Market making in international capital markets
Challenges and benefits of its implementation in emerging markets

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Abstract
Purpose – The purpose of this paper is to critically evaluate the different market-making systems found in most developed capital markets and to provide guidance to emerging market regulators for a possible implementation of such a system.

Design/methodology/approach – The paper looks closely at the market design of seven developed countries focusing on the obligations and privileges of market makers. Through a case study and empirical evidence the paper identifies advantage and disadvantage of a possible implementation of a similar design to an emerging market.

Findings – The paper identifies three forms of market making applied today: the quote-driven, the centralized and non-centralized systems. Four factors are proposed that regulatory authorities in emerging markets should consider when deciding whether, and which of, the three market-making systems they should implement. These are: current exchange design and the costs of restructuring, international and domestic investors’ sentiment towards the exchange, size of the emerging market and the market designs in countries hosting the target foreign capital.

Research limitations/implications – The paper looks at the implementation of a market-making system in an emerging market. Further research may investigate other ways of how emerging markets authorities can restructure their markets into more efficient, compatible and trustworthy financial venues in order to attract both domestic and foreign investors.

Originality/value – The area of emerging markets’ microstructure design and market quality is still relatively under-studied. We provide evidence of the challenges and benefits of the implementation of a market-making system in those markets.

Keywords Capital markets, Market system, Order systems

Paper type Research paper

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1. Introduction
It is well documented that two of the main problems that emerging markets face are capital supply shortage and low liquidity (Comerton-Forde and Rydge, 2006; O’Hara, 2001; Kairys et al., 2000). Market regulators in these countries can consider a number of restructuring measures to alleviate these problems: introduction of market segmentation (i.e. segmenting trading hours, creating main and parallel markets), implementation of trading phases (i.e. offering both continuous and call auction trading in a day), or provision of special incentives for the submission of limit orders (i.e. offering hidden orders and standing orders). In addition, the implementation of a market making system can help boost liquidity, and, in combination with other restructuring measures, can provide important improvements in market quality. As Venkataraman and Waisburd (2007), Nimalendran and Petrella (2003) and Majnoni and Massa (2001) show, the implementation of a market making system significantly promotes liquidity, lowers transaction costs, reduces volatility and improves daily turnover of listed securities. This study critically evaluates the types of market making systems found in developed capital markets and identifies the factors that stock market regulators in developing countries should consider when deciding which type of system to implement[1].

In this study, we examine the market design of 30 stock exchanges in both developed and developing countries. Based on regulations (obligations and privileges of market makers) and market design characteristics, we identify three types of market making systems which are applied in modern stock markets:

1. the quote-driven market making system;
2. the centralized market making system in an order-driven market[2]; and
3. the non-centralized market making system in an order-driven market[3].

We critically evaluate these three market making systems and discuss possible advantages and disadvantages of each system for emerging markets. We also identify patterns in the geographic and temporal evolution of each market making system.

We propose four factors that regulatory authorities in emerging markets should consider when deciding whether, and what kind, of market making system to implement. These are:

1. current exchange design and the costs of restructuring;
2. international and domestic investors’ sentiment towards the exchange;
3. size of the emerging market; and
4. the market designs in those countries hosting the target foreign capital.

Empirically, using a dataset of mutual fund holdings invested in 46 countries, we test whether familiarity with market design is a significant factor affecting foreign investors’ intention to invest. While similar to the approach of Chan et al. (2005), we extend their model by including the similarity of the market design between the foreign and domestic markets as a possible predictor. We find that similarity is indeed a significant factor affecting foreign investors’ decisions to invest in a country.

In addition to providing guidance to capital market regulators in emerging markets, this study is relevant to academic researchers studying the determinants, costs and benefits of the different market making systems. The paper identifies factors that
explain cross-national variation in market making systems. And it provides evidence that market design is indeed a significant factor affecting the decisions of foreign investors. These findings have implications for theoretical models of optimal market design.

The paper proceeds as follows. Section 2 reviews the market making literature as it applies to international capital markets. We focus on empirical studies identifying the effect of market making on the quality of financial markets. Section 3 describes the microstructure design of seven developed markets with respect to:

- the role of market makers;
- the rights and obligations of market makers; and
- market makers’ fees.

Section 4 critically evaluates the major market making systems and identifies the benefits and disadvantages of each system. Section 5 prescribes the major factors that need to be taken into consideration by emerging market authorities for the efficient implementation of a market making system in their exchanges. Summary and conclusions are presented in Section 6.

2. Existing literature
Numerous theoretical and empirical studies investigate the role of market makers in the trading process. Early theoretical work by Garman (1976), Amihud and Mendelson (1980), Kyle (1985), Glosten (1989) and Hasbrouck (1991) identifies the importance of market makers and their effect in the quoted and transaction prices. Recent empirical studies have looked at the effect of market making using two distinct approaches. The first approach is that of a natural experiment which investigates market quality changes within exchanges following the introduction of market makers. The second group of studies is a cross-sectional comparison of market quality in exchanges with and without market making systems.

The first category of studies includes mainly a description of European exchanges that have recently undergone a restructuring process. Nimalendran and Petrella (2003) look at the introduction of the market making system in the Italian Stock Exchange equity trading process. Investigating different market quality measures before and after the implementation of the system, the authors find that the market has become more efficient. In particular, looking at the volume, spread and liquidity (depth of the market), they find that the introduction of market makers has substantially improved liquidity, increased trading volume and lowered the bid-ask spread (cost of trading) of each individual instrument. Evidence shows that this improvement is greater for low trading (illiquid) stocks. Venkataraman and Waisburd (2007) reach similar conclusions for the Euronext Paris. However, they fail to identify a similar effect for highly liquid stocks. These stocks are shown to be unchanged for the daily market turnover before and after the restructuring of the system.

Moving beyond European exchanges, Anand and Weaver (2006) look at the introduction of the specialist system for equity options on the Chicago Board of Options Exchange (CBOE)[4]. In 1999, the exchange superimposed the specialist system – with the introduction of the Designated Primary Market Makers – to the existing dealer system that employed multiple market makers. Evidence shows that the specialist system improved the spread (both quoted and effective) and the depth of
the market. In addition, the CBOE gained market share from the other major competitor, the AMEX option exchange.

In sum, studies find substantial evidence that market makers serve as liquidity providers in developed markets. Our study (Figures 1 and 2) shows that a major problem in emerging markets is low liquidity and low daily turnover. Thus, by investigating the implementation of market making in emerging markets, we provide a connection between the particular needs of these markets and the advantages of the market making system. To our knowledge, there is no other study to date that examines market making in developing countries, either empirically or theoretically[5].

There are, of course, numerous comparative studies of market design in different exchanges. Westerholm et al. (2003) examine the three existing models of trading (continuous quote driven, order-driven, and periodic auctions that can either be quote-driven or order-driven) in 32 exchanges. Their results indicate that the existence of a market making system can lead to lower price volatility and to lower transaction costs than pure order driven systems. Furthermore, Jain (2003), who examined the market structure of 51 stock exchanges, finds that market makers can significantly improve stock liquidity. Interestingly enough, he finds that this effect, and in particular the reduction of transaction costs, is more pronounced in less liquid emerging markets compared to that in more developed markets. Our study builds on this important result and looks at the way emerging markets can restructure their design effectively in order to benefit from the market quality that the market making system provides, while avoiding the undesirable effects (i.e. higher transaction costs, collusion in dealer markets) that might appear with the application of the new system.

There are also a number of studies that investigate the market quality of the two largest capital stock exchanges, namely the NYSE (order driven system with a market maker) and NASDAQ (quote driven system). Bennett and Wei (2006) look at recent listing switches of companies from NASDAQ to NYSE and find significant reductions in return volatilities and price reversals, quoted spreads, and trading costs. In addition, Bessembinder (1999) looks at the transaction costs between the two markets and finds evidence that the market making system at the NASDAQ market is more costly[6].

![Figure 1.](image)

**International capital markets**
Annual turnover velocity (1997-2003) for selected international markets vis-à-vis the case study: the Cyprus Stock Exchange (CSE)

**Figure 2.**

**Annual Measurements**

*Notes:* The annual turnover velocity is defined as the ratio of the value of shares traded over the annual value of shares outstanding. The time series for each individual stock market projects how the stock liquidity has changed in the past seven years.
Bessembinder and Kaufman (1997) and Huang and Stoll (1996b) also investigate execution costs between the two large exchanges and find that NASDAQ is twice as costly. Moreover, Christie and Schultz (1994) find collusion among market makers in the NASDAQ market.

