ASIC
Australian Securities & Investments Commission

REPORT 215

Australian equity market structure

November 2010

About this report

This report provides background and supplementary information and analysis on selected issues discussed in Consultation Paper 145 *Australian equity market structure: Proposals* (CP 145). This report:

- outlines the key attributes of successful equity markets and the objectives of regulation of the market for exchange market services;
- describes the current Australian equity market structure;
- observes overseas experiences in relation to equity markets;
- discusses issues arising from likely changes to Australian equity market structure; and
- foreshadows likely developments in Australian equity markets.

About ASIC regulatory documents

In administering legislation ASIC issues the following types of regulatory documents.

Consultation papers: seek feedback from stakeholders on matters ASIC is considering, such as proposed relief or proposed regulatory guidance.

Regulatory guides: give guidance to regulated entities by:

- explaining when and how ASIC will exercise specific powers under legislation (primarily the Corporations Act)
- explaining how ASIC interprets the law
- describing the principles underlying ASIC's approach
- giving practical guidance (e.g. describing the steps of a process such as applying for a licence or giving practical examples of how regulated entities may decide to meet their obligations).

Information sheets: provide concise guidance on a specific process or compliance issue or an overview of detailed guidance.

Reports: describe ASIC compliance or relief activity or the results of a research project.

Contents

A About this report

Government's policy to introduce competition for exchange market services

1 On 31 March 2010, the Australian Government announced its support for competition between exchange markets for trading in listed products in Australia and its in-principle support for granting an Australian market licence (market licence) to Chi-X Australia Pty Limited (Chi-X).[1] The Government announced that competition is an important step in ensuring that Australia's financial markets are innovative and efficient, as well as for the development of Australia as a leading financial centre. The decision was commensurate with Recommendation 4.5 of the Johnson Report,[2] which encourages competitive, efficient and innovative equity markets.

2 The announcement of 31 March 2010 followed the Government's announcement on 24 August 2009 that the Australian Securities and Investments Commission (ASIC) would take over the supervision of real-time trading on Australia's domestic licensed markets,[3] which the Government said was a necessary step in the process towards considering competition between market operators. Responsibility for market surveillance shifted from the Australian Securities Exchange (ASX) and a number of other domestic market operators to ASIC on 1 August 2010.

3 We note that the new Government has confirmed that competition is still its policy subject to an appropriate regulatory framework being put in place by ASIC.

Recent market developments

4 Markets have evolved considerably over recent years. We expect competition for exchange market services may increase the impact of recent market structure developments. These developments are discussed in detail in this report.

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[1] The Hon Chris Bowen MP, Minister for Financial Services, Superannuation and Corporate Law, Media Release No. 032, *Government announces competition in financial markets*, 31 March 2010, http://mfsscl.treasurer.gov.au/DisplayDocs.aspx?doc=pressreleases/2010/032.htm&paragraphsID=003&min=ceba&Year=&DocType=0.

[2] Australian Financial Centre Forum, *Australia as a financial centre: Building on our strengths* (Johnson Report), November 2009, www.treasury.gov.au/afcf/content/final_report.asp.

[3] The Hon Chris Bowen MP, Minister for Financial Services, Superannuation and Corporate Law and the Hon Wayne Swan, Treasurer, Media Release No. 013, *Reforms to the supervision of Australia's financial markets*, 24 August 2009, http://ministers.treasury.gov.au/DisplayDocs.aspx?doc=pressreleases/2009/013.htm&paragraphsID=003&min=ceba&Year=2009&DocType=0.

ASX–SGX merger announcement

5 On 25 October 2010 ASX and Singapore Exchange (SGX) entered into a merger implementation agreement.[4] The market issues raised by the merger implementation agreement are distinct from those addressed in the consultation in Consultation Paper 145 *Australian equity market structure: Proposals* (CP 145), and the merger proposal will be subject to various government, regulatory and shareholder approvals. For these reasons, this report does not deal with issues associated with those approvals, or the issues associated with cross-border exchange market consolidation. However, in the section on global market trends, we do note recent history in global exchange market consolidation.

Purpose of the report

6 This report is intended as an aid to those reading CP 145. It provides background and supplementary information and analysis on selected issues discussed in less detail in CP 145.[5]

7 The report provides:

(a) a historical perspective on the evolving role, characteristics and regulation of exchange markets (Section B);

(b) more detail on the current Australian equity market structure (Section C);

(c) a summary of overseas experience with competition in equity markets (Section D);

(d) more detail on issues arising from likely changes to the structure of the Australian equity market (Section E); and

(e) a summary of likely market developments in response to competition (Section F).

Consultation paper and market integrity rules

8 This report should be read in conjunction with CP 145, which:

(a) outlines how we consider the Australian secondary market for cash equities is evolving, including the likely impact of competing exchange markets; and

(b) proposes market integrity rules to:

(i) address some of the regulatory issues resulting from market developments; and

[4] ASX–SGX Joint News Release, *ASX and SGX combine to create the premier international exchange in Asia Pacific: The heart of global growth*, ASX Limited and Singapore Exchange (SGX), 25 October 2010, www.asx.com.au/about/pdf/20101025_asx_sgx_media_release.pdf.

[5] ASIC wishes to acknowledge the contribution of Carole Comerton-Forde, Associate Professor of Finance at the University of Sydney, alongside ASIC staff, to this report and CP 145.

(ii) address the additional regulatory issues resulting from the introduction of competition.

Feedback

9 We are interested in your feedback on whether there are any other key market structure developments that we have not commented on in CP 145 or this report. Submissions can be made either in conjunction with responses to CP 145 or specifically in relation to this report.

10 We will not treat your submission as confidential unless you specifically request that we treat the whole or part of it (such as any financial information) as confidential. Non-confidential submissions may be published on our website.

11 Comments should be sent by 21 January 2011 to:

Tania Mayrhofer
Exchange Market Operators
email: marketstructure@asic.gov.au

Australian Securities and Investments Commission
GPO Box 9827
Sydney NSW 2001

B Role of equity exchange markets

Key points

Exchange markets are a type of execution venue that enable trading in listed products, including via a 'central limit order book' (CLOB). Many exchange markets also offer listing services for companies. They play an important role in allocating capital in an economy. They provide issuers with cost-effective access to capital and savers with an investment asset class that is liquid and transparently priced. High-quality price formation is vital for capital allocation.

Historically, exchange markets developed as natural monopolies but technological developments have lessened many of the advantages of that model.

Competition among exchange markets is likely to yield a number of benefits. Overseas experience shows that competition has increased market depth and liquidity, lowered trading costs and promoted innovation.

The longstanding justification for the regulation of exchange market services has been the mitigation of the effects of information asymmetries.

12 Advances in technology have dramatically altered the landscape for equities trading overseas in recent years. The impact of technological advances in each country has also been substantially affected by the rules and regulations put in place.

13 One key lesson from overseas has been that net public benefits from competition between equities exchange markets are increased if the full regulatory framework and rules are established at the outset of the introduction of competition. There may be negative net public benefits (i.e. a net public cost), or at least lesser gains, if competition between equities exchange markets is introduced without a comprehensive framework and rules that support market quality.

