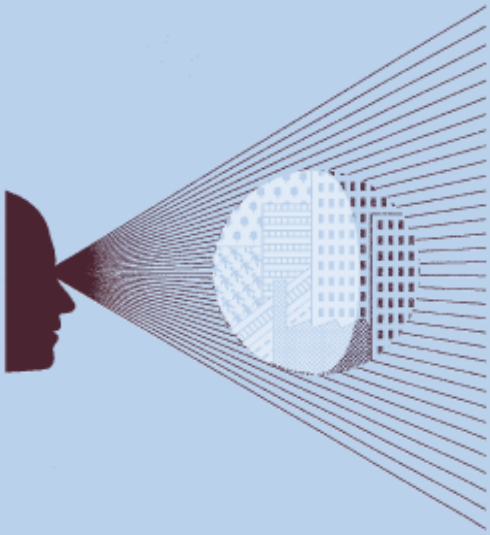
Oxera

What are the benefits of the FIX Protocol?

Standardising messaging protocols in the capital markets

Prepared for
FIX Protocol Limited

December 2009



Foreword

Governments worldwide are debating counter-recessionary plans. It is abundantly clear that step changes need to be made in our financial markets. However if pulling on tactical levers is to succeed, the strategic decision makers need a clear understanding of what those levers are connected to.

The capital markets turmoil has exposed the failure of the industry and its regulators to keep up with its actual operation. It has exposed the lack of knowledge within the industry of where assets actually resided and the risks of those assets. There are numerous causes of the turmoil being put forward. We do not yet know where the fundamental causes are located. The definitive study is to come but it is already clear that the paucity of information is a significant cause. This is why the heart of this Oxera analysis is the role of efficient information transmission.

We at FIX Protocol Limited (FPL) commissioned Oxera to analyse the benefits that flow from the use of the FIX (Financial Information eXchange) Protocol in capital markets. However Oxera's focus was not really FIX itself. The fact-based analysis concentrates on the enablement of operationally efficient capital markets through standardised messaging protocols. Oxera shows there are very significant benefits for the overall market if stakeholders use common and standardised communications protocols. But Oxera also highlight that the private incentives to adopt a common standard are not necessarily aligned with maximising total benefits. The public policy implication of this is profound.

There is the *potential* to increase the efficiency with which the capital markets around the world can operate. However, there is not necessarily the universal incentive to deliver it. The desired outcome of the world capital market reforms will need to be fit for purpose. Real benefits to end-investors result from integrated markets but it is vital that stakeholders can easily and efficiently communicate with each other. This must encompass the complete value chain of intermediaries including, critically, *all* the relevant regulators.

The coming rebuilding and reform of the capital markets creates an opportunity to unify communications. However the pressing need for reform brings its dangers. As regulators and market participants understandably call for quick changes to obtain timely and accurate information, communication protocols could fragment. Knee-jerk short cuts may build in more rekeying, delay and translation errors. Local and immediate communication repairs might mollify the current heated political agenda, but may also build in serious inefficiencies for the future, or possibly worse, onerous requirements for unification could be imposed that would make obsolete existing infrastructure investment and discourage future advances.

Capital markets require a sustainable infrastructure that can enable the delivery of concrete benefits to investors and the real economy. Central to that must be efficient communications between all the stakeholders. In this report Oxera show how these benefits can be delivered using standardised common protocols. We think participants in the financial markets industry should now deliver them.

FPL recognises that dynamic markets need dynamic languages. Standardising a common set of protocols that is fit for purpose is not a one-off exercise. Regulation changes, markets mature and end-investors seek to exploit new opportunities. Thus the language used to communicate must itself evolve. If the benefits of FIX are to be maintained and if additional benefits are to be realised by more widespread use of FIX, then FIX must also evolve.

FPL is a not-for-profit body committed to ensuring that FIX remains a free and open standard. Our current membership of approximately 200 firms continues to grow and has become increasingly geographically diverse. In 2008 for example we welcomed additional new members from Argentina, India, Nigeria, Pakistan, Russia and Turkey. As Oxera points out, keeping communications protocols up to date requires effort. However the volunteer based FPL model results in the usefulness of FIX flowing to those who do not contribute, as well as those that do. In economic terms, common and open standards that are free to use like FIX have a free-rider problem.

The adoption of FIX can, and has, delivered considerable benefits to those taking it up. This is the highly visible part of the advantages of using a standardised messaging protocol. However, as Oxera shows, there are hidden and second order effects of the widespread adoption of a common standard. These may be much more important for the long-term efficiency of the capital markets. Given where we are, now is the time to make sure that the benefits to the world economy materialise.

FPL recognises that efficient and cost-effective electronic communication between all stakeholders is only part of the answer. However this report supports our belief that it is at the core of an effective solution to the crisis in world capital markets. We consider this report could have a significant role in developing policy in this area.

FPL believes the Oxera report objectively highlights how valuable the benefits of FIX are. However given the importance of FIX, FPL recognises that FPL as an organisation cannot be static. We wish to be proactive. We welcome engagement and discussion with all interested parties on how FPL might itself develop to move FIX forward. FPL is more than willing to help deliver the capital market dynamics and structure that might hasten economic recovery.

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Past FPL EMEA Regional Committee Co-Chair (2003–2008)

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Executive summary

Over recent years global financial markets have undergone significant changes, and further significant changes are expected over the next few years. There have been major advances in technology, regulation, market structure and the scope of services offered, as well as an increase in the level of trading activity across most, if not all, asset classes. Standardisation of communications for various functions within firms, and for interactions between firms, has played a significant role in facilitating these developments.

The FIX[1] Protocol (FIX) is a global messaging standard for trading and, increasingly, post-trade communications among brokers, investment managers and trading platforms such as exchanges, MTFs and ATSs. This study provides an assessment of the way in which FIX benefits firms, wider markets, and ultimately the end-investors.

Standards provide a platform for efficiency, competition and innovation

Communication standards have historically played a significant role in economic developments, often increasing the efficiency and competitiveness of sectors and countries that adopt them. For example, the Internet Protocol (IP) and the Global System for Mobile communications (GSM) have had significant effects on innovation among providers of Internet and mobile communication services respectively.

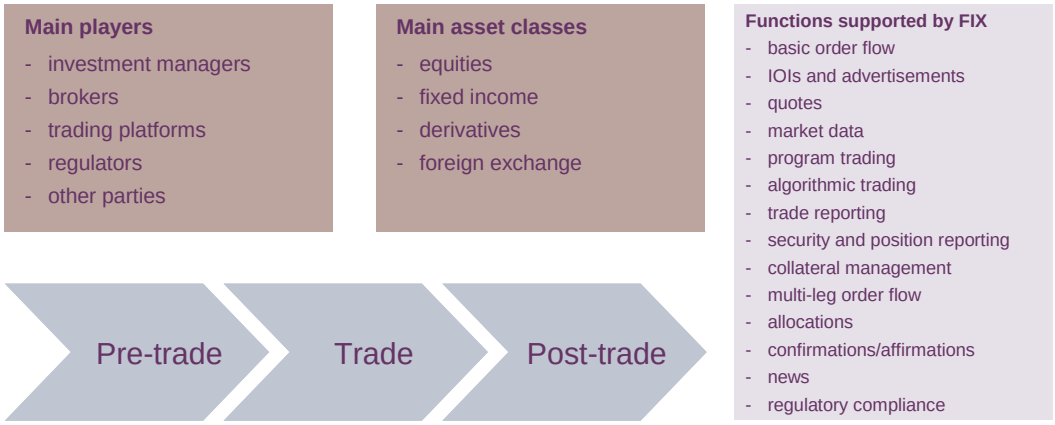
In the financial services industry, standardisation of messaging plays an especially important role due to the complexity of communications needed to operate these markets effectively and the large number of firms involved in delivering the service that end-investors need. The benefits associated with standardising communications among financial services firms are therefore likely to be greater than for many other economic sectors.

Activities and market participants affected by FIX

FIX standardises the key trading-level, and some of the post-trading, communications among brokers, investment managers and trading platforms. Increasingly, FIX is also used by regulators, post-trade service providers and other market participants (see Figure 1). Since its inception in 1992 as a standard used to trade equities, the use of FIX has expanded to other asset classes including fixed income, derivatives and foreign exchange markets. The scope of FIX has also been extended to include most pre-trade, trade and post-trade (pre-settlement) business processes as well as listed derivatives clearing. It is maintained as an open standard that is used by firms free of charge and is managed and developed by a not-for-profit organisation, FIX Protocol Ltd (FPL). (This particular approach addresses some of the potentially negative side effects of standardisation—the creation of market power through network effects.)

[1] Financial Information eXchange.

Figure 1 Main activities and players affected by FIX



Source: Oxera.

Benefits of standardising communications using FIX

The automation of trade and post-trade processes over the past 10–20 years has changed the way firms operate and interact, bringing about a reduction in the risks and costs associated with these activities. However, the automation of processes within firms can only take them so far; therefore, the automation of the communication *between* different participants offers additional benefits. As this study indicates, these benefits are particularly strong when internal automation and external communication are conducted with the same messaging protocol, such as FIX.

These additional benefits of the widespread use of a standard messaging protocol arise from a number of sources, which include the following:

– reduced cost and complexity of integrating various internal activities;

– reduced cost and complexity of the automation of new external links as a result of using the same messaging protocol as any of the existing internal or external links;

– increased ability to share infrastructure in terms of software, hardware and support staff;

– less need to rekeying and translate data, which lowers costs and results in fewer errors;

– easier monitoring of the overall positions of markets and flows within them (eg, for regulatory purposes) as the inputs are supplied in the same format and use the same protocol.

These benefits are greatly enhanced when a significant number (or high proportion) of firms use the same standard messaging protocol. Where market participants adopt the same communications standard across the value chain, many of the system-wide benefits arise externally to the firms actually making the decision to use a particular communications protocol. Within the firm, the decision to automate processes delivers benefits that are largely private benefits. When dealing with its customers or suppliers individually, there are also significant private (bilateral) benefits, but as a result of the multiple client/supplier relationships, adoption of a common standard also delivers benefits to others (who may be competitors) who have adopted the same standards. Significant public benefits start to arise from the common standard. As more firms and more layers in the value chain adopt the same protocols, greater levels of public benefit arise as cost reductions flow to those providing inputs to the transaction processes.

However, the interests of all the potential adopters of a standard protocol are not necessarily always aligned for a number of reasons:

– at any point in time the standardised communication may not encompass the full required communication needs of all parties involved in all parts of the value chain, resulting in non-standard (and potentially conflicting) additions;

– the benefits that can flow to actual or potential competitors may remove/reduce the incentive for some suppliers to adopt a standardised protocol;

– where automation has already taken place using a different standard, there is an immediate cost of changing, while the external benefits may take some time to materialise.

What benefits does FIX deliver to market participants?

Evidence from wider market developments together with the experiences of individual firms interviewed for this study confirm that widespread adoption of FIX is delivering benefits to firms involved in trading activities and to end-investors.

Because many of the benefits of the widespread adoption of FIX are external to the individual decision of a specific firm to adopt FIX, getting a *direct* measure of the total benefits is difficult. However, the value of the activities over which the benefits are arising is very high—the markets which benefit from FIX include the $113 trillion (annual turnover in 2008) equity markets in the USA, Europe and Asia-Pacific.[2] Increasingly, FIX is being used in other global emerging equity markets as well. The benefits of FIX are also starting to be realised in the markets of other asset classes, including government and corporate debt securities markets, which had outstanding value globally of $83.9 trillion in June 2009;[3] global foreign exchange markets with estimated monthly value in April 2007 of $3.2 trillion;[4] exchange-traded derivatives with notional amounts in the USA, Europe and Asia-Pacific in June 2009 of $63.4 trillion;[5] and global over-the-counter (OTC) derivatives markets with notional amounts in December 2008 of $591 trillion.[6]

The widespread adoption of FIX affects both the costs and efficiency of market participants; it also changes their behaviour and affects market dynamics through increased competition and innovation. The most direct effects of FIX are from a reduction in connectivity costs and an increase in efficiency.

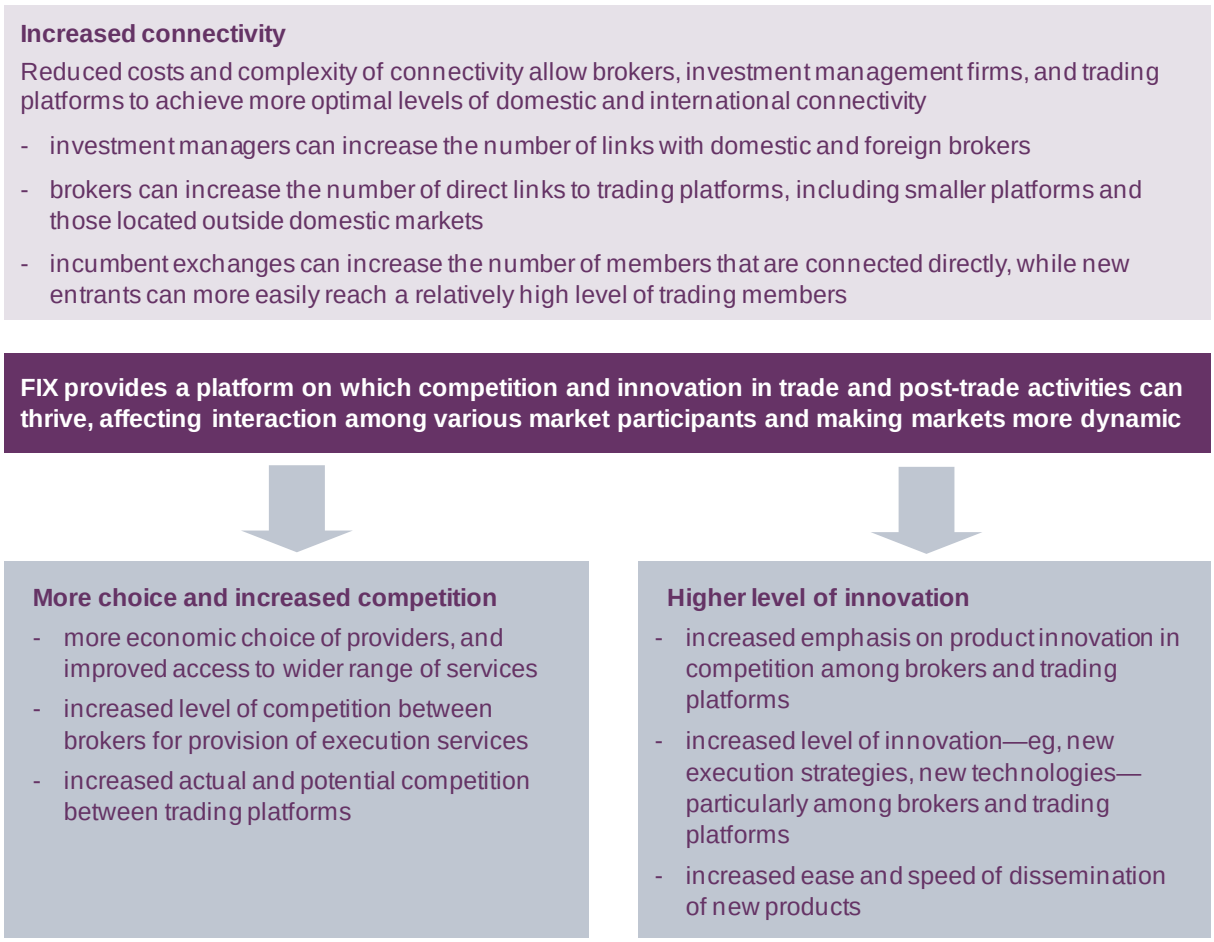
– **Connectivity costs**—one key effect of the widespread adoption of FIX is a reduction in the connectivity costs during the adoption, use and maintenance of application software when establishing links between investment managers and brokerage firms and between brokerage firms and trading platforms.

– **Efficiency level**—through integrating internal processes and external operations, the adoption of FIX also increases efficiency internally, for example by reducing costs and operating risks.

In the market segments where a high number (or proportion) of firms have adopted FIX, these changes in the level of costs and efficiency can also have an indirect effect on the behaviour of firms (see Figure 2).

[2] World Federation of Exchanges, annual time series statistics.
[3] BIS (2009), 'BIS Quarterly Review', September (sum of international bonds and notes and domestic debt securities).
[4] BIS (2007), 'Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in April 2007'.
[5] BIS (2009), 'BIS Quarterly Review', September.
[6] BIS (2009), 'BIS Quarterly Review', September.

Figure 2 Indirect benefits: changes in behaviour of market participants



Source: Oxera.

The widespread adoption of FIX also affects activities beyond the key trade processes of investment managers, brokers and trading platforms. The standardisation of the electronic format of information within and between layers in the value and transaction chain(s) creates conditions where other 'services' (both internal and external) can be delivered much more cheaply and effectively. These effects include the following.

– **Reporting**—improved capacity of firms to generate comprehensive reports covering all their trading activity with various counterparties across different market segments. This can increase transparency and a firm's ability to make more informed decisions about their choice of service providers.

– **Regulatory requirements**—reduced costs and complexity of compliance with MiFID in the EU, Reg NMS in the USA and other regulatory requirements for both firms and regulators.

– **Post-trading activities**—increased efficiency of the post-trade processes within firms and enables the development of a more integrated post-trading market in the EU.

These effects of FIX are not limited to equity markets. They increasingly extend to fixed income, derivatives and foreign exchange markets across countries, delivering similar benefits to those observed in the equity markets, including lower connectivity costs, wider connectivity, increased competition, and improved transparency and reporting.

Illustrations of individual experiences of firms

The investment managers, brokers and trading platforms interviewed for this study confirm the significance of the effects of FIX. Firms noted that FIX has facilitated reduced costs, complexity and time required to achieve connectivity between brokers and investment managers, and brokers and trading platforms. In addition, these changes have resulted in more dynamic relationships between investment managers, brokers and trading platforms. Some examples provided by firms are highlighted in the box below.

Effects of FIX: examples

Firms noted that the proliferation of alternative trading platforms in the USA was made possible largely as a result of the existence of standardised connectivity solutions that brokers could use at little marginal cost to connect to the new trading platforms. Similarly, in Europe, they noted that FIX connectivity—allowing new entrants to achieve widespread connectivity quickly—will be an important factor in facilitating competition between new trading platforms and incumbent exchanges.

Firms also confirmed the effect of FIX on the innovation and provision of new valued-added services by brokers, and the relationship between investment managers and brokers more generally. For example, increased ease of switching between brokers has contributed to the increased intensity of competition between brokers for the provision of execution services. At the same time, stronger competition between brokers, an expanded network of clients over which investment costs can be recovered, and the increased ease with which new products can be disseminated, have all contributed to the proliferation of new execution strategies and other innovative products.

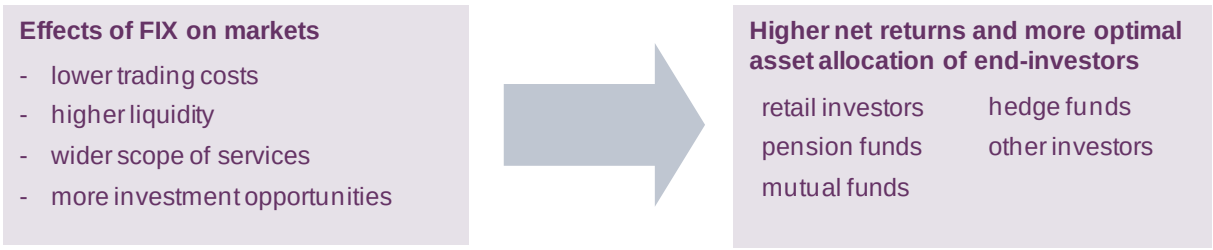
Transaction costs, liquidity and benefits to end-investors

Changes in the costs and behaviour of firms as a result of widespread adoption of FIX are making markets more dynamic, affecting the costs and prices (commissions/fees) of firms in the trading value chain, and improving the overall efficiency of capital markets. Lower connectivity costs, for example, reduce the overall fixed costs of firms, while greater competition—particularly among brokers and trading platforms—is bringing down the level of brokerage execution commissions and trading platform fees and increasing the scope and quality of services provided. This in turn affects the overall level of activity and liquidity in secondary markets, reducing the indirect trading costs (eg, bid–ask spreads) facing investors.

In addition, given the global nature of FIX, achieving remote access to a trading platform supporting FIX in a foreign country involves similar technical effort to accessing a domestic platform that uses FIX. In lowering cross-border costs, improved connectivity means that brokers can now access foreign markets more economically, which leads to a higher degree of integration of markets.

Ultimately, these changes translate into lower overall costs of investing and a wider scope of services available to end-investors—pension funds, mutual funds and other institutional and retail investors. Figure 3 summarises the key effects on end-investors.

Figure 3 Effects on end-investors



Source: Oxera.

Further benefits—what is required?