In summary, existing literature has identified several advantages of the implementation of market making systems, namely improvements in liquidity, increases in trading volume and reductions in the bid-ask spreads. Interestingly, evidence suggests that these improvements are greater for low trading (illiquid) companies. Since stocks in emerging markets are mostly illiquid, the introduction of a market making system may provide similar benefits to these markets. However, it should be noted that possible disadvantages might also be related to the implementation of market making systems[7]. Knowledge of such disadvantages is important, as it can determine which market making system should be implemented in a particular emerging market.

3. Market making in international markets

Financial intermediaries have played a significant role in the stock market design in the USA and Germany since the inception of stock markets in the nineteenth century. Even in today’s electronic era, market makers continue to be widely used in one form or another as liquidity providers, stabilizers and order managers of the market.

Initial investigation regarding international capital markets showed that market making is applied (or is considered for application) in the majority of the stock markets that we have examined. Table I depicts 30 stock markets in 29 countries (column 1). It includes 20 developed markets in North America, Europe and Asia, and ten emerging markets, most of which are European. This table also presents the market capitalization of each exchange (column 3), the trading system applied in that market (column 4) and whether market making is applied in their equities’ market (column 5). In addition column 5 shows the number of market makers per company. We observe that internationally the vast majority of developed countries implement market making systems in their capital markets[8].

We proceed to classify market making systems into four categories based on market makers’ characteristics and trading design (Westerholm et al., 2003; Jain, 2003)[9].

3.1 Market making (dealer) system in a quote-driven, electronic market

In this market, public investors generally cannot trade directly among themselves. In order for buyers (sellers) to execute an order they have to contact a market maker (dealer) who uses his/her own inventory in the transaction. In a quote-driven system there is more than one market maker per company who announces on a continuous basis quotes to buy and sell a number of shares at a particular price[10]. In a quote-driven system, dealers (market makers) offer almost all the liquidity in the market as they monopolize one side of the transaction with their quotes. At the same time they compete among themselves for more competitive bid and/or ask prices that will attract the order flow from public investors. Stock markets that apply this system are the NASDAQ and the London Stock Exchange (LSE).
<table>
<thead>
<tr>
<th>Countries</th>
<th>Stock market</th>
<th>Market capitalization (millions of $ as of January 2003)</th>
<th>Type of market</th>
<th>Number of market makers</th>
</tr>
</thead>
<tbody>
<tr>
<td>North America</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United States</td>
<td>New York Stock Exchange</td>
<td>8,779,485</td>
<td>Order driven floor-based market</td>
<td>One</td>
</tr>
<tr>
<td>United States</td>
<td>NASDAQ</td>
<td>1,932,026</td>
<td>Quote driven electronic market</td>
<td>At least one</td>
</tr>
<tr>
<td>Canada</td>
<td>Toronto Stock Exchange</td>
<td>592,580</td>
<td>Order driven electronic market</td>
<td>One</td>
</tr>
<tr>
<td>Europe</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>United Kingdom</td>
<td>London Stock Exchange</td>
<td>1,666,054</td>
<td>Quote driven electronic market</td>
<td>At least one</td>
</tr>
<tr>
<td>Germany</td>
<td>Deutsche Borse</td>
<td>677,934</td>
<td>Order driven electronic market (traditional)</td>
<td>None</td>
</tr>
<tr>
<td>Germany</td>
<td>Euronext Paris</td>
<td>1,508,127</td>
<td>Order driven electronic market</td>
<td>Possibility of one or more</td>
</tr>
<tr>
<td>The Netherlands</td>
<td>Euronext Amsterdam</td>
<td>1,508,127</td>
<td>Order driven electronic market</td>
<td>Possibility of one or more</td>
</tr>
<tr>
<td>Belgium</td>
<td>Euronext Brussels</td>
<td>1,508,127</td>
<td>Order driven electronic market</td>
<td>Possibility of one or more</td>
</tr>
<tr>
<td>Portugal</td>
<td>Euronext Lisbon</td>
<td>1,508,127</td>
<td>Order driven electronic market</td>
<td>Possibility of one or more</td>
</tr>
<tr>
<td>Spain</td>
<td>Madrid Stock Exchange</td>
<td>474,246</td>
<td>Order driven electronic market</td>
<td>At most one</td>
</tr>
<tr>
<td>Italy</td>
<td>Italian Stock Exchange</td>
<td>471,492</td>
<td>Order driven electronic market</td>
<td>Possibility of one or more</td>
</tr>
<tr>
<td>Greece</td>
<td>Athens Stock Exchange</td>
<td>65,792</td>
<td>Order driven electronic market</td>
<td>Possibility of one or more</td>
</tr>
<tr>
<td>Denmark</td>
<td>Copenhagen Stock Exchange</td>
<td>74,956</td>
<td>Order driven electronic market</td>
<td>Possibility of one or more</td>
</tr>
<tr>
<td>Austria</td>
<td>Wiener Borse</td>
<td>26,374</td>
<td>Order driven electronic market</td>
<td>One</td>
</tr>
<tr>
<td>Finland</td>
<td>Helsinki Stock Exchange</td>
<td>129,000</td>
<td>Order driven electronic market</td>
<td>At most one</td>
</tr>
<tr>
<td>Norway</td>
<td>Oslo Stock Exchange</td>
<td>65,670</td>
<td>Order driven electronic market</td>
<td>Possibility of one or more</td>
</tr>
<tr>
<td>Switzerland</td>
<td>Swiss Stock Exchange</td>
<td>522,311</td>
<td>Order driven electronic market</td>
<td>Possibility of one or more</td>
</tr>
<tr>
<td>Iceland</td>
<td>Iceland Stock Exchange</td>
<td>7,029</td>
<td>Order driven electronic market</td>
<td>None</td>
</tr>
<tr>
<td>Asia</td>
<td>Tokyo Stock Exchange</td>
<td>2,016,277</td>
<td>Order driven electronic market</td>
<td>None</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Countries</th>
<th>Stock market</th>
<th>Market capitalization (millions of $ as of January 2003)</th>
<th>Type of market</th>
<th>Number of market makers</th>
</tr>
</thead>
<tbody>
<tr>
<td>Israel</td>
<td>Tel-Aviv Stock Exchange</td>
<td>40,667</td>
<td>Order driven electronic market</td>
<td>None</td>
</tr>
<tr>
<td>Hong Kong</td>
<td>Hong-Kong Stock Exchange</td>
<td>464,366</td>
<td>Order driven electronic market</td>
<td>None</td>
</tr>
<tr>
<td><strong>Emerging markets (recently joined the European Union)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Poland</td>
<td>Warsaw Stock Exchange</td>
<td>26,315</td>
<td>Order driven electronic market</td>
<td>At least one</td>
</tr>
<tr>
<td>Czech Republic</td>
<td>Prague Stock Exchange</td>
<td>11,148</td>
<td>Order driven electronic market</td>
<td>At least one</td>
</tr>
<tr>
<td>Slovakia</td>
<td>Ljubljana Stock Exchange</td>
<td>5,724</td>
<td>Order driven electronic market</td>
<td>None</td>
</tr>
<tr>
<td>Malta</td>
<td>Malta Stock Exchange</td>
<td>1,413</td>
<td>Order driven electronic market</td>
<td>None</td>
</tr>
<tr>
<td>Estonia</td>
<td>Estonian Stock Exchange</td>
<td>2,511</td>
<td>Order driven electronic market</td>
<td>At most one</td>
</tr>
<tr>
<td>Cyprus</td>
<td>Cyprus Stock Exchange</td>
<td>4,726</td>
<td>Order driven electronic market</td>
<td>None</td>
</tr>
<tr>
<td><strong>Other emerging markets</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Egypt</td>
<td>Cairo Stock Exchange</td>
<td>42,822</td>
<td>Order driven electronic market</td>
<td>None</td>
</tr>
<tr>
<td>Turkey</td>
<td>Instanbul Stock Exchange</td>
<td>36,605</td>
<td>Order driven electronic market</td>
<td>None</td>
</tr>
<tr>
<td>India</td>
<td>Bombay Stock Exchange</td>
<td>119,714</td>
<td>Order driven electronic market</td>
<td>None</td>
</tr>
</tbody>
</table>

**Notes:** This table shows the market design of 30 stock markets in 29 countries under investigation with respect to Market Making. In particular, we present information for three major stock markets in North America, 12 European Union (EU) countries and two major stock markets in Asia. Additionally, we investigate the market structure of ten emerging markets, six of which have recently joined the EU. Each market is characterized with respect to the type of market-making system used, i.e. as Floor-based market, Electronic market or Quote-driven market (Column 4). In addition the number of market makers used in each country (column 5) also characterize the market.
3.2 Centralized market-making system in an order-driven, floor-based market

All potential buyers or sellers in this market can directly trade among themselves, and post limit orders that can be included in the quoted prices. The set of all limit buy and sell orders at any point in time is called the limit order book. The centralized market making system requires the use of a single market maker that has monopolistic information on both the market orders and the limit order book. All orders (mainly market and limit orders) arrive at the market maker’s post and it is the market maker sole responsibility to disseminate information about the orders to the market participants[11]. No other market participant can observe either the book or the order flow in real time. In this centralized market making system there exists a floor, which is a physical location where market makers reside and interact with orders that come electronically to their terminal and with orders that come from floor brokers. Floor brokers are present on the floor where they receive faster information on the market and have immediacy in the transaction process. Market makers in this system are required to announce quotes on a continuous basis that reflect both the limit order book interest and floor brokers intentions (supply and demand sides). As a result, market makers only provide the necessary liquidity from their own account when there is a lack of either a buy or a sell interest. Typically this scenario occurs when there is a temporary disparity between supply and demand that asks for the market maker’s intervention in order to come up with an equilibrium price. Floor-based markets where a centralized market making system is applied are the NYSE and the eight stock markets in Germany (Deutsche Börse).