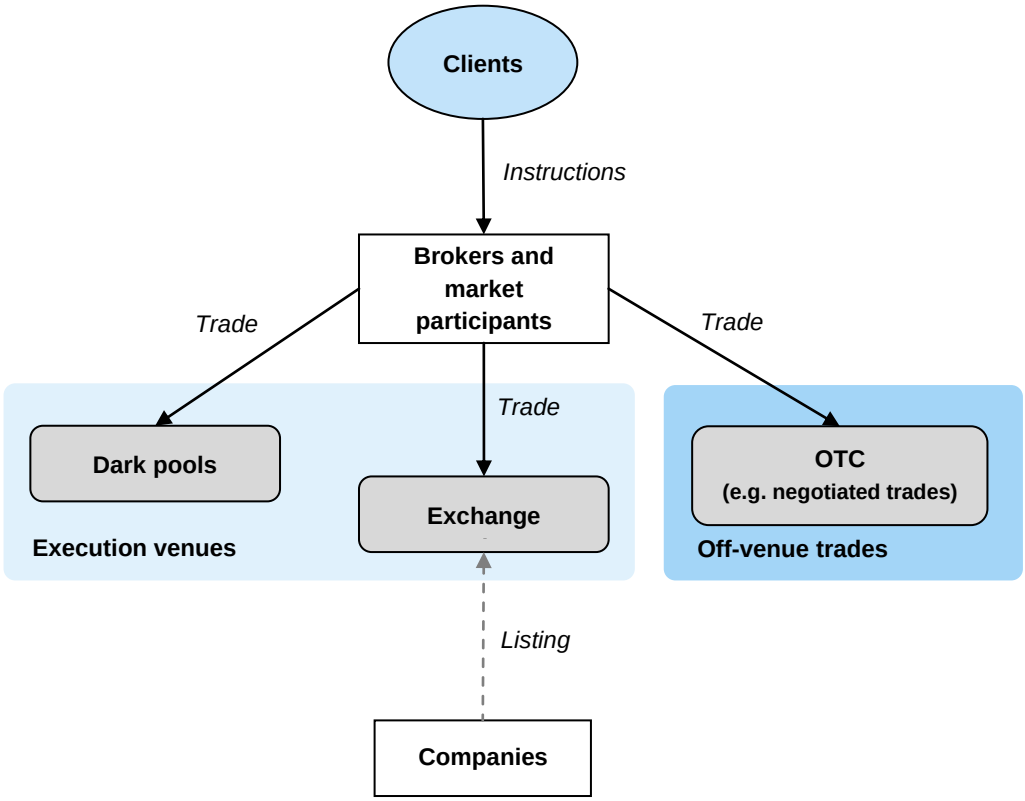
14 Australia is well positioned for the introduction of competition—we are able to learn from experience in other jurisdictions and build on an already generally strong foundation. Nevertheless, the pace of change in the exchange market trading sector has been rapid as a result of technological progress and behavioural responses, and has already led to some fragmentation within the Australian market. Thus, some changes to the regulatory framework are likely to be required, whether or not formal competition between exchange markets is introduced.

15 This report starts by outlining the key attributes of successful equity exchange markets and the objectives of the regulatory framework.

Purpose of exchange markets

16 Exchange markets are a type of execution venue[6] that enable trading in listed products, including via a 'central limit order book' (CLOB). Many exchange markets also offer listing services for companies. They play an important role in business capital formation and household allocation of savings, as do other financial markets, intermediation services and internal finance. Trading also occurs in dark pools[7] and on over-the-counter (OTC) markets.[8]

Figure 1: Australian equity market



Source: ASIC

17 We view the principal function of exchange markets as offering a cost-effective mechanism for companies to raise funds[9] and a venue for fair, orderly and transparent trading of listed securities once they are issued.

18 These fundraising and trading functions are most successfully achieved by exchange markets that embody certain characteristics. Successful exchange markets minimise transaction costs and the costs of search and verification

[6] An execution venue is a facility, service or location on or through which transactions in equity market products are executed and includes each individual order book maintained by a market operator, a crossing system and a participant executing a client order against its own inventory otherwise than on or through an order book or crossing system.
[7] These can be categorised as non-pre-trade transparent electronically accessible pools of liquidity.
[8] Over-the-counter markets are bilateral negotiated transactions.
[9] Not all exchange markets or execution venues offer primary listings services. For example, ASX, Asia Pacific Exchange and the National Stock Exchange of Australia provide this service, but Chi-X does not intend to provide this service.

of title, and minimise inherent information asymmetries between issuers, investors and their agents that can provoke distrust and a reluctance to participate. For instance, investors and market participants fear a lack of information and, especially, the risk of being traded against by someone with superior information or with a manipulative intent.

19 The many benefits of the development and persistence of successful exchange markets for listed shares are set out in Table 1.

Table 1: Benefits of exchange markets for certain stakeholders

Stakeholders	Benefits
Companies (issuers)	Issuers benefit from lower capital costs and increased accessibility to their securities. They also benefit from deep and liquid exchange markets as this may support demand for primary and subsequent capital raisings. Capital obtained through exchange markets allows companies to invest in technology, execute expansion plans or strengthen balance sheets.
Those with savings to deploy (investors)	Investors benefit from security, fairness and efficiency in managing their investments. A deep, liquid market, with an efficient transparent price formation mechanism, enables investors to value their assets and manage their risk. Well-functioning exchange markets allow investors to partake in company profits and benefit from growth opportunities with a relatively low degree of intermediation.
The community as a whole	The efficient marrying of the needs of issuers and investors and the timely and efficient repricing of risk through trading on an exchange market are important drivers of economy-wide resource allocation and ongoing management of systemic risks.

20 A deep and liquid exchange market creates opportunities to raise funds for listed companies and opportunities to invest for savers. It also embodies active and efficient price formation through trading, quickly pricing in changing news and perceptions and assessments of risk. The structure and performance of the market matters not only for the quality of price formation but also for ongoing access to fundraising for companies and for portfolio choices for investors.

21 Deep and liquid markets in securities listed on exchange markets—with high-quality, efficient and transparent price formation, readily available and affordable data to inform market participants, and strong fundraising capacity and low transaction costs—are thus a public good, which needs to be protected as the market changes, including as a result of competition.

22 We see from Australian and international experience that avoiding problems associated with the fragmentation of secondary market trading among many execution venues is a major challenge. The potential problems with fragmentation include the possibility of:

(a) deterioration in the quality of pre-trade and post-trade transparency;

(b) transfer of regular trading in equities from pre-trade transparent markets to dark pools, thereby limiting pre-trade transparency;

(c) erosion of liquidity in pre-trade transparent markets;

(d) deterioration in the efficiency and effectiveness of price formation;

(e) uncertainties over order protection and best execution, and the absence of a single source of pre-trade and post-trade information; and

(f) problems in achieving effective surveillance.

23 Together, these problems may indirectly create impediments to capital raising for some issuers. In addition, incentives driven by the rules framework have created opportunities for some unhelpful regulatory arbitrage. These are vital concerns for the public interest.

24 We consider that the objectives regarding efficient price formation, data and information availability, fundraising capacity and lower transaction costs continue to be best supported by a regulatory framework that promotes market quality, market integrity, investor protection, and fairness and efficiency in the implementation of changes to the rules.