While FIX has already significantly affected the way in which firms operate, there is opportunity for additional benefits through both the more efficient application of FIX by existing users and the extension to further activities and market participants in the value chain. The organisational structure of FPL—a voluntary organisation run by market participants—may be well suited to respond to changing markets and identifying further opportunities because it is, as a result of its structure, close to its users. However, because the nature of standard protocols is such that efficient development and implementation often require coordinated action by a significant number of firms, achieving maximum benefits will require a concerted effort from stakeholders, including the entire hierarchy within financial firms. The mixture of potential private and public benefits that arise from the adoption of standards also means that the private incentives of adopters may not always be aligned with delivering the highest overall system-wide benefits. This, in turn, means that tensions will inevitably arise between different users. Ensuring that the further implementation and development of the FIX standard delivers the optimum overall outcome is not, therefore, straightforward and will need to be effectively managed. FPL will need to respond to this challenge to ensure that the maximum benefits from standardisation can be realised across the relevant markets.

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1 Introduction

Over recent years global financial markets have undergone significant changes. There have been major advances in technology, regulation, market structure and the scope of services offered. At the same time, regulators are increasingly focusing on improving the transparency, efficiency, and overall stability of financial markets, while investors are requiring more cost-efficient and sophisticated solutions to their needs.

The question of how the use of standard communications can affect the activities of firms and markets and contribute to achieving efficient and sound capital markets is therefore particularly important. This study considers the ways in which the FIX Protocol (FIX), which is the most widely used common messaging standard for trading in equities and is also widely used in markets for other financial instruments, benefits firms, wider markets and ultimately end-investors.

FIX dates back to 1992, when Salomon Brothers and Fidelity Investments designed a messaging protocol for use in communications in equity trading. Since then it has been widely adopted for communications between investment managers, brokers and trading platforms in the trading and increasingly post-trading of equities, fixed income, derivatives and foreign exchange, and has spread to firms across the USA, Europe, Asia and other regions. FIX is maintained as an open standard, which can be used by firms free of charge, and it is managed and developed by market participants representing organisations that are members of a not-for-profit organisation, FIX Protocol Ltd.[7]

Despite the significant use of FIX among firms, to Oxera's knowledge, there has been no comprehensive review of the benefits associated with widespread adoption of FIX or the standardisation of communications in trading or post-trading more generally. This study provides insight into the nature of these benefits, focusing on an in-depth assessment of:

– the economic principles underlying the benefits associated with standardisation of communications in general, and the specific benefits associated with the widespread adoption of standard messaging protocols in the financial services industry;

– the way in which FIX can be expected to benefit firms and end-investors in the segments where there is widespread adoption and use of the FIX messaging standard;

– the nature of the specific benefits associated with FIX, and the degree to which the economic rationale underlying these benefits, combined with the evidence on the experience of individual firms and wider market developments, confirm the notion that FIX is delivering notable economic benefits to firms involved in trading and to investors.

The analysis in this report is aimed at providing a better understanding about the benefits of FIX to market participants, policy-makers, regulators and the investment community. It provides a basis for debate surrounding the role that FIX has played in recent developments and in assisting efforts to increase the efficiency of the markets going forward. A detailed assessment of the implementation costs and of individual firms' incentives to adopt FIX (depending on the firms' characteristics, market position, etc), however, is beyond the scope of this study.

[7] Appendix 2 provides more detail on FIX Protocol Ltd's organisational structure and objectives.

The analysis is based on a variety of primary and secondary data available in academic and professional literature. As part of the study, Oxera also interviewed investment managers, brokers, trading platforms and vendor firms with activities in Europe, the USA and Asia.

The report is structured as follows.

– Section 2 outlines the economic principles underlying the benefits associated with the standardisation of communications in general, and the standardisation of messaging protocol used in the financial services industry.

– Section 3 sets out the benefits that can be expected to accrue as a result of the widespread adoption of FIX for trading in secondary markets.

– Section 4 considers the degree to which the economic rationale underlying the benefits of FIX, combined with evidence on the experience of individual firms and wider markets, confirm that FIX is delivering notable economic benefits to firms involved in equity trading and to the end-investors.

– Section 5 provides insights into the nature of the benefits associated with the adoption of FIX across other asset classes.

– Section 6 sets out the main conclusions.

The appendices provide a glossary of terms, the corporate structure behind FIX Protocol, a list of FIX Protocol Ltd member firms and country coverage, an overview of institutional factors behind the development and management of standards, a description of the FIX versions and its functionality, and a list of messaging protocols in trading and post-trading.

2 Benefits of standards: economic principles

Standards affect many aspects of economic life, providing an intellectual or physical infrastructure in, or around, which business can be transacted or developed. However, due to the ubiquity of standards, their importance is often overlooked. This section provides a basis for assessing the benefits associated with the FIX standard messaging protocol by considering the sources and nature of the generic benefits associated with standardisation in general, and the adoption of communication standards in the financial services industry. In particular, this analysis outlines the *economic principles* underlying network effects associated with standards, diffusion of standards among firms, and different sources and types of benefit associated with standardisation.

2.1 Standards in communication technology

2.1.1 Key characteristics of standards

Standardisation has played a major role in enabling improvements in communications technology. The examples of these standards include alphabets, languages, Internet Protocol (IP), Global System for Mobile communications (GSM), Wireless Access Protocol (WAP), Hypertext and Extensible Markup Language (HTML and XML), Simple Mail Transfer Protocol (SMTP), and Bluetooth.

Although standards vary in nature and application, the use of standardised processes—particularly standards used in communications—is characterised by network effects. Where network effects exist, the more parties adopting a particular way of doing something, the greater the immediate benefit to new parties who subsequently adopt the same way of doing it, as well as increasing the value to those who have already adopted it. This feedback effect means that, beyond a certain level of adoption, the adoption of a particular way of doing something can spread rapidly. (It also means that the private benefit of adopting the standard is below the total benefit of that action, and this can lead to a failure to standardise when there would be significant total benefits from doing so.)

These network effects come in several different forms. They range from impacts such as reductions in the cost of inputs as a result of pure economies of scale (eg, the costs of GSM handsets), through pro-competitive effects such as making it easier to switch suppliers if all of them are using a standard electronic interface (eg, FIX used by investment managers and brokers) and enlarging the market so that more suppliers are competing, to operational efficiencies through (ease of) learning and a reduction in transcription/translation errors.

2.1.2 Design, development and uptake of standards

Often (though not always), the adoption of a particular way of carrying out a process is achieved by implementing a standard, which can be open (eg, English language, A4 paper size) or owned by its inventor(s) (eg, Windows operating system or the GSM mobile phone standard). When a sufficiently large number of people and/or organisations have adopted a particular standard, all, or most, of those who would benefit from the network effects then follow suit. However, notwithstanding that standard adoption *can* reach these tipping points, this dynamic raises the question of how generally adopted standards are established in the first place, and how they reach or do not reach a critical mass in order to maximise the network benefits that are potentially available.

A challenge in establishing a standard is that the benefits do not necessarily flow directly to the parties that developed the standard (and/or keep the standard up to date), making it hard to coordinate parties to develop a standard in the first place. This has been advanced as an argument for having public standards organisations to develop and implement standards,

and is also the basis for having a large number of potential users involved at the start in establishing a standard, as early adoption of the standard by this involved group provides a greater incentive for others to adopt the standard. Having a large number of potential users who have committed to using a standard, once developed, also increases the immediate benefit of its introduction, and, at least in theory, reduces the costs to any individual firm of developing the standard.

However, because the benefits of the adoption of the standard or keeping it up to date are diffuse, and critically do not depend on actual participation in the standard-making processes, there is always the temptation for individual users to 'free-ride' on the work of others.[8] This is particularly acute where the standard is open (or is not covered by intellectual property rights, IPR), as those developing (and maintaining) the standard cannot recover their costs through charges to users of the standard. Some of the specific features of open standards are explored in more detail below.[9]

Open standards versus proprietary standards: development and maintenance

Several models can be used to manage standards:

- private sector proprietary standard;
- private sector cooperative standard-setting bodies;
- hybrid of different models;
- public sector standard-setting bodies;
- user maintenance/development of open standards;
- voluntary maintenance/development of open standards.

The choice of model has clear implications for the approach to developing and maintaining standards. For example, where standards are open and can be freely used, there is a potential commercial interest in users free-riding on the efforts of others to keep the standard up to date and/or to extend its scope. Notwithstanding that all/many users would be better off with the extension, the resources are not forthcoming as each potential supplier of the resource hopes that someone else will pick up the expense.

The use of proprietary standards, where the owners of the intellectual property in the standard charge users, can, at least for a widely used standard, generate the resources needed to maintain and update the standard. The free-rider problem can be solved, but at the economic cost of the deadweight effort required to enforce the payment for the right to use (eg, the overhead costs of running the payment collection system, monitoring that all users have paid, etc). In addition, where a voluntary approach to updating and extension has worked, such resources might be withdrawn if the model changes, or at least the maintenance and updating may have to be paid for on a contractual basis.

Another result of network effects is that, once a standard is established, it may be hard for a competing standard to take off because the costs of switching to it become too high and/or the coordination problem of getting all (or most) users to change at the same time—thus preserving the network effects—is too complex. It has been argued that this can be the case even if the competing standard is demonstrably superior. However, the extent to which this phenomenon has been established empirically is debatable, and not to enjoy the benefits of standardisation now because a better solution might arise sometime in the future is likely to result in an overall less efficient outcome, unless an accurate prediction can be made of both the additional benefit of the future 'better' standard and when it will arise.

[8] Most of the value of, say, an expanded messaging set will come from the fact that all users will be able to use that expansion in communications between all the adopting parties. This benefit arises for an individual user irrespective of whether that individual user participates in, or contributes to, the work of developing that expansion.

[9] Appendix 3 provides a more detailed analysis of the differences between open and proprietary standards, and the advantages and disadvantages of the various organisational structures used for developing and maintaining the standard.

2.2 Standardisation of communications in financial services

2.2.1 Financial transactions, complexity of interactions and records

Typically, in order to complete a financial transaction, a significant number of institutions will need to be involved. They must communicate often complex messages with each other, and record, for their own internal purposes (management of the institution, billing, regulatory requirements, etc), both the fact that a communication took place and, in many cases, its content. In addition, in many cases both the content of the message and the requirement for recording are substantially the same in different layers as they pass through the system. In other words, although the information may be aggregated/is aggregated as it passes through the systems, the core information is often very similar.

Although obvious, underlying both the communication process and the recording process is a requirement that two parties can understand the language that is being used. Both the sender and the receiver, and the recorder and the retriever, must derive the same meaning from the message (ie, understand the language of the message). This requirement for a common understanding between these individual bilateral pairs is a *necessary* condition for the transaction to be successfully carried out and recorded.

If the communication is between people, a common spoken or written language is required (eg, spoken and written English). If the communication is between machines, this also requires a common language between pairs of machines or between the recording function and retrieval function. To communicate this back to humans, this machine language must also be translated back into a human language (eg, written English on a screen).

When looked at from a system-wide perspective, the complexity of the possible transaction processes, and the requirement for machines to communicate with each other and with humans, means that the potential need to translate messages is very high if machines are using different messaging protocols. If the machine-to-machine translations go through humans, there is also a significant overhead in terms of rekeying information. If it is a direct translation, a translation engine is required for every pair of languages encountered, and issues of completeness can arise unless both languages have a similar scope and level of detail.

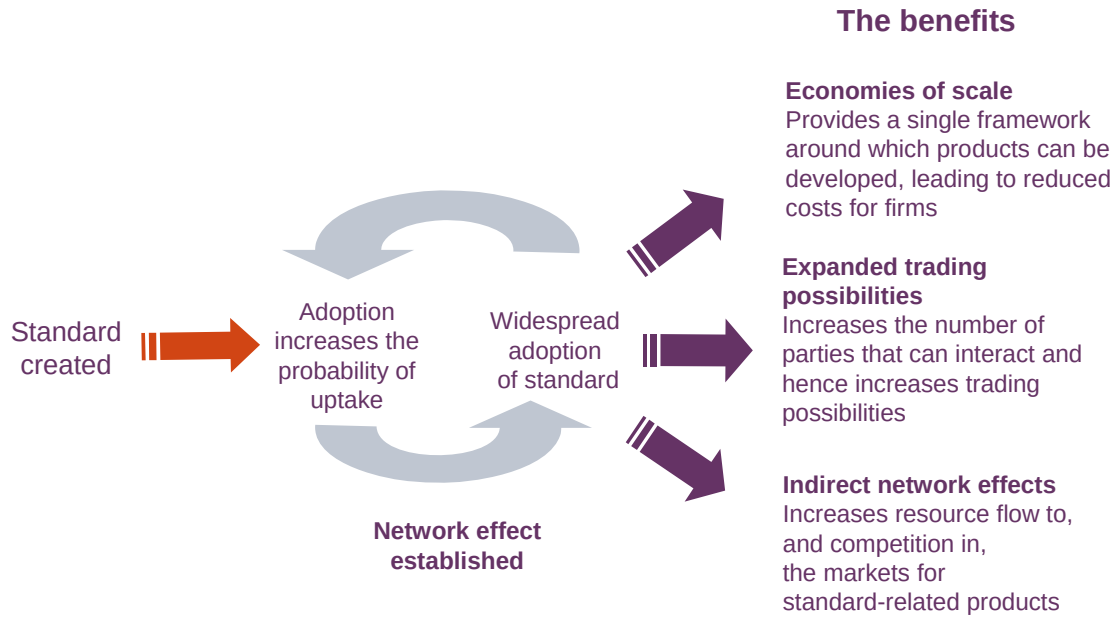
As a result, the *common* usage of the same language/protocols for internal purposes and for communications with all bilateral partners reduces the overall complexity of the messaging infrastructure and the potential to mistranslate the information.[10]

2.2.2 What are the sources of benefits?

The benefits of standards and network effects in financial services transactions are illustrated in Figure 2.1, and include expanded trading possibilities, indirect network effects and economies of scale.

[10] However, the advantages of adopting one language/protocol over another for the individual making the choice may not fully reflect the advantages to all participants in the system. Primarily, this arises because there is an external value of the choice that does not flow back to the party making that choice. Indeed, under some circumstances, the party making the choice may be disadvantaged (at least in the short run) by choosing the language/protocol that delivers the maximum overall benefit to the system.

Figure 2.1 Benefits of standards



Source: Oxera.

– **Expanded trading possibilities**—the widespread use of a single standard increases the ease with which computer systems can talk to one another. This reduces the costs of establishing effective communication between systems, thereby expanding the economical number of participants in markets, and hence increasing trading possibilities.

  In the case of a common communications standard in financial services, this means that it becomes easier for different types of financial market participants operating in different financial markets (different types and locations) to communicate with one another. Again, this increases the economic potential for doing business in innovative ways, or accessing a wider range of potential counterparties.

  At the same time, adoption of a standard protocol results in shorter time-to-market, whereby a service provider can deliver new products to market in less time by using the same communications protocol as is already used by potential customers, simplifying the adoption decisions and implementation process for the customer.

– **Indirect network effects**—the more people use a standard, the greater the potential number of adopters of technologies and solutions built around this standard, thereby increasing the incentive for firms to build technologies around it. This benefits both the users, who have a wider range of products to choose from, and suppliers, who have a larger market to address.

  In the case of a messaging standard in financial services, the existence of these indirect network effects should result in innovation and price competition by technology vendors, or firms being more willing to contribute to the development of the standard in general.

– **Economies of scale**—the widespread use of a standard means that firms (users or suppliers) do not need to develop products or business procedures that are compatible with multiple specifications, but can focus on meeting a standard template. This leads to economies of scale in production (suppliers), learning and implementation (users).

  A communication standard allows firms to minimise the number of different protocols around which electronic communications are based, which shortens the time taken to transmit information between different systems/transactions, and reduces the scope for

error, as there are fewer compatibility issues, all of which ultimately lowers the costs of transacting. Standardisation can also lead to the ability to re-use what has been developed using the standard, in turn generating economies of scale and reducing the need for additional resources/capital to develop non-standard elements.

The degree to which these benefits accrue in the case of particular standards depends on factors such as the characteristics of the firms involved in a given activity (the number of firms, their cost structures, etc), the regulatory environment, and the complexity of the messages being communicated.

2.3 Insights from other sectors

Empirical evidence from other sectors provides some insights into the actual benefits that have accrued from standards, although it is generally accepted that there are the innate difficulties in assessing 'market shares' and different types of benefit—in particular, in the case of open standards.

For example, the UK's Department of Trade and Industry (now the Department of Business, Enterprise and Regulatory Reform) has studied the effects of standards on national manufacturing productivity. The measure of standardisation adopted was the stock of formal standards. In the UK, economic growth between 1948 and 2002 averaged 2.5% annually, of which 1.5% could be accounted for by the accumulation of capital and labour and 1% by technological change. It was estimated that a quarter of technological growth was related to standards growth. However, it was also noted that standards interact with other factors, such as innovation, in ways that have not yet been fully researched, so this finding should be treated with caution.[11]

There are also studies that have considered the effects of standardisation on the diffusion of technology. For example, a study on digital mobile phone use in 46 countries found that the diffusion speed of digital mobile phone use was negatively related to the number of national analogue and digital wireless phone standards in existence.[12] Countries that adopted a formal standards policy, as opposed to a market-driven one, were found to have slower diffusion rates. Standards with more documentation were found to have a greater impact. It is suggested that this is because the extent of the documentation is a reflection of the number of participants involved in developing a standard and its technical complexity, both of which lead to greater impact.[13]

Notably, compared with other industries, the financial services sector has an unusually high proportion of transactions between competing and complementary participants, potentially increasing the value of common standards because the number of entities that need the same, or similar, information in order to carry out the transactions is very large (see also section 3.1 below).

[11] DTI (2005), 'The empirical economics of standards', DTI Economics Paper No 12, p. 5.

[12] Kauffman, R. and Techatassanasoontorn, A. (2003), 'Does one standard promote faster growth? An econometric analysis of the international diffusion of wireless technology', Proceedings of the 37th Annual Hawaii International Conference on System Sciences, Kona, HI, Computer Society Press, Los Alamitos, CA.

[13] Shah, R. and Kesan, J. (2008), 'An Empirical Examination of Open Standards Development', Proceedings of the 41st Hawaii International Conference on System Sciences.

3 FIX: what kind of benefits can be expected?

The main objective of this study is to consider the benefits associated with widespread adoption of FIX among investment management firms, brokerage firms and trading platforms. In other words, this analysis considers how the generic benefits associated with standard messaging protocols, outlined above in section 2, materialise in the case of FIX.

This section provides a conceptual assessment of the types of benefit associated with FIX given its functionality, and the particular activities in the trading of securities and other asset classes that can be developed around FIX. The focus here is on the pre-trade and trade activities, although FIX can also be used to carry out some post-trade functions. Where relevant, the analysis provides an indication of the additional benefits that can arise from use of FIX for post-trade functions.

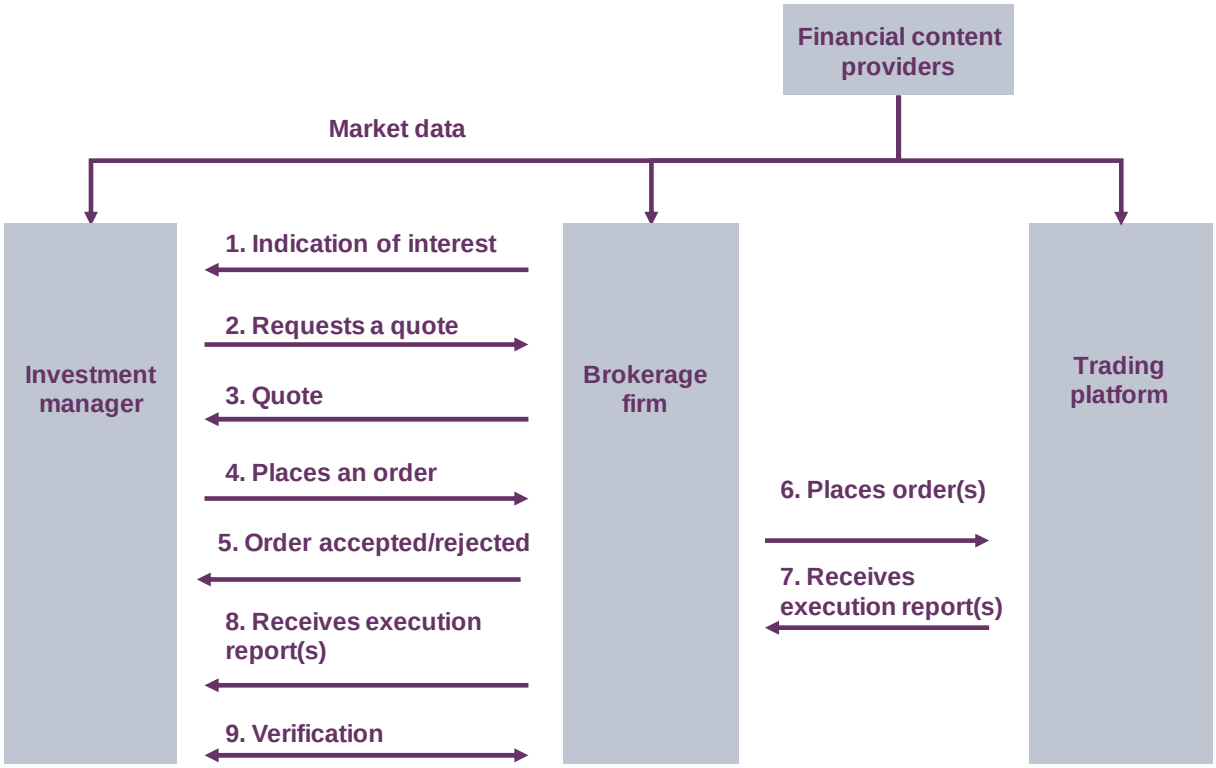
This analysis therefore provides insights into the types of benefit that would expect to be observed in those market segments, in terms of both asset classes and geographic, where firms have widely adopted FIX for their trade and pre-trade functions. These benefits are not specific to FIX per se, however, and in principle, notwithstanding technical differences, a similar level of adoption of other standard(s) related to these particular functions would be expected to deliver similar benefits.

