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INFORMATION FLOW AND NETWORK OF INTERPERSONAL TIES IN THE FIXED-INCOME MARKET

Breakthrough Ideas in Information Technology

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Abstract

The \$45 trillion fixed-income market still makes little use of the electronic marketplace. Our research findings show this to be mainly due to the market structure of embedded interpersonal ties, which allow participants to take advantage of information asymmetry for profit taking. This research-in-progress, based on ethnographic data and face-to-face interviews with 72 fixed-income senior managers and traders from 20 financial institutions, provides a unique insight into the information flow and networks of interpersonal ties in a fixed income market for market makers.

Keywords: Network ties, information flow, embedded relationships, arm's length relationships, fixed-income market

Introduction

Markets have three main functions: matching buyers and sellers; facilitating an efficient exchange of information, goods, services and payments associated with market transactions; and providing an institutional infrastructure, such as a legal and regulatory framework, that enables the market to function efficiently (Bakos, 1998). Operational efficiency means that market participants are able to conduct transactions at competitive cost, and informational efficiency means that all available information is incorporated into the price. The degree of informational and operational efficiency determines the extent to which markets are allocationally effective. Information systems can serve as intermediaries between the buyers and the sellers in a market, creating an "electronic marketplace" that lowers the buyers' cost to acquire information about sellers' prices and product offerings (Bakos, 1997).

In recent years, we have witnessed the growth of electronic trading systems use in support of Fixed-Income (FI) trade. To date, there are at least 44 platforms used internationally (The Bond Market Association, 2005). The growth in online trading in derivatives reflects the rapid growth that has taken place in the market in the use of derivative products and the vital role these play in FI portfolios, and it reflects also a trend toward commoditization in some sectors of the derivatives market. This growth also points to the greater efficiency brought about by electronic execution in a product sector where just a few years ago electronic trading was a novelty. Online bond-trading platforms have accelerated the development and implementation of value-added services to enhance the efficiency

of electronic trade execution and to reduce users' costs. A recent survey (The Bond Market Association, 2004) shows that virtually all of the trading platforms offer a combination of the following services: (a) pricing data, (b) confirmation and allocation services, (c) pre-trade analytics, (d) matching services, (e) electronic research delivery, (f) regulatory compliance services, (g) risk monitoring or management services, and (h) identity management services. Nonetheless, the telephone is still the main means of information flow between buyers and sellers in FI market (Gallaugh, 2002; Montazemi and Siam, 2005; The Bond Market Association, 2005). Thus, our research is guided by the following central question: What are the implications of information flow to mediate brokerage relationships that are enacted through the work practices and interaction of actors in FI market? To this end, the next section details the FI market environment and information flow among actors. Section three presents a framework to analyze information flow among actors in a social network. Application of this framework in the context of sell-side FI market is presented in section four. The paper closes with a discussion of the findings.

Fixed-Income Market Environment

It is estimated that the global FI market is about \$45 trillion. An FI security is defined as one whose income stream is fixed for the duration of the loan and whose maturity and face value are known. Unlike equities that are traded on exchanges and are subject to exchange rules, FI securities trade over the counter. The term "over the counter" (OTC) stems from the traditional method of selling securities, literally over the counter, before the establishment of exchanges. Fixed-income securities did not go through the exchange and continued to be an over-the-counter operation.

In a typical FI market, there are four major players: securities issuers, dealers, brokers, and investors. Fixed-income securities are issued by the borrower — governments or corporations — and purchased by a dealer or a group of dealers for resale. The dealers are the brokerage houses and the banks known in market parlance as the "sell-side". A typical FI transaction involves a considerable sum of capital and is mainly oriented toward institutional investors, who constitute more than 80% of the market. These institutional investors are professional money managers who invest for third parties such as insurance companies, mutual funds, pension funds, and deposit-taking institutions. These are referred to as the "buy-side".

The supply of new FI products comes from borrowers known as "issuers". This supply is channeled through the primary market, where borrowers issue paper, such as bonds, to raise funds. Dealers assist issuers with the design, marketing, and sale of the new securities. Dealers form a "banking syndicate" consisting of a number of dealers and bankers whose job it is to value the new issue, buy it, and sell it to investors. The process is known as "underwriting".