25 The guiding principle for this report and CP 145 has been to achieve the objectives that support the public good. We consider that this requires an interlocking framework, as described in Table 2.

Table 2: Objectives of the proposed regulatory framework

Objective	Description
Market quality	Our objective is to promote general market quality and efficient price formation, and to minimise any negative impacts of order fragmentation to multiple execution venues, through: • ensuring the availability of consolidated pre-trade and post-trade data; • mechanisms to promote deep pre-trade transparent markets; and • controls to limit unnecessary volatility and promote market stability.
Market integrity	Our objective is to deliver market integrity through: • common minimum risk controls and conduct standards for market participants and market operators; • cooperation arrangements between ASIC, market operators and other stakeholders to promote fair, orderly and transparent markets; • consolidated and tailored pre-trade and post-trade data for the market and ASIC; and • efficient ASIC surveillance systems and sufficient capacity to anticipate changes in market structure—supported by a fair and reasonable cost recovery regime.
Investor protection	Our objective is to promote investor protection through: • a clear best execution requirement; • post-trade reporting and information to assess the quality of order execution; • other market integrity rules; and • education of retail investors on the implications of changes in markets.
Fairness	Our objective is to promote fair markets through: • clear requirements for fair and equal access to services, including consolidated information about orders and trades; • functional regulation that applies similar obligations to similar activities; • common and non-discriminatory rules that apply to all market operators; and • market operators taking steps, on an ongoing basis, to ensure that their exchange markets are fair, orderly and transparent.
Efficient implementation	Our objective is to ensure efficient implementation of the final rule changes, including: • recognising that the principles underlying the existing framework in Australia have worked well and build on the strengths of the existing framework and avoid any unwarranted change; • taking account of international best practice, including the core principles of the International Organization of Securities Commissions (IOSCO);[10] • learning the lessons from overseas experience (e.g. some of the issues now emerging from analysis of the 6 May 'flash crash') by taking a measured approach to the transition to competition; and • having a regulatory framework that is as simple and robust as possible, with clear responsibilities imposed on market operators and market participants.

[10] IOSCO Report, *IOSCO objectives and principles of securities regulation* (IOSCOPD323), International Organization of Securities Commissions (IOSCO), 10 June 2010.

Competition between exchange markets

26 The market structure and the drivers of exchange market services in each country differ and evolve. The exchange market business has evolved from initial high fragmentation (e.g. in 17th century London cafes) to centralised manual floor trading (but usually with some off-exchange 'dark' trading) and, more recently, to all-electronic trading floors, computerised trading, fragmentation into pre-trade transparent and non-pre-trade transparent pools, and rapid changes—partly driven by technological advances—to the structure of the exchange markets. Many of these pressures are leading to the increased fragmentation of previously quite centralised markets.

27 Over the past decade or so, a number of overseas jurisdictions introduced competition among exchange operators for stocks listed on other venues.

28 Based on experience overseas, competition in trading stocks listed on ASX in Australia is expected to lower trading costs and improve the quality of services for users, promoting innovation and greater usage. Much of the anticipated benefit is likely to come in the form of increased market depth in orders and transactions. Bid–ask spreads may also decline after competition is introduced, as a result of the entry of new market participants, new trading technologies and a rise in aggregate volumes.

29 Market quality is a concept that encompasses liquidity, depth and stability (and the capacity to absorb large transactions without adverse price movements), as well as narrow spreads. By themselves, narrow spreads may not constitute a sign of high market quality. Overall trading costs can still be high even if spreads are narrow. The bid–ask spread is compensation for providing liquidity. This compensation has to be larger for bigger orders, because these increase price dislocation. If the spread is very narrow, compensation for liquidity provision on displayed markets is very low and limit orders will tend to go to non-displayed markets, or—if it is permitted—limit orders will be internalised and never reach the displayed market. Over time, with inadequate compensation for liquidity provision or with easy utilisation of internalisation, the volume of orders going to the displayed market would decline and the quality of the overall market (including for internalisations, which use the spread on the displayed markets for reference) would deteriorate.

30 For these reasons, in some cases, market depth and stability, with a special focus on the volumes on displayed markets, may be a more accurate indicator of quality than narrow spreads. However, analysis of the extent of improvement in market quality as a result of competition is complicated by the concurrence of the introduction of competition with technological improvements and the drastic shifts in risk appetite that have occurred over the past decade.

31 Competitive forces are also likely to be a major factor in promoting research and development of new technologies and strategies. Historically, competition and the search for some strategic advantage over other market participants have been drivers of innovation.

32 These benefits, however, come at the cost of fragmenting across a number of execution venues the orders and transactions—and the associated data—that previously were consolidated. Increased volatility (beyond a level considered desirable for efficient price formation) may also result, and fundraising capacity may be affected. This is because fragmentation can reduce the market depth in each competing execution venue and lead to adverse price dislocations as larger orders are filled. Another potentially adverse impact is a need for greater spending on technology for compliance and surveillance.

33 Search costs can also increase where trading is fragmented across multiple execution venues. Market participants would have to pay for smart order routers (SORs) to direct their trade to venues offering the best prices, greater depth or other parameters. This has been particularly true in Europe, where fragmentation is particularly pronounced, given that the European market is the amalgamation of a number of smaller national exchange markets and given that there is no mandated consolidation of data.

34 Despite the potential costs associated with competition, overseas experience suggests that opening exchange markets to competitive forces has a net beneficial effect. The gains in innovation, productivity, efficiency and new entry seem to outweigh the impact of fragmentation.

35 Overseas experience also bears out that potential costs of fragmentation can be minimised through appropriate regulation that ensures investors can gain a consolidated view of the market. This makes it more likely that the net balance from introducing competition in exchange market services will be positive.

36 The benefits and costs of competition may affect stakeholders in different ways. It is likely that investors in general will gain a net benefit through lower costs of trading. New entrants will have the opportunity to begin operations, while the incumbent may see some of its pricing power constrained. Special consideration should be given to issuers (corporations raising equity capital). Market liquidity may improve, especially for larger companies, which can facilitate capital raising. However, this could still be offset if competition leads to higher price volatility in some stocks. For this reason, there should be mechanisms in place to mitigate the impact of fragmentation.

Historical perspective on competition between exchange markets

37 Over time, equities exchange markets have tended to develop from more or less formal associations of dealers that transacted among themselves. The need for agility and low search and verification costs meant that dealers would often prefer to transact only with other well-established and known dealers. Any market participant that breached the codes of conduct or operated outside established norms was banned from the associations. Soon, these informal aggregations began to establish more formal rules that prevented trades from taking place outside designated premises or among non-market participants. A case in point is the Buttonwood Tree Agreement of May 1792—an association of securities dealers that later gave rise to the New York Stock Exchange (NYSE). A number of exchange markets in Europe and Asia had similar origins and imposed analogous exclusivity requirements.[11]

38 Thus, the need for agility and low search and verification costs meant that most of the first equities exchange markets eventually developed as natural monopolies. This structure also allowed for economies of scale, especially as overhead costs were distributed among a higher number of individual trades. Concentrating traders in a single exchange market also had the advantage of increasing the probability of finding a suitable trading counterparty.