3.1 Communications and messaging flow in trading: applications of FIX

The specific role of FIX in trading can be illustrated using a simplified example of operations involved in transactions in cash equity markets.[14] Figure 3.1 below shows a stylised example of the type of communications involved, consisting of pre-trade, trade and post-trade functions. Pre-trade refers to the stage when price quotes are obtained and trading orders are placed. The trade stage is when the order is executed at the trading platform. The post-trade stage consists of activities related to verification, clearing and settlement, block allocation of securities or cash to the correct accounts, etc.

[14] This is a simplified example. In reality, completion of a trade requires a number of further communications between these and other players in the value chain (eg, CCPs, CSDs, custodians).

Figure 3.1 Illustration of message flows for cash equity transactions



Source: Oxera.

As noted, this study considers the benefits associated with standardisation of messaging mainly in the pre-trade and trade stages (steps 1–7 in Figure 3.1) and, where relevant, the market data flow.

Step 1 An indication of interest (IOI) is typically sent by the broker to the investment manager. The broker advertises liquidity by sending multiple IOIs to its clients.

Step 2 The investment manager sends a request to the buy side for a price quote.

Step 3 The investment manager receives a quote.

Step 4 The investment manager sends an order to the broker. This usually contains specific handling and execution instructions.

Step 5 The broker sends a number of messages that may contain confirmation of the receipt of an order, confirmation of changes to the existing order or reject orders.

Step 6 The broker submits an order(s) to the trading platform for execution, which can be a regulated stock exchange or an alternative platform.

Step 7 There is a flow of execution report(s) from the trading platform to the broker.

Step 8 The broker reports back to the investment manager on the progress of the execution of the order. The broker may send a number of execution reports which contain order status information and relay fill information on working orders.

Step 9 The investment manager and the broker verify that the order has been executed as both sides expected, including affirmation and confirmation of various trade details (eg, price, quantity, account details)

Simultaneously, other related activities surrounding the actual transaction processes are using similar elements in their messages. These activities include:

– communication of market information by financial data providers to various players;

– dealing by both firms and regulators with regulatory reporting requirements;

– clearing and settlement of a trade, which requires further communications between these and other players. For example, once a trade has been completed on the trading platform, it is normally cleared through a CCP and settled on the CSD, often also with the involvement of custodians.

The above discussion outlines the main functions involved in pre-trade, trade and post-trade activities. These communications are carried out either by automated means (eg, computer to computer) or through human action (eg, voice communications over the phone). Where they are done by automated means, this *necessarily* requires the use of a messaging protocol that can be understood by both ends of the communication link.

FIX is the prevalent global messaging standard used for pre-trade and trade functions in cash equities, as described above, and is also increasingly being used in other asset classes (ie, fixed income, derivatives, and foreign exchange), as well as in post-trade functions. Similarly, FIX provides functionality that allows firms and regulators to deal with regulatory compliance. Appendix 5 outlines the full functionality of FIX in equities, fixed income, derivatives and foreign exchange.

3.2 Benefits of messaging standards in trading

3.2.1 Incidence of the effects of FIX: where do they materialise?

In the case of trade and pre-trade standard messaging protocols, the main effects associated with messaging standards set out in section 2—new trading possibilities, indirect network effects, and economies of scale—materialise through changes in how investment managers, brokers and trading platforms operate and interact.

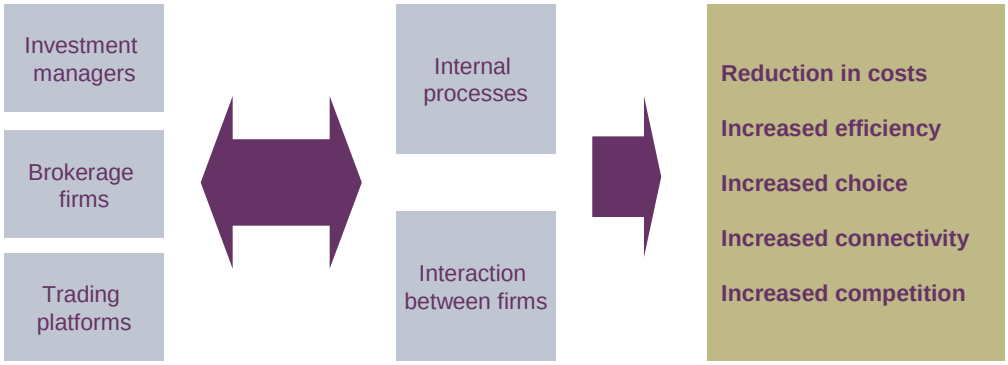
Figure 3.2 sets out in more detail the nature of the effects of standardising pre-trade and trade functions using FIX. The key effects of adoption of a standard arise in the way in which investment managers, brokers and trading platforms undertake their activities. In this context, it is important to distinguish between the ‘internal’ and ‘external’ effects of the proliferation of standardisation of relevant functions.

– Internal effects include changes in the internal IT systems, the ability to integrate systems that are used for different functions, etc.

– External effects include direct effects such as a reduction in the costs of connectivity and the ability to achieve widespread connectivity, and indirect effects such as increased competition between brokerage firms and between trading platforms.

These effects are discussed in more detailed in section 3.2.2.

Figure 3.2 Incidence of effects



Source: Oxera.

These effects are particularly strong when compared with other applications of standards, given the number of systematic characteristics that a message flow in financial services transactions has. First, in carrying out the functions at different layers in the chain, most, if not all, parties want to send (or receive) the same message or message type to (from) multiple potential counterparties. For example, executions of trades on a given exchange involve messages from different trading parties that essentially carry the same type of information (eg, security, volume, etc). Second, messages at different points in the chain often have a high proportion of the same information in them. For instance, the message sequence is referring to the same security throughout its path. Similarly, messages at the same point in the chain at different times also have the same information in them. For example, requests for a quote may differ only in relation to the security and the quantity, while all other parts of the message are the same.

This combination of consistency of message elements and multiplicity of communication partners, as well as volume of messages, means that, if standardisation can be achieved, there will be scope for:

– reducing translations needed for each pair of communicators to understand the message (particularly when the communication is between machines);

– automating the processes that enable the entire messaging stream (ie, from the expression of interest through to the transaction and beyond) to be undertaken.

3.2.2 The effects of FIX: what are the main benefits?

The generic analysis of standards and the specific role played by FIX suggest that widespread adoption of FIX by investment managers, brokerage firms and trading platforms can be expected to deliver significant benefits to these players and wider markets.

At a high level, these benefits fall into the following three categories.

– **Reduction in the connectivity costs and general IT costs**—standardisation improves a firm's ability to reduce its general IT and connectivity costs, in particular in relation to the adoption, use and maintenance of application software. The strongest effect is likely to be associated with the connectivity costs that investment managers face when they connect to brokers, and brokers when they connect to trading platforms (especially if they are connecting to multiple trading platforms). Given the similarity of at least some of the message elements on both sides of the broker (ie, the investment manager on one side and the trading platform on the other), the ability to transmit the message through the broker without translation or rekeying will also tend to reduce IT and operational costs. At the same time, if a firm operates multiple protocols, its maintenance implies greater resource costs than if a single protocol were used.

– **Increased level of connectivity and choice of services**—the reduced overall connectivity costs are expected to result in improved levels of connectivity. For instance, reducing the costs of connecting to trading platforms is expected to allow more firms to be able to afford to connect to them, and new entrant firms to achieve high levels of connectivity more quickly, which would not be possible if they were using proprietary (ie, different) protocols in each link.

– **Increased actual and potential competition between firms**—the greater ability of investment managers to switch between, and connect to, brokers is expected to strengthen competition among brokers for the provision of trading services. Similarly, the greater ability of trading platforms to achieve high levels of connectivity is expected to strengthen competition (and the threat of competition) among trading platforms. Lastly, factors such as investment managers being able to achieve cost-effective access to a wide range of market segments are also likely to increase competition among investment managers.

More specific details of these benefits, including their nature in the case of particular market participants (investment managers, brokerage firms and trading platforms), are provided in section 4 below, together with an illustration of the experiences of individual firms and markets.

In addition, FIX can be expected to have an effect in areas such as the costs of compliance with market regulations, for example MiFID (for both firms and regulators), and the efficiency of post-trade processes within firms. For instance, with respect to the latter, FIX and other messaging standards can play a significant role in developing a more integrated post-trading market in the EU. In particular, over recent years there has been a significant drive towards reducing the costs of cross-border trading by increasing the integration and competition among European exchanges, CCPs and CSDs.[15] Where adopted, global standards such as FIX can facilitate this process by allowing more efficient connectivity among exchanges, CCPs and CSDs.

Overall, widespread adoption of FIX in a given market segment can be expected to result in reduced trading costs and improved liquidity in the markets. In particular, in industries where there is a reasonable degree of competition, such cost savings and improvements in the degree of competition, as described above, would be expected to be passed on. In the case of FIX, these benefits at the individual firm level can therefore be expected to result in the following.

– **Reduced explicit trading costs (eg, brokerage commissions and trading platform fees)**—cost reductions (if passed through) and increased competition as a result of widespread adoption of FIX are expected to result in lower explicit trading costs, including brokerage fees and trading platform fees.

– **Improved choice and quality of services (eg, increased availability/feasibility of portfolio trading and statistical arbitrage strategies)**—similarly, greater competition among brokers and trading platforms as a result of widespread adoption of FIX is expected to result in more choice and higher quality in the services provided by brokers to investment managers, and by trading platforms to brokers.

– **Improved liquidity and reduced implicit trading costs (eg, effective bid–ask spreads)**—the increased level of trading activity arising particularly from the lower brokerage commissions and exchange fees and greater choice of execution services

[15] See, for instance, The Giovannini Group (2001), 'Cross-border Clearing and Settlement Arrangements in the European Union', Brussels, November; and The Giovannini Group (2003), 'Second Report on EU Clearing and Settlement Arrangements', Brussels, April.

associated with widespread adoption of standard protocols such as FIX can be expected to result in a higher level of liquidity and lower implicit trading costs.

From an international perspective, a financial centre where a high number or proportion of firms have adopted FIX will therefore, other things equal, be more competitive than a one where only a few firms (or a small proportion of firms) have adopted FIX or other standard protocols that covers the same activities.

Increased international connectivity can also have an impact on the degree of integration across markets. In principle, where there is greater connectivity as a result of a global standard, such as FIX, not only are domestic activities affected, but also firms' cross-border activities. For instance, where global standards are present, achieving remote access to a trading platform in a foreign country involves similar effort (from a technical connectivity point of view) to achieving access to a domestic platform. In those instances, improved connectivity can reduce the level of cross-border costs and therefore the degree of integration between markets, by allowing brokers to economically access foreign markets directly instead of using a third-party local broker or another foreign intermediary located in that market.

The level of these benefits depends on the specific characteristics of firms, the market structure in which they operate, the regulatory framework, and other features of firms and market more generally. Although analysis of the interaction of these factors and standards is beyond the scope of this study, it is important to recognise the interaction between them and the effects of standards. At the same time, it is important to recognise that the level of benefits of standards, by their nature, depends on:

– the level of uptake among firms—everything else equal, the most significant overall benefits would be expected to arise in the market segments where most, if not all, firms have adopted a common standard, such as FIX. In the case of FIX, for instance, this implies that the strongest competition among trading platforms would be expected to arise in circumstances where all trading platforms have adopted FIX and where all brokers using (or potentially using) these platforms have adopted FIX;

– the degree of 'full' standardisation—even where firms have adopted FIX or a similar standard, the benefits flowing from this standardisation will depend on the degree to which they use the same version of FIX, and customise the protocol, for instance to enable provision of a specific type of service for which FIX is not adapted. For instance, if, as in the above example, trading platforms adopt a different version of FIX and/or customise some aspects of FIX, the costs to users and the degree of existing (and potential) competition would be somewhat reduced since each link becomes less standardised and more complex to set up, manage and maintain.

3.3 What is the size of the relevant markets?

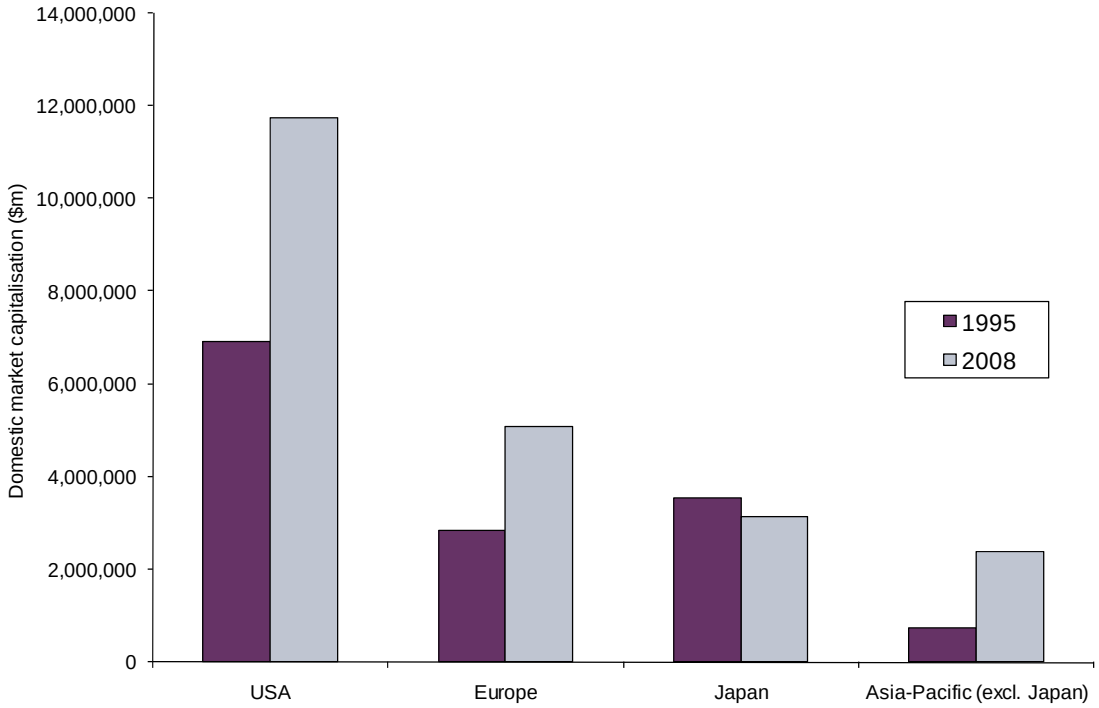
The level of activity in equities, bonds and derivatives has grown significantly over the past 10–20 years. The costs and efficiency of these markets are becoming ever more important, increasingly affecting savings and economic growth. Assessing the total size of the effects of standardisation of messaging in trading in markets is beyond the scope of this study. However, the evidence on the level of activity in different markets that can be affected by FIX indicates the economic significance of effects that can be expected to arise as a result of widespread adoption of FIX in the respective market segments.

3.3.1 Size and trading activity in equity markets

Over recent years there has been a significant increase in public equity market capitalisation and trading activity across countries. This trend has been driven by factors such as increased equity issuance of listed companies, more companies listing on exchanges, and a greater velocity of trading.

Figure 3.3 shows domestic equity market capitalisation of the US, European, Japanese, and Asia–Pacific (excluding Japan) exchanges in 1995 and 2008.[16] The figure suggests that, over the period, domestic market capitalisation in all regions, except Japan, experienced growth: in the US exchanges, it grew by 70%; in European exchanges by 80% and in other Asia–Pacific exchanges by 222%. In Japan, the market capitalisation declined 12%.

Figure 3.3 Domestic equity market capitalisation, 1995 and 2008 ($m)



Source: World Federation of Exchanges and Oxera calculations.

These exchanges have also experienced changes in the velocity and value of turnover.[17] Over the same period, in the USA, for instance, velocity of turnover increased from 0.7 to 5.5.0; in Europe, this increase was from 0.5 to 2.5; in Japan it rose from 0.2 to 1.8; while in Asia–Pacific (excl. Japan) it rose from 0.8 to 1.5. At the same time, the value of total turnover (domestic and foreign companies) between 1995 and 2008 in these four regions increased significantly—in the USA, by a multiple of 12.7, in Europe by 7.3, in Japan by 6.3 and in Asia–Pacific (excl. Japan) by 6.3.[18]

Changes in the markets have also materialised in terms of significant increases in the number of trades and associated communications messages observed across markets. In 2008, for instance, in the USA, Europe and Asia-Pacific combined, there were as many as 9 billion completed trades executed on the main stock exchanges (see Figure 3.4).[19] This compares with less than 0.5 billion completed trades in 1995.

Each of these trades is associated with multiple messages sent between investment managers, brokers and trading platforms. Moreover, there are a significant number of messages between market participants that do not result in a completed transaction on a trading platform (eg, a message containing an indication of interest sent by a broker to investment manager that does not result in a completed trade).

[16] US exchanges include NYSE Euronext (US), NASDAQ OMX (US), and Amex. European exchanges include London Stock Exchange, NYSE Euronext (Europe) and Deutsche Börse. Japanese exchanges include Tokyo Stock Exchange. Asia–Pacific (excl. Japan) exchanges include Hong Kong, Taiwan and Australian stock exchanges.

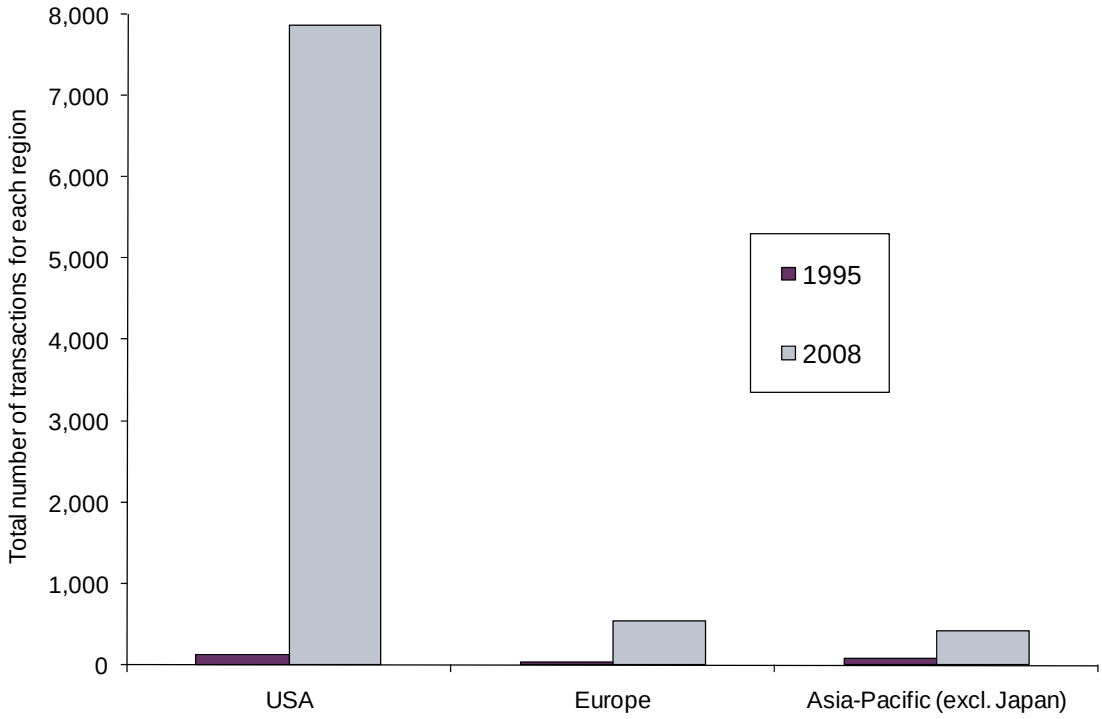
[17] Velocity of turnover is defined as a ratio of annual value of turnover and average market capitalisation over the year.

[18] World Federation of Exchanges and Oxera calculations.

[19] The World Federation of Exchanges does not provide data on the number of trades in Japan in 2008.

Overall, this evidence provides an indication of the significant number of messages involved in equity trading every year, and therefore of the important role of messaging protocols in carrying out these transactions.

Figure 3.4 Number of trades, 1995 and 2008 (m)



Source: WFE, Oxera calculations.