Actual trading takes place in the secondary market that lists and trades primary issues once they are sold. Market quotes (benchmark prices) to the FI market are provided through information vendors, such as Reuters and Bloomberg, which are connected electronically to the dealers' market. Investors (buy-side) are usually blind to the "real" and "live" market, and the prices (quotes) provided to them serve as a benchmark and are the first step in a process that may lead to a trade. The "real" or "live" dealers' markets normally take place over the phone and represent a binding commitment by the dealer either to buy or sell (Montazemi & Siam, 2005). Fixed-income market infrastructure is built around information asymmetry.

Information is critical to market transparency in FI trade (Moulton et al., 1998; Chakraborty & Yilmaz, 2004). Market transparency refers to the amount of quote, price, and volume information available to markets and to the general public. In FI markets, dealers provide quotes to a potential counterparty. They also act as market-makers, taking on inventory risk. Complete transparency in these circumstances may reduce their ability to manage this risk, which could have the perverse effect of reducing liquidity and increasing transaction costs. Thus, we find information asymmetry to be an important aspect of FI market operation. Information asymmetry arises when one side has private information that is not disclosed to the other side, and it is the cornerstone of the FI trades environment. This information could be about securities and their issuers, about general market conditions, about economic events, or about the analytic models used to analyze the profit margin of particular securities. Our focus in this paper is on the sell-side of the FI market.

Sell-side firms have traditionally played a critical role in FI markets. In negotiated deals (in contrast to auction-based deals), which are the dominant type of transactions in FI market, sell-side firms utilize their market expertise, which constitutes an information asymmetry that works to their advantage (Gallaughar, 2002). The information needs for sell-side firms in particular include information that they would like to receive about positions held in the buy-side portfolios to make better trading recommendations (Moulton et al., 1998) and to gain control over the significant effects of information asymmetry (Mendelson & Tunca, 2004; Xiao et al., 1998). Information asymmetry, as manifested in trade size, and the information environment of the trade have an impact on both prices and liquidity.¹ Furthermore, large trades have a greater price impact during times when asymmetric information is at its greatest (Koski & Michaely 2000). Thus, information flow among different actors in the FI market is most critical for opportunistic trade. Next, we provide a framework to analyze information flow among actors in the FI market.

Information Flow among Actors in Information Networks

In this section, basing ourselves on a review of the social network, information processing, and organizational learning literature, we develop a framework to assess the information flow among actors in the sell-side of FI market. Our framework highlights extend to which information flow in support of economic action is embedded in structures of social relations in an FI market. The relational view of information, seeking, and learning of actors in a social network, indicate that, faced with information asymmetry, the probability of seeking information from another person is a function of (1) knowing what that person knows, (2) valuing what that person knows, (3) being able to gain timely access to that person's thinking, and (4) perceiving that seeking information from that person would not be too costly (Borgatti & Cross, 2003). Actors use direct and indirect ties to seek private information under conditions of information asymmetry (Shane & Cable, 2002). Direct tie can be defined as a personal relationship between two actors (e.g. buyer and seller). Indirect tie, however, is a relationship between two actors who are not directly connected but through whom a connection can be made through a social network of each party's direct ties (Burt, 1987). Direct ties between actors could shift the logic of the transaction from one of economic relationship to one of social relationship (Marsden, 1981). By embedding a transaction in an ongoing social relationship, direct ties (a) motivate both parties to maintain the relationship in a fair and trusting manner, and (b) generate a sense of obligation between the parties, which causes them to behave generously towards each other (Gulati, 1995). Thus, in the absence of direct prior ties, actors are more likely to engage in zero-sum business transactions through arm's-length ties (Uzzi, 1996).