39 Over time, and with technological development, the costs of processing information, searching for trades, counterparties or titles, and enforcing contracts have declined substantially in most developed economies. New communication and data transfer technologies have increased the speed of trading, clearing and settlement on exchange markets. These developments have lessened the ongoing benefit of operating exchange markets as monopolies.

40 However, the costs of the monopolistic frameworks have persisted. Investment in innovation has been hindered because projected net benefits have not outweighed the projected capital expenditure on research and development. The absence of competitive forces or threats has prevented exchange market fees and other operating costs from declining as rapidly as in other sectors of the economy. Monopolistic exchange markets have also found it difficult to cater for specific market niches or meet the often conflicting needs of different traders.[12]

41 These factors have led a number of jurisdictions to adopt and promote competition in exchange markets in recent times.

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[11] L Harris, *Trading and exchanges: market microstructure for practitioners*, Oxford University Press, New York, 2003, p. 64.

[12] Giovanni Petrella ('MiFID, Reg NMS and competition across trading venues in Europe and the USA', *Journal of Financial Regulation and Compliance*, vol.18, 2010, pp. 257–71) highlights some of these conflicting needs: institutional traders usually need a market for large transactions, while retail traders in general can only operate with small transaction parcels; well-informed traders need speed, while less-informed traders would prefer the assurance of cheaper trading and optimal prices.

Objectives of market regulation for exchange market services

42 The longstanding justification for the regulation of exchange market services has been the mitigation of the effects of information asymmetries, including adverse selection and principal–agent conflicts, as described in Table 3.

Table 3: Information asymmetries

Type	Description
Adverse selection	In exchange market trading, there is a risk that the person you trade with is more informed than you are. If this is so, or you fear that it is so, you may respond by becoming more risk averse, reducing the price at which you are willing to buy or increasing the price at which you are willing to sell. The consequence of such adverse selection is a widening of spreads. In an extreme, investors might decline to participate in trades or to not post limit orders. If many participants in a market act according to the principles of adverse selection, trading becomes encumbered and inefficient.
Principal–agent conflicts	These take place when the interests of an agent (such as a market participant) are not aligned with those of the principal (an investor). If principals in a market are not confident that agents will act in the principal's interest, trading again becomes encumbered and inefficient.

43 These asymmetries, conflicts and inefficiencies reduce the attractiveness of trading—and, with it, the number of market participants, the frequency of transactions and, ultimately, the representativeness and accuracy of prices. In such circumstances, both issuers and investors would withdraw and exchange markets would cease to exercise their crucial economic functions.

44 In addressing these adverse effects of information asymmetries, regulation has focused on promoting a fair, orderly, fully informed and transparent market, in which investors and the community can have confidence, through the sustainable and transparent provision of exchange market services, timely and complete informative disclosure by issuers, and actions against insider trading, market manipulation and front-running.

45 Since the global financial crisis (GFC), the mitigation of systemic risk has emerged as a further justification and focus for regulation of the provision of exchange market services.

C Current Australian equity market structure

Key points

The Australian equity market is currently dominated by ASX. In equities, it provides services in listing, trading, clearing, settlement and data information services. Historically, equity trading on ASX has taken place either via the electronic central limit order book (CLOB) or via the crossing market. More recently, ASX has introduced other means of execution.

Currently, a number of additional non-ASX execution venues exist.

In March 2010, the Australian Government announced in-principle support for the approval of an Australian market licence to Chi-X Australia Pty Ltd (Chi-X).

There is substantial competition in the securities broking industry. The top 12 ASX market participants accounted for 81% of the value of equities traded in 2009–10. High-frequency traders currently account for a small percentage of cash equity turnover in Australia compared with estimates in the United States and Europe.

The Australian equity market compares well against its international counterparts. It is comparatively liquid and displays a relatively early adoption of innovation and technological development. However, the costs of trading in local markets remain higher than in other jurisdictions.

46 The main players in the Australian equity market include market participants, issuers, retail and institutional investors (e.g. superannuation funds, hedge funds, private equity and proprietary traders), their advisers, execution venues, technology and data vendors, data centres, share registries, custodians, other administrators and supervisors.

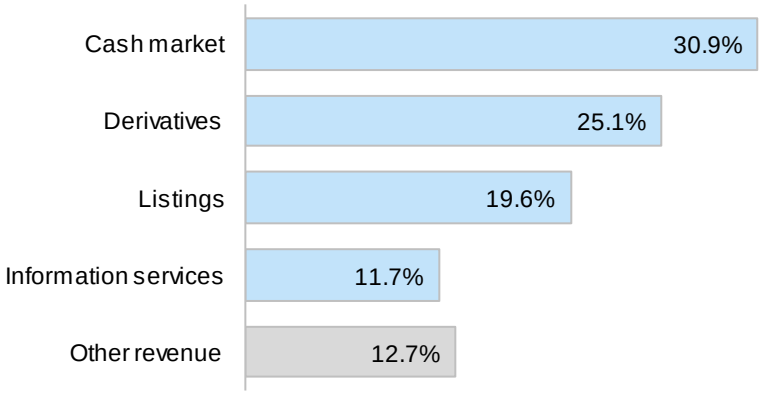
47 These players distribute themselves along the 'value chain' of the cash equity market: listing, order management, trading, data information services, clearing, settlement and supervision (Figure 3).

48 The Australian equity market is dominated by ASX, formed in 1987 from the merger of six independent exchange markets that operated in state capital cities. (There are currently four other licensed market operators which list equities—however, these exchange markets only cater for small or micro capitalisation companies.[13] This paper focuses only on the equity exchange market structure and competition for trading in securities issued by ASX-listed entities.) ASX demutualised in 1998. Since then, it has operated as a for-profit company and is listed and its shares are traded on a licensed

[13] The other market operators are the National Stock Exchange, SIM Venture Security Exchange (formerly Bendigo Stock Exchange), Asia Pacific Exchange and IMB Ltd.

financial market operated by ASX.[14] ASX operates equities, futures and options exchange markets, although this report focuses on the equities segment. In equities, ASX provides services in listing, trading, clearing, settlement and data information services. Up until August 2010, ASX was responsible for market supervision. This function was transferred to ASIC on 1 August 2010.