At the same time, there has been significant growth in the size of fixed income, derivatives and foreign exchange markets. In the case of the over-the-counter (OTC) markets, for example, global notional amounts of OTC derivatives totalled $591 trillion in December 2008 compared with $380 trillion in 2004.[20] The total government and corporate debt securities outstanding globally in June 2009 were estimated at $83.9 trillion, compared with $57.0 trillion in 2004.[21] Daily volumes in global foreign exchange markets in April 2007 were estimated at $3.2 trillion compared with $1.9 trillion in April 2004.[22] In contrast, the size of the exchange-traded derivatives in the USA, Europe and Asia grew from $57.8 trillion in 2005 to $63.4 trillion in June 2009.[23]

This growth has been accompanied by an associated increase in the number of transactions, although estimates of how many transactions took place in these markets are not readily available. Nevertheless, the size of these markets suggests that any improvements in the operations of firms and in the efficiency of interactions would have a significant impact on the market participants and end-investors. Section 5 below examines in more detail the benefits of widespread adoption of FIX in derivatives, fixed income and foreign exchange markets.

3.3.2 Scoping the impact of standards

The above evidence provides an indication of the size of markets and the significant number of messages (and, in particular, the growth in the messaging levels) involved in trading. It

[20] BIS (2007), 'Triennial and semiannual surveys on positions in global over-the-counter (OTC) derivatives markets at end-June 2007', BIS (2009), 'BIS Quarterly Review', September

[21] SIFMA (2007), 'Securities Industry and Financial Markets Global Addendum 2007', BIS (2009), 'BIS Quarterly Review', September (sum of international bonds and notes and domestic debt securities)..

[22] BIS (2007), 'Triennial Central Bank Survey of Foreign Exchange and Derivatives Market Activity in April 2007'.

[23] BIS (2009), 'BIS Quarterly Review'.

therefore indicates the essential role played by messaging protocols in carrying out these transactions. Establishing an efficient means of understanding and executing these messages is therefore important in achieving high overall efficiency in financial markets, benefiting not only direct market participants, but also end-investors and the wider economy.

3.4 What are the expected benefits to end-investors?

As explored in section 3.2, widespread adoption of a standard, such as FIX, in a given market segment affects the activities of investment managers, brokerage firms, and trading platforms. However, the ultimate beneficiaries of these changes are pension funds, individual savers and other end-investors who are investing in equities or other assets affected by FIX.

The benefits that can be expected to accrue to end-investors as a result of widespread adoption of FIX among firms can be categorised as follows.

– **Reduction in explicit trading costs (eg, brokerage commissions)**—from the perspective of end-investors, investments in equities and other financial assets have direct transaction costs. These costs are relatively transparent and, from the end-investor's point of view, are usually in the form of a brokerage commission (which includes other costs, such as trading platform fees).

– **Reduction in implicit costs (eg, bid–ask spreads)**—although often not directly visible to end-investors, implicit costs, such as the bid–ask spread, are effectively passed on in the form of a worse execution price (ie, worse than might have been achieved if the bid–ask spreads were tighter).

– **Increase in the scope of available (and economic) trading strategies**—the scope of strategies available to the different classes of end-investor determines their ability to best match their preferences to the actual investment strategy adopted. In principle, the increase in the range of trading strategies described in this study widens the scope of economic strategies available to end-investors, allowing more favourable choice of trading strategies.

The effects on trading costs ultimately translate into changes in the net returns after all transaction costs and taxes facing investors have been paid. In other words, the efficiencies associated with widespread adoption of FIX, or a similar standard, ultimately translate into higher net returns from investments facing pension funds, individual savers and other investors.

The way in which these benefits accrue depends on a number of factors. Everything else being equal, investments in countries with the highest adoption of FIX are likely to attract lower all-round trading costs—for example, in two otherwise identical equity markets, trading costs in the country where most investment managers, brokers and trading platforms have adopted FIX, or a similar messaging standard, would be expected to be lower than in the country where trading is carried out using multiple protocols.

4 FIX: the story so far

This section assesses the way in which FIX affects the activities of investment managers, brokerage firms and trading platforms, and considers wider changes in the equity trading landscape and use of FIX among firms in different countries. This analysis builds on the assessment of the benefits that can be expected to arise as a result of widespread adoption of FIX among firms (set out in section 3), providing insights into the benefits that are accruing to the firms (and wider markets) that have adopted FIX for trading in equities.

4.1 Exploring the benefits

4.1.1 Investment management firms' internal processes

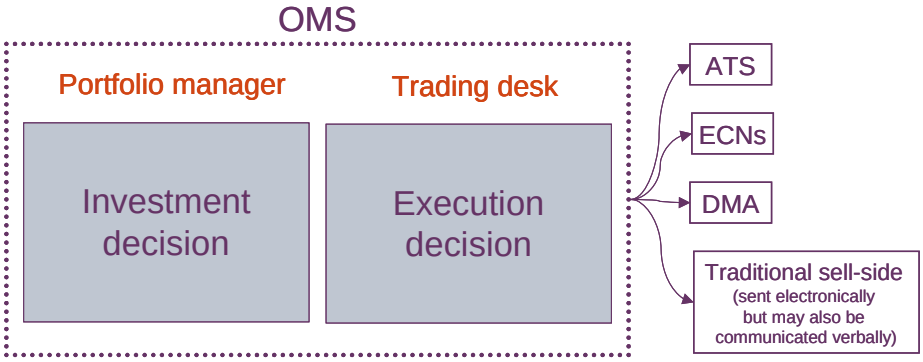
The first category of benefits associated with FIX arises as a result of changes in the internal processes of investment management firms.

The widespread adoption of FIX among buy- and sell-side firms in a given market segment increases the ease with which investment management firms can integrate their internal processes with their external communications. The increased ability to integrate internal processes arises primarily from the increased ability for investment management firms to have order management systems (OMS) that can simultaneously handle their relationships with multiple brokers (irrespective of the number of brokers used), running on the same standard protocol.

Figure 4.1 illustrates this effect. With the full order flow using FIX, the investment management firm can relatively easily integrate all its external trading relationships into its internal OMS. This then allows the firm to directly integrate the OMS with the portfolio management systems and other trade and post-trade systems. Under this structure, for example, the trades initiated by portfolio managers can be executed in the market electronically via FIX without further intervention by the trading desk at the investment manager.

In principle, OMS, portfolio management systems and the other systems of investment management firms could be integrated without widespread adoption of FIX or similar standard—ie, where the investment management firm has multiple relationships with brokers and other venues based on the different proprietary technologies in each link. The costs and complexity of integrating internal systems under these circumstances, however, tend to be higher—for example, as a result of a less streamlined external integration process.

Figure 4.1 Overview of internal processes within an investment firm



Source: Oxera.

The interviews with market participants carried out as part of this study have confirmed that FIX has a positive impact on the activities of investment managers. An illustration of the nature of these benefits is provided by the experience of a US investment management firm, American Century Investments (ACI). Following integration of internal systems based on FIX-compatible technologies, the portfolio manager is the only person who can 'key in' a security symbol, and buy or sell on their order. The OMS and portfolio accounting systems simply use that information throughout the rest of the process, including the external communication message flow.

Moreover, the benefits in relation to the efficiency of internal processes should be viewed in the wider context of the improvement of the entire flow of trade and post-trade processes. The investment managers interviewed for this study confirmed that the most significant benefits in the context of improved internal processes are likely to be achieved when all pre-trade, trade and post-trade processes are integrated such that human intervention is reduced to a minimum. They also confirmed that having a standard protocol, such as FIX, makes it easier to achieve such integration.

Overall, the benefits arising from improved internal processes within the investment management firms can be categorised as follows.

– **Reduction in costs**—internal integration has an effect on technological costs and overall operating costs. As a result of automation and integration, firms are able to achieve scalability of their operations, allowing growth in operations without the need for significant increases in the operating cost base.

– **Reduction in operational risks**—the reduction in manual intervention through deeper integration of internal systems (which is facilitated by adoption of a standard communication protocol) results in fewer errors, as well as overall improved monitoring of order flow and open positions. For instance, with a fully integrated internal system, only the portfolio manager enters instructions on the total quantity and direction of sale, eliminating the possibility that the internal trader misunderstands the portfolio manager's intentions.

– **Improved ability to use new execution and trading strategies efficiently**—closer integration of internal systems improves the feasibility of (and, in some instances, enables) certain electronic trading and execution strategies. These benefits are particularly high if other parties involved in these execution and trading strategies are using the same standard protocol. For instance, program trading requires fully integrated portfolio management and execution systems.

The level of these effects depends on a particular firm's characteristics, the nature of its activity and relationships with brokers, and broader characteristics of the market in which it operates. For example, everything else being equal, a given investment management firm can achieve the greatest benefits if it can integrate all its brokerage relationships using FIX. Therefore, from this perspective, the greatest benefits can be extracted if all of this investment manager's existing (and potential) brokerage firms have FIX capabilities.

4.1.2 Interaction between investment managers and brokerage firms

The second category of benefits associated with FIX arises from changes in the interaction between investment management firms and brokerage firms. The effects of these changes can be divided into two categories:

– **first-order effects**—these arise directly from the use of a messaging standard to establish a connection between investment managers and brokerage firms, and materialise mainly in terms of reduced costs of connectivity;

– **second-order effects**—these mainly materialise in the form of increased choice of services and competition between brokers, and lower explicit and implicit trading costs.

First-order effects

The widespread adoption of FIX has an impact on the nature of connectivity between buy- and sell-side firms. The most significant direct effect is associated with the reduced cost and complexity of establishing connections between investment managers and brokers. The specific types of benefits are as follows.

– **Reduced initial connectivity costs**—these are the costs—in particular, those related to the adoption, use and maintenance of application software—associated with establishing a connection with a new intermediary, or implementing a new electronic execution tool from an existing service provider. The use of a standardised messaging protocol reduces these costs, especially by allowing replication of existing connections to new counterparties and greater familiarity when coding and testing the new connection.

– **Reduced switching costs**—these are the costs of replacing an established relationship with one intermediary to a different intermediary, to which the investment firm may or may not already have an established electronic connection. As with the initial connectivity costs, the use of a standardised messaging protocol reduces some elements of the connectivity costs arising in the switching process.

– **Reduced ongoing connectivity costs**—these are the costs associated with maintaining a connection with an intermediary or upgrading an electronic execution tool from an existing service provider. Where a similar change is being carried out by a number of service providers (eg, upgrading of the messaging protocol), the use of a messaging standard reduces the costs associated with such upgrades.

  This effect of reduced connectivity costs can be accelerated by the reduction in the unit IT costs due to relatively stronger competition and scale economies of application software vendors arising when a standard messaging protocol is used. In the context of FIX, this effect is sometimes referred to as the 'commoditisation of the FIX engine', and can be identified by comparing the number of software vendors offering FIX-compatible products and the prices of these products.

In addition to the reduction in both connectivity costs and complexity, a strong direct effect of standardisation arises in the context of the ability of buy-side firms to efficiently integrate multiple brokerage relationships directly into their OMS. In particular, it is likely to be prohibitively expensive for most firms to integrate multiple relationships directly into their OMS if each requires a propriety communications protocol. At the same time, in an environment where target brokers are FIX-compatible, the costs of such integration are considerably lower, resulting in a significant degree of integration of multiple sell-side links into the buy-side OMS.

Interviews with market participants conducted as part of this study have confirmed that widespread adoption of FIX has a significant effect on the connectivity costs faced by market participants. Investment management firms have pointed out that by using FIX, there has been a significant reduction in both:

– the costs and time required to connect a new broker compared with connections carried out using the proprietary protocols; and

– the ongoing costs of connectivity associated with maintaining links with multiple brokers, including a reduction in the costs associated with updating trading algorithms.

Another indication of the benefits of FIX is provided by changes in the ability of buy-side firms to achieve connectivity. Using proprietary links to establish multiple relationships is likely to be time-consuming. At the same time, the experience of Gartmore Investment Management (GIM), ACI, and Norges Bank Investment Management (NBIM), highlighted during the

interviews, shows that the use of FIX can significantly reduce the cost and time required to achieve widespread connectivity.

– Within six months of implementing FIX in 2000, GIM had upgraded its OMS to the FIX-compatible version, built a server and installed a FIX gateway, completed testing and was sending orders via FIX. Initially, FIX was used with only one broker, but within three years, GIM was communicating electronically with 50 or more brokers for FIX orders and executions, 13 of which also handled FIX allocations.

– In the case of ACI, FIX was introduced in 1996. Within three years of introducing FIX capabilities for executions, more than 97% of US executions and 93% of international executions were carried out using FIX. At the same time, within three years of introducing FIX-compatible allocations, more than 88% of US allocations and 43% of international allocations were carried out using FIX.

– A more recent example is provided by NBIM, which adopted FIX in late 2002 and went from 100% manual execution to 80–90% via FIX within one year. Its current use of FIX is almost 100%.

The experience of these three buy-side firms demonstrates the relative ease with which they moved from non-FIX-based to FIX-based trading. Although data allowing for the direct comparison of introducing similar changes—ie, effectively adopting a new type of electronic relationship between buy- and sell-side firms—using proprietary messaging protocols is not available, these examples highlight the ease with which investment management firms can achieve widespread connectivity using FIX.

Overall, the degree to which such benefits arise varies across firms and geographic markets. For instance, the potential benefits depend on the number of brokers that investment managers use, whereby the benefit of being able to communicate to them all through one interface increases with the number of relationships.

Second-order effects

Reducing the costs of connectivity and of switching between brokers affects the interaction between investment managers and brokers in several ways. The most significant changes are as follows.

– Investment management firms are able to switch more easily between brokers.

– There is increased competition in the provision of trading services among brokers.

– There is a proliferation of new execution strategies, channels and venues available to investment managers.

Interviews with market participants conducted as part of this study have confirmed that widespread adoption of FIX has an effect on the nature of the interaction between buy- and sell-side firms. For example, investment management firms have noted the improved ability to choose execution options that are most cost-effective and best serve their specific execution needs for a particular trade. They have also highlighted the benefits associated with the improved ability to develop smart Indication of Interest (IOI) engines that use discretion in marketing order flow and sourcing liquidity, and that internal integration facilitates real-time pre-trade cost analysis. Lastly, they have indicated that there are benefits associated with increased anonymity of trades.

These changes in activity have further implications for the quality and cost of services available to investment managers, and ultimately the end-investors. The main effects are as follows.

– **Increased quality of service**—competition among brokers can improve the quality and scope of the services they provide.

– **Reduced explicit trading costs (eg, brokerage commissions)**—competition among brokers, more cost-efficient choice of execution channels by investment managers, and the availability of new execution strategies result in lower explicit trading costs.

– **Reduced implicit costs (eg, bid–ask spreads)**—more optimal choice of execution channels by investment managers, the availability of new execution strategies, and a reduction in the explicit trading costs leading to higher liquidity and lower implicit trading costs.

An illustration of the impact of FIX on the activities of investment managers and brokers is provided by the evidence on changes in dominant execution strategies and explicit and implicit trading costs. Although comprehensive market data on this is not readily available, interviews with market participants have confirmed that, over recent years, there has been a reduction in all-round trading costs, and that the factors underlying the reduction in trading costs include the following.

– The explicit costs of conventional execution strategies have decreased.

– The explicit and implicit trading costs in new electronic execution strategies are lower than in conventional execution strategies. There has been an increasing shift to new electronic execution strategies.

– The reduction in explicit trading costs (and other factors) has resulted in greater liquidity and lower implicit trading costs.

For example, during the interviews, one institutional fund manager informed Oxera that it had estimated that its average broker fees between 2003 and 2007 fell by more than half. This can be explained by the relatively lower cost of electronic execution strategies and the move to increased use of new execution strategies. This institutional fund manager estimates that electronic execution strategies attract commissions that can be as much as ten times lower than conventional agency trades.

The trends in explicit and implicit trading costs and changes in execution strategies identified through the interviews are, for aggregate markets, confirmed by recent academic and professional studies. For example, Domowitz and Yegerman (2005) confirm that algorithmic trading strategies result in implicit costs that are lower for comparable trades executed using non-algorithmic strategies.[24] In particular, they show that algorithmic trading is less expensive, based on a measure of implementation shortfall, than the alternative means represented in the sample of trades considered in the study. However, this result is only found for orders of up to 10% of average daily volume.

4.1.3 Brokerage firms' internal processes

The third category of benefits associated with FIX arises from changes in the internal processes of brokerage firms.

Widespread adoption of FIX increases the ability of brokerage firms to integrate their internal processes, including integrating the order flow from the investment management firms to execution on trading platforms.

In principle, such integration can be achieved in circumstances where the brokers are using their own proprietary protocol to communicate to investment managers and trading platforms'

[24] Domowitz, I. and Yegerman, H. (2005), 'The cost of algorithmic trading: A first look at comparative performance', working paper.

proprietary protocols to communicate to trading platforms. However, FIX-compatible links with investment management firms and trading platforms reduce the complexity and cost of achieving such integration.

The benefits arising from improved internal processes at the brokerage firms can be categorised as follows.

– **Reduction in costs**—internal integration has an effect on the operating costs (and, in the long run, the technological costs) that brokerage firms face. As a result of automation and integration, firms have better scalability of their operations, allowing growth in operations without the need for large increases in the operating cost base.

– **Reduction in operational risks**—the reduction in manual intervention through deeper integration of brokerage firms' internal systems results in fewer errors as well as overall improved monitoring of order flow and open positions.

– **Improved ability to offer new electronic execution services**—closer integration of internal systems improves the overall ability to offer certain electronic trading and execution strategies.

The interviews with market participants have confirmed that these can be a source of benefits arising from widespread adoption of FIX. For example, they illustrate the ability to offer enhanced service levels and a reduction in the time-to-market of new products as one of the benefits. Widespread adoption of FIX has also simplified the process of launching new products, such as execution strategies based on algorithms.

The level of these effects depends on the characteristics of a particular firm, the nature of its activity and the link with investment managers and exchanges, and the broader characteristics of the market in which it operates. For example, the level of benefits is closely linked to the degree to which buy-side firms in relevant markets are FIX-compatible, whereby the greatest benefits would, everything else equal, accrue to brokerage firms operating in the markets where most investment managers have FIX capabilities.

4.1.4 Brokers and trading platforms

The fourth category of benefits associated with FIX arises from changes in the way in which brokerage firms (and increasingly buy-side firms directly) connect to trading platforms. These changes can be divided into two categories:

– **first-order effects**, which arise directly as a result of using a messaging standard to establish connection between brokerage firms and trading platforms, and mainly materialise in the form of reduced connectivity costs;

– **second-order effects**, which mainly materialise in the form of increased choice and competition, and reduction in the explicit and implicit trading costs.

First-order effects

The widespread adoption of FIX among brokerage firms and trading platforms has an impact on how brokerage firms connect to trading platforms, and on the relationships between trading members and trading platforms more generally.

The most significant direct effect is associated with the reduced cost and complexity of establishing connections between brokers (and investment managers) and trading platforms. The specific types of benefits are as follows.

– **Reduced initial connectivity costs**—these are the costs associated with establishing a software connection with a new trading platform or implementing a new electronic execution tool (eg, the costs related to the adoption, use and maintenance of application

software). The use of a standardised messaging protocol reduces these costs, in particular by allowing replication of existing connections to new trading platforms.

– **Reduced ongoing connectivity costs**—these are the costs associated with maintaining a software connection with a trading platform or upgrading an electronic execution tool from an existing service provider (eg, the costs related to the adoption, use and maintenance of application software). Where a similar change is carried out by a number of trading platforms (eg, upgrading of the messaging protocol), the use of a messaging standard reduces the costs associated with such upgrades.

Widespread adoption of FIX among platforms can also reduce the latency of transactions, particularly where multiple execution venues are used simultaneously to execute trades in a given security (eg, through the use of smart order routing).

Interviews with market participants conducted as part of this study have confirmed that widespread adoption of FIX reduces the connectivity costs that market participants face. In particular, they have confirmed that connectivity to FIX-enabled trading platforms can be achieved at a fraction of the cost required to achieve connectivity to trading platforms using proprietary protocols (assuming that a broker already has at least one FIX-compatible trading platform connection).

They also confirmed that these differences in connectivity costs using standardised and proprietary protocols can affect a decision to connect to a new or existing platform. This is more likely to affect medium and small brokerage firms (ie, their decision to connect to a given platform), and medium and small trading platforms (ie, the decisions of brokers to connect to these platforms), and relates to the volume of order flow in question. Therefore, particularly in the case of small and medium brokers, the reduction in connectivity costs allows them to connect to more trading platforms and more execution venues, improving their competitiveness and widening the scope of services that they can deliver.

The experience of the European MTFs established over recent years serves to illustrate the effects of standardisation (see box below).

European MTFs

The Markets in Financial Instruments Directive (MiFID), which came into force in November 2007, has encouraged new levels of competition between execution venues and brokerage firms. One of its key aspects was that it facilitated the creation of domestic and pan-European multilateral trading facilities (MTFs)—alternative execution venues that could compete against existing exchanges across the 30 countries of the European Economic Area (EEA).