3.3 Centralized market-making system in an order-driven electronic market

This market system is the same as the aforementioned one – the centralized market making system in an order-driven, floor-based market – with a single market maker in the centralized dual role of matching buyers and sellers and providing the necessary liquidity when needed. The only major difference is that in an order driven market there is neither a floor nor floor brokers to interact with the limit order book for providing extra liquidity. Such a system was applied in the Amsterdam Stock Exchange (prior to its inclusion in Euronext).

3.4 Non-centralized market-making system in an order-driven electronic market

Market makers in this system (in which there can be more than one per company) are required to announce limit orders to buy and sell on a continuous basis for their own account subject to specific quantitative rules set by the exchange. As opposed to the centralized system, they do not possess any monopolistic information over all other market participants on the incoming orders or the limit order book. In other words, the presence of market makers in this market is expected to increase the liquidity provided by public investors. They compete with investors for order flow. This system is applied in Euronext, in the Italian Stock Exchange (ISE) and in the Athens Stock Exchange (ASE), among others. Very recently the system was also introduced in Electronic Communications Network systems (ECNs) in the United States. The Archipelago market (Lead Market Maker) is an example of such ECN.

The major similarities and differences between the four market making systems are depicted in Table II. The quote-driven system primarily differs from the order-driven system, as market makers in the first system have to compete only among themselves,
whereas in the order-driven systems public investors provide substantial competition for order flow. The role and the number of the market makers divide the centralized and non-centralized systems. The monopoly of information and the continuous announcement of quotes that represent a fair and orderly market are the characteristics of the single market maker in the centralized system, whereas one or more market makers in the non-centralized system act as mere liquidity providers submitting limit orders continuously for their own account. The existence of floor brokers distinguishes the last two systems: the centralized floor-based and the centralized electronic market making systems.

<table>
<thead>
<tr>
<th>Dealer system in a quote-driven electronic market</th>
<th>Non-centralized MM system in an order-driven electronic market</th>
<th>Centralized MM system in an order-driven electronic market</th>
<th>Centralized MM system in an order-driven floor-based market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Market makers compete (mainly) among one another for the order flow from investors. Investors cannot trade among themselves, as a dealer is the principal buyer or seller for each transaction (using his/her own inventory)</td>
<td>One or more market makers submit their quotes using their own inventory on a continuous basis. The only regulations they have to follow are quantitative rules with respect to the minimum amount of their quote depth and their maximum spread</td>
<td>Only one market maker per company acts as a manager or auctioneer matching buyers and sellers. The quotes that she submits usually represent the best orders in the limit order book. She is only adding personal orders to buy and sell when the book does not provide enough liquidity. The regulations that the market maker follows describe the way in which she provides a fair and orderly market when announcing the quotes using the investors’ demand and supply</td>
<td>There is no floor and there are no floor brokers standing by the market maker’s post. All the orders come electronically to the market maker’s limit order book. The market maker is the manager matching electronic buyers and sellers</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>The floor of the exchange is the venue where floor brokers can negotiate deals more efficiently without displaying their intentions to the public. The market maker is the auctioneer for the floor brokers’ incoming orders</td>
</tr>
</tbody>
</table>

Note: This summary table describes the major differences and similarities of the four market-making systems.
In order to provide guidance to regulators in emerging markets on the introduction of a market making system, we proceed by looking more closely at seven major stock markets in nine developed countries that use market-making systems. The choice of these markets was based mainly on their economic influence in the international market scene. By identifying in detail the parameters that characterize the market making design in these stock markets we aim to provide guidance to emerging market regulators who want to implement such a design. Table III shows these markets and the particular market making system that is applied. We observe that the NYSE design, which is the oldest one, follows the centralized market making system with the specialist acting as the manager of the limit order book and the provider of a “fair and orderly market”, (NYSE, 1999 Rule 104). This system goes back to the inception of the NYSE in the nineteenth century. Under this system, electronic communication has a secondary role in the functioning of the market[12]. In the USA, there exists also the NASDAQ market, introduced in 1971. Its trading system is based on the quote-driven electronic market. This market making system was also applied in the London Stock Exchange since the 1981 “big bang” reform.

Similar to the NYSE, the German Deutsche Börse has a long history of centralized market making. All eight stock markets of the Deutsche Börse have a floor and a centralized market maker, the “Official Exchange Broker” (formerly “Kursmakler”). Germany is also host to a second market making system, the Xetra market. This electronic market is a non-centralized system, with the Designated Sponsors (formerly “Betreuers”) acting as the market makers. The new system in Germany absorbs the majority of the electronic orders (as opposed to the orders that are handled by floor brokers), as 90 per cent of the DAX index orders and 80 per cent of all orders flow through Xetra. This form of market making is also applied by Euronext (liquidity provider), the Italian Stock Exchange (specialist) and the Athens Stock Exchange (market maker). Moreover, prior to 2001 the Amsterdam Stock Exchange was using the centralized market making system in an order-driven electronic market with the “Hoekman” acting as the human intermediary responsible for all orders that were arriving to his/her terminal electronically[13].

Certain characteristics of different market making systems that should be taken seriously into consideration by regulatory bodies when redesigning their markets relate to:

- the obligations and privileges of market makers; and

- the market maker’s profits and the determination of those profits in each system[14].

These characteristics are important elements to the functionality of the market making system.

Table IV presents the major obligations and privileges of the market makers in the seven developed markets under investigation. In the quote-driven market (NASDAQ, LSE), market makers (dealers) are obliged to continuously post bid and ask for reasonable spread and trade with either other dealers or investors who post limit or market orders exclusively. Their bid (ask) prices can never be greater (less) than the ask (bid) price of all the other dealers for that security. Dealers in quote-driven systems do not pay any trading fees. In addition, they have the privilege to set bid and ask quotes to attract trades on only one side of the spread and thus limit their exposure to...
<table>
<thead>
<tr>
<th>Type of market</th>
<th>Quote-driven electronic market&lt;sup&gt;a&lt;/sup&gt;</th>
<th>Non-centralized</th>
<th>Centralized</th>
<th>Order-driven floor-based market centralized&lt;sup&gt;b&lt;/sup&gt;</th>
<th>Year of inception</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYSE (USA)</td>
<td>“Dealers”</td>
<td></td>
<td></td>
<td>“Specialist”</td>
<td>Nineteenth century</td>
</tr>
<tr>
<td>NASDAQ (USA)</td>
<td>“Dealers”</td>
<td></td>
<td></td>
<td></td>
<td>1971</td>
</tr>
<tr>
<td>LSE (UK)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1986</td>
</tr>
<tr>
<td>Deutsche Börse (Germany)</td>
<td>“Designated Sponsors”</td>
<td></td>
<td></td>
<td>“Official Exchange Brokers”</td>
<td>Nineteenth century</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Xetra (1997)</td>
<td>Up to 2001</td>
</tr>
<tr>
<td>Paris Bourse (France)&lt;sup&gt;d&lt;/sup&gt;</td>
<td>“Animateurs”</td>
<td></td>
<td></td>
<td>“Hoekman”</td>
<td>1992 up to 2000</td>
</tr>
<tr>
<td>Amsterdam Stock Exchange</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Up to 2001</td>
</tr>
<tr>
<td>(The Netherlands)&lt;sup&gt;d&lt;/sup&gt;</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Euronext (France, The Netherlands, Belgium, Portugal)</td>
<td>“Liquidity provider”</td>
<td></td>
<td></td>
<td></td>
<td>2001</td>
</tr>
<tr>
<td>Italian Stock Exchange (Italy)</td>
<td>“Specialist”</td>
<td></td>
<td></td>
<td></td>
<td>2001</td>
</tr>
<tr>
<td>Athens Stock Exchange (Greece)</td>
<td>“Market Maker”</td>
<td></td>
<td></td>
<td></td>
<td>2002</td>
</tr>
</tbody>
</table>