Figure 2: ASX Group operating revenue by category 2009–10[15]

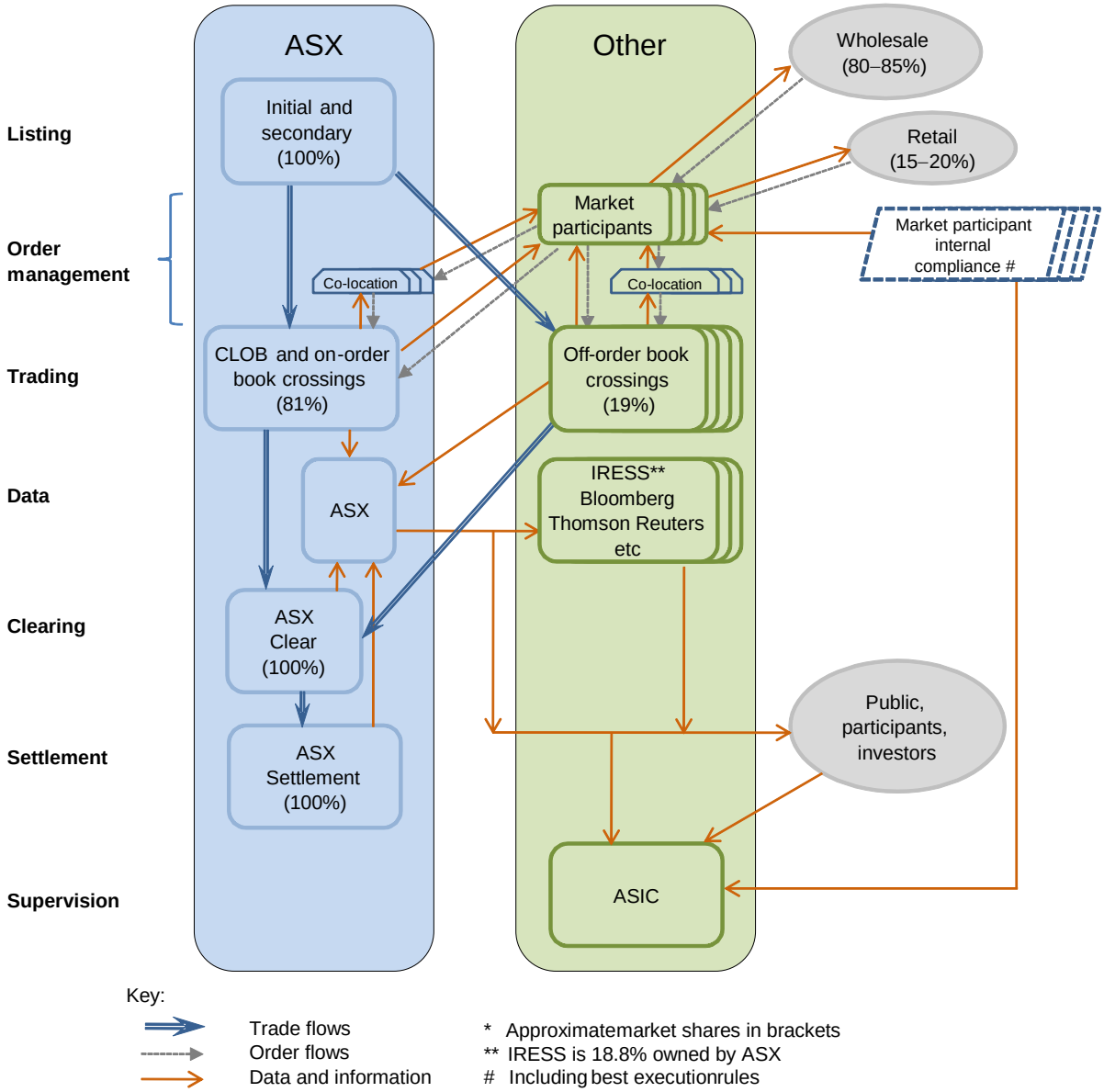


Source: ASX, ASIC

49 On 25 October 2010, ASX and Singapore Exchange (SGX) announced that they have entered into a merger implementation agreement. The transaction will be subject to various regulatory and shareholder approvals.[16] This report does not deal with issues associated with these approvals.

[14] ASIC performs the role which ASX does in relation to other listed entities in respect of ASX's compliance with the listing rules.
[15] ASX Annual Report, *Annual Report 2010*, ASX Limited, 19 August 2010, www.asx.com.au/about/pdf/asx_annual_report_2010.pdf.
[16] Joint News Release, *ASX and SGX combine to create the premier international exchange in Asia Pacific—the heart of global growth*, ASX Limited and SGX, 25 October 2010, www.asx.com.au/about/pdf/20101025_asx_sgx_media_release.pdf.

Figure 3: Australian cash equity market—Current structure*



Source: ASIC, ASX

Note: This figure does not include OTC trading

Issuers

50 Issuers in the equity market include private sector companies and listed managed investment schemes with tradeable financial products. There were almost 2,200 ASX-listed entities as at June 2010. This represents a 24% increase during the past five years.[17]

[17] ASX Limited, 'Market statistics—Top 20 most traded stocks—Trading volumes', www.asx.com.au/research/market_info/index.htm.

51 The top 200 ASX companies are quite large and range in market capitalisation from approximately $100 million to over $200,000 million. The S&P/ASX 200 comprises approximately 81% of the domestic market by value.[18]

52 In the 2009–10 financial year, capital raisings (IPOs and secondary market raisings) were equivalent to 5.9% of total market capital. This was down from 7.5% in 2008–09.[19]

53 In addition to their ASX listings, issuers have a choice of whether to also offer their stock internationally. This gives rise to dual and cross-listed shares, and ADR (American depositary receipt) programs, to facilitate foreign investor access to Australian listed shares. Australian issuers are also able to access foreign pools of capital by listing on overseas markets.

54 In July 2010 there were 29 companies listed on international exchange markets where ASX was their home exchange market.[20] Conversely, a number of large international companies have secondary listings on ASX. Furthermore, ADR.com, run by JP Morgan, has 46 Australian corporates issuing ADRs in the US—either in the over-the-counter (OTC) market or on exchange. The broad exposure of Australian listed corporates to international markets provides a visible reminder that global capital markets are heavily interconnected, and developments in international markets will be transmitted to Australian capital markets.

Equity execution venues

ASX

55 Since 1987,[21] equity trading on the ASX exchange market has either taken place via the CLOB or been conducted via the crossing market. The crossing market includes both on-order book crossings, called 'priority crossings', and off-order book crossings, called 'block special crossings', 'portfolio special crossings' or 'facilitated special size block special crossings' (Table 4).

[18] IRESS.
[19] ASX Limited, 'Market statistics—Top 20 most traded stocks—Trading volumes', www.asx.com.au/research/market_info/index.htm.
[20] IRESS.
[21] ASX launched computer-based trading (SEATS) for a limited range of ASX-listed stocks in 1987. Stocks were gradually transferred from the trading floor to the electronic central limit order book over a three-year period. This process was completed, and the ASX trading floor closed, in October 1990.