Neither MiFID nor the Committee of European Securities Regulators (CESR) addressed the issue of communications standards for electronic trading and market data publication. Notably, at the time of the introduction of MiFID, existing exchanges in the EU typically operated private communications environments with proprietary message formats. In practice, the proprietary nature of the exchanges' systems may have acted as a barrier to increased access by brokerage firms.

Industry sources suggest that developing specific software to access each of the existing exchanges' proprietary electronic trading environments can cost each firm as much as €50,000. Although this data is not based on a comprehensive sample, and might not be representative of the average costs facing firms, it nevertheless provides a good indication of the order of magnitude associated with achieving connectivity to the individual exchanges. The level of costs might be one of the reasons for the relatively low number of brokerage firms that are members of any stock exchange outside of their home country.

In the case of MTFs, when entering the market, the costs of connectivity associated with a proprietary protocol can reduce the competitiveness of the offering. This is because introducing another proprietary environment for market information and message delivery would add to their difficulties in winning over brokerage firms to use the new execution venues.

Instead of creating an additional barrier to access, many new MTFs used the existing international industry standard for financial messaging that brokerage firms already used for electronic trading—the FIX Protocol—making access of brokerage firms to their facilities as easy as possible. This meant that brokerage firms could re-use their existing investment in trading software with minimal changes and at minimal cost. Arguably, the success of this approach may be judged by the considerable percentage of total order flow in blue-chip equities now passing to the new MTFs compared with the existing exchanges. At least one of the new, successful, MTFs

has already stated publicly that it would not be in existence today without its use of the FIX Protocol.

The ability to use FIX to connect to participants and to clearing houses has enabled MTFs to come to market more quickly than if they were using a proprietary protocol. Less than two years after MiFID was introduced, several MTFs are already up and running, including Chi-X, Plus Markets, Turquoise, BATS Europe and NASDAQ OMX Europe. Between them, they currently (September 2009) account for a significant proportion (around 30-40%) of turnover in stocks listed on the London Stock Exchange.[25]

The experiences of Chi-X, BATS, Turquoise and other MTFs therefore provide insights into how standardisation can benefit increased competition between execution venues. Chi-X, for example, using a standardised protocol, has been able to connect 100 trading participants in Europe in a timely fashion. According to Mark Howarth,[26] CEO of Chi-X Europe: 'As a result of low cost connectivity, low cost technology and low cost business operations, single participants report savings to their bottom line of over US$10m per year. Across all participants this probably totals savings to the industry of about US$500m.'

Chi-X does not use FIX just to connect participants to its front-end, but also to distribute its trade feed to its clearing houses using FIX 4.2. Mr Howarth notes: 'This has been significant in providing end to end service and has helped manage both risks and costs. We offer a trade data monitor service which uses FIX 4.4. At this time we publish market data in the ITCH format but plan on reviewing this as FAST becomes more popular.'[27]

Similarly Turquoise, which has a FIX gateway to its internal API, has also benefited. Eli Lederman, Turquoise CEO, comments: 'FIX, more than anything, has transformed the economics of competition in Europe, and without the efficiency that FIX lends to the marketplace, the frictional cost of trading would have continued as it had been, and the improved liquidity that benefits investors today would have remained hidden in the cobwebs of an ancient market infrastructure.' [28]

The example serves to illustrate the potential effect of standardisation on the connectivity costs facing individual firms, as well as the aggregate connectivity costs across the industry. To maintain connectivity to trading platforms, brokerage firms incur potentially significant one-off initial costs as well as ongoing costs. Initial one-off costs include the internal IT investment required to build an API to use the exchange protocol, etc. Annual ongoing costs are associated with maintenance on API to modernise and link up new technology.

The difference in costs between the case where firms use a trading platform's proprietary protocols and standard protocols depends primarily on the number of platforms to which firms wish to connect. Interviews with market participants have confirmed that, in the case of a standard messaging protocol, once the investment required to connect to one platform has been made, the initial one-off costs of adding further platforms operating using the same protocol are relatively small. Similar scale economies are observed in respect to the ongoing costs of maintaining links.

Figure 4.2 illustrates the level of connectivity costs depending on the number of trading platforms to which the brokerage firm wishes to connect under different assumptions about the relative costs of connectivity using FIX. For illustrative purposes, it is assumed that the costs of adding an additional platform using FIX are 0% and 20% of the costs of adding the first connection respectively; the cost of connecting to a platform using a proprietary protocol, as well as establishing the first connection using FIX, is normalised to 100.

The figure shows that, under these simple assumptions, standardisation can bring about significant savings in connectivity costs. For instance, the cost of establishing connections to ten trading platforms is between four and ten times lower than under proprietary protocols, depending on the assumptions about the relative costs of connectivity using FIX.

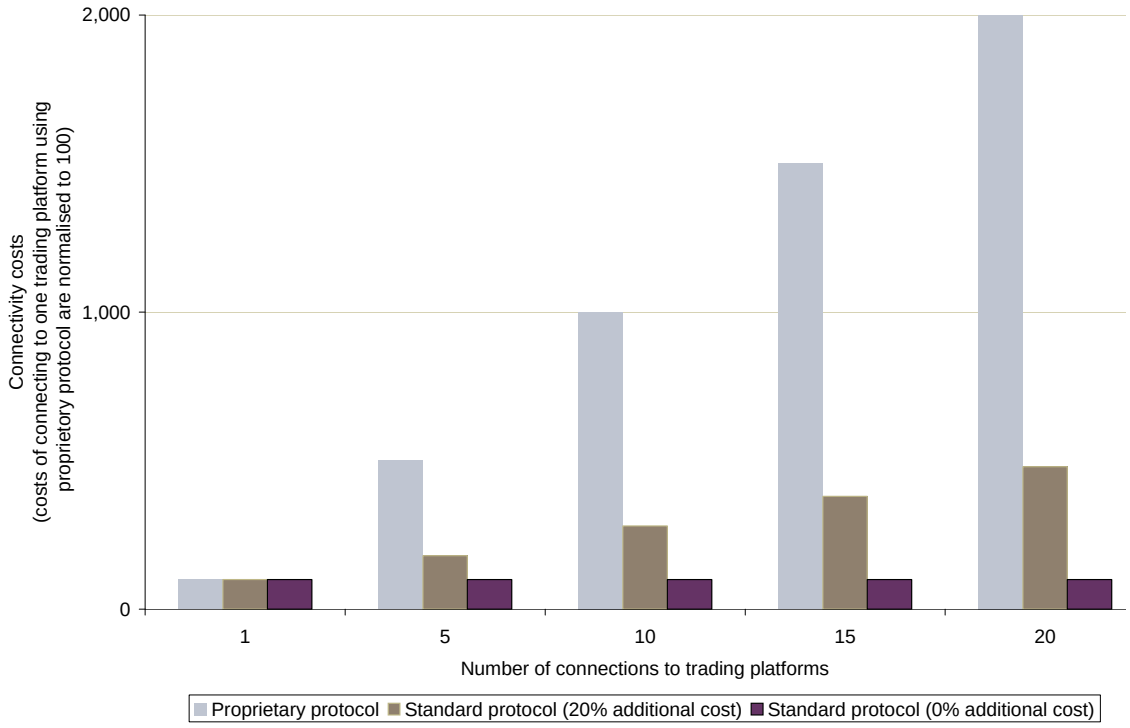
[25] As reported by BATS Europe and Chi-X on their websites: http://www.batstrading.co.uk/market_data/market_share/market/, http://www.chi-x.com/market-data/market-report.asp

[26] As reported by FPL.

[27] As reported by FPL.

[28] As reported by FPL.

Figure 4.2 Illustration of the connectivity costs facing brokerage firms: proprietary versus standard protocols



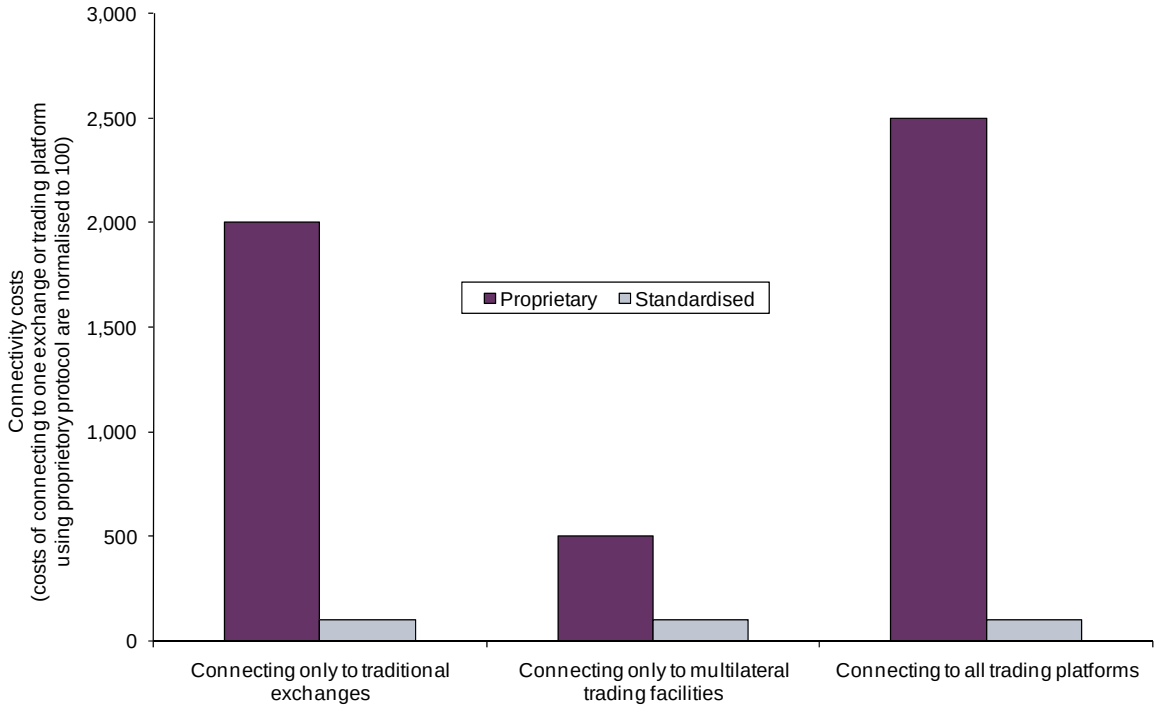
Note: The cost of connecting to a platform using a proprietary protocol, as well as establishing the first connection using FIX, is normalised to 100. The cost of adding a second and subsequent connections using the standard protocol is assumed to be 20 (20% additional cost) and 0 (0% additional cost) respectively.
Source: Oxera.

Another example in the context of European trading platforms serves to illustrate the impact of standardisation of trading platform connections on the costs of achieving connectivity. Currently there are around 20 exchanges and at least five multilateral trading platforms for trading of shares of companies from the EU. Assuming that a new broker wants to enter these markets, its costs of connectivity will vary greatly depending on whether it requires links to be established with these trading platforms based on the different proprietary protocols or the same standardised connections for all of them.

Figure 4.3 illustrates the trader's costs of connectivity assuming a uniform cost of connecting to a platform using a proprietary protocol, as well as establishing the first connection using FIX (normalised to 100), and assuming that, under standardised connections, the costs of connecting another platform once one connection has already been established are negligible.

The figure illustrates the significant differences in the costs of achieving connectivity to all trading platforms trading the shares of EU companies, depending on whether the trading platforms provide a standardised or proprietary connectivity.

Figure 4.3 Illustration of the costs of connecting to European trading platforms



Source: Oxera.

In practice, the difference in the overall cost of gaining connectivity under these two approaches is likely to be somewhat smaller. In particular:

– there are initial connectivity costs that are not directly linked to whether the platform uses a standard protocol or proprietary protocol, which include, for instance, 'keying in' costs;

– there are also some ongoing connectivity costs that are not directly linked to whether the platform uses a standard or proprietary protocol. These include, for instance, the costs associated with bandwidth rental.

Data on these costs is not readily available. Nevertheless, interviews with market participants have confirmed that the connectivity costs that are related to standardisation form a significant part of the overall initial and ongoing costs of connectivity.

Overall, the degree of benefits that can be achieved through introducing FIX connectivity between brokers and trading platforms differs depending on their characteristics and the overall market structure. For example, brokerage firms with a high number of required connections to the trading platforms domestically and in foreign markets would benefit more than brokers that required only a few connections.

Second-order effects

Reducing the costs of connectivity and of switching between trading platforms has a number of effects on the interaction between brokers and trading platforms. The most significant changes are as follows:

– increased ability of new entrants and existing platforms to achieve widespread connectivity;
– increased existing (and potential) competition between trading platforms;
– proliferation of new execution channels (eg, dark pools of liquidity).

Several further indirect benefits may arise as a result of widespread adoption of FIX—for example, increased use of public communication networks for dealing with trading platforms.

An insight into the potential role of FIX in achieving widespread connectivity to trading platforms is provided by the experience of the US markets. Although there is no direct empirical evidence on how FIX has increased overall connectivity, the availability of a common protocol has been one of the key factors enabling new trading platforms (particularly smaller/later arrivals) in the USA to gain connectivity by reducing the marginal costs of connectivity for their potential clients compared with the situation where all connections were done using proprietary protocols.

The interviews with brokers and trading platforms conducted as part of this study have confirmed that the significantly lower connectivity costs to the platforms that are FIX-compatible is one of the factors that has enabled the proliferation of various alternative trading venues. The ease of entry into markets, particularly when there are suppliers with high market shares, is an important factor in ensuring that existing suppliers cannot exploit their current market positions in ways that are detrimental to their customers.

These changes in activity have further implications for the quality and cost of services available to the brokers (and investment managers), and ultimately the end-investors. The main effects are as follows:

– **increased quality of services**—competition among trading platforms brings about an increase in the quality and scope of services they provide;

– **reduced explicit trading costs (eg, trading platform fees)**—competition among trading platforms results in lower explicit trading costs;

– **reduced implicit trading costs (eg, bid–ask spreads)**—more optimal choice of execution channels and increased trading activity as a result of lower explicit trading costs result in higher liquidity and lower implicit trading costs;

– **reduced regulatory overheads**—the overall cost of new requirements is reduced as a result of the need to adjust just one widely adopted communications protocol, rather than many individual bilateral protocols.

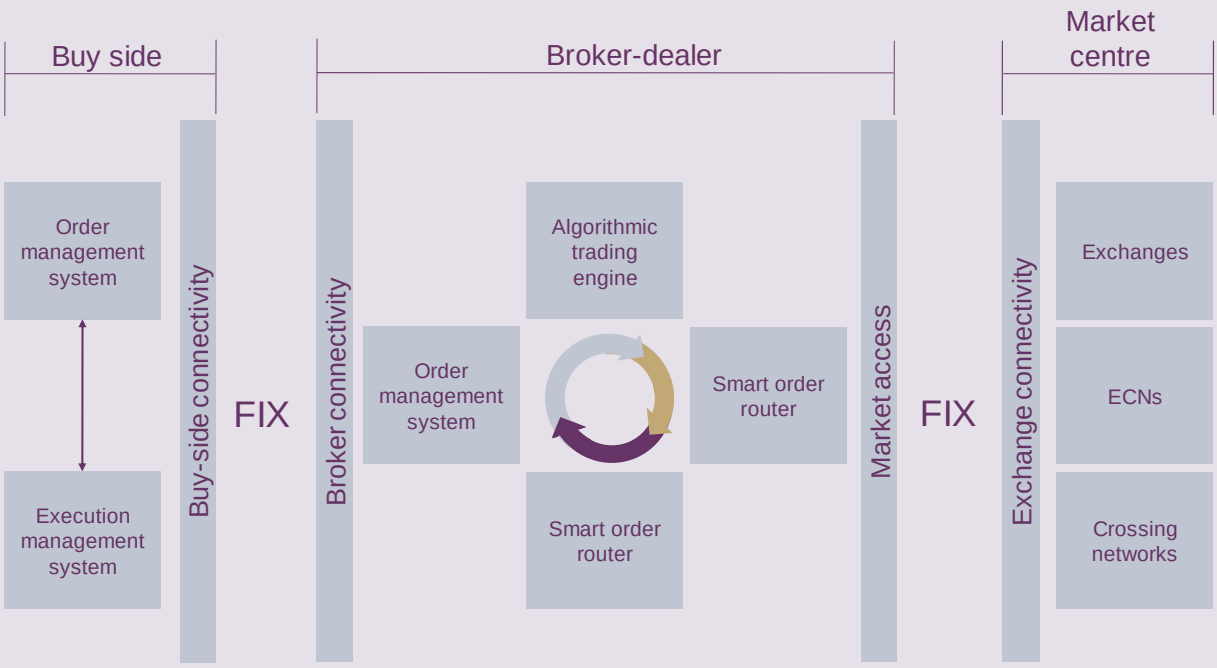
Developments in the US trading of equities illustrate some of these effects. In particular, factors such as regulatory changes (eg, the introduction of Reg NMS) aided by the ability of non-incumbent exchanges to achieve high levels of connectivity using FIX, has led to significant competition between trading venues and reduced trading costs. In addition, an example of the way in which FIX can reduce regulatory costs is provided by changes in the Reg NMS rule on order protection (see box below).

Impact on regulatory costs

Where many market participants are already using a standardised communications protocol, and where new regulations require new reporting, a single technical solution can be worked out which can then be applied across all those using the same protocol. The process by which new rules are implemented can be shortened and made more efficient, and the information to the regulator can be delivered such that the processing of that information is made easier.

Recent changes to the Reg NMS in relation to order protection illustrate the potential changes and how FPL has responded to these rule changes.

The figure below illustrates how the trading systems of dealers, market makers and execution venues are affected by Reg NMS. Complex information flows are required between market participants, and between participants and the regulator.



Source: FPL.

On the buy side:

- broker-dealers often educate the buy side regarding regulatory requirements from a technology perspective (the difficulty being that there is often little incentive for the buy side to follow this directive);
- the buy side (or, more typically, the sell side) communicates to the vendor (EMS/OMS/back-office processing systems) what needs to be done. Each internal application must be modified to provide a straight-through process, regardless of FIX version(s):
  - OMS, EMS and back-office processing systems develop and incorporate new data fields for GUI to support any additional tags;
  - the buy side creates an interface with its FIX engine or vendor system;
  - scenarios and scripts are developed and tested;
  - certification takes place with the vendor/broker.

For broker-dealers towards buy side:

- they communicate regulatory requirements to vendors and IT departments (OMS/back-office processing system). Each internal application must be modified to provide a straight-through process, regardless of FIX version(s);
- OMS and back-office processing systems develop and incorporate new data fields for GUI to support any additional tags;
- the broker-dealer creates an interface with its FIX engine or vendor;
- scenarios and scripts are developed and tested;
- certification takes place with the vendor/sell-side customer.

For broker-dealers towards trading systems:

- the broker-dealer communicates regulatory requirements to vendor and IT departments (Algo Trading Engine, Smart Order Router, Internal ATS—Cross System, OMS). Each internal application must be modified to provide a straight-through process, regardless of FIX version(s);
- vendors and IT departments develop and incorporate new data fields for GUI to support any additional tags;
- the broker-dealer creates an interface with its FIX engine;
- scenarios and scripts are developed and tested;
- certification takes place with the vendor and other market participants

For trading systems:

- trading systems (exchanges/ECNs/crossing networks) modify systems to communicate to vendor and IT departments;
- trading systems create an interface to their FIX engine;
- scenarios and scripts are developed and tested;
- testing is undertaken with broker-dealers and other trading systems.

Ensuring that the required information is flowing efficiently through the different layers is (relatively) simpler if the existing information flows can be used—ie, building on the shared protocols. If the new information flows had to be agreed bilaterally between participants, the total effort and time to implement would be significantly greater,

implying higher total costs. In addition, the regulator can, where necessary, gain access to standardised information flows with respect to its new rule in a way that simplifies both aggregation of the information (to give a market-wide view) and to monitor compliance.

In recognition of the role that a standardised protocol can play in the regulatory functions of the operation of securities markets, the Securities and Exchange Commission (SEC) and FPL have initiated coordination meetings with a view to ensuring, among other considerations, that regulatory implementation costs are minimised by building on the capacity of FIX to provide a single technical implementation that can be adopted throughout the communications chain.

4.2 Changing trading landscape: the role of communication technology and standards

This part of the analysis considers the changing landscape of equity trading over recent years, outlining the role played by standard messaging protocols in these developments and FIX in particular. This analysis also provides evidence on the current usage of FIX and the potential for further standardisation among firms.[29]

4.2.1 Diffusion of FIX over time

From its origination as a bilateral trading protocol between two firms, the use of FIX has spread to many other firms on both the buy and sell sides, and to trading platforms.

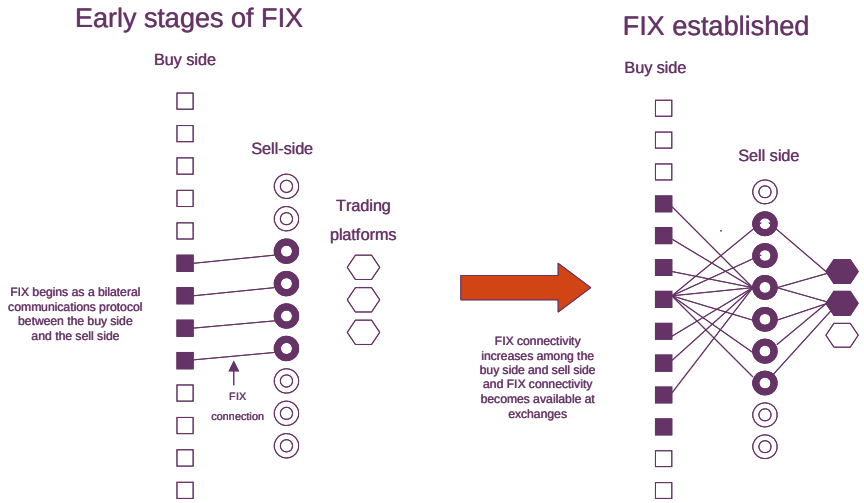
Initially, FIX was developed as a messaging protocol intended for use in communications between investment managers and brokers. FIX for use in equity transactions was piloted by Salomon Brothers and Fidelity in 1992. A committee of firms was subsequently formed in 1994 leading to FIX 2.7 being released to the wider financial community in 1995. At this stage the protocol had capabilities for use in communications with exchanges, although initially this was between the buy and sell sides only. The capability to handle fixed income, derivatives and foreign exchange transactions was first introduced in FIX versions 4.3, 4.1 and 4.2 respectively.[30]

Figure 4.4 illustrates the spread of FIX since its beginnings as a communications protocol used between a number of buy- and sell-side firms. The lines and shading are intended to illustrate FIX connectivity, and hence the potential to use FIX, rather than indicating actual FIX trading patterns.

[29] As FIX involves no registration/centralised record of its use, there is no public source of information on the number of FIX users and their level of usage. Therefore, comprehensive evidence on the proportion of FIX-enabled buy-side firms, sell-side firms and trading platforms, and the proportion of volumes carried through FIX-compatible links, is not available.

[30] See Appendix 5 for more detail on functionality across product classes.

Figure 4.4 The diffusion of FIX adoption



Source: Oxera.

The processes through which communications between investment managers and brokerage firms, and between brokerage firms and trading platforms, are being standardised are somewhat different. In the relationship between investment manager and brokerage firm, the move towards widespread use of FIX has largely been achieved by gradually adopting FIX for bilateral links between particular investment managers and brokerage firms.

At the same time, in the relationship between brokerage firm and trading platform, the move towards widespread use of FIX is being achieved through more discrete increments. In this case, for example, if an exchange moves to the FIX API and discontinues all connections based on the existing proprietary protocols, all of its members (who wish to continue trading on that exchange) have to use FIX. In this way, a large part, if not all, of trading activity in a given country can be shifted overnight to FIX. Similar effects can arise as a result of (successful) entry by new trading platforms that provide FIX connectivity.

4.2.2 The changes in trading possibilities and the flow of communications

Over the same period, there have been significant changes in the way in which trading is carried out. Driven by factors such as regulatory changes, technological development and standardisation of communications, there have been major changes in how investment managers, brokerage firms and trading platforms operate.

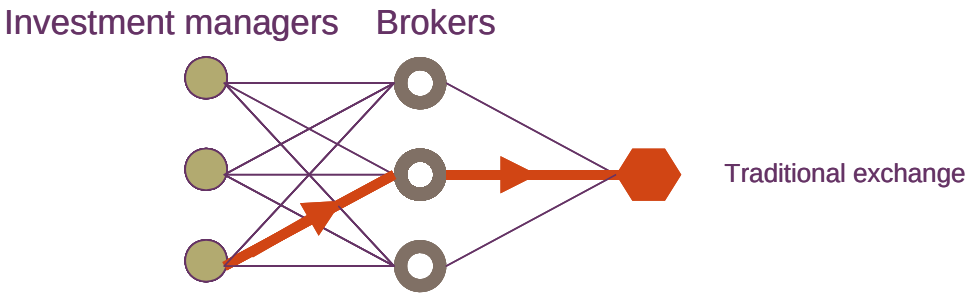
Markets have moved from a situation in which most of the communication between investment managers and brokers was done over the phone and where floor trading dominated trading on exchanges, to a situation in many financial centres where most of the communication between investment managers and brokers is done electronically, as is trading on exchanges (or trading platforms more generally).

Evolution of trading processes

The use of FIX first proliferated among investment managers and brokers, and then ‘spread’ to the trading platforms. This part considers the first of these links, focusing on the changing relationship between investment managers and brokers.

In the past, investment managers were generally limited to using brokers for executing trades on the exchange. These trades were normally carried out using basic communication devices, including phones and faxes. Figure 4.5 shows this in a simplified example with three investment managers who are all able to use the three brokers to trade on an exchange.

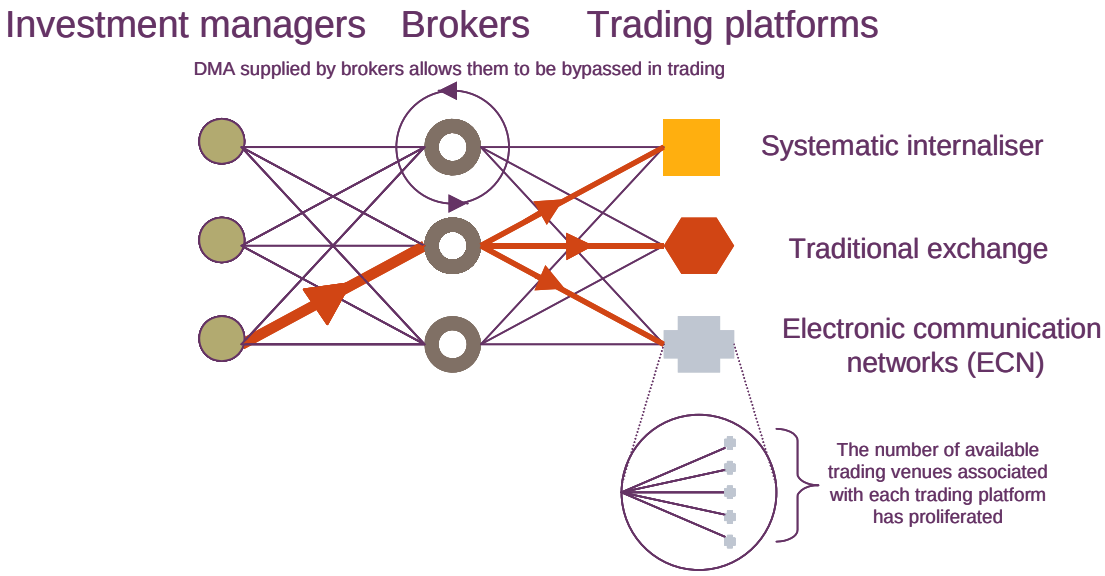
Figure 4.5 Example of the trading landscape in the past



Source: Oxera.

Now, however, links between investment managers, brokers and trading platforms have evolved to include different forms of electronic communications. At the same time, the number and variety of venues on which trades can be executed have increased. Figure 4.6 illustrates the current trading landscape, showing that these changes have greatly expanded the trading channels available to investment managers.

Figure 4.6 Example of the current trading landscape



Source: Oxera.

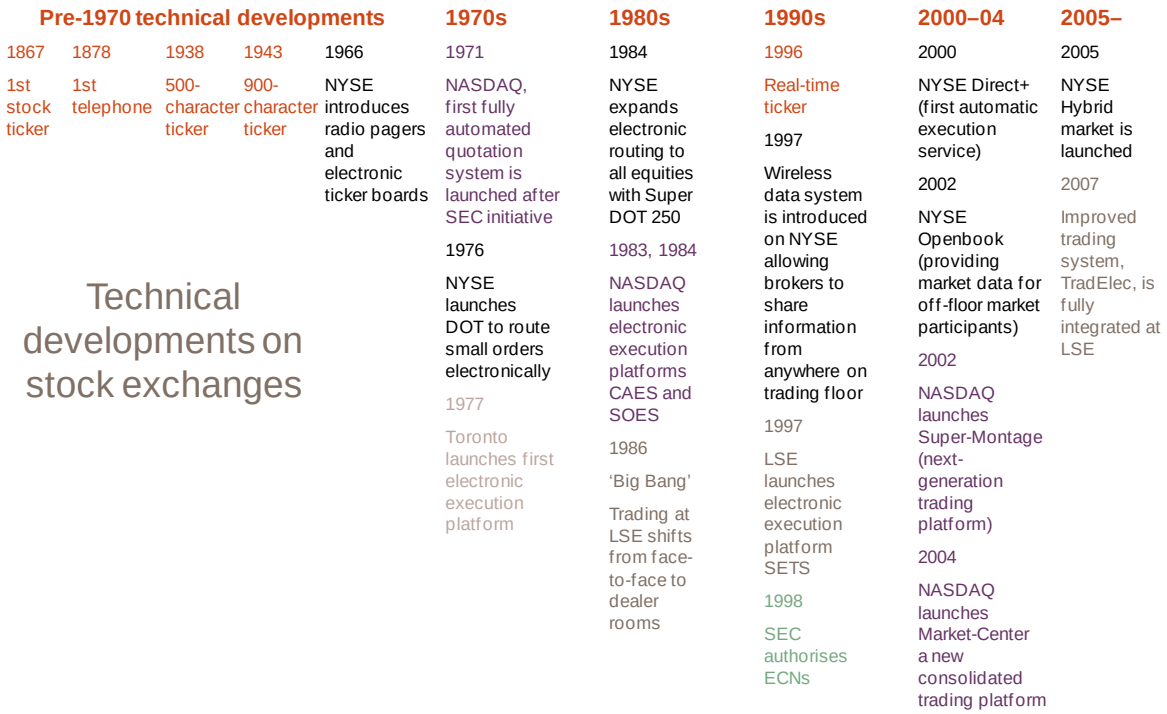
Moreover, in the past, exchanges were structured as collectives of broker/dealers, and the floor trading mechanism was used to carry out transactions. However, most exchanges have now moved away from open-outcry to electronic approaches, and there has been consolidation of local and national exchanges.

At the same time as regulated exchanges have consolidated, trading has increasingly taken place on platforms other than the traditional regulated exchange. The main alternative venues are MTFs—also called alternative trading systems (ATSs)/electronic communication networks (ECNs). These arrangements bring together a number of third parties with buying and selling interests in financial instruments. An example of an MTF is a 'crossing network', where buyers and sellers are matched at the midpoint of the best bid and offer price in a parallel market (such as the London Stock Exchange or NASDAQ OMX). Examples include POSIT, Liquidnet, Instinet, Pipeline Trading System, BATS and Track ECN in the USA, and Chi X, BATS Europe and Turquoise in Europe.

Trading outside of a regulated exchange is also increasingly associated with the concept of 'dark pools of liquidity', where liquidity is split up across multiple trading venues and the ability to observe underlying trades is limited. Trading in dark pools originated in the USA, although there has been an increased use of these venues in Europe over the past few years.

The technological changes underlying some of those developments are illustrated in Figure 4.7. This shows changes in the technology used in trading platforms observed over recent years, illustrating how exchanges have developed from venues where trading is carried out using basic technology to the fully automated sophisticated technologies observed now.

Figure 4.7 Examples of technological innovations on exchanges



Source: Various exchanges.

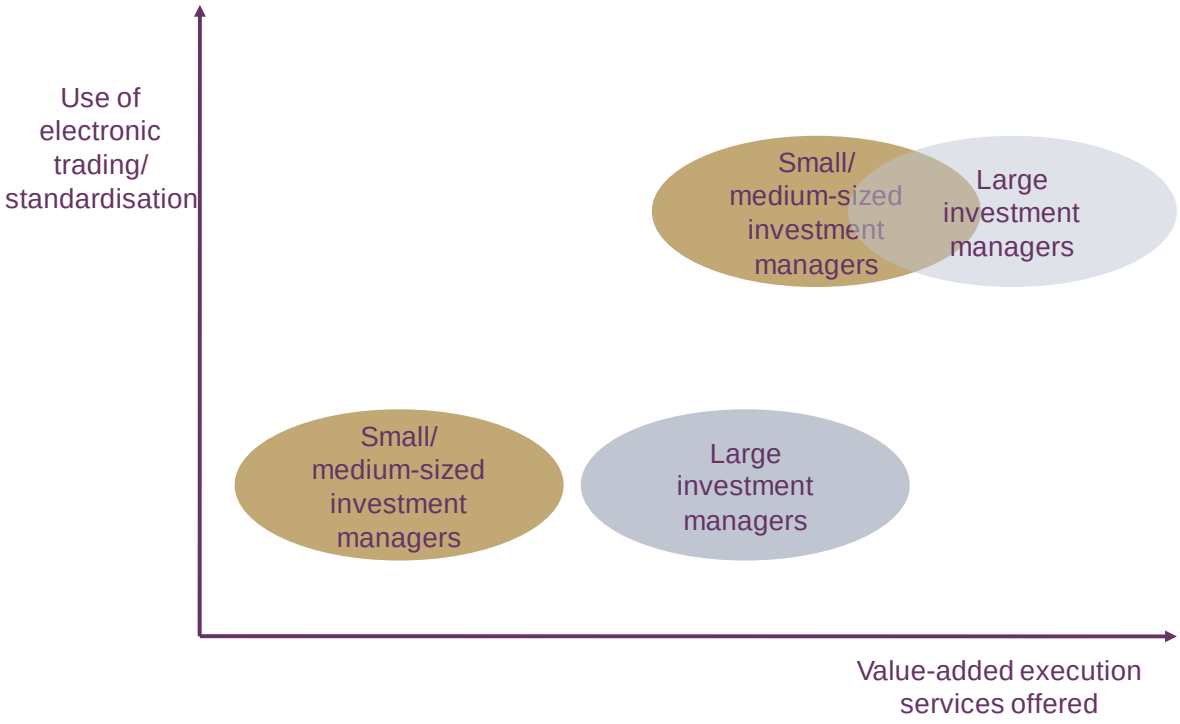
Evolution in trading and execution strategies and other services

Changes in the relationships between investment managers and brokers have expanded the network over which trades occur and the number of parties and systems involved in any one trade. This means that electronic communications (rather than voice or written) have become ever more important, and in turn so have electronic communication protocols, such as FIX, that enable communications between participants in a trade.

These changes have had profound implications for the operations of investment managers, the execution services available to them, and their interactions with brokers. For instance, interviews with market participants carried out as part of this study suggest that there has been a significant increase in the value-added services that can be offered, particularly to small and medium-sized investment managers. Figure 4.8 below illustrates this trend, comparing value-added services that brokers could feasibly offer to investment managers in the early days of electronic trading with the current environment of a high level of electronic trading and standardisation among investment managers.

The figure shows both an increasing level of value-added services offered and convergence of the level of services that can be offered to large, medium-sized and small investment managers. The latter trend can have important implications for the innovations and for brokers' incentives to innovate, since, everything else being equal, this increases the base of parties over which these investments can be recovered.

Figure 4.8 Value-added services offered by brokers



Source: Oxera.

One important aspect of changes in investment managers' activities is the increased use of direct market access (DMA) and algorithmic execution strategies.

– DMA is an electronic execution strategy that allows buy-side participants to deal directly in the (electronic) market. At present, in most cases this capability is provided by brokerage firms.

– In algorithmic trading, computers are used to implement and execute a trade directly, with the trade being executed according to certain objectives, such as reducing information leakage and market impact, and hence the costs of execution. This is obtained by removing the human element in a trade, but also allowing more sophisticated trading strategies to be implemented by splitting up larger trades into smaller ones, reducing the time between trade initiation and execution (known as 'data latency'), simultaneously monitoring trading conditions on multiple markets to achieve the best price, etc.

Electronic execution strategies discussed here require a high degree of automation, both within firms and between firms in the value chain, and the availability of electronic communication tools. Increasingly, FIX is being used to carry out these types of trading and investment strategies (see section 4.2.3 for more detail).

4.2.3 FIX connectivity: current levels and further scope

The interviews and other evidence suggest that there is significant usage of FIX among firms, in communications both between investment managers and brokerage firms, and between brokerage firms and trading platforms. This part of the analysis outlines the evidence on FIX usage among firms, although, due to its nature, precise estimates of the level of activity using FIX are not available. This evidence provides insights into the current usage of FIX, the intentions of firms and the potential for further standardisation going forward.

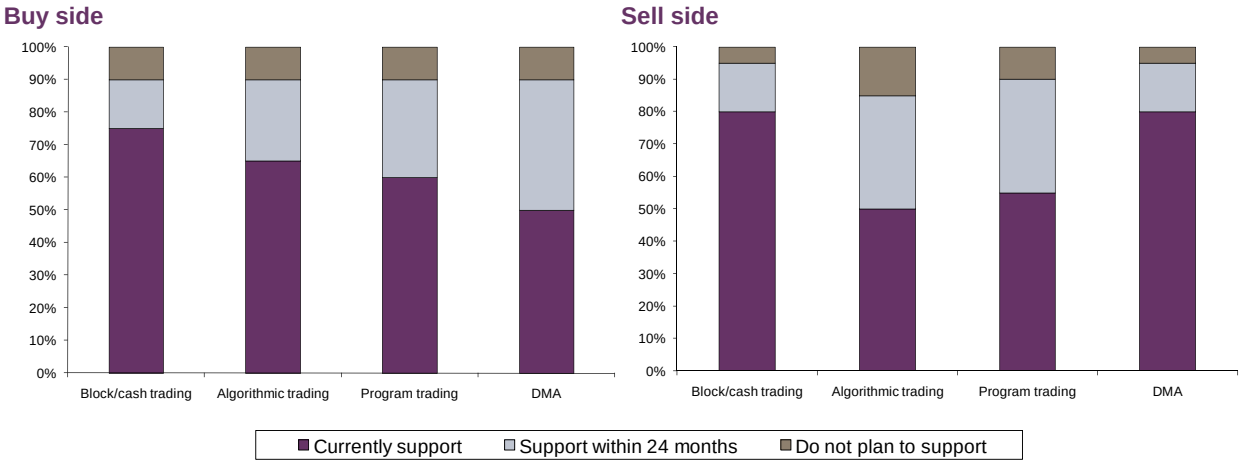
The main evidence in this part of the analysis is obtained from a FIX Global Survey 2005, which was carried out primarily among the member firms of FPL (65% members, 35% non-members).[31] Although the survey has its shortcomings, particularly as it is carried out among a sample of firms which is not fully representative, it provides insights into the level and nature of FIX connectivity among firms.[32]

FIX connectivity among buy-side and sell-side firms

Figure 4.9 shows the current and expected future level of FIX connectivity among buy-side and sell-side firms for applications such as block/cash trading, algorithmic trading and DMA. Overall, this suggests that, at the time when this survey was carried out, about 90% of firms either supported or intended to support FIX connectivity within the following 24 months.

In the case of buy-side firms, the highest uptake can be observed for block/cash trading, but the lowest for DMA; although, in the 24-month time horizon, all four applications are expected to be equally well supported. For sell-side firms, the highest uptake can be observed for block/cash trading, but the lowest for algorithmic trading, with a similar pattern expected to remain in the 24-month horizon. Although there are some differences between sell-side and buy-side firms in terms of current uptake, the level is expected to be broadly similar in 24 months' time.

Figure 4.9 FIX uptake by buy-side and sell-side firms



Source: 2005 FIX Global Survey.

FIX connectivity among trading platforms

Similarly to the buy- and sell-side firms, detailed data on the level of FIX connectivity among trading platforms over time is not available. However, the 2005 FIX Global Survey yields insights into the current levels of FIX connectivity among trading platforms in the USA, Europe and Asia.

The survey suggests that 77% of the 49 exchanges interviewed provided an interface based on FIX, and every exchange without a FIX interface said that they intended to provide one within the following 24 months. This demonstrates high levels of FIX connectivity among exchanges, although over 90% of exchanges also indicated that they provided an API interface based on propriety protocols.

[31] For each type of participant there were respondents from the Americas, the UK, Continental Europe, Japan and the rest of Asia. The sample of respondents consisted of 153 buy-side firms (48% members), 168 sell-side firms (78% members), 49 exchanges (57% members) and 210 vendors (68% members). The survey was carried out by Tower Group.

[32] Additional evidence on FIX usage can be obtained by considering information on FIX vendors. For instance, evidence on the FPL webpage suggests that the numbers and range of products on offer have grown substantially over time. In 1998 the FPL website indicated that there were nine vendors selling FIX engines; by 2008, this had increased to 115 vendors offering around 149 products in total. This information provides a more indirect indication of the growth of usage over time, complementing evidence from the FIX Global Survey used in this part of the study.

Moreover, in terms of volumes handled, around half of the exchanges surveyed believed that less than 25% of their volumes came through FIX, while 15% believed that 75% of volumes came through FIX. Therefore, the level of usage of FIX in terms of volume handled was comparatively low, although respondents did anticipate a greater proportion of traffic coming via FIX in future.

No information was made available on the actual versions of FIX, or the degree to which they can be customised. However, interviews with market participants as part of this study suggest that there are currently differences among trading platforms in terms of the versions they use, and that exchanges often apply a degree of customisation to their FIX connections.

Geographic diffusion

The 2005 FIX Global Survey also provides insights into the use of FIX across different regions. The survey results suggest that FIX is currently most widely used among buy-side and sell-side firms for trading in the Americas (mostly USA), followed by the UK, Continental Europe, Japan, and Asia excluding Japan.

Among the buy-side firms, 41% of respondents reported trading more than three-quarters of their Americas volumes via FIX. The equivalent figure was 23% for the UK, Continental Europe and Japanese volumes, and 17% for Asian volumes (excluding Japan). Among sell-side firms, 19% of respondents reported trading more than three-quarters of their Americas volume through FIX. The equivalent figures were 9% for the UK, 8% for Continental Europe, and 5% for Japan and Asia.

The evidence on differences of FIX connectivity among trading platforms in different countries is not readily available. However, interviews with market participants confirmed that, overall, the FIX connectivity among the US and European trading platforms was better than that observed in the Asian countries.

5 Application to other asset classes

FIX was initially designed for use in trading in equity markets, although it is increasingly being used for pre-trade, trade and post-trade communications in derivatives, fixed income and foreign exchange markets. The benefits associated with FIX should therefore be viewed in this wider context, affecting the activities of firms across all main classes of financial instruments. This section builds on the analysis in sections 3 and 4 above, outlining the way in which widespread adoption of FIX outside equities benefits firms and end-investors.

5.1 Background

From its origins as a messaging protocol for equity trading, FIX has been developed into a messaging standard capable of handling certain types of trading and post-trading activity in derivatives, fixed income and foreign exchange markets. The latest version of FIX now supports a variety of functions across these financial instruments. Table 5.1 provides an overview of the functionality of FIX in these instruments.

Table 5.1 FIX in derivatives, fixed income and foreign exchange

Asset class	Functions supported (FIX 5.0)
Futures and options	Basic order flow, multi-leg order flow, IOIs and advertisements, quotes, market data, allocations, confirmations/affirmations, trade reporting, security and position reporting, collateral management
Fixed income	Basic order flow, multi-leg order flow, IOIs, quotes, allocations, confirmations/affirmations, trade reporting, collateral management
Foreign exchange	Basic order flow, quotes, market data, allocations, confirmations/affirmations, trade reporting

Source: FPL.

Data on the use of FIX in these markets is not readily available. However, there is evidence to suggest that, in some market segments, there is significant uptake of FIX among market participants. For example, at present, the trading and post-trading activities of every trade on the Chicago Mercantile Exchange (CME Group)—the largest futures exchange in the world—are carried out using FIX.[33] Other major trading facilities that offer FIX connectivity for trading include FXall, Currenex and FX Connect (foreign exchange) and TradeWeb (for fixed income).

5.2 What are the benefits?

The high-level benefits associated with adoption of FIX in derivatives, fixed income and foreign exchange markets are similar to those in equity markets. All of these markets fulfil certain common functions and involve a similar need for communications between parties. However, the detail of communications, particularly their complexity, and market structure involved often varies significantly between equity markets and other financial instruments, and among different types of derivatives, fixed income and foreign exchange market segments more generally.

Based on the analysis in section 3, widespread adoption of FIX in derivatives, fixed income or foreign exchange market segments can be expected to deliver the following benefits.

[33] CME.

– **Reduction in connectivity costs and general IT costs**—standardisation improves the ability of firms to reduce their general IT and connectivity costs, particularly those associated with the adoption, use and maintenance of application software.

– **Increased level of connectivity and choice of services**—the reduced connectivity costs are expected to result in improved levels of connectivity and choice.

– **Increased actual and potential competition between firms**—the increased ability of investment managers to switch between and connect to brokers is expected to strengthen competition among brokers for the provision of trading services; while the increased ability of trading platforms to achieve high levels of connectivity is expected to strengthen competition (and the threat of competition) among trading platforms.

The establishment in the USA of the Options Linkage Authority (OLA) provides an example of how standards can contribute to increased choice of trading venues (see box below).

Options Linkage Authority

The establishment of the OLA in the USA, which was in operation from January 2003 to August 2009, provides an interesting insight into the potential role played by FIX.

The US options market is distributed across multiple exchanges (currently there are seven operating equity options exchanges in the USA). In 1999 the SEC decided to require exchanges to introduce practices ensuring that customer orders would always be executed at the national best bid and offer (NBBO). Markets that were not willing to step up to the NBBO were required to be routed to the market where the NBBO existed. The SEC requested that the exchanges establish some form of real-time market linkage to support routing orders to the NBBO market.

In a winning competitive bid, the Options Clearing Corporation (OCC) recommended a solution that used the FIX.4.2 Protocol to interconnect the US listed options markets. The selection of FIX reduced the time it took to bring the OLA into production by leveraging not only the existing FIX specification, but also technology available at the majority of the exchanges.

When the OLA was originally designed, the prevailing view was that orders would not be routed away to alternative market venues. However, when the system went live, the interconnected markets behaved quite differently, and the order flow through OLA was much higher than expected. Because OLA was built on the same FIX platforms and technology already in use for order routing, the overall system withstood the unanticipated volumes. On August 31st 2009 the new Distributed Linkage Plan commenced which introduced the Intermarket Sweep Order (ISO) to the options market; this primarily used the FIX Protocol for ISO routing. Tim Watkins of the Chicago Board Options Exchange reports: 'The months of October 2008 and August 2009 were the busiest months; within each of these months 6.8 million executed contracts were routed through the OCC hub'.[34]

Another important aspect of the effects of FIX, particularly in the derivatives and fixed income markets, is the potential for the standard to contribute to increased transparency and better reporting practices. For example, widespread adoption of FIX in a given market segment can be expected to improve the ability of regulators to carry out ongoing monitoring of firms' activities (eg, by providing a more efficient and standardised flow of the necessary information). This can be particularly important given the increased scrutiny by regulators and legislators of the industry, especially of the fixed income and derivatives segments, which is aimed at improving the transparency of firms' trading activities, for example.

At the same time, the effects of FIX can be expected to go beyond the pre-trade and trade functions of firms. In exchange-traded derivatives, for example, FIX is increasingly used by exchanges for both trade and (some aspects) of post-trade messaging. This trend affects not only the activities of the exchanges themselves, but also the way in which trading members interact with the exchange. In particular, the increased use of FIX for post-trade functions by exchanges can also be expected to allow better integration of different processes within trading member firms.

[34] As reported by FPL.

As noted above, the nature of the benefits of FIX can be expected to vary significantly between different derivatives products, and between market segments. With respect to market structure, for example, the type of benefits depends on whether markets are predominantly on-exchange or OTC. For instance, exchange-traded derivatives can be expected to deliver similar types of benefit to those observed in equity trading, among other benefits, materialising in terms of lower costs of connectivity and increased connectivity of firms.

An illustration of the benefits that can accrue in listed derivatives is set out in the box below.

Implementation of FIX at MEFF

The experience of MEFF, the Spanish Derivatives Market and a BME subsidiary, illustrates the benefits that can arise from the implementation of FIX. In 2004, MEFF adopted a FIX-based independent software vendors (ISVs) gateway, replacing a version based on the proprietary protocol. Following its introduction, FIX was used for functions such as order routing, post-trade processing and the communication of market data messages. In terms of functionality, the scope included market data (contracts, status, prices), indications of interest, order management, exercise instructions, position tracking and clearing house trade reporting.

In terms of the effects, one of the benefits to MEFF of choosing FIX was that it enabled ISVs to connect more easily than using the proprietary protocol, and to expand their reach through increased ISV support. Francesc Prats, FIX project manager at MEFF, shared his thoughts on choosing FIX stating: 'FIX is the best way to simplify the connection to our market for the ISVs and is more efficient for both sides.' [35]

Four years on, in MEFF's view, it has significantly benefited from the introduction of FIX. When considering the effects of FIX implementation, in 2008 Garry O'Reilly from MEFF commented:

> In 2004 MEFF implemented, in both the Exchange and the Clearing House, new systems for Trading and Clearing. FIX is central to both these systems, being the only external API offered. In this increasingly competitive and IT dependent industry, FIX has enabled MEFF to compete in the global marketplace and has seen volume on MEFF increase more than threefold since 2004. Offering FIX has facilitated the incorporation of new members to the exchange and increased sophistication in trading and clearing applications. [36]

In contrast, most of the trading activity in fixed income and foreign exchange markets is carried out in the OTC markets. The benefits in these markets are therefore likely to differ somewhat from those observed in equity markets. For instance, the role of exchanges in fixed income markets is relatively small, and therefore standardisation cannot deliver the specific benefits associated with increased connectivity of exchanges and stronger competition between exchanges that arise as a result of standardisation. At the same time, the types of benefit associated with standardising relationships between buy-side and sell-side firms can be similar to those observed in cash equities.

The benefits of widespread adoption of FIX among different market players described above materialise in the form of the following effects:

– reduced explicit trading costs—eg, brokerage commissions and trading platform fees;

– improved choice and quality of services—eg, increased availability of electronic trading.

– improved liquidity and reduced implicit trading costs—eg, effective bid–ask spreads.

Importantly, these reductions in trading costs and the increased scope of trading strategies ultimately benefit the end-users, such as pension funds. In segments of the market—in terms of financial instrument and geography—where there is widespread adoption of FIX among firms, investors are therefore expected to earn higher net returns after all transaction costs

[35] As reported by FPL.
[36] As reported by FPL.

compared with similar markets where firms use proprietary protocols for their communications.

The adoption of FIX by trading venues in foreign exchange markets provides another illustration of the effects of standardisation in other asset classes (see box below).

Alternative FX trading venues adopt FIX as a strategy

Over recent years, several alternative execution venues have appeared for FX trading, established to provide improved market access and quality for FX trading participants that were not able to participate directly in the highly liquid, but relatively narrow, inter broker–dealer markets operated primarily by Electronic Brokerage System (EBS) and Reuters. At the time, several FX trading venues approached FPL in order to define a common use of the Protocol for these markets and thereby reduce the costs of entering these new markets. This was done largely in response to demands from its customers—asset managers or banks/broker–dealers. The Global FX Committee within FPL was created as a result of this initiative. Active participants in this included HotSpotFX, Currenex, and FXAll. The objective stated at the time was to enable use of FIX in FX markets in a similar manner to the equities ECN Exchanges in the USA.

By the completion of the project, new and existing market places, such as EBS (now part of ICAP), had committed to adoption of the FIX Protocol. FIX is now widely used for FX trading globally.

Notably, before the introduction of FIX in FX markets, clients (end-users and brokers–dealers) would typically connect directly to multiple liquidity providers via proprietary protocols or stand-alone computer programs. In contrast, widespread availability of FIX for the FX asset class enables easier connection to multiple providers.

Venues that have already invested in FIX and adopted FIX include FXall, FXConnect and Currenex (the latter acquired by FXConnect/State Street), HotSpotFX, Thomson Reuters, Bloomberg, EBS (now part of ICAP), Lava, Baxter-FX, BGC, eSpeed, and the professional individual trader and retail-oriented platform FXCM.

5.3 What can be inferred from this analysis?

At a high level, the adoption of FIX in derivatives, fixed income and foreign exchange markets can have significant impacts on firms' activities, resulting in lower connectivity costs, wider connectivity, increased competition, and better transparency and reporting.

The way in which standardisation benefits firms, however, differs according to the particular characteristics of the market segments, such as whether products are predominantly traded on exchanges or in OTC markets. The differences across the segments are also reflected in terms of different levels of current usage of FIX. Although data on the level of usage is not readily available, there is evidence on significant usage in some segments, including, for instance, trading in financial futures on exchanges.

6 Conclusions

The objective of this study has been to consider the way in which FIX benefits firms, wider markets and ultimately end-investors. This analysis provides insights into the benefits of FIX, and messaging standards in financial markets more generally, providing a basis for the debate about the role of FIX in recent developments and in assisting the efforts to increase the efficiency of the financial markets going forward.

The analysis in this study shows that widespread adoption in financial markets of messaging standards, such as FIX, and standards more generally, is expected to result in significant benefits accruing to the direct participants and other stakeholders.

- Standards play an important role in economic development, often resulting in improved efficiency and competitiveness of a sector of the economy, or a country adopting the standard.

- Due to the complexity of communications in the financial services industry, the benefits associated with standardisation in this sector are likely to be high compared with other sectors of the economy.

- Widespread adoption of FIX in a given market segment can be expected to deliver benefits to firms involved in trading activities, as well as the ultimate end-investors.

The analysis in this study provides insights into the nature of the benefits of FIX. The economic rationale underlying the benefits of FIX, combined with the evidence of the experiences of individual firms and wider market developments, confirm the notion that widespread adoption of FIX is delivering benefits to firms involved in trading activities and to the ultimate end-investors.

The benefits in the different parts of the value chain can be summarised as follows.

- Investment management firms—widespread adoption of FIX among buy- and sell-side firms in a given market segment increases the ease with which investment management firms can integrate their internal processes with their external communications, as well as achieve increased integration of the entire internal flow of pre-trade, trade and post-trade processes.

    - This results in a reduction in the costs and operational risks that investment managers face, while also increasing their ability to use new execution and trading strategies efficiently.

- Interaction of investment managers and brokerage firms—the most significant direct effect of FIX is associated with the reduced cost and complexity of establishing connections between investment managers and brokers. The specific benefits include reduced initial and ongoing connectivity costs, and reduced switching costs.

    - Reducing the costs of connectivity to brokers results in investment managers being more able to switch between brokers, increased competition in the provision of trading services among brokers, and the proliferation of the new execution strategies and channels available to investment managers.

- The internal processes of brokerage firms—widespread adoption of FIX increases the ability of brokerage firms to integrate their internal processes, including integrating the order flow from the investment management firms to execution on trading platforms.

    - The benefits arising from improved internal processes include a reduction in the operating costs and risks, and improved ability to offer new electronic execution services.

- The interaction of brokerage firms and trading platforms—the most significant direct effect is associated with the reduced cost and complexity of establishing and maintaining connections between brokers (and investment managers) and trading platforms.

    - Reducing the costs of connectivity and of switching between trading platforms increases the ability of new entrants and existing platforms to achieve widespread connectivity, increased existing (and potential) competition between trading platforms, and greater proliferation of new execution channels.

Ultimately, these effects of FIX can be expected to result in lower explicit trading costs (eg, brokerage fees, exchange fees), lower implicit trading costs (eg, bid–ask spread), and greater scope in the trading strategies available to pension funds, individual investors and other end-investors.

- The effects on trading costs ultimately translate into changes in the net returns after all transaction costs and taxes facing investors. In other words, everything else equal, efficiencies associated with widespread adoption of FIX, or a similar standard, translate into higher net returns to end-investors from investments in equities, and other financial assets.

From a market-wide perspective, there is further scope for benefits associated with FIX, which can be achieved by increasing the level of uptake and degree of standardisation. The main obstacles to further increases in standardisation are the lack of incentives for individuals to adopt a particular standard—eg, not extracting sufficient individual benefits and a need for more functionality.

The analysis in this study also suggests that, similar to cash equity markets, widespread adoption of FIX in derivatives, fixed income and foreign exchange markets can be expected to deliver benefits to market participants and end-investors. At a high level, the adoption of FIX in these markets can have significant effects on firms' activities, resulting in lower connectivity costs, wider connectivity, increased competition, and better transparency and reporting.

A1 Glossary of terms

Algorithmic trading	Algorithmic execution strategies fragment trading orders in order to minimise the market impact. The size of the realised trading orders, destination and timing depend on the pre-determined parameters of the algorithm and the prevailing market environments
Alternative trading system (ATSs)	SEC-approved non-exchange trading venues
Application programming interface (API)	Middleware technology that facilitates the exchange of messages or data between two or more different software applications. Within financial services, APIs are used by trading platforms to provide their members access to their liquidity and services more generally.
Broker or broker-dealer	See 'sell-side firms'
Buy-side firms	Firms which trade securities to make a return on an initial capital investment. When the initial capital investment originates within the firm itself, the firm is known as an institutional investor. Examples include hedge and mutual funds. Alternatively, when buy-side firms are making investment decisions on behalf of external investors they are known as fund, investment or asset management companies. In such cases, investment decisions are in accordance with the agreed mandate of the fund.
Confirmations/affirmations	The sell side will 'confirm' the receipt of a trading order to the buy side and/or other interested parties, such as the account custodian. The buy side will 'affirm' the sending of such an order in response to the sell-side's confirmation or if the buy side does not recognise the trade order.
Crossing network (CN)	A type of financial market in which orders are executed at a predetermined time, at a price taken from a predetermined sponsor market. CNs are often used to execute large orders, as, by taking a price from another market, the size of the order will have minimal direct market impact.
Direct market access (DMA)	Electronic facilities that allow buy-side firms to access trading more directly. While the name indicates completely direct access, DMA is generally provided by a sell-side firm that provides infrastructure and membership rights to a buy-side firm. There are several motivations to use DMA rather than alternative forms of order placement, including greater control over how a transaction (trade) is executed.
Electronic communication network (ECN)	Defined in 1996 through the SEC order-handling rules as any electronic system that widely disseminates to third parties orders entered into it by an exchange market maker or OTC market maker, and that permits such orders to be executed in whole or in part.
Execution management system (EMS)	Desktop software applications used by institutional investors to access multiple trading venues. Often, an EMS provides additional features such as algorithms, market data and predictive technology, to 'smart route' orders to various trading venues in search of the best price.
Equity market capitalisation	The market value of equity capital of a company or group of companies (eg, all listed stocks on a given exchange).
Execution report	After a trading order has been executed by the sell side, the sell side will send an execution report to their relevant client.

Financial Information eXchange (FIX) Protocol	The protocol used primarily for pre-trade, trade and post-trade communications. As a messaging protocol, it is defined on two levels: syntax and vocabulary: The FIX vocabulary encompasses real-time market data, standing data, order and quote entry, and street-side trade capture. The syntax behind FIX has been designed to maximise efficiency in the pre-trade and trading space. Implementation of FIX is flexible in both the addition of new vocabulary and in terms of the exact syntax used, however to minimize fragmentation, FPL request such customisation is only adopted to enhance (rather than replace) existing FIX functionality.
Hybrid trading platforms	Platforms which offer both an open-outcry trading floor and a fully automated electronic order book. The trader can opt to send their order to either venue for execution. The NYSE Hybrid was launched in 2005.
Indication of interest (IOI)	Advertisements of liquidity typically sent from a broker to their client to generate or establish existing interest in a trade. The broker is not committed to executing an IOI.
Institutional investor	See 'buy-side firms'
Investment management firms	See 'buy-side firms'
Messaging protocol	A messaging protocol consists of two components: the syntax and the vocabulary. The syntax is the technical basis of the protocol that defines the order in which data is sent. The vocabulary defines what data can be conveyed, what it means and how it is represented.
Messaging standard	A messaging standard is a less technical term than messaging protocol. It is used to define any means of communicating information such that the recipient can process the information received. Whereas messaging protocol is generally used to describe electronic communication, a messaging standard is broader in scope. For example, the English language may be thought of as a messaging standard provided both the receiver (the listener) and the originator (the speaker) understand what has been discussed.
Multilateral trading facility (MTF)	A trading platform that is not regulated as an exchange. The term, MTF, is most commonly used within Europe and is equivalent to the US term, ATS. It was formerly defined in MiFID. MTFs can be crossing networks or matching engines that are operated by an investment firm or a market operator. Instruments may include shares, bonds and derivatives.
Open communication messaging protocol	A protocol that is cooperatively owned and developed. Access to the protocol is not restricted, although technical providers offering implementations of the protocol typically charge for such services.
Order management system (OMS)	A software system used by investment management firms to send and monitor electronic trading orders. They were introduced to replace the paper blotter where traders would traditionally manually enter trades executed over the phone. Basic functionality provided by an OMS involves: – initial order entry by the user, where the destination(s) for the order to be routed to is established; – the ability to change, cancel and update orders up until the time of execution; – automatic revision of the investor's internal database, involving automatic messaging of an execution report to the order's originating firm. An OMS may also incorporate other internal processes of an investment firm. For example, the entering and modifying of dividend and stock split transactions, and processing and managing underwriting functionality.
Proprietary communication messaging protocol	A protocol that is privately owned and developed. Use may be restricted, either by licence fees or other commercial arrangements, or by restricting access to the technical providers which can offer commercial implementations of the protocol.
Quantitative trading	This trading applies numerical techniques to make investment decisions.
Quote	A quote is offered by one party as a price at which they are willing to trade. Quotes can be indicative or firm. If issued as firm, the party is committed to executing at the quoted price, once accepted by a counterparty.