**Note:**

<sup>a</sup> Market makers called Dealers post bid and ask prices and the shares they are willing to trade at these prices. Public investors can only trade against the Dealers; <sup>b</sup> Market makers can have a centralized role by keeping the limit order book and announcing bid and ask prices and shares (called quotes) at these prices that reflect directly the best limit orders placed by public investors. If they want to trade for themselves, market makers should improve the best limit buy/sell side or add depth to the number of shares when announcing the new quotes. Market makers can also have a non-centralized role as independent investors that continuously post bid and ask prices, subject to certain quantitative rules; <sup>c</sup> In a floor-based market, the market makers must only have a centralized role as they need to manage both the limit order book and floor brokers that stand by, ready to trade and be included in the market makers’ quotes; <sup>d</sup> The Paris Bourse and Amsterdam Stock Exchange have merged into the Euronext market in the Fall of 2001; These data are for their market design before the merger; The table shows the classification of the market design of the seven major Stock Markets in the World that apply a form of Market Makers. For each form we identify the market maker for that market.
<table>
<thead>
<tr>
<th>Stock market and market makers</th>
<th>Obligations</th>
<th>Privileges</th>
</tr>
</thead>
<tbody>
<tr>
<td>NYSE: “Specialists”</td>
<td>Continuously post bid and ask quotes that are equal to or better than the best limit order book orders</td>
<td>Unique knowledge of the limit order book</td>
</tr>
<tr>
<td></td>
<td>Add to the book quotes prices, and trade when there is insufficient order flow or when they are acting as an agent to floor traders</td>
<td>Percentage fee when acting as an agent for floor brokers</td>
</tr>
<tr>
<td></td>
<td>Determine the opening price. Maintain a fair and orderly market</td>
<td>Unique position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No trading fees</td>
</tr>
<tr>
<td>NASDAQ: “Dealers”</td>
<td>Continuously post bid and ask quotes of reasonable spread and trade with either other dealers or investors who post limit or market orders exclusively</td>
<td>No trading fees; set bid and ask quotes to attract trades on only one side of the spread; thus limit their exposure to unwanted inventory positions. Relatively constant competition for order flow from mainly the other dealers. Limit orders are not as frequent or competitive.</td>
</tr>
<tr>
<td></td>
<td>The bid(ask) prices can never be greater (less) than the ask(bid) of all the other dealers in the security</td>
<td></td>
</tr>
<tr>
<td>LSE: “Dealers”</td>
<td>Continuously post bid and ask quotes of reasonable spread and trade with either other dealers or investors who post limit or market orders exclusively</td>
<td>No trading fees; set bid and ask quotes to attract trades on only one side of the spread; thus limit their exposure to unwanted inventory positions. Relatively constant competition for order flow from mainly the other dealers. Limit orders are not as frequent or competitive.</td>
</tr>
<tr>
<td>Deutsche Börse: “Official Exchange Brokers, formerly Kursmaklers”</td>
<td>Continuously post bid and ask quotes that are equal to or better than the best limit order book orders</td>
<td>Unique knowledge of the limit order book</td>
</tr>
<tr>
<td></td>
<td>Add to the book quotes prices and trade when there is insufficient order flow or when they are acting as an agent to floor traders</td>
<td>Percentage fee when acting as an agent for floor brokers</td>
</tr>
<tr>
<td></td>
<td>Determine the opening price</td>
<td>Unique position</td>
</tr>
<tr>
<td></td>
<td></td>
<td>No trading fees</td>
</tr>
</tbody>
</table>

(continued)
<table>
<thead>
<tr>
<th>Stock market and market makers</th>
<th>Obligations</th>
<th>Privileges</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deutsche Börse: “Designated Sponsors, formerly Betreuers”</td>
<td>Post two-sided quotes when requested by members for a minimum amount and a maximum spread (see Table V) Post quotes in call markets</td>
<td>No trading fees Knowledge of the identity of the trader placing the order Access to surplus in call market</td>
</tr>
<tr>
<td>Euronext Paris/Amsterdam/Brussels and Lisbon: “Liquidity provider”</td>
<td>Continuously post bid and ask quotes for a minimum quantity and a maximum spread for a minimum daily volume (see Table VI) Make similar offers for call markets</td>
<td>No trading fees Inventory may be provided by major shareholders</td>
</tr>
<tr>
<td>Italian Stock Exchange: “Specialist”</td>
<td>Continuously post bid and ask quotes for a minimum quantity and a maximum spread for a minimum daily volume (see Table VII) Produce two financial reports per annum for the listed firm Similarly organize two meetings between the management of the company and professional investors</td>
<td>Unique knowledge of the company No trading fee</td>
</tr>
<tr>
<td>Athens Stock Exchange: “Market Maker”</td>
<td>“Almost” continuously post bid and ask quotes for a minimum quantity and a maximum spread for a minimum daily volume (see Table VIII)</td>
<td>No trading fees Pool of liquidity may be provided by the Repurchase Agreement Derivative Tax breaks Inventory may be provided by major shareholders</td>
</tr>
</tbody>
</table>

**Notes:** The table shows the major obligations and privileges of market makers for each international capital market under investigation, that is the NYSE, NASDAQ, LSE, Euronext, Deutsche Börse, ISE and the ASE market makers. The second column identifies what rules each individual market maker is obliged to follow, whereas the third column shows some unique advantages that they have over other investors.
unwanted inventory positions. Finally, only in a quote-driven system do market makers have the advantage of a relatively constant competition for order flow. Thus, in contrast to the order-driven system, limit orders are not the driving force of liquidity and therefore any competition from limit order traders with dealers is minimal and not competitive. This competition has direct positive implications for the dealers’ profits and risks.

In the centralized market making system (NYSE, Deutsche Börse), market makers are obliged to announce on a continuous basis bid and ask quotes that are representative of the best prices in the limit order book (electronic orders) and of the intentions of the floor brokers – reflecting the interest of the market. In addition, whenever there is a disparity of supply and demand, the market makers have to step in and provide the necessary liquidity by announcing bid/ask quotes for their own account. Their role as defined by the NYSE (Rule 104) is to act as providers of a “fair and orderly” market. As such they are obliged to be either the buyer or the seller for orders that otherwise had been defused through the market would have created big temporal price fluctuations not representative of the true price of the stock.

Finally, centralized market makers are responsible for announcing the opening price in any auction trading periods. This is in contrast to the pure order book system in which the opening price is based on a simple algorithm that maximizes the transaction volume. As far as privileges are concerned, centralized market makers have monopolistic knowledge of the limit order book. Their unique position on the floor of the exchange allows them to observe both all orders that are entered electronically into the system and the intentions of the floor brokers. Moreover, they are waived of any trading fees for their own transactions. Finally, they are free to set a fee for all orders that the floor brokers are leaving with them on the floor.

Lastly, in markets that employ the non-centralized market making system (Euronext, Germany’s Xetra market, the Italian Stock Exchange, the Athens Stock Exchange,) market makers are obliged to continuously enter the system orders to buy or sell for their own account (principal bid and ask quotes) following a clearly formulated quantitative set of rules. Tables V-VIII present these detailed rules that relate to the minimum quantity announced at the quoted prices, the maximum spread between bid and ask prices, the minimum number of transactions intra-daily, and the maximum time between new quote announcements by the market makers. In addition to these quantitative rules, market makers may also be obliged to inform investors of the current financial state of their listed company at regularly scheduled yearly conferences and bi-annual reports (Italian Stock Exchange). Regarding trading privileges, in the non-centralized-market making system, market makers have no trading fees. They also enjoy the privileges of having their inventory rebalanced by either major company shareholders or exchange mechanisms (as in Euronext, Athens Stock Exchange), as well as possessing specific knowledge of their company (as in the ISE)[15].

In addition to the aforementioned obligations and possible penalties of the market makers, evidence shows that profits differ between the non-centralized and the centralized and quote-driven market making systems. Specifically, for both the centralized and quote-driven market making systems, the market makers’ profits relate primarily to intra-day transactions. In particular, empirical studies have shown that the main profits come primarily from the daily change in the market makers’ inventory
position plus the daily change in their cash position resulting from their own account intra-day trading (Panayides, 2007, Coughenour and Harris, 2004, Sofianos, 1995). Additional profits come from floor brokerage commissions and limit order book fees. In non-centralized market making systems, in contrast to the other two systems, the profits of the market makers are primarily derived through the fees that are determined by a contractual agreement with the listed company. The trading profits through intra-day transactions in these systems due to the lack of informational monopoly of the limit order book appear to be insignificant (Anand et al., 2008).

4. Advantages and disadvantages of the market-making systems
In this section we critically evaluate the different market making systems and identify their major advantages and disadvantages.

4.1 The market-making (dealer) system in a quote-driven, electronic market
The dealer system has numerous advantages, especially as it relates to the nature of order flow. This is the system that is generally favored by institutional investors. This is because institutional investors either have prearranged transactions with a preferred dealer (due to previous personal experience with him/her), or find the use of multiple market makers less expensive, Hansch et al.(1999). Moreover, due to the competition among dealers for order flow, there is a continuous search for better knowledge of the fundamentals and the true market price for that stock. As a consequence, better bid-ask spreads and low temporal volatility of transaction prices are expected around the market price throughout the day. Moreover, investors are expected to experience lower transaction costs. In general, investors have more confidence in revealing their intentions to those dealers that have shown price discovery capabilities.
<table>
<thead>
<tr>
<th>Type of stocks (liquidity related)</th>
<th>Liquidity provider</th>
<th>Maximum spread</th>
<th>Minimum size of each order</th>
</tr>
</thead>
<tbody>
<tr>
<td>Euronext 100</td>
<td>Not possible</td>
<td>3%</td>
<td>Related to daily turnover; &gt; 20,000 euro, &lt; 100,000 euro</td>
</tr>
<tr>
<td>Next 150</td>
<td>Possible (permanent only)</td>
<td>3%</td>
<td></td>
</tr>
<tr>
<td>More than 5,000 transactions a year + in AEX or AMX or Be20 or CAC40 or SBF120</td>
<td>Possible (permanent or volatility)&lt;sup&gt;a&lt;/sup&gt;</td>
<td>4%</td>
<td>10,000 euro for permanent liquidity provider 15,000 euro for volatility liquidity provider</td>
</tr>
<tr>
<td>Fewer than 5,000 transactions – continuous trading</td>
<td>Necessary (permanent or volatility)&lt;sup&gt;ab&lt;/sup&gt;</td>
<td>4%</td>
<td>10,000 euro for permanent liquidity provider 15,000 euro for volatility liquidity provider</td>
</tr>
<tr>
<td>Fewer than 5,000 transactions – call trading</td>
<td>Possible (auction&lt;sup&gt;c&lt;/sup&gt;)</td>
<td>4%</td>
<td>5,000 euro</td>
</tr>
</tbody>
</table>

**Notes:**
- <sup>a</sup> A permanent liquidity provider has to enter quotes both in continuous and call auction trading;
- <sup>b</sup> A volatility liquidity provider has to enter quotes only in call auctions even if there is also a continuous trading period;
- <sup>c</sup> An auction liquidity provider has to enter quotes in the call auction. There is no continuous trading phase. This table shows the quantitative rules that the market makers in the Euronext market in Paris, Amsterdam, Brussels and Lisbon (liquidity providers) are obliged to follow during the trading session. It deals with the trading characteristics of the limits orders to buy and sell that each market maker is required to submit throughout the trading day. In particular, it identifies for which types of stocks the market maker is required in the market and quantifies the minimum size of each order and the maximum spread. As the table shows, some of the measures are different for the two phases of trading that exist in the Euronext, continuous and auction trading.
In contrast, one of the major disadvantages of this system is the dealers’ monopolistic control of the prices of the financial instruments they trade. Since the majority of orders are traded through the dealers (they are either the buyers or sellers in a transaction), there is evidence that the dealers set quoted prices that are more profitable to them. Studies by Christie and Huang (1994) and Christie and Schultz (1994) led investors to take unprecedented legal actions against dealers and be penalized by the SEC. These institutional and individual investors were responding to the fact that dealers were not quoting prices in odd ticks of a dollar but rather they preferred to trade in even ticks only. Bessembinder and Kaufman (1997) also reveal the effects of the even-odd ticks misconduct when they compare measures of market quality between NASDAQ and

<table>
<thead>
<tr>
<th>Daily average turnover$^a$</th>
<th>Minimum daily quantity$^b$ (euro)</th>
<th>Maximum spread (%)</th>
<th>Minimum size of each order (euro)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Up to 150,000 euro</td>
<td>50,000</td>
<td>3.5</td>
<td>2,500 euro</td>
</tr>
<tr>
<td>150,000-500,000</td>
<td>75,000</td>
<td>3.0</td>
<td>2,500</td>
</tr>
<tr>
<td>Over 500,000</td>
<td>100,000</td>
<td>2.5</td>
<td>2,500</td>
</tr>
</tbody>
</table>

Notes: $^a$ The obligations of the specialist on the market are determined on daily average turnover in the six preceding months (March-August or September-February) for shares subject to the obligation. For newly-listed companies, the liquidity of shares with equal capitalization is considered; $^b$ For each trading session, the specialist undertakes to sustain the liquidity of the instrument until the execution of trades, operating as a specialist, for a value at least equal to the minimum daily quantity. Afterwards, the specialist may continue to operate as a specialist on a voluntary basis; This table shows the quantitative rules that the market makers in the Italian Stock Market (specialists) are obliged to follow during the trading session. It deals with the trading characteristics of the limits orders to buy and sell that each market maker is required to submit throughout the trading day. In Italy, only companies in the Star market are allowed to use a market maker. For the companies, market makers are obliged to follow quantitative rules that are related to the daily trading turnover of the company, the minimum daily quantity, the maximum spread and the minimum size of each order.

Table VII. Athens Stock Exchange

<table>
<thead>
<tr>
<th>Maximum spread</th>
<th>NEHA</th>
<th>Main and parallel market</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minimum daily quantity</td>
<td>5 per cent</td>
<td>3 per cent</td>
</tr>
<tr>
<td>Minimum size of each order</td>
<td>0.5 per cent times shares outstanding</td>
<td>Shares outstanding times one-fifth of the daily average turnover in the six preceding months</td>
</tr>
<tr>
<td>Maximum time for a new order to be announced</td>
<td>One-fifth of the minimum daily quantity</td>
<td>1/30 of the minimum daily quantity</td>
</tr>
<tr>
<td></td>
<td>Five minutes</td>
<td>Ten minutes</td>
</tr>
</tbody>
</table>

Notes: This table shows the quantitative rules that the market makers in the Athens Stock Market are obliged to follow during the trading session. It deals with the trading characteristics of the limits orders to buy and sell that each market maker is required to submit throughout the trading day. In particular, in the ASE, the rules are differentiated between two markets, the NEHA market and the main and parallel market. The rules are further quantified with respect to four measures: The maximum spread of the market maker’s orders, the minimum daily quantity, the minimum size of each order and the maximum time for a new order to be announced.

Table VIII. Athens Stock Exchange
NYSE. They conclude that the higher transaction costs shown in the NASDAQ market are partly due to the monopolistic control of quotes by the dealers.

Another disadvantage of this system is the collusion that appears in dealer markets. This collusion may result in severe cost manipulation and lack of competitiveness on one side of the quote. In particular, Hansch et al. (1998) provide evidence that the dealers focus intra-daily only on one side of the quote (either the bid price or ask price) due to either the dealers’ information signals and/or their inventory rebalancing. Thus, they tend to announce misleading quotes that may affect negatively the price discovery process (Barclay, 1997).

4.2 The centralized market-making system in an order-driven, floor-based market
The centralized system has a number of major advantages that makes it preferable to certain groups of investors. In particular, this system is attractive to institutional investors that have the ability to transact large orders using the skills of floor brokers. Floor brokers can decide to “work through” an order. They have the knowledge and means to get competitive prices for institutional customers without revealing their intentions to the public and thus avoid creating large price disturbances (Heidle and Huang, 2002). Published reports on floor trading at the NYSE reveal that even if the number of trades that are carried over by floor brokers is small compared to electronic orders, the size of these orders represents more than 60 per cent of the daily trading volume (Sofianos and Werner, 2000).

Another advantage of this system is that its transaction costs are relatively low. The fact that market makers are expected to step in and add liquidity when there is a large bid-ask spread from other liquidity investors, results in trading costs that are significantly lower than in a pure limit order market. In addition, the market makers’ daily interaction with floor brokers, lowers the market makers’ risks in keeping a fair and orderly market. Price-relevant information is disseminated on the floor of the exchange more effectively and that makes market makers less worried of trading against privately informed traders[16].