Table 4: Equity trading on ASX

Venue	Type of crossing	Description
CLOB A CLOB allows maximum order interaction, where demand can meet supply in the most efficient manner.		Orders that are mostly pre-trade transparent.[22] Bids and offers are matched based on price–time priority. Trades are reported immediately.
Crossing market The crossing market assists the efficient functioning of the equity market by allowing large orders to be executed without causing dramatic price impacts on the CLOB.	On-order book crossings (must be at or within the spread)	Orders matched in the CLOB with a pre-existing bid or offer of the trading participant. These trades adhere to the ASX price–time priority rules. Priority crossings are a form of on-order book crossing and can be executed at any size at or within the spread. The executing market participant must appear in the market at the crossing price before executing the trade—however, this allows the market participant to execute its trade even where price–time priority would ordinarily not permit this.[23] These trades must be reported immediately.
	Off-order book crossings (large trades at any price)	Large trades[24] that may occur at any price. These trades have no pre-trade transparency, but are generally required to be reported to the market immediately.[25]

56 In the 2009–10 financial year, the average daily turnover on ASX was $5.4 billion.[26] In August 2010, approximately 68% of total turnover was executed via the CLOB; approximately 13% of turnover was on-order book crossings (including priority); and 19% of turnover was off-order book crossings (Figure 4).[27]

57 More recently, ASX has introduced or proposed a range of other types of execution venue. These are listed in Table 5.

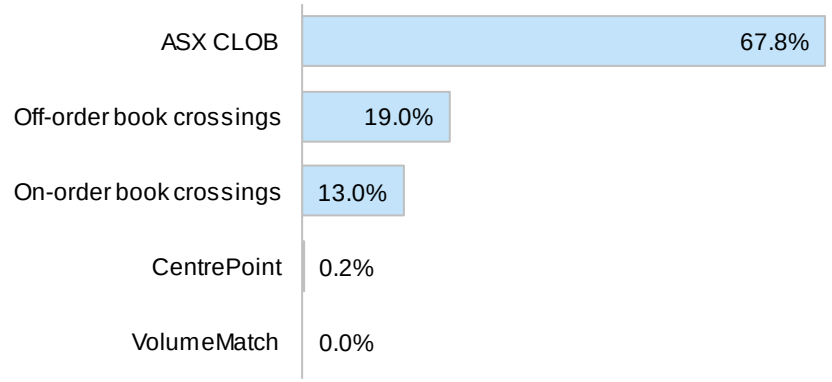
[22] An exception to pre-trade transparency is the undisclosed order type, which allows brokers to conceal the volume of their order. The minimum amount of an undisclosed order is $500,000.
[23] The rules for on-order book priority crossings were changed on 30 November 2009. Prior to the change, the executing broker was required to appear in the market at the crossing price, create a one price-step market for at least 10 seconds, and only then could they execute the crossing. In November 2009, the need to wait 10 seconds was removed.
[24] To be eligible for off-order book trading, trades in a single stock must exceed $1 million or be part of a portfolio of at least 10 stocks totalling more than $5 million.
[25] Market participants are entitled to a reporting delay for facilitated specified size block special crossings (i.e. for transactions above $15 million, $10 million, $5 million or $2 million, depending on the security) and for certain portfolio transactions.
[26] ASX Market Announcement, *ASX Group monthly activity report—June 2010*, ASX Limited, 5 July 2010, www.asx.com.au/about/pdf/20100705_asx_group_monthly_activity_report_june2010.pdf.
[27] ASX Market Announcement, *ASX Group monthly activity report—August 2010*, ASX Limited, 6 September 2010, www.asx.com.au/about/pdf/20100906_asx_group_monthly_activity_report_august_2010.pdf.

Table 5: ASX additional execution venues

Name	Description
VolumeMatch	An ASX-operated venue that facilitates the matching of large orders (over $1 million). Anonymous orders are matched with reference to prices on ASX's CLOB. VolumeMatch began operations in June 2010.
CentrePoint	An ASX-operated venue that references the midpoint of the bid–ask spread on ASX's CLOB. They are anonymous unpriced orders, which are executed in time priority. CentrePoint began in June 2010.
PureMatch (proposed)	A proposed parallel CLOB aimed at high-frequency traders (HFTs) and other users of high-speed trading technology. It will allow trading in the 200 most liquid securities and seeks to encourage HFTs. Arbitrage opportunities between the traditional CLOB and PureMatch may be sought out by HFTs. ASX is planning to launch PureMatch in 2011.[28]

58 ASX has sought to deliver better access to its execution venues via sponsored access and co-location arrangements.

Figure 4: Trading breakdown, August 2010[29]



Source: ASX data[30]

Other execution venues

59 In addition to the execution venues offered by ASX, a number of dark crossing systems are offered by market participants and third parties for buy-side firms (e.g. Liquidnet), or that automatically match client order flow (e.g. Price Improvement Network (UBS), CrossFinder (Credit Suisse) and Sigma X (Goldman Sachs)). These execution venues operate under the ASX

[28] ASX Market Announcement, *ASX fees and activity rebates*, ASX Limited, 3 June 2010, www.asx.com.au/about/pdf/20100603_asx_fees_and_rebates.pdf.
[29] Figure 4 illustrates the breakdown of trades by value done on the CLOB, CentrePoint, VolumeMatch and via crossings. It has not been possible to isolate the proportion of dark crossing systems. They are included in the crossing figures.
[30] ASX Market Announcement, *ASX Group monthly activity report*, ASX Limited, August 2010, www.asx.com.au/about/pdf/20100906_asx_group_monthly_activity_report_august_2010.pdf.

trading rules for both pre-trade and post-trade transparency. All of these new venues are pre-trade non-transparent but trades must be immediately reported to ASX.

Chi-X

60 In March 2010, the Australian Government announced in-principle support for the approval of an Australian market licence to Chi-X, a wholly owned Australian incorporated subsidiary of Chi-X Global, Inc (Chi-X Global).[31] The market operator intends to compete with ASX. Chi-X proposes that trading on its exchange market will operate via a CLOB similar to the one currently employed by ASX. Further detail about Chi-X's market licence application is contained in CP 145, Appendix 2: Chi-X's application.

Chi-East

61 On 4 October 2010, Chi-East (a joint venture between Singapore Stock Exchange Limited and Chi-X Global) received regulatory approval from the Monetary Authority of Singapore to operate a non-pre-trade transparent execution venue (i.e. a dark pool) for securities listed in Australia, Hong Kong, Japan and Singapore.[32] Australian stocks will be limited initially to those comprising the S&P/ASX 200 index. Chi-East will offer a reference price system, where orders will be matched between the best bid and offer price on the primary market. In addition, it will offer two periodic matching sessions, a morning volume weighted average price (VWAP) match and a market-on-close match. Clearing services will be offered by LCH.Clearnet, and CitiGroup will act as the settlement agent in Australia. Chi-East will not be available to Australian investors.[33]

Need for smart order routers

62 The existence of multiple execution venues creates the need for SORs (Figure 5). An SOR is an automated process of scanning various execution venues to determine which venue will deliver the best outcome on the basis of predetermined parameters. SORs provide linkages between multiple pools of liquidity and are an important tool in achieving the best execution of client orders. In overseas exchange markets they have been established by large market participants or provided to market participants by market operators or data consolidators.

