agents. Thus, one of the differences between equity and GS is the amount of payoff-relevant private (or insider) information that is embodied in each type of security. One can safely assume for modelling purposes that GS traders hold zero payoff-relevant private information, while equity securities traders hold some positive private information. This implies that traditional market microstructure asymmetric information models based on the prevalence of investors who are better informed than dealers, are likely ill-suited to describe the trading environment of the GS market.

Term to maturity also affects the trading decisions of market participants and, in turn, the relative market liquidity characteristics. Stocks have an infinite maturity, while government debt securities have a finite term to maturity. A finite maturity structure implies that investors have the option of waiting to liquidate their position at the security's *known* maturity date, in addition to liquidating their position before that date through the secondary market. A government debt security provides the investor with the option of fixing the holding period to a known date. This therefore generates two types of GS investors: buy-and-hold and trading market participants. The existence of buy-and-hold investors for GS implies that the supply of the GS available for trading—*the floating or effective supply*—is less than the total

(outstanding) supply, which is not the case for equities.[3] It is argued that as the GS becomes more seasoned, the effective supply of the security declines, which in turn has a negative impact on market liquidity.

One of the important properties of GS inventories relative to equity inventories is that there are many more instruments available to hedge GS inventories. Market-makers can borrow or lend the same security in the repo or lending markets, they can hold the opposite position of a nearly identical bond (one with a similar duration), or they can offset this position with one in the related futures contract. For equity market-makers, avenues for hedging inventory balances in a specific stock are, for all but the most actively traded securities, much more limited. Often, the only inventory risk adjustment available to equity market-makers is to rebalance inventory. The greater ease of inventory price hedging for the GS market-makers relative to their counterparts in equity markets makes GS market-makers able to endure greater extremes in their inventory balances relative to equity market-makers. This would have to be taken into account when modelling the inventory management behaviour of equity market-makers relative to their GS counterparts.

Section 3 of the paper shows that subtle structural differences exist between GS and equity dealership markets. Dealership equity markets (such as the LSE and Nasdaq) are centralized, while multiple-dealership GS markets are decentralized. Decentralized and centralized markets are distinguished by the amount of information that is available to the public (to customers and dealers alike) on a consolidated basis. Here, "consolidated basis" means that price and trade data from the spectrum of dispersed dealers are available on a single screen. For example, multiple-dealer quotes on Nasdaq are generally available to the public in a consolidated format such as a single Bloomberg page. In contrast to multiple-dealer equity markets, investors in GS markets cannot easily ascertain what is the best, most current bid-ask spread being offered by the dealers. In principle, the only way for an investor to ascertain which dealer has the best quote in a decentralized market would be to contact each dealer directly. However, in the U.S. and European GS markets, electronic trading systems such as TradeWeb and BondVision have increased the degree of centralization in these markets, since they allow investors to view multiple quotes from multiple dealers on

3. Note that some firms may choose to hold (or repurchase) a proportion of their own stock, thus allowing the amount of the stock available for trading to differ from the total amount of issued stock. However, since the firm's objective in holding some of its stock is to maximize its price, the firm avoids reducing the supply of the stock to the point of affecting liquidity. Furthermore, it should be clear that a floating supply of GS arises from the utility-maximizing behaviour of the investors and not the issuer.

one screen, i.e., in a consolidated format.[4] These electronic trading platforms allow investors to solicit quotes from a number of participating dealers simultaneously, without having to contact them sequentially over the telephone (as is traditionally the case), and then trade electronically with the dealer of their choice.[5]

In section 4, we examine differences in the transparency of equity and GS dealership markets.[6] The degree of transparency in equity dealership markets such as Nasdaq and the LSE tends to be greater than that observed in GS markets. This stems in part from the centralized nature of the equity dealership markets, where dealer quotes are reported on a consolidated basis. Given the decentralized nature of most GS markets, consolidated pre-trade quote information is generally not available to public market participants. Therefore, key factors underlying the degree of transparency in dealership markets are the existence of a system that consolidates and collects (links electronically) the individual dealer quotes, and the accessibility of these data by potential market participants. However, since a feature of these systems is their ability to transmit (electronically to information providers) the indicative quotes posted by dealers participating in the system, the recent arrival of electronic multiple-dealer systems in the public (customer-to-dealer) sphere of GS markets has increased the degree of consolidation and, in turn, the degree of pre-trade transparency in U.S. and European GS markets.

The potential effect of greater transparency on dealership markets and how the regulatory approach to mandating transparency should differ across equity and GS markets are also examined in section 4 of the paper. There is a well-known tension between post-trade transparency and market liquidity and trading costs. Greater disclosure of post-trade information in the public

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4. These systems operate in the public sphere of GS markets and should not be confused with electronic fixed-income interdealer broker (IDB) systems such as EuroMTS or eSpeed, which cater to interdealer trading.

5. Although these electronic systems offer a significant improvement in time savings and operational efficiency (particularly the back-office efficiencies offered by straight-through processing), these quote-driven systems do not alter the way investors interact with dealers. These systems represent simply an automation of the telephone-based investor-to-dealer interaction. Moreover, GS investors (and dealers) participating in these electronic trading platforms remain concerned with minimizing the price impact (or trading) costs of large GS transactions.

6. A market is generally more transparent when more data on the market's internal trading processes are publicly available. In dealership markets, a market is classified as being pre-trade transparent when traders (customers and dealers) can directly view all or, at a minimum, the best firm bid-ask quotes offered by the spectrum of market-makers. Post-trade transparent markets, on the other hand, are defined as those that report all completed trades to the public immediately.

sphere of dealership markets may not benefit the overall market, since it affects a market-maker's ability to carry out inventory risk-sharing activity. These market-maker incentives help explain the different approach to post-trade equity market transparency taken across jurisdictions. This helps to explain arguments defending delayed trade reporting for large orders on the LSE, as discussed in O'Hara (1995, 258–9) and Board and Sutcliffe (1995).

The optimal level of post-trade transparency is likely to vary, considering the differing sensitivities of market-makers to revelation risks in these markets. Market-makers handling large orders tend to be particularly sensitive to so-called "Hirshleifer revelation risks" (Lyons 1996 and Naik, Neuberger, and Viswanathan 1999). Because revelation risks have made it increasingly more costly for market-makers to manage their inventory, these additional costs must be passed on to investors. The larger the trade and/or the less frequent the trading activity, the more susceptible market-makers are to revelation risks. In the end, investors who must transact relatively large-size orders are worse off, because they must trade in a market that charges a higher price (in terms of bid-ask spread, for example) to access the market liquidity services provided by market-makers. Since public investors in GS markets are predominantly large institutional investors, whereas there is a preponderance of small retail investors in equity markets, it is likely that less post-trade transparency in the public sphere of GS markets than is currently observed in equity dealership markets would be appropriate.

Section 5 of the paper examines the factors underlying the relationship between the scale of interdealer trading and market-maker inventory risk management practices, and it highlights gaps in the literature in this area. Data provided show that dealers in markets such as the GS markets tend to rely almost exclusively on IDBs when trading among themselves, while dealers in the FX markets tend to trade bilaterally. In addition, the data indicate proportionally more IDB trading in GS markets than in equity dealership markets. Differences in the arrival rate of customer orders and the variation in size and direction of these orders across markets may help to explain these stylized facts.

Risk-averse dealers, subject to greater order-arrival variability and/or order-size variability, will probably require more inventory risk management services. Interdealer trading will occur as dealers choose between the uncertainty of public order arrival and the certainty of interdealer trading. Dealers are also more likely to require the anonymous trading offered by IDBs (rather than "name-give-up" direct interdealer trading) if the order's size is large enough to move markets. Thus, the fact that GS market-makers receive orders that are, relative to their desired (risk-adjusted) inventory

level, larger as well as less frequent than their counterparts in dealership equity markets, results in the greater use of IDBs in GS securities markets.

On the other hand, GS market-makers are better equipped to manage inventory risks and seem less sensitive to inventory variations. Evidence indicating that the size of U.K. GS market-maker inventory imbalances does not influence the quote prices suggests that the market-makers do not aggressively manage their inventory levels. Relative to equity market-makers, GS market-makers have access to several hedging avenues (futures or repo contracts, for example), and this suggests that they can manage their inventories less aggressively. Consequently, GS market-makers can endure a greater divergence from desired inventory levels and, given the lower inventory rebalancing needs, are less likely to engage in interdealer trading. This contradicts the data indicating that GS market-makers rely heavily on IDB trading relative to equity markets.

This contradiction may be explained by the fact that for GS market-makers to competitively supply liquidity to the public sphere, they must be able to endure greater inventory imbalances *and* engage in interdealer trading. More precisely, even though GS market-makers require larger inventory imbalances before engaging in interdealer trading, they are nonetheless relatively active participants in the interdealer sphere, because GS order-flow dynamics bring about frequent and extreme inventory imbalances. Moreover, interdealer trading is motivated by information extraction. That is, dealers either endeavour to ascertain market-wide order-flow information by observing the order flow passing through all IDB systems,[7] or, by trading in the interdealer market, they are able to garner a sense of the depth of the market at a given price.

The paper's discussion can be summarized as follows. Although multi-dealer government and equity securities markets have, on the surface, similar market structures, the paper demonstrates that there are differences between these markets that are likely to significantly affect the way market-makers trade and, as such, have an impact on the liquidity that market-makers provide. Moreover, policy-makers should be wary of applying similar regulations across both equity and GS markets, since these rules may, in fact, be detrimental to the investors that these rules seek to benefit.

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7. Lyons (1996) suggests that IDBs play a role in the information extraction process for FX dealers. GS markets are very similar in terms of information flows and order-arrival dynamics to FX markets.

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