Furthermore, embedding economic exchange in social attachments can both create unique value and motivate exchange partners to share the value for their mutual benefit. Embeddedness explicates how informal mechanisms of trust and agreed-upon expectations of cooperative behavior arise in relationships and facilitate resource transfers between actors. For example, we see that embedded ties between firms and banks enable the creation of unique governance mechanisms that motivate and safeguard the transfer of select bank capabilities to the firm (Uzzi & Gillespie, 2002). Arm's-length ties, on the other hand, are characterized by lean and sporadic transactions (Uzzi, 1999). These ties determine the degree to which an actor can access heterogeneous information in a market, even if that information is publicly available, because actors use network ties to search for up-to-date information (Burt, 1992). Since arm's-length ties require little investment in time or mutual obligation, they enable actors to economically maintain many ties to other actors. Therefore, when public information is scattered unevenly among actors in a market, arm's-length ties should provide an effective and economical means for acquiring that information (Uzzi & Lancaster, 2003).

In contrast, embedded ties promote private knowledge transfer because expectations of trust and reciprocity provide assurances that the transfer will be used to the mutual benefit of both parties (Uzzi, 1999). Uzzi and Gillespie (2002) contend that the process of embedding commercial transactions instills into future exchanges expectations of

¹ Liquidity, loosely defined as the ability to execute transactions at short notice, low cost, and with little impact on price, depends on market microstructure. How can we tell if a market is liquid? Harris (1990) proposes four operational criteria to measure liquidity: Width: is the price wedge between buyers and sellers (or bid-ask spread) narrow? Depth: are large trades executed routinely without price change? Immediacy: are large trades executed promptly without price changes? Resilience: if prices move due to an order imbalance, do these prices return quickly to normal?

trust and reciprocity that promote unique value creation in the relationship. These expectations arise because the embeddedness of commercial transactions in social attachments associate the commercial transaction with expectations of exchange that people normally use for transacting with individuals they come to know well, expectations that offer a reliable template for managing transactions from what they learned in their prior experiences. Therefore, embedded ties are well suited for the transfer of novel and private information. Nonetheless, embedded ties and arm's-length ties are complementary rather than cannibalistic when they are combined within the same social network (Uzzi, 1999): arm's-length ties are superior at "shopping" the market for publicly available information, and embedded ties are superior at "plugging" actors into the unique private information network. Next, we use the above framework to assess relational ties and information flow among actors in sell-side FI market as depicted in Figure 1.

Data Collection and Analysis

The data were collected through ethnographic field study as well as face-to-face interviews using a semi-structured questionnaire. The purpose of the ethnographic study was to understand the operational dynamics of sell-side actors (dealers, sales reps, and management) on the trading floor to service buy-side and react to market news. The essence of ethnographic research is that it enables us to better understand the values, meanings, motivations, and logics that govern the action of the actors. It is based on "naturalist modes of inquiry" such as participant observation and semi-structured interviews, within a predominantly inductive framework. As a result, the researcher is immersed in the operational environment for a period of time to directly participate with the group being studied. This enabled us to view live operation on the trading floor and discuss, through face-to-face interviews, the specific operational issues with the actors within the context of their specific activities.

Our subjects consisted of 72 senior managers, traders, and sales reps from 20 financial institutions that represented both sell-side and buy-side. The financial institutions included all six Canadian market-makers, a major U.S.-based market-maker, four medium-sized sell-side, two major institutional investors, four medium-sized buy-side institutions, one IDB (inter-dealer broker) service provider, one ATS service provider, and one major research boutique. Each interview lasted 60-120 minutes and was tape recorded with the consent of interviewee. This enabled us to use the transcripts of the interviews for further analysis. Our objective in this research is to investigate the implications of information flow to mediate brokerage relationships that are enacted through the work practices and interaction of actors in FI market sell-side. This will enable us to better understand how information technology can be used in support of the FI market's daily operation. Figure 1 depicts Information Flow and Network Ties among Actors in sell-side FI market. This is based on a multilevel representation of organizational memory model proposed by Anand et al., (1998). All boxes but one are divided into two parts, Internal and external, representing within the sell-side firm and outside the firm (e.g. other sell-side, buy-side, government, news agencies).

Figure 1. Information Flow and Network Ties among Actors in Sell-Side FI Market

(I stand for Internal and E for external. See Table 1 for details)

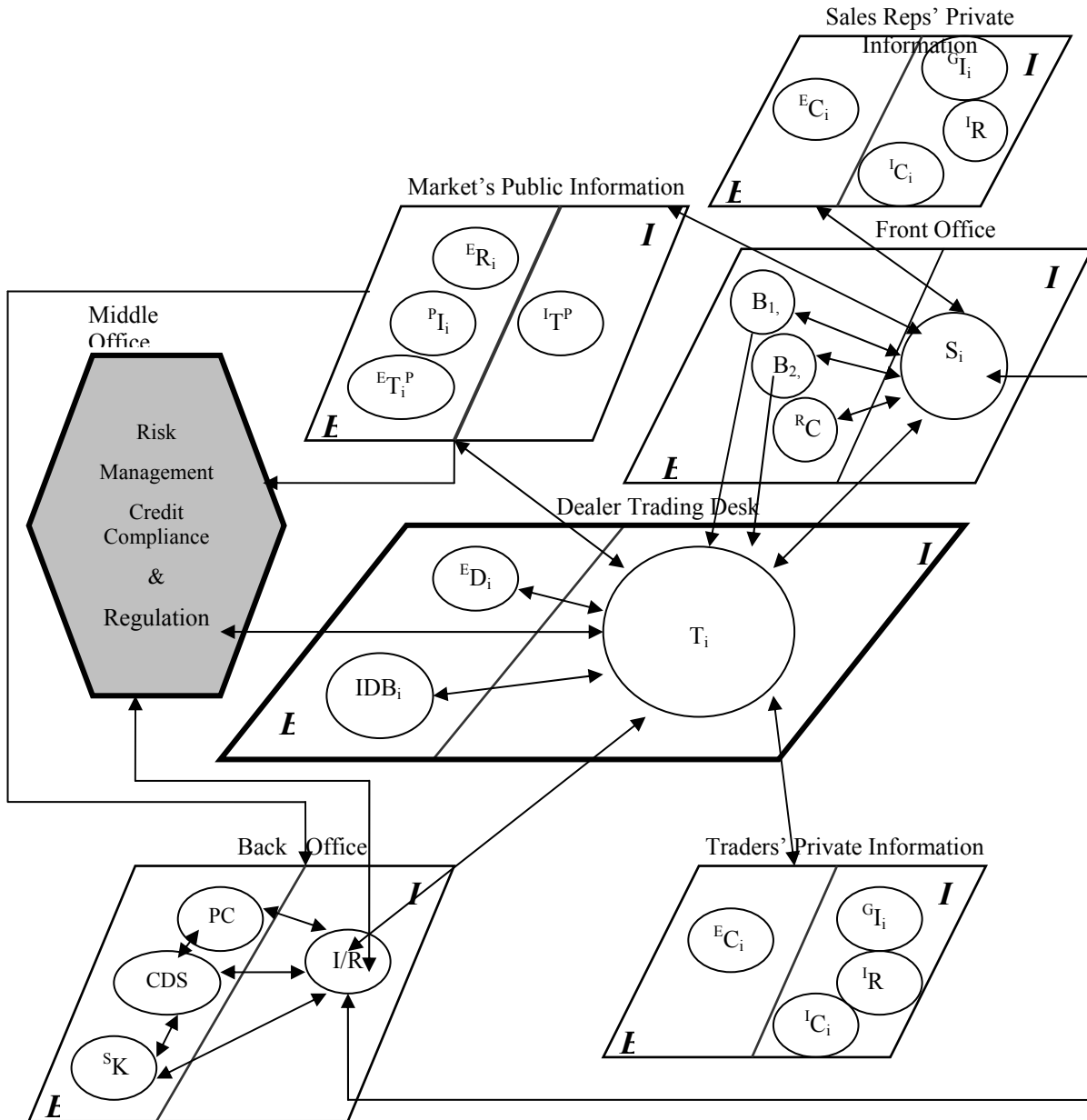


Table 1. Legend for Figure 1		
Description	Internal	External
Sales Office {Front Office}	S_i : Fixed income sales force, including the retail sales force (Sales/Traders)	$B_{1,i}$: Large buy-side institutional Firms $B_{2,i}$: Small buy-side Institutional firms ${}^R C_i$: Retail clients
Dealer trading desk	T_i : Sell-side market makers or Traders, including the senior trader/manager (VP trading)	IDB_i : Inter-Dealers Brokers ${}^E D_i$: Other dealers C_i : Contacts
Sales reps' & traders' private information	${}^I R$: Internal research ${}^I C_i$: Internal contacts ${}^G I_i$: Internal news, order flow and market intelligence	${}^E C_i$: External contacts
Market's public information	${}^I T^P$: Proprietary automated trading platform	${}^P I_i$: Public Info from vendors ${}^E R_i$: External research boutiques ${}^E T_i^P$: External automated trading Platforms
Clearing and settlement {Back office}	I/R : Inventory	CDS : Canadian Depository for Securities ${}^S K$: Sell-side custodian PC : Private clearing firm
Middle office	Risk management and trade policy Credit compliance Regulations	

The initial version of this Figure was first developed through detailed inputs from a senior trader. Next it was presented to all other 71 subjects for comments and was refined based on new information as we progressed through interviews to the point that final 10 subjects found it to be complete.

Let us start with the front office. The primary responsibility of sales reps [S_i] is to manage the relationship between the clients (large institutions such as Teachers and Omar denoted by $B_{1,i}$ and small institutions denoted by $B_{2,i}$ and retail clients denoted by ${}^R C_i$) and dealers on the trading desk. The sales reps provide information to the client about the state of the market (market intelligence) and/or pass information to a specific trader at the desk if the client intends to buy/sell securities. Furthermore, sales reps also initiate daily contacts with “preferred clients”, and each sales rep has embedded ties with up to 40 such clients who are considered profitable for the firm. The daily contacts

enable the sales reps to keep track of clients' needs and provide them with market intelligence, about the "breadth"² of the market and if necessary provide further information about the "depth"³ of the market through traders at the trading desk. Large institutional clients, because of embedded ties with the dealers, enjoy the privilege of directly calling the trading desk by phone for consultation, negotiation, and immediate execution of the order. This relationship with traders enables them to exchange private information such as depth of market, liquidity, and effects of large transactions on the market. For example, traders as intermediaries may divide a large order into smaller lots for market offerings to avoid any adverse effect on their market (e.g. a \$500-million-dollar purchase of a specific bond can send an undesirable signal to the market causing a price increase). Here we see private information exchanged between client and trader with embedded ties to create information asymmetry for their mutual benefit. The relationship between small institutions and traders is usually at arm's-length, however. For example, the \$1 million purchase of a specific bond may not get the attention of a senior trader. As a result, a junior trader (or retail trading desk) would use alternative trading systems (ATSS) such as TradeWeb to purchase the bond for the client. The exception here is when the client from a small institution contacts a trader with whom he or she has embedded ties. In this case, the client from the small institution can receive from the trader with embedded ties the same service as a large institution. It should be noted that institutional clients use a mix of embedded ties and arm's-length ties when contacting sales reps/traders. They use arm's-length ties to broker market differences by asking for "benchmark quotes" from different market makers. However, embedded ties are used to exchange detailed private information when the client asks for a "market quote" for an immediate transaction.

Sales reps use internal and external private and public information to serve their clients. Internal private information includes: Internal Research [^IR] (supplied by the firms' analysts), internal experts [^IC_i], and Information created by different groups or departments [^GI_i] (e.g., internal news, order flow, and market intelligence). Thus, sales reps use direct ties with knowledge sources within the firms to obtain internal private information. External Private Information gathered from external contacts [^EC_i] (e.g. colleagues who might be working for other firms, and business acquaintances "in the know") through embedded ties with their contacts outside their firm. Internal public information is accessed through proprietary automated trading platform [^IT^P] that supplies the firm's quotes and prices accessible internally to the traders and sales reps as well as externally to some of the clients. The external public information includes: market prices and news from public Info/data vendors [^PI_i] (e.g. Reuters and Bloomberg), research boutiques [^ER_i] (e.g. Action Economics, UFG Research) that the firms subscribe to, and the external trading platform [^ET^P] (e.g. TradeWeb, eSpeed, and CBID; see Appendices A & B for details).

The traders at the trading desk also gather private and public information internally and externally. Internally the trader has access to private information from: (a) direct ties with other traders at the desk [^ED_i] (e.g., information about prices of other "related"⁴ bonds, market intelligence); (b) Direct ties with the firm's sales rep's private information [^Si] (e.g., information about firm's order flow and volumes for the current day); (c) Direct ties with senior managements' private information [^IC_i] (e.g., firm's guidance and policy, and expertise); and (d) Direct ties with the internal research unit and publications [^IR].

Externally the trading desk has access to Inter-Dealers Brokers' markets [IDB_i]. The IDB market is an "intermediate" and "live" market to facilitate trading between different dealers—traders who post bids and asks on individual securities on inter-dealers' screens for execution. The IDBs (e.g. Shorcan, Prebon, Cantor, Tullet, and Freedom) enhance market liquidity by managing inventories from different traders/firms for a fee. The public information accessed through IDBs includes market prices, market supply, and demand (indicated by the sizes of the

² Breadth of the market consists of basic information about the state of the day's market activities such as, type of bonds traded, news, and events (e.g., change in interest rate or unemployment figures released) impacting market liquidity.

³ Depth of the market is the latest information about liquidity of a specific bond.

⁴ Bonds trade off a benchmark yield curve, each bond trading at a premium or discount to that benchmark. This benchmark, however, changes from time to time according to market information flow. To avoid arbitrage, the trader wants to know (at the time of the trade) that his or her bond pricing is appropriate and in line with the benchmark and other bonds that are trading.

Bids and Asks posted) from anonymous competitors. Traders use arm's-length ties with external dealers [^ED_i] for a possible trade. Similar to sales reps, traders also have embedded ties with outside contacts [^EC_i] such as colleagues in other financial institutions. Their external public information includes market prices and news from public Info/data vendors [^PI_i] (e.g. Reuters and Bloomberg), research boutiques [^ER_i], and the external trading platform [^ET_i^P] (e.g. TradeWeb, eSpeed and CBID. See Appendices A & B for details).

Once a trade is executed, it is electronically reported to the back office by both the sales office and the trader. The back office is where all clearing and settlements occur. The back office is also divided into internal and external components. Internally, under the supervision of the firm, the back office performs the Inventory and Risk Management System [I/R] that keeps track of all the firm's trades. It performs an audit trail, verifies trades with counter parties, arranges for payments and settlement, and prepares electronic reports to the clients, sales office, trading desk, managers, and regulatory authorities. A third party sell-side custodian [^SK] is notified, either to deliver or to accept delivery if the firm sold or bought the security in question. Final clearing and settlement is done through an independent body called the "Canadian Depository for Securities" [CDS], established by the member brokerage houses. It is the common clearing and settlement link between the dealers and their clients (the buy- and sell-sides) and between different dealers. A Private Clearinghouse [PC] that acts on behalf of the buy-side is also involved. The back office has access to all external market information, although only the risk and inventory system have access to the firm's internal private information (such as internal research and order flow). The back-office transaction is performed for the most part electronically, in which case it is called "straight-through processing". All the pertinent operations among actors here is direct ties for maximum transparency.

Risk Management, Compliance, and Regulation divisions use all available information (public and private from within the firm) to oversee the operations of the firm (from the front to the back offices) plus all staff and client activities. These divisions are the custodians of the firm, dealing with issues such as the firm's overall risk exposure (market risk), credit compliance, and compliance by staff and clients with the rules and regulations of the firm and industry. Here relationships are direct ties with other actors in the firm for the sake of transparency and adherence to the rules and procedures that govern the operation of the firm.

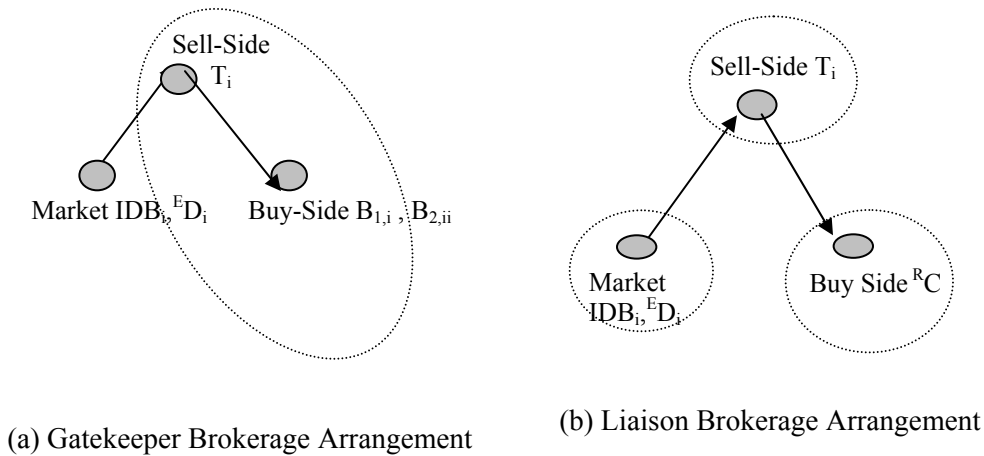
Discussion

The objective of this paper was to present our initial research findings to explore the implications of information flow to mediate brokerage relationships that are enacted through the work practices and interaction of actors in FI market from a practice lens. Essentially, these relations instantiated daily, are by and large embedded to deal with mutual need for private information to maximize profitable transactions. The basic needs for embedded relationships among actors are to deal with information asymmetry for mutual profit taking. To this end, more than 80% of FI transaction in volume is done by phone, but to improve distribution of information, the digital economy encourages the creation of institutional structures that assure online inter-organizational exchange relationships. Of course, there is no shortage of alternative trading systems in FI market place. More than 44 different ATS platforms are used internationally to support different types of FI trade. These ATSs, such as TradeWeb, are notably characterized by (a) the impersonal nature of the online environment, and (b) the extensive use of communication technology as opposed to other modes of transactions, such as face-to-face and telephone. The question arises as to why, unlike the equity market, ATSs cannot replace traditional methods of phone transactions. The characteristics of the brokering arrangement are central to this question.

Marsden (1982, p. 202) defines "brokerage" as a process "by which intermediary actors facilitate transactions between other actors lacking access to or trust in one another." Thus, any brokered exchange can be thought of as a *relation* involving three actors, two of whom are the actual parties to the transaction and one of whom is the intermediary or broker (Gould & Fernandez, 1989). Gould and Fernandez identified five structurally distinct types of brokerage configurations by examining differences in activities and interests of the actors in the network relationships. Two of their five brokering types, *gatekeeper* and *liaison*, are particularly relevant to our discussion of IT-mediated network relationships in financial firms.

In the *gatekeeper* brokerage arrangement (Figure 2a), the broker's interests tend to be aligned with those of the buyer. As a *gatekeeper*, the broker gathers information from a third party and manipulates it by filtering, sorting, and editing it before distributing a selective content to the buyer. In contrast, the *liaison* brokerage arrangement (Figure 2b) consists of actors who have different interests without any allegiances among them. In this liaison arrangement, the broker is seen to be both independent and unbiased. We use these two types of structural network relations to assess the FI market environment.

Figure 2: Brokerage Arrangement in an FI Market



Information is the life-blood of FI market operation, with benefits contingent on access, timing, and referrals. Access refers to receiving a valuable piece of information and knowing who can use it. This is particularly relevant in the FI market in which actors are unevenly connected with one another, are attentive to the information pertinent to the trade at hand, and are overwhelmed by the flow of public and private information. Traditional FI market trade is based on gatekeeper brokerage arrangements in which the embedded relationship between the sell-side and buy-side has facilitated an exchange of private information among actors to optimize mutual profits through embedded ties. Recent applications of the electronic marketplace, however, have resulted in two complimentary means of trade. On the one hand, liquid bonds — small lots of bonds worth less than one million dollars — and/or products with little information asymmetry, such as foreign exchange, are traded through online systems or ATSS). This is where the retail trade benefits from market efficiency and from the transparency that the electronic marketplace provides. We see here brokerage arrangements with arm's-length relationships among the actors (Figure 2b). The liaison brokerage arrangement is also evident from inter-dealer brokerage systems (IDBs) that facilitate efficient transactions among traders who are well informed about the products traded. In other words, there is little information asymmetry among the dealers trading through IDBs.

On the other hand, more than 80% of the volume of total FI trade is done between institutional buyers and market-makers using the traditional gatekeeper brokerage arrangement. They use the traditional method of voice communication by phone, relying on their embedded ties to use information asymmetry for mutual profit taking. As a result, use of information technology to mediate network relations would undermine the viability of the FI market's present business model. Thus, detailed analysis of information requirements and of social network structure can provide us with the requisite knowledge of the transition of the FI market to the electronic marketplace in our quest for improved market efficiencies. The analysis of FI market information flow and network ties detailed in this paper provides a first step in this endeavor.

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APPENDIX A: Services Offered by Electronic Trading Systems

Pricing data — Users can access a database of all trades executed on the system and in some cases trades executed on other platforms or by voice.

Confirmation and allocation services — Users can obtain electronic trade confirmations and/or use the platform to allocate trades among several accounts.

Order management system — Users can view and manage orders and positions on a real-time basis, in some cases across all traders within a firm or group.

Pre-trade analytics — Users can access research, data, and analytical functions to develop or test trade ideas before actual execution.

Matching services — Users can compare trades against a counterparty’s records to enhance the clearance and settlement process.

Electronic research delivery — Users can obtain research products produced by dealers or third-party providers.

Regulatory compliance services — Assist users in complying with certain regulatory requirements such as record-keeping or due diligence in price discovery.

Risk monitoring or management services — Allow users to apply risk assessment functions or models to portfolio holdings or monitor and control portfolio risk for individual traders or across a group or firm.

Identity management services — Advanced login features that allow users to monitor or control access to certain functions or services.

APPENDIX B: Types of Systems Supported by the Electronic Trading Systems

Auction Systems

Auction systems enable participants to conduct electronic auctions of securities offerings. Some auction systems are tailored to new issues in the primary market. Others focus on auctions of secondary market offerings by investors or others. In either case, a seller or issuer typically posts the details of a security on offer and the specific terms of the auction (i.e., whether the auction is single-price or multiple-price) the time the auction is open, whether partial orders will be filled, etc. Buyers are able to submit bids for the securities on offer, and the offering is awarded to the bidder that offers the highest price or lowest yield. In some cases the identities of the bidders and the amounts of the bids are kept anonymous. In others, identities or bid amounts are viewable by all participants.

Cross-Matching Systems

Cross-matching systems generally bring both dealers and institutional investors together in electronic trading networks that provide real-time or periodic cross-matching sessions. Customers are able to enter anonymous buy and sell orders with multiple counterparties that are automatically executed when contra side orders are entered at

the same price or when the posted prices are “hit” or “lifted.” In some cases, customers are able to initiate negotiation sessions to establish the terms of trades.

Interdealer Systems

Interdealer systems allow dealers to execute transactions electronically with other dealers through the fully anonymous services of interdealer brokers.

Multi-Dealer Systems

Multi-dealer systems provide customers with consolidated orders from two or more dealers and allow customers to execute from among multiple quotes. Often multi-dealer systems display to customers the best bid or ask price for a given security among all the prices posted by participating dealers. These systems also generally allow investors to request quotes for a particular security or type of security from one or more dealers. Participating dealers generally act as principals in transactions. A variety of security types are offered through these systems.

Single-Dealer Systems

Single-dealer systems allow investors to execute transactions directly with a specific dealer of their choice, with the dealer acting as principal in each transaction. Dealers offer access through a combination of third-party providers, proprietary networks, and the Internet.