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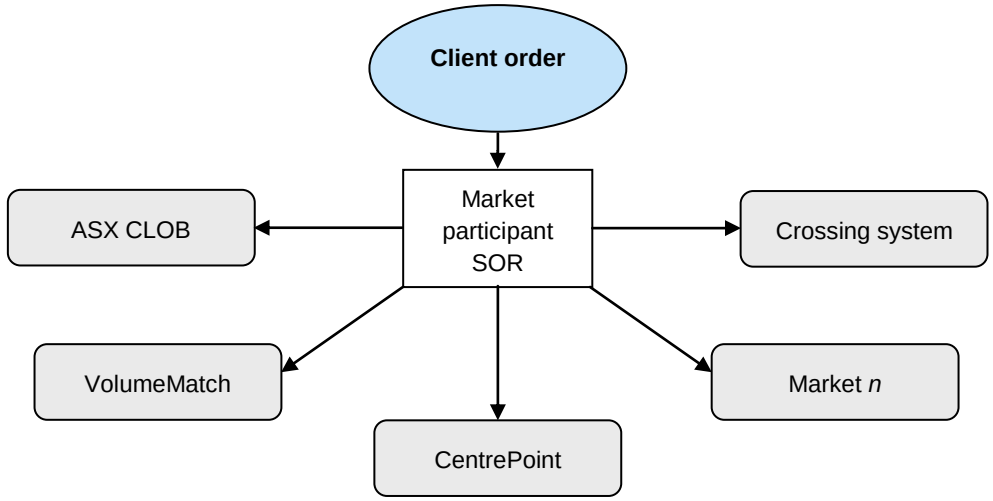
[31] The Hon Chris Bowen MP, Minister for Financial Services, Superannuation and Corporate Law, Media Release No. 032, *Government announces competition in financial markets*, 31 March 2010, mfsscl.treasurer.gov.au/DisplayDocs.aspx?doc=pressreleases/2010/032.htm&pageID=003&min=ceba&Year=&DocType=0 .
[32] Chi-East News Release, *Chi-East receives regulatory approval to launch independent, pan-Asian, non-displayed trading venue*, Chi-East, 4 October 2010, www.chi-east.com/resources/file/Press_release_Chi-East_RMO_Eng_041010.pdf .
[33] Chi-East, 'Membership: Participation on Chi-East', www.chi-east.com/pages/sub_pages.asp?pid=5.

Figure 5: Smart order routers



Source: ASIC

63 In Australia, IRESS currently offers an SOR service called 'Best Market Router'.[34] ASX has indicated that it will launch an SOR, called 'ASX Best', to enable ASX market participants to route orders to ASX for execution within the expanded ASX offering.[35]

Interconnection of trading on ASX and ASX 24

64 Trading in certain products on ASX and ASX 24 (formerly the Sydney Futures Exchange) are intrinsically linked. This is because certain ASX 24 futures and options contracts are priced on the basis of the expected future price movements of the underlying product traded on ASX. Futures and options contracts may be linked to an individual product (e.g. a derivative over BHP Billiton) or a basket of products (e.g. the ASX 24 SPI 200 futures contract).[36]

65 This interconnection means that price movements on ASX or in certain ASX securities flow through to trading on ASX 24 and vice versa. This occurs both in normal trading conditions and when there are extreme price movements.

[34] IRESS Factsheet, *IOS Plus smart order routing*, IRESS Market Technology, 17 May 2010, www.iress.com.au/assets/IOS_Smart_Order_Routing_FactSheet.pdf.
[35] ASX Market Announcement, *New data centre for ASX*, ASX Limited, 10 June 2010, www.asx.com.au/about/pdf/20100610_new_data_centre_for_asx.pdf.
[36] An ASX 24 SPI 200 futures contract enables investors to trade movements in the S&P/ASX 200 Index in a single transaction, thereby allowing exposure to Australia's top 200 companies without having to buy or sell shares in every company in the index.

Clearing and settlement

66 All on-order book trades in ASX-listed shares are cleared by ASX Clear Pty Limited (ASX Clear). All trades in ASX-listed shares are settled by ASX Settlement Pty Limited (ASX Settlement). ASX Clear and ASX Settlement are group subsidiaries of ASX. ASX revenues earned from the cash equities exchange market are approximately 35% from clearing and 30% from settlement.[37]

The broking industry

67 There is substantial competition in the broking industry. There are approximately 90 ASX market participants, and around an additional 150 indirect market participants that use market participants' authority to trade on behalf of their clients as a substantial part of their business model ('white labellers'). The market is also relatively concentrated. The largest 12 ASX market participants accounted for 81% of the value of equities traded in 2009–10, and the top three market participants (Macquarie, UBS and Deutsche Bank) account for close to 30% of the market.[38] The concentration of trading in the equity exchange market has changed very little over the past decade, with the majority of the top 12 market participants servicing institutional clients.

Investors

68 Retail investors consistently represent 15–20% of equity market turnover.[39]

69 For institutional investors, funds under management (FUM) in Australia can be separated into:[40]

(a) private funds management ($302 billion in June 2010); and

(b) superannuation assets ($1,050 billion in June 2010).

70 The private sector fund management industry is reasonably concentrated, with five fund managers (Commonwealth Bank, National Australia Bank, AMP Ltd, Macquarie Group and ANZ Bank) accounting for approximately 70% of FUM.[41] Its main clients comprise: share brokers, research analysts, derivative traders, fund managers, financial planners, portfolio managers and

[37] A Main, 'ASX earns less for doing more trades', *The Australian*, 7 January 2009, www.theaustralian.com.au/business/opinion/asx-earns-less-for-more-trades/story-e6frg9jf-1111118493740.
[38] IRESS.
[39] IRESS; ASIC.
[40] Superannuation assets include those of life insurance offices; all assets on a consolidated basis (Australian Bureau of Statistics, '5655.0—Managed funds, Australia, Jun 2010', last updated 3 September 2010, www.abs.gov.au/ausstats/abs@.nsf/mf/5655.0).
[41] IBIS World Report, *Funds management (except superannuation funds) in Australia*, IBIS World, June 2010.

administrators, risk managers, market makers, private traders, corporate organisations and mortgage brokers.

Data vendors

71 There are currently 24 real-time data providers for ASX cash equities and an additional seven that provide either delayed or end-of-day information.[42] Globally, the dominant providers of financial information are Bloomberg and Thomson Reuters, accounting for approximately 60% of market share.[43] For Australia-specific financial market information, IRESS Market Technology Limited (IRESS) has a market share of almost 90%.[44]

Technology, algorithmic trading and high-frequency traders

72 While the use of algorithms (automated electronic trading activity whose parameters are set by predetermined rules) in Australia remains relatively low by world standards, their use has grown rapidly over recent years and we expect this growth to continue. Although it is not possible to measure the level of algorithm-generated trades in Australia directly, ASX estimated in its February 2010 report on algorithmic trading and market access[45] (ASX Report) that algorithms account for approximately 30–40% of ASX cash equity turnover.

73 High-frequency traders (HFTs), which engage in a specialised form of high-speed algorithmic trading, are also thought to have a relatively low share of the Australian market, accounting for around 3–4% of cash equity turnover.[46] This is very small when compared with estimates in the US of over 60% of total trading,[47] and in Europe of between 13% and 40% of total trading.[48]

74 It is likely that ASX's introduction of PureMatch, and the corresponding reduction in latency (i.e. the time it takes for data to get from one point to another), will encourage the growth of high-frequency trading (HFT) in Australia, regardless of competition. The introduction of Chi-X's low-latency execution venue will also encourage more HFT activity. This is

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[42] *ASX Information Vendors Guide*, October 2010, www.asx.net.au/resources/information_services/information_vendors_guide.pdf
[43] Burton-Taylor International Consulting Press Release, *Burton-Taylor Publishes First Ever Analysis of Bloomberg News v Reuters News*, 30 April 2009, www.burton-taylor.com/consulting/PR-B-T-4-30-09.html
[44] SAEF Newsletter, *Quarterly Newsletter #21*, Selector Australian Equities Fund, March 2010, www.selectorfund.com.au/newsletters/SAEF%20Mar%202010.pdf.
[45] ASX review, *Algorithmic trading and market access arrangements*, ASX Limited, 8 February 2010, www.asx.com.au/about/pdf/20100211_review_algorithmic_trading_and_market_access.pdf.
[46] Feedback ASIC has received from the industry and comments in the press suggest this figure may be higher.
[47] See, for example: L Tabb, *High frequency trading: What is it and should I be worried?*, Address by Founder and CEO of TABB Group, WFE Executive Briefing: MIT Exchange Technology Workshop, Cambridge MA, 23 November 2009.
[48] CESR Technical Advice, *CESR technical advice to European Commission in the context of the MiFID Review—Equity markets* (CESR/10-802), Committee of European Securities Regulators (CESR), 29 July 2010, p. 40.

further facilitated by the provision of co-location facilities, where market participants locate their trading systems with the exchange market matching engine in a single data centre, and the increased potential for arbitrage strategies across these execution venues.