Numerous studies have compared the NYSE market to other market designs. Bennett and Wei (2006), Bessembinder (1999), Barclay et al. (1998) and Huang and Stoll (1996a, b), among others, showed that the NYSE centralized market making structure has lower transaction costs than its counterpart, the NASDAQ quote-driven market. Venkataraman (2001) compares the centralized market making system with the pure-order driven system by looking at the CAC40 stocks of the Paris Stock Exchange (before its ascension to Euronext) and compares transaction costs with matching pairs of NYSE stocks. He finds that the NYSE costs are substantially lower and attributes that to the structural design of the exchanges. In addition, Kehr et al. (2001) look at the centralized market making system in Germany (Deutsche Börse). They find that the existence of the market makers minimizes the costs of trading in an auction phase. They also find that market makers smooth prices when the transaction phase changes between an auction and continuous phase. Garfinkel and Nimalendran (2003) show that the degree of anonymity – that is, the extent to which a trader is recognized as informed or not – is less in the NYSE than in NASDAQ. As we have already discussed, the centralized market making system’s structure creates a unique relationship between the market maker (specialist) and the floor brokers. Battalio et al. (2007) identify empirically the networking behavior that exists on the floor. Such a structure
leads to a faster dissemination of information on the market participants and to a lower degree of anonymity. Heidle and Huang (2002) also find such an effect. They attribute the higher transaction costs (bid-ask spreads) of the NASDAQ market to the higher risk of transacting with informed traders, a problem that is greatly mitigated by the market structure of the NYSE.

In contrast with the aforementioned advantages, there are a number of disadvantages that are shown empirically in the literature. One of the major disadvantages of this system is that it is less transparent to the market participants than either the quote driven system or the non-centralized system. The centralized position of the specialists (market makers) allows them to have unique knowledge of the market and thus be able to observe on a continuous basis the supply and demand parity. This may lead to unfair practices by market makers, practices that lead only to personal gains. For example, recent articles in the financial press have criticized specialists for “front running”[17]. The allegations claim that when specialists observe a disparity between supply and demand in their limit order book, they step ahead on the side of the book that has the prevalence in the disparity and place their own order knowing that once their order is executed either the instrument’s price will move in a favorable direction – their order to buy (sell) is executed and the prices move up (down) – or if not, they have several other orders waiting so that they can discharge their transaction. This free option, that especially the specialists can spot quite easily, has become much cheaper after the decimalization of the NYSE[18]. The specialists can now “front run” – step ahead of the other orders to buy or sell depending on the disparity – with only a cent cost. This practice is also called “penny jumping.” Thus, the problem has been intensified and the public and institutional outcry for reform has greatly escalated in recent years[19].

Another disadvantage of this system arises from the fact that market makers in a centralized system have to maintain a fair and orderly market. They are obliged to smooth transaction price changes when large price fluctuations are pending. This price continuity rule leads to large inventory risks for market makers. In order to adjust for these risks, market makers move the quoted prices in a direction favorable to themselves in order to rebalance their position (Panayides, 2007). This practice adds significant “noise” to the price discovery process and it temporarily masks the true market price. Theissen (2002) results are evident of such an effect. He compares empirically the contribution to price discovery between the centralized system of Deutsche Börse and its non-centralized Xetra market and finds support that the Xetra market has a larger share.

4.3 The non-centralized market-making system in an order-driven electronic market

One of the major advantages of this system is the transparency of the limit order book to all market participants. In non-centralized markets the limit order book is either almost as visible or equally visible (i.e. transparent) among investors and market makers. Thus, there is no monopolistic information of the order flow by either side. Such transparency can lead to lower transaction costs, especially among uninformed investors (Pagano and Roell, 1996). At the same time, since market makers have to continuously enter the system with limit orders to buy and sell, they provide the necessary liquidity on a continuous basis and provide the necessary competition on equal terms between themselves and other investors (Nimalendran and Petrella, 2003). This system stands in contrast to both the centralized market making system and the
quote-driven system, where limit orders from the public cannot directly compete with market makers’ orders. This is so because market makers have immediacy and more knowledge of the general market on their side.

Another advantage of this system relates to market making surveillance, as it is less costly to regulate. This is because the duties of the market maker in a non-centralized system are predefined in a set of quantified rules (Tables V-VIII) that can be formulated and controlled electronically. In addition, as market makers’ access to the market in a non-centralized system is only through a terminal similar to any other investor (broker), there is no need for extra technical and human resources to monitor their trading role.

On the other hand, major disadvantages of this system have been shown empirically in previous research. In particular, the application of this system does not necessarily provide extra liquidity in the market. The market maker can practically avoid trading by providing orders to buy or sell that are non-competitive. Of course, this can only occur when the minimum liquidity available for the stock is already sufficient. Venkataraman and Waisburd (2007) show that the application of the non-centralized market making system in Euronext Paris improved only the liquidity of the low turnover stocks and had no effect on the liquidity of highly traded stocks.

Another disadvantage of this system is that institutional investors do not find the non-centralized market making system an attractive venue for investing. This is because they cannot hide their trading intentions and have to reveal their orders to the whole market. Any effort to transact large volumes brings unwanted temporary price fluctuation and “front-runners” that take advantage of the signal that the institutional investors provide.

5. Implementing the market-making systems in emerging markets

In this section we investigate the major factors that need to be taken into consideration by stock market regulators in developing countries when they consider implementing one of the aforementioned market making systems.

In order to make our conclusions more appealing to regulators in emerging market settings and to capital market participants, we also conduct a case study of the Cyprus Stock Exchange (CSE). The CSE is an emerging European exchange that is currently considering the implementation of the market making system with the hope to remedy major market problems. The CSE case is an analytically useful one for several reasons: First, it is a clear case of an emerging market that has both low liquidity and a capital supply shortage. These problems are common problems to most emerging markets. In addition, the market suffers from a general attitude of indifference and lack of trust on the part of both domestic and international individual and institutional investors. Many countries in Eastern Europe suffer from similar problems. In recent years, the Cypriot exchange authorities have been looking for new ways to redesign the market structure of their exchange in order to improve its liquidity and thus attract both domestic and international investors[20].

5.1 Costs and challenges of applying a market-making system to emerging markets: factors for consideration

As we have already mentioned, current conditions in emerging markets are characterized by low volume, low liquidity (i.e. low depth of the market), large price
fluctuations and lack of interest from domestic and foreign institutional investors. These problems imply that the market is both less efficient and less cost-effective in determining stock prices.

According to the empirical studies summarized in Section 2, the presence of a market maker may have a number of positive effects for the investors, the listed companies, and the exchange itself. Foremost among these benefits is the increased liquidity, as the market makers are obliged to enter the system’s orders (quotes) to buy or sell for their own account. Because the market maker’s orders are regulated by rules that specify maximum quoted spreads, and in some instances depth of spread, the market maker’s actions are expected to have a direct positive effect on price fluctuations and transactions costs.

In an emerging market, introducing one of the market making systems described in Section 3 – either the quote-driven market making, the centralized market making or the non-centralized market making system – is expected to improve the current situation. However, given the particularities of each market making system, implementation comes with significant costs and challenges. In particular, the factors determining the size and nature of the challenges of implementation are:

- current exchange design and the costs of restructuring;
- current investors’ sentiment towards the exchange, both domestically and internationally;
- the market design in countries hosting the target foreign capital; and
- size of the emerging market.

We proceed by looking at how each factor affects the choice of implementation of one of the three market making systems for the case of any emerging market that considers restructuring its market design.

5.1.1 Current exchange design and the costs of restructuring. Most emerging markets currently use the pure order limit book system. This system is currently employed in 10 out of the 30 exchanges examined in this study (see Table I). Under this system, all orders (both limit and market orders) are entered electronically through brokerage terminals. The best buy and sell limit orders in the book are automatically assigned as the quoted prices and the market orders of the relevant side are executed against them. Of the three market making systems, the least costly to implement in an emerging market, in terms of both machinery and technical personnel and supplies, is the non-centralized market making system. This is because in essence this system only entails – other than the surveillance department – one extra terminal for each designated market maker. The surveillance department will be required to monitor the market making provision of liquidity in order to make sure that it complies with the obligations set by the exchange[21]. By contrast, the quote-driven market making system is much more costly as it requires more capital to function – i.e. several such terminals are needed for all the dealers in addition to electronic communication networks between investors, brokers and the dealers. In order for the centralized market making system to be applied, a physical venue (the floor) equipped with terminals for market makers and floor brokers is needed, along with the technically equipped personnel. In addition, a sophisticated monitoring unit is needed by the exchange to watch that both market makers and floor brokers’ comply with their
fiduciary responsibilities. Therefore, we conclude that the most appropriate system in terms of ease of implementation and expense appears to be the non-centralized market making system.

In summary, the potential cost of implementation of the non-centralized market making system in an emerging market that already uses the pure electronic limit order book system is minimal. In contrast, the cost is substantial for either one of the other two market making systems. However, regulatory authorities can potentially share the costs of implementation with market maker firms. In that case, market makers’ expected profits could be a significant factor in adjusting implementation costs of each one of the three systems.

5.1.2 Current investors’ sentiment towards the exchange. Lack of confidence by investors in their institutions can be found in many emerging markets, which may be due to lack of knowledge and experience. One example in an emerging market is the market downturn in the CSE that began in 1999, when investors suspended investment almost entirely due to their lack of confidence and mistrust. Investors strongly suspected that insiders and financial analysts had deceived them.

Under the centralized market making system and the quote-driven market making system, market makers have monopolistic knowledge of the market’s trading interest through their unique position to observe the limit order book and floor brokers’ intentions. In addition, their position gives them unique immediacy in making transactions. One possibility is that this monopolistic knowledge and immediacy may lead to even greater suspicion on the part of investors. Instead of improving the liquidity and attract more capital, the implementation of a market making system may have the opposite effect. Recent accusations of “front running” and “collusion,” as well as the fact that market makers profits are generated through intraday trading, – as mentioned in Section 3 – will certainly attract the attention of an already skeptical local and international population. The non-centralized market making system may be the most suitable to address the problem of investors’ inhibitions. In this system, market makers do not possess any more information than the average investor, and their profits are pre-determined by a flat fee paid by the listed company (a contractual agreement between the listed company and the specified market maker) and not through trading.

In conclusion, applying the non-centralized market making system to emerging markets appears to be a good mechanism to increase investors’ confidence due to the system’s transparency. We also believe that regulators should clearly articulate to the public the rules and regulations that govern the market makers’ actions. They should establish a reputation of a strict surveillance department that thoroughly monitors market makers. Of course, the restoration of investors’ confidence is also affected by strong regulation and equal implementation of regulations on a number of other issues, such as prohibiting insider trading, protecting the rights of minority shareholders, requiring the timely disclosure of corporate information, and regulating mergers, acquisitions and corporate governance.

5.1.3 Market designs in countries hosting the target foreign capital. A third factor that emerging markets need to take into consideration is the nature and location of the foreign investors that the emerging market regulators want to attract. A recent paper by Chan et al. (2005) identifies factors that affect foreign investors’ bias by looking at the mutual fund holdings data from 26 countries investing across 46 countries during 1999 and 2000. The authors investigate factors relating to economic development, capital
control, familiarity, investors’ protection and, most importantly to our study, the effect of stock market development. In particular, they show that higher transaction costs and emerging capital markets tend to be deterrent factors for foreign investments, whereas bigger markets and markets that have larger turnover ratios attract more foreign investments. Thus, they provide direct evidence that liquidity is very important to foreign investors in support of the introduction of a market maker system.

However, Chan et al. (2005) do not look at the stock market design. We extend their model by investigating the effect of market design familiarity. In particular, we construct a distance variable that indicates whether the target market and the foreign investors’ market design are similar. We achieve this by looking at all 46 countries in Chan et al.’s (2005) sample and classify each market in one of the four categories:

1. pure limit order book market;
2. non-centralized market making system;
3. centralized market making system; and
4. dealer system.

We identify whether the target market and foreign market have the same design and construct the indicator variable Similar-Market-Design (SMD). Table IX presents results of both the Chan et al. (2005) model and our extended model. The SMD variable (column 3) is significant and positively related to foreign investors’ bias. In short, familiarity with market design is a significant factor affecting foreign investors’ intentions to invest in a country. Given that international investors are generally skeptical of investing in emerging markets where financial market efficiency is a new and shaky phenomenon (also seen in Table IX for the negative effect of the emerging market indicator), a market design that resembles their own market’s may give them some assurance due to their familiarity with the trading structure.

<table>
<thead>
<tr>
<th>Variables</th>
<th>Chan et al. (2005) Coefficients (t-value)</th>
<th>Extended model Coefficients (t-value)</th>
</tr>
</thead>
<tbody>
<tr>
<td>SIZE</td>
<td>0.26 (2.89)*</td>
<td>−0.02 (−0.40)</td>
</tr>
<tr>
<td>TURN</td>
<td>0.76 (6.09)*</td>
<td>0.17 (2.07)**</td>
</tr>
<tr>
<td>COST</td>
<td>−1.26 (−5.81)*</td>
<td>0.25 (1.77)</td>
</tr>
<tr>
<td>DUMEMG</td>
<td>−0.8 (−5.97)*</td>
<td>(−5.97)*</td>
</tr>
<tr>
<td>SMD</td>
<td>0.31 (3.00)*</td>
<td></td>
</tr>
</tbody>
</table>

Notes: * Statistically significant at α = 0.01; ** Statistically significant at α = 0.05; The table shows Chan et al. (2005) linear model results of foreign investors’ bias on stock market development and the extension of their model by including the similarity of the market design between the two markets as an independent variable. The study looks at the market microstructure factors that affect 26 developed countries in their decision to invest in 46 foreign countries. Column 2 shows the original factors used in Chan et al. (2005): SIZE (stock market capitalization), TURN (market turnover), COST (trading costs) and DUMEMG (indicator variable for an emerging market). Column 3 includes an extra variable related with the current study: the familiarity of the two markets (SMD). The familiarity of the two markets (foreign investors’ market and the market in which they are investing) is defined as an indicator variable when the two markets are the same using four categories: 1) Pure Limit Order Book markets, 2) Non-centralized Market Making systems, 3) Centralized Market Making systems, and 4) Quote-Driven dealer Markets.

Table IX. Investigation of the market design in foreign countries and foreign investors’ bias.
In conclusion, emerging market regulators should identify their target foreign capital market prior to implementing any market making system. Deciding which market making system to follow is expected to affect foreign investors’ perceptions and confidence. As Table IX shows, in addition to geographic location, liquidity costs, and the financial development of the domestic country, familiarity with the trading system is also an important factor that attracts foreign capital[22].

5.1.4 Size of the emerging market. By looking at the capitalization of the markets that employ either the centralized market making system or the quote-driven market making system, we observe that these are much larger on average than other markets that follow the non-centralized market making system. Table I (column 3) depicts the market capitalization of 30 stock markets internationally. In particular, for the centralized system, the existence of a floor, floor brokers, market makers and electronic orders make the system better adapted to a large market. Similarly, for the quote system, there must be at least three dealers assigned at any point in time to a financial instrument (or even five for a newly listed company). This is because a high level of competition is needed for the efficient functioning of the quote-driven market (Grossman and Miller, 1988). This system also tends to require a large market in terms of size, with companies that are large enough to maintain the intraday interest of all the necessary participants. As Table I shows, emerging markets usually have a much smaller number of listed companies and market capitalization (e.g., the CSE has about 150 listed companies with a market capitalization of about $4.7 billion). The only system that can be accommodated easily given the size of these markets is the non-centralized system.

Of course, issues related to managing inventory risk will be more severe in small markets, especially for illiquid stocks, irrespective of the market making design. In particular, the non-centralized market making system can accommodate those risks with the right contractual agreement between market makers and the listed firm. As mentioned in Section 3, big blockholders can agree to provide the necessary inventory and alleviate risks from market makers. In the other two market making systems, market makers’ inventory rebalancing is achieved only through trading.

In general, we believe that the size of an emerging market does matter significantly when capital market authorities decide on the appropriate market making system.

5.2 Potential market makers
Emerging markets’ authorities can improve liquidity and attract capital to their market by implementing either one of the three market making systems. However, they must be cautious with any restructuring. Numerous interviews with potential market makers in the Athens Stock Exchange – a market that recently introduced a market making system – revealed that, irrespective of the chosen system, market makers are reluctant to be assigned to extremely low liquidity stocks for reasons of high risks. Similarly, listed companies in the non-centralized system find the idea of hiring market makers for providing liquidity less appealing, because it will increase their costs.

We suggest that the emerging markets’ exchange authorities inform all market participants involved of the risks and benefits of the implementation of a market making system. In particular, brokerage houses that usually undertake the market makers’ role should make sure they identify the capital involved and the sources of profits of each system. In addition, authorities and listed companies can provide incentives to alleviate initial fears. For example, regarding the non-centralized system we described in Section
big blockholders can provide the inventory needed for market making. In addition, the exchange can reduce the costs related to the submission of limit orders by allowing market makers to short-sell. Such privileges should provide an effective way to convince brokers to undertake the role of a market maker.

6. Conclusions

Different market making systems can be found in most developed capital markets. By investigating 30 stock markets worldwide, we conclude that the majority of countries, as opposed to having a pure electronic limit order book design, follow one of three forms of market making. These are: the quote-driven market making system (NASDAQ, London Stock Exchange), the centralized market making system in an order-driven market (NYSE, Deutsche Börse), and the non-centralized market making system in an order-driven market (Euronext, Germany’s Xetra, Italian Stock Exchange, Athens Stock Exchange). We critically evaluate these three market making systems in an effort to shed light on the merits of each system and its compatibility in an emerging market environment.

Evidence shows that two of the main problems that emerging markets face are capital supply shortage and lack of liquidity. In an effort to restructure their market design into a more efficient and attractive venue for international investors, regulators are required to adopt one of the three market making designs. We propose a number of factors that the regulatory authorities of an emerging market need to consider in order to implement the most appropriate market making system and thus avoid excessive costs and negative reactions from investors. These factors are:

- current exchange design and the costs of restructuring;
- current investors’ sentiment towards the exchange, both domestically and internationally;
- market designs in countries hosting the target foreign capital; and
- size of the emerging market.

In summary, this study identifies the challenges and benefits of implementing a market making system in restructuring emerging markets. The area of emerging markets’ microstructure design and market quality are still relatively under-studied. Our paper contributes to the understanding of the microstructure regarding the restructuring of the emerging markets and the implementation of a market making system. Further research may investigate the changes in the quality of the market that follows such an implementation.

In addition to using market makers, regulators in emerging markets may want to partition the trading phases into both call auction (periodic trading) and continuous trading. Pagano and Schwartz (2003) show that the introduction of call auction trading in addition to continuous trading improved market quality in the Euronext Paris. The use of call auction trading in emerging markets as an alternative restructuring measure to improve liquidity is a venue for future research.

Notes

1. To date, the implementation of market making systems in emerging markets has been limited. Only Poland, Estonia and the Czech Republic (see Table I) have recently adopted a
market making system, whereas Turkey and India are considering implementing such a design. In spite of the fact that there are differences between developed and emerging markets, the long history and extensive use of the market making systems in developed countries is expected to provide lessons not only in developed markets but also in emerging markets (O’Hara, 2001).

2. In particular, we identify two different forms of the centralized market making system in an order-driven market: the floor-based and the electronic system. However, the latter system is not as widely used. It was applied in the Amsterdam Stock Exchange before the exchange merged with Euronext.

3. Similar methods of classifications of market making designs are found in Jain (2003) and Westerholm et al. (2003).

4. The Specialist system is referred in this paper as the centralized market making system.

5. Kairys et al. (2000) investigate empirical issues regarding liquidity and market structure when they look at the effect of the change from auction trading to continuous trading in the Riga Stock Exchange.

6. Bessembinder’s studies are of significant importance since they were conducted after the market reform in the NASDAQ market. This reform was enforced in order to deal primarily with dealers’ collusion. Previous studies have attempted to explain that the higher cost of trading in the NASDAQ market in comparison to the NYSE is due to the collusion of the NASDAQ dealers.

7. Such disadvantages are described extensively in Section 4.

8. Certain exchanges prohibit the use of market makers for their high liquidity stocks. In LSE, the 100 stocks that belong to the SETS system are traded electronically. In Euronext the stocks that belong to the Euronext 100 Index are prohibited for using market makers. Lastly, in Italy only stocks in the STAR market are allowed to use market makers (most stocks). For the purposes of our study, the vast majority of stocks in the developed markets, including the low liquidity stocks are obliged to use a form of market making. We study the trading mechanism of these stocks in detail as they can relate to the emerging market ones.

9. Our classification is somewhat different from Jain (2003), which is based on the following three dimensions: execution system (quote driven versus order driven), location of the market (floor-based versus screen based) and level of competition (monopolistic competitive). We characterize each market in our sample according to Jain’s dimensions but we also control for the presence of a market making system.

10. These limit orders to buy and sell a number of shares at specific prices are defined as the market maker’s quotes. Each quote has a bid and ask price with a certain depth respectively.

11. The market makers’ monopolistic power is constrained by exchange traded-rules that oblige them to provide a fair and orderly market.

12. The NYSE is in a process of restructuring itself as a more order driven electronic market. The Direct + system, which enables investors to trade instantly without going through the specialist, is dramatically expanded to include all orders (was 1099 shares order only) with unlimited usage (was one order every minute). More information on the new “hybrid” system and the specialist participation can be found in Hendershott and Moulton (2008).

13. We do not differentiate between the order-driven centralized market making system and the floor-based one. In particular, due to the current use of only the floor-based market making system, we proceed by looking more closely at this market design by looking at the NYSE and the Deutsche Börse.

14. The supervisory body for market makers’ surveillance in each country and the possible penalties for market maker misconduct are also important characteristics. Due to the similarity of their main supervisory body – governmental – and penalties, we do not report them in this paper.
15. The share rebalancing by major blockholders is arranged through contractual agreements that are negotiated when the market makers first take the responsibility of providing liquidity for a particular firm. It is not at the discretion of the major blockholders to withdraw or add inventory to market makers after the contractual agreement is set.

16. Informed traders can potentially manipulate the market and create huge costs for market makers. Such costs are also known as adverse selection risk.

17. Numerous articles accuse the Specialist for front running have appeared since April 2003 in an on-going debate in the *Wall Street Journal*, *Business Week* and *Financial Times*.

18. Interestingly enough, Chakravarty et al. (2005) find that at the NYSE there appears to be less institutional trading overall. They attribute this to decimalization and the fear of front running.

19. A number of NYSE Specialists were indicted with the accusation of front-running (“15 specialists from big board are indicted”, *New York Times* 04/13/2005)

20. See appendix for a detailed description of the CSE and the current levels of liquidity in its market

21. The exchange should also decide on the level of transparency in relation to market making orders or trades. Currently, the exchanges that apply the non-centralized system, market making orders and trades are not disclosed.

22. As far as the emerging market of Cyprus is concerned, it has always been financially linked to Europe. In recent years its European ties have grown even closer as the country joined the European Union in May 2004. Therefore, the CSE must be harmonized with the European stock market models, all of which feature a market maker system (see Table I). Because the target foreign capital that the CSE expects to attract is primarily from Europe, clearly the most advantageous choice is to restructure to a model that resembles its European neighbors. As it is shown in Table III there is a European trend toward the non-centralized market making system. The main European markets of Euronext and Germany’s Xetra, as well as markets closer to Cyprus like the Italian and Athens Stock Exchanges, follow the non-centralized system. By implementing this market making system, it will be easier for Cyprus to attract the attention of the international target market.

23. At its “peak” in November 1999 the CSE index was 849 points. Four years later in August 2004 the CSE index was around 73 points (i.e. drop in the CSE index of about 90 per cent). According to the international financial press, this was one of the highest drops in the recent history of stock exchanges worldwide. In July 2005, the CSE index was around 80 points.

24. The monthly turnover velocity is defined as the ratio of the total number of shares traded during the month over the total number of shares outstanding.

25. The data and graph are available from the authors on request.

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Further reading


Appendix
Cyprus is one of the ten countries that joined the European Union in May 2004. As such, the country needs not only to comply with European standards but also to compete on a larger scale for economic development and establishment as an “equal partner”. Its stock market situation however, suffers from severe problems of low liquidity and mistrust by investors. This is partly due to the financial crisis that the market has suffered in recent years. The market index has dropped more than 90 per cent since 1999[23]. This sharp decline caused investors to lose their confidence in the CSE and thus lose interest in the exchange.

Figure 1 depicts the current state of the Cyprus market with respect to the level of liquidity as compared with other selected international markets. We take the average monthly turnover velocity for the months of January to June of 2003 as a measure of the current market liquidity for each exchange[24]. We observe low liquidity for the CSE compared to both developed markets and exchanges such as Prague’s and Ljubljana’s markets which have also recently joined the European Union. The only market that has lower liquidity measure than the CSE is Malta. However, if we look at the levels of liquidity over time (Figure 2), we observe that Malta’s exchange has been steady in its liquidity measure over the years, while the CSE has shown a significant decline in the turnover velocity, especially since 1999. Figure 2 also shows that the CSE had the highest fluctuation in liquidity of all the other exchanges since 1999, with a striking decrease of 92 per cent. Other markets, such as the Athens Stock Exchange (ASE) and the Ljubljana Stock Exchange have also shown significant decreases, 69 per cent and 60 per cent, respectively. However, these drops are much smaller in magnitude compared to the decline of the CSE. Further examination of annual turnover velocity was also conducted, adjusting for company characteristics. In particular, looking at the time series of the annual turnover velocity of the 5 per cent most capitalized and most traded companies respectively we find even further fluctuation in liquidity for the Cyprus Stock Exchange compared with other markets. This provides evidence of the severe liquidity problem that exists for the exchange[25]. Clearly, the CSE authorities are expected by the capital market participants to take significant corrective actions to gain investors’ confidence in the Exchange, such as actions to improve market liquidity and depth.

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