Regulated market	A European term established by the launch of MiFID, this describes an entity that offers multilateral trading for financial instruments (such as an order book) which is not already recognised as an exchange, systematic internaliser or MTF.
Sell-side firms	Firms that provide execution services to investors. Depending on the technical capabilities of the investor, these can range from traditional order execution at either a pre-agreed trading venue or chosen at the sell-side firm's discretion to achieve best execution, to DMA for specific liquidity pools. Costs are typically recovered through commission fees or are implicit within bid–ask spreads.
Specification	A particular version of a messaging protocol (for example, FIX version 4.4).
Syntax	The technical basis of a communication protocol. It defines the order in which data, messages, is sent.
Total value of share trading	The monetary value of shares traded over a period of time (eg, a year) for a company or group of companies (eg, all companies listed on a given exchange).
Trading platform	Stock exchanges, ATS, MTF and crossing networks are all forms of trading platforms for financial instruments. Platforms vary in both how they match outstanding trade orders and in the degree of automation. On the most automated platforms, all orders are sent directly to an 'electronic order book', a database that matches and executes orders according to the platform-specific rules. If the electronic order book is hidden, the platform may be known as a 'dark pool'. The first trading platforms were stock exchanges, which originally matched orders by verbal communication between 'floor brokers' and 'specialists' within a physical market place, or 'pit'. This is often known as open outcry.
Turnover velocity	A measure of trading activity in a stock or group of stocks. It is estimated as the ratio of the value of shares traded to the market capitalisation of the respective company or group of companies.

A2 The corporate structure behind the FIX Protocol

The corporate structure behind the FIX Protocol consists of the following five bodies:

– FIX Protocol Purpose Trust, the Purpose Trust (established in October 2005);
– FIX Protocol Holdings Limited (FPHL) (established in October 2005);
– FIX Directors Limited (FDL) (established in October 2005);
– FIX Protocol Limited (FPL) (established in 1999 as a company limited by guarantee);
– FIX Protocol Trading Limited (FPTL) (established in November 2005);
– Global Steering Committee (GSC) (established in 1998).

The Purpose Trust deed states that the protocol will remain 'open' and available royalty-free. It also seeks to establish the neutrality of the protocol and effectively formalises the principles on which the organisation FPL has been based. These are: to promote cooperation between bodies and corporations engaged in the conduct of global securities trading and transaction settlement processing; and to seek to enhance and promote the adoption of the FIX Protocol within the financial services community.

The GSC is an elected body, formed from the leaders of all FPL's top-level (product, region, and service) committees. A key duty is to recommend appropriate 'persons' to occupy the position of directors, FDL. Currently there are seven directors. The specified eleven sub-committees are:

– Global Exchanges and Markets Committee;
– Global Technical Committee;
– Global Events Committee;
– Global Membership Committee;
– Global Foreign Exchange Committee;
– Global Derivatives Committee;
– Global Fixed Income Committee;
– Americas Regional Committee;
– Asia Pacific Regional Committee;
– Europe, Middle East and Africa Regional Committee;
– Japan Regional Committee.

FPHL is the sole guaranteeing member of FPL and is recognised as the Trustee. FPTL was established as a subsidiary of FPL designed to accept 'commercial revenue' (from non-membership sources) and thus is subject to tax liabilities. The anticipated sources of such fees include revenues from advertising and sponsorship from FPL events and the FPL website.

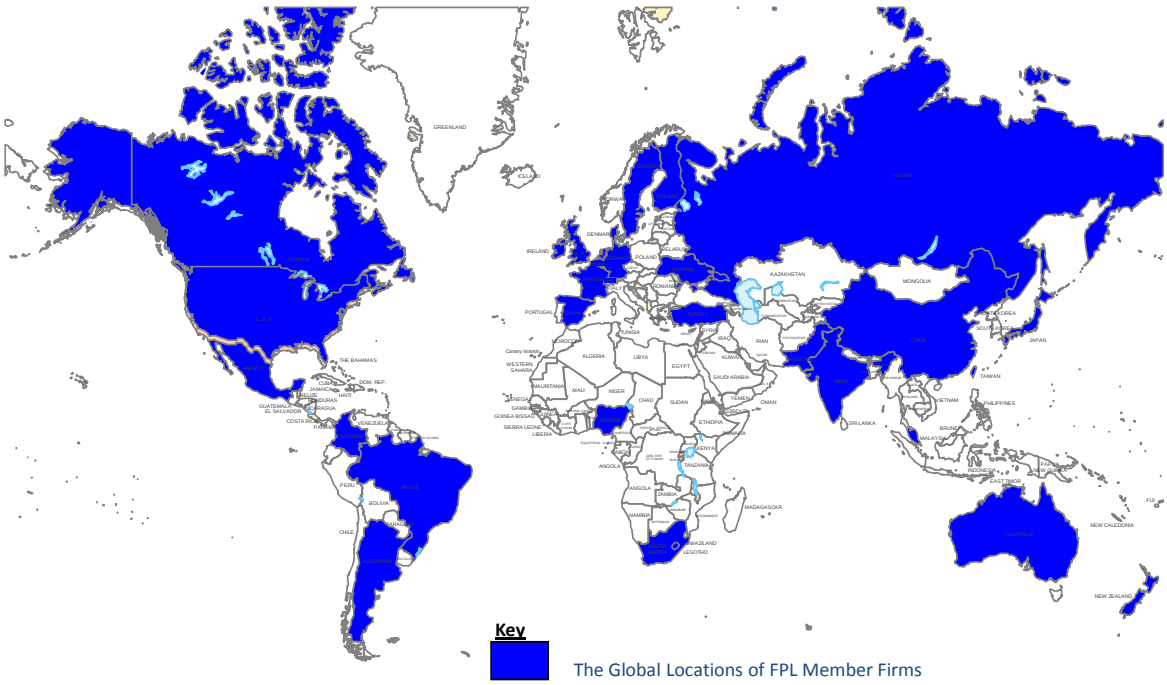
A3 FPL member firms and country coverage[37]

Abaxs AG	J. P. Morgan Cazenove
Actuare Software	JSE Limited
Aegisoft, LLC	K & K Global Consulting Ltd (K&KGC)
Afrifocus Securities - South Africa	kabu.com Securities Co., Ltd
AG Capital Nordic	Knight Capital Group
Agora CTVM	Life Dust Ltd
AllianceBernstein	LIM Advisors
American Century Investments	Linedata Services
Assimilate Technology, Inc.	Link S/A CCTVM
Australian Securities Exchange	Liontrust Investment Services Limited
B2BITS EPAM Systems Company	Liquidnet
Baillie Gifford & Co.	London Market Systems
Banc of America Merrill Lynch	London Stock Exchange Group
Barclays Capital	Macdonald Associates Ltd.
Barclays Global Investors	Macquarie Securities Limited
Baring Asset Management	MAE - Mercado Abierto Electronico S.A.
BAXTER Financial Services Ltd.	Mantara
Bloomberg L.P.	Marco Polo Network Inc.
BM&F BOVESPA	MarketAxess
BNP Paribas	Marketcetera
BNY ConvergEx Group - Eze Castle Software	Massachusetts Financial Services
BOCI Securities	MEFF
Bon Trade Solutions	Mitsui Asset Trust & Banking Co. Ltd
BourseTech	Mizuho Securities
BreakThrough Trading Solutions	Morgan Stanley
Brook Path Partners, Inc.	Morgan Stanley Investment Management
BT Global Services	NASDAQ OMX
Bursa Malaysia Berhad	National Stock Exchange of India
Cameron Edge	NeoNet Securities
Cantor Fitzgerald	Newedge Financial
Capital Group Companies, Inc.	Nikko Asset Management
Charles River Development	Nirvana Financial Solutions
Chelmer Ltd	Nomura Asset Management
Chicago Board Options Exchange	Nomura
Chi-X	Nordic Growth Market
Cisco Systems	NYFIX, Inc.
Citi	NYSE Technologies
CL&B Capital Management	OCBC Securities Private Ltd
CLSA Limited	OMG (Object Management Group)
CMA	Omgeo
CME Group	Onix Solutions [OnixS]
Commerzbank	Options Clearing Corporation
Counterparty Systems, Inc.	Orc Software
Credit Suisse	Pantor Engineering AB
Daiwa SB Investments	Patsystems
Daiwa Securities	Peresys (Pty) Ltd

[37] The list of member firms as of September 2009. An up-to-date list is available at http://fixprotocol.org/members/.

DATAROAD	PFSoft
Deutsche Bank Securities	PLUS Markets plc
Deutsche Börse Group	Portware
Devexperts	Pravega Financial Technologies, Inc.
Ecominds	Precision Systems Concepts
Edge Financial Technologies Consulting	Prediction Labs
Equinix	Primary e-Trading Latin America
ETNA Software	Progress Apama
Euroclear Finland Ltd (prev. NCSD Group)	Putnam Investments
Excellent Solutions	Quadriserv
EXTOL	QUICK
EZX Inc.	Rapid Addition Ltd.
FIA (Futures Industry Association)	Royal Bank of Scotland
Fidelity Capital Markets	RTS Realtime Systems Group
Fidelity Management & Research Co	SASLA (South African Securities Lending Association)
Fidessa group	Shanghai Stock Exchange
Financial Technologies (India) Limited	SIFMA
Financial Technology Laboratories	SimCorp
First Derivatives	Singapore Exchange
First Futures Software	Singapore Mercantile Exchange
FISD	SIX Swiss Exchange
Fiserv	Smart Trade Technologies
FIX Flyer LLC	Societe Generale
Forex Capital Markets, LLC	Solutionforge Limited
FpML	Stanlib Asset Management
Franklin Templeton Investments	State Street Global Markets
FXall	SunGard
Gartmore	SWIFT
GBM Grupo Bursatil Mexicano S.A. de C.V.	T&M Testes de Software Ltda
Goldman, Sachs & Co.	TAIFEX (Taiwan Futures Exchange)
Greenline Financial Technologies, Inc.	Tata Consultancy Services
HM Publishing	Tbricks
Hong Kong Exchanges & Clearing	Teraspaces
HSBC Bank plc	Tethys Technology, Inc.
Hundsun Technologies Inc.	The LaSalle Technology Group, LLC
HYPERCUBE Ltd	Thomson Reuters
ICAP	Tora Trading Services
ICMA (International Capital Markets Association)	Townsend Analytics
IFIS Asia Pte Ltd	Tradeflow AB (prev. MiFID Consulting AB)
IG Group	Tradeweb
IIROC (Investment Industry Regulatory Organization of Canada)	Trading Technologies
innerExchange	TradingScreen
Instinet	Transaction Network Services, Inc.
Intelcheck Services Inc.	Trayport
Intercontinental Exchange (ICE)	TSX Inc. (Toronto Stock Exchange)
International Securities Exchange (ISE)	Turquoise
Investment Technology Group (ITG)	TWIST
IS Investment	UBS Investment Bank
IsoSoft Solutions	ULLINK
J. P. Morgan	Vanso Nigeria Limited
JetTek	Versitrac Systems Corporation
JF Asset Management	Winterflood Securities
Jordan & Jordan	Wipro Technologies

The Global Locations of FPL Member Firms



Key

The Global Locations of FPL Member Firms

1/26/2009

*To ensure equality the country highlighted indicates the headquarter location of the FPL member firm

A4 Managing standards

The diffusion of standards throughout a particular activity where interoperability is required—either horizontally between people undertaking the same activity, or vertically when communication is between different parties along the value chain—can create significant market power if those using the standard have to pay the owner of the standard to use it. In addition, there is an ongoing problem of how to keep the standard up to date so that it continues to meet the requirements of users, and, within this dynamic, to keep the optimal level of interoperability and standardisation among the user group. These issues generally apply to all standards where use is diffuse.

A number of different models have been used to address these issues. Some standards, such as spoken languages, tolerate diversity of developments and quite significant differences in the standard, which can create misunderstandings when users with slightly different protocols try to communicate (eg, the Americans and the English). Natural languages are, however, quite tolerant of minor differences and contain flexibility to overcome communication where there are differences in meaning.

Other standard communication protocols are very tightly controlled by their owners. An example of such an approach is Microsoft and the Windows Operating System. Under this type of model the costs involved in maintaining and developing the standard are recovered from those who want to use it. In addition, by controlling the use made of the operating system, idiosyncratic changes developed outside the control of the owners can be effectively curtailed, ensuring that the level of interoperability and mutual understanding of machines using the same standard are tightly controlled and, at the behest of the owner, maintained.[38] Where such a standard is (very) widely used, its ownership can be highly valuable, as the benefits available from its use are considerable (or, to put it another way, the ability to operate economically in the relevant area without using the same ubiquitous standard as everyone else is very limited). There is also the concomitant problem that such economic power can be (but is not necessarily) abused.

Between these two extremes there are many variants on how standards can be developed and maintained:

– public sector standard-setting bodies;
– private sector cooperative standard-setting bodies;
– hybrid bodies;
– user maintenance/development of open standards;
– voluntary maintenance/development of open standards.

From an economic perspective, the maintenance of an existing communications standard needs to solve several problems, to which there is no obvious ‘right’ answer and where different problems may have conflicting requirements. These problems include:

– acquiring the resources needed to keep the standard up to date and relevant to the existing and potential users;

– acquiring the resources need to create the capability to extend the use of the standard to increase the benefits of usage;

[38] The owners of such a standard may, under some circumstances, have an interest in a lack of interoperability if they wish to persuade their customers to upgrade to a new system.

– ensuring that the benefits of widespread standardisation/interoperability are maintained (minimising the development of incompatible extensions);

– ensuring that the benefits of *additional* functionality that is of importance to (some) users are available economically (minimising the development of unnecessary restrictions on the customisation of a standard)

– minimising the potential for any abuse of economic power arising from the widespread adoption of the standard.

The trade-offs involved in maintaining and developing standards are complex. Just as the network benefits that arise from the adoption of certain forms of standards (eg, communications protocols) do not all flow to the individual adopting the standard at any one point in time, so the network disadvantages of, for example, adding a non-standardised extension which reduces interoperability do not flow to the person making the decision to add that extension. (In other words, they can cause additional costs to other users of the standard if, for example, two people introduce two different ways of communicating a new message which will then require a translation mechanism if the two sub-groups are to communicate with each other.) Thus, the interests of different users are not necessarily aligned.

In addition, where the standard is open and can be freely used, there is a potential commercial interest in users free-riding on the effort of others to keep the standard up to date and/or to extend its scope. Notwithstanding that all/many users would be better off with the extension, the resources are not forthcoming since each potential supplier of the resource hopes that someone else will pick up the expense.

The use of proprietary standards, where the owners of the IP of the standard can charge users, can, at least for a widely used standard, generate the resources needed to maintain and update the standard. The free-rider problem can be solved, but at the economic cost of the deadweight effort required to enforce the payment for the right to use. In addition, where a voluntary approach to updating and extension has worked, such resources may be withdrawn if the model changes, or at least they may have to be paid for on a contractual basis.

In addition, where a standard is valuable as a result of network effects, the interests of the owner may not be aligned with those of the users, particularly if one standard can be displaced by another. Under these circumstances, interoperability with another standard may create the conditions under which the network effects can be overcome and the two interoperable standards collapse to a single standard, or compete with each other, reducing the economic value of the standard to the owner, although enhancing the economic value to the users. If the standards are open, users should be able to make the necessary changes to allow interoperability (subject to overcoming the resource constraints).

In the case of FIX, it is currently being operated as an open standard managed by a not-for-profit organisation, FPL, although other models could, in principle, be applied in the future. The precise nature of the optimal approach to managing the FIX standard is beyond the scope of this analysis, although the discussion on the generic characteristics of different models set out above provides insight into the type of issues that determine the best-suited approach in the case of FIX. These considerations include maturity of the standard (in different target segments), the incentives of parties involved in managing and developing the standard, the benefits of expanding capabilities (eg, into other asset classes), and the ability to facilitate further uptake of FIX given the current organisational structure. As there is no unique way of managing and developing a standard like FIX—indeed, in other settings, different forms of ownership and governance have been applied—it is possible that, on balance, it is (or might be in future) optimal for FPL to transform its organisational form and the approach to managing the FIX Protocol.

A5 FIX versions and functionality

This appendix outlines the functionality of FIX and the development of different versions over time. For illustration, it also provides a more detailed description of the functionality of FIX5.0.

A5.1 Functionality and versions

Figure A5.1 summarises the functionality of FIX across different product classes, showing its evolution over time.

Figure A5.1 FIX functionality

Message support	FIX version							
	4.0	4.1	4.2	4.3	4.4	5.0	5.0 SP1	5.0 SP2
Equities								
Basic order flow								
IOIs and advertisements								
Quotes								
Market data								
Allocations								
Confirmations/affirmations								
Trade reporting								
Program trading								
Algorithmic trading								
Futures and options								
Basic order flow								
Multi-leg order flow								
IOIs and advertisements								
Quotes								
Market data								
Allocations								
Confirmations/allocations								
Trade reporting								
Security & position reporting								
Collateral management (listed derivatives)								
Fixed income								
Basic order flow								
Multi-leg order flow (repos, swaps, switches, rolls)								
IOIs (offerings)								
Quotes								
Allocations								
Confirmations/affirmations								
Trade reporting								
Collateral management								
Foreign exchange								
Basic order flow (spots, forwards)								
Basic order flow (swaps)								
Quotes (spots, outright forwards, FX swaps)								
Market data (executable streaming prices)								
Allocations								
Confirmations/affirmations								
Trade reporting								
Exchanges and markets								
Market data (including price dissemination)								
Reference data (instruments and products)								
Parties reference								
Market structure								
Quote driven markets								
Order driven markets								
General								
News								
Email								
Transport independence framework								
Regulatory compliance								

Source: FPL. Key: No support; Some support; Good support; Not applicable

A more detailed timeline of different versions of the FIX Protocol is provided in Table A5.1.

Table A5.1 Versions of FIX

Launch date	Version	Still supported
April 2009	5.0 Service Pack 2	
February 2009	FAST 1.2	
April 2008	5.0 Service Pack 1	
January 2007	FAST 1.1	
December 2006	5.0	
January 2006	FAST 1.0	
April 2003	4.4	
August 2001	4.3	
March 2000	4.2	
April 1998	4.1	
January 1996	4.0	
September 1995	3.0	No
January 1995	2.7 (first version of FIX used in production)	No

Source: FPL.

A5.2 FIX 5.0 in detail

In January 2007 the FPL launched FIX 5.0, significantly expanding the messaging functionality provided by earlier versions of the protocol. The additional functionality delivered by FIX 5.0 includes, but is not limited to:

- enhanced support for foreign exchange trading;
- enriched order-routing features for reserve, peg and triggered orders;
- major new support for post-trade and clearing processes for allocation, trade and position reporting;
- market data optimisation extensions improving book management;
- support for Reg NMS and MiFID regulatory initiatives;
- algorithmic trading extensions to better support the exchange of information used to initiate and execute algorithmic trading strategies.

In early 2008 FPL launched FIX 5.0 Service Pack 1, which includes 25 Extension Packs, each of which will further enhance the current functionality delivered by FIX 5.0. The additional support includes:

- enhanced listed derivatives reference data support for options, futures, and options on futures;
- foreign exchange OTC settlement obligations;
- improved functionality for exchange quotation models and order-routing practices;
- a new set of messages for market structure definition;
- support for trading listed interest rate swaps;
- application-level sequencing with advanced support for market data recovery;
- improved integration between FIX, FIXML and FpML;
- changes to Rule80A, order capacity and order restrictions to reflect revised NYSE regulations.

In April 2009 FPL launched FIX 5.0 Service Pack 2, which included 19 Extension Packs contributed by industry participants to meet the requirements of the rapidly changing financial markets providing additional messaging support to a wide range of areas including:

- enhancements to identify standardised Credit Default Swaps (CDS) for clearing, an initiative that proactively works towards government efforts to help support the future risk environment;
- enhancements to support the needs of the London Stock Exchange;
- enhancements to support the trade capture requirements of the Commodity Futures Trading Commission (CFTC);
- improvements to the delta position limit functionality offered by The Options Clearing Corporation (OCC);
- new set of Parties Reference data messages set to support the dissemination of party relationships and risk limits;
- new messages to support real time pre-trade market data stream assignments by price makers when prices are distributed via third party distribution channels;
- enhancements for indentifying NYMEX energy products and Unit Of Measure;
- enhancements to support Foreign Exchange Non-Deliverable Forwards (NDF);
- enhancements to support exotic options products.

A6 Messaging protocols in trading and post-trading

This appendix lists examples of the messaging protocols used in trading and post-trading of equities and other financial instruments.

Market data

– Examples in this category include FIX Market Data and MDDL (Market Data Definition Language) that is used for static data.

Trade/pre-trade

– NASDAQ provides several proprietary protocols (as well as FIX) for trading in its equity and options markets. These include QIX and OUCH. All of these protocols enable subscribers to place, execute or cancel orders, and to integrate NASDAQ into their proprietary networks.

Post-trade

– SWIFT (Society for Worldwide Interbank Financial Telecommunication) is not only a messaging standard for clearing and settlement messages, but also a messaging network. The latest version of the protocol is recognised as ISO 200022.

OTC derivatives

– FpML (Financial products Markup Language) is an XML messaging standard for the deal or product description in the OTC derivatives industry that is freely licensed. It is managed by the International Swaps and Derivatives Association (ISDA).

Research and financial reporting

RIXML (Research Information Exchange Markup Language) is used for research, while XBRL (Extensible Business Reporting Language) is used for financial reporting.

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