75 ASX has announced plans to build a new co-location facility outside Sydney central business district by August 2011.[49] In some cases overseas, different execution venues have co-located in 'neutral' centres to reduce latency between markets.[50] Data and system vendor IRESS and ASX have recently announced that they will be working together to develop connectivity to the ASX's suite of execution services. As part of this market access initiative, IRESS will become a foundation customer of the new ASX co-location facility.[51] IRESS and Chi-X have also agreed to co-locate.[52]

76 In addition to enhancements for automated trading, ASX is responding to demands for greater speed and capacity by upgrading to a new trading system expected to be launched in November 2010, called 'TradeMatch', which will provide enhanced functionality to the existing CLOB.[53] This new technology is expected to substantially reduce latency and boost capacity.

77 IRESS is also responding to market developments. It recently announced the launch of the IRESS Optical Network (ION), connecting all Australian IRESS client sites via dark fibre and delivering market data and trading connectivity. ION will be the connectivity platform for additional IRESS services and those anticipated with multi-venue trading, such as consolidated market data feeds, high-speed smart routing and connectivity for third-party services.[54]

78 A more detailed discussion and analysis of algorithmic trading and HFT can be found in Section E.

Market performance and benchmarks

79 Figure 6 provides an illustrative example of the Australian cash market and some overseas comparisons across a sample of indicators. We note that there are many other indicators that could also be used to describe exchange markets.

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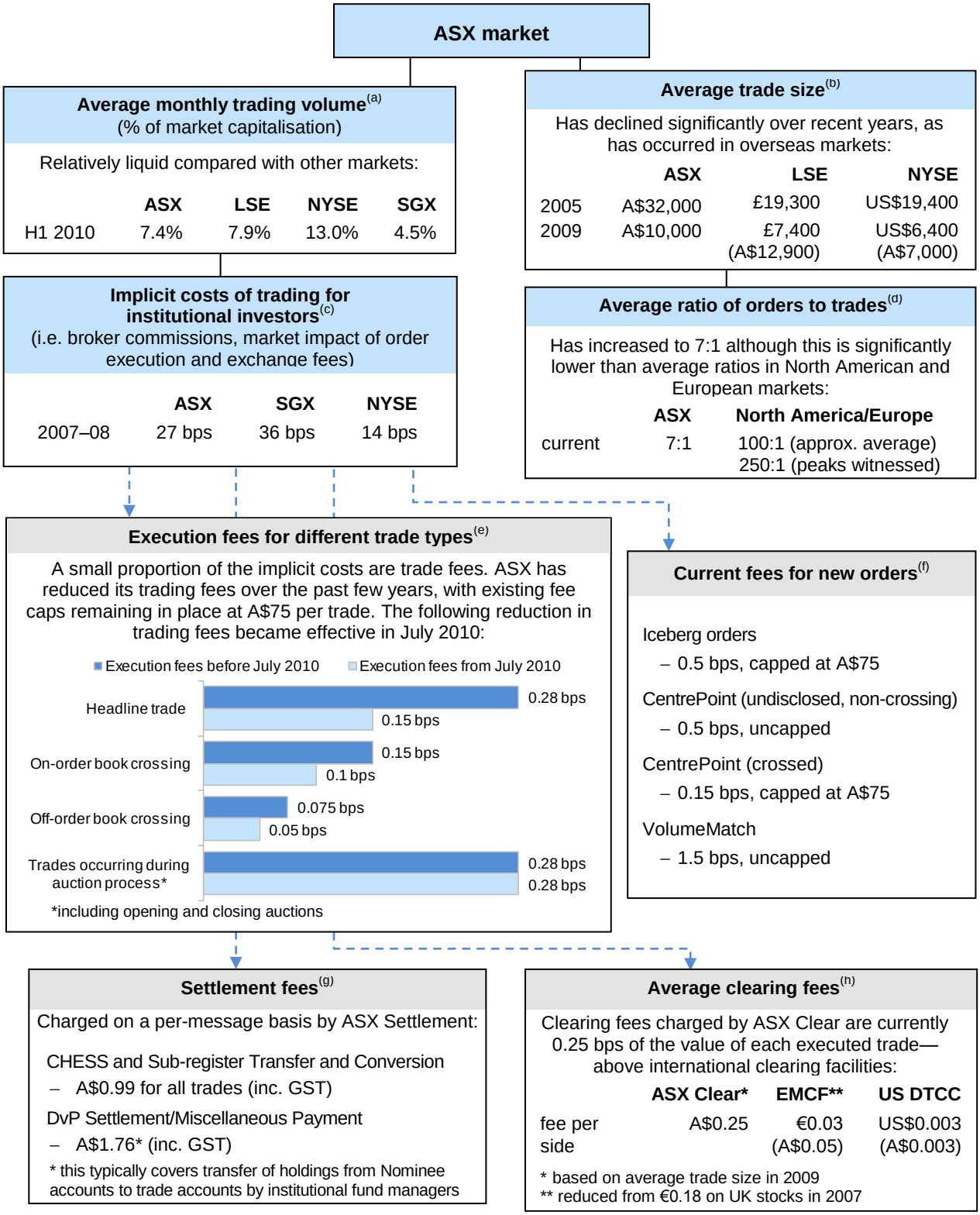
[49] ASX Market Announcement, *New data centre for ASX*, ASX Limited, 10 June 2010, www.asx.com.au/about/pdf/20100610_new_data_centre_for_asx.pdf.
[50] This is to reduce latency when routing between markets. For example, National Association of Securities Dealers Automated Quotations (Nasdaq), Better Alternative Trading System (BATS), International Securities Exchange (ISE) and others use BT Radianz's data centre in the US.
[51] Joint Media Release, *IRESS and ASX launching new market connectivity initiatives: IRESS to co-locate with ASX as foundation customer*, ASX Limited and IRESS Market Technology, 27 October 2010, www.asx.com.au/about/pdf/20101027_iress_and_asx_launching_new_market_connectivity_ini.pdf.
[52] IRESS Media Release, *IRESS launches low-latency trading eco-system in Australia*, IRESS Market Technology, 29 October 2010, www.iress.com.au/news_detail.aspx?view=626.
[53] ASX Market Announcement, *ASX fees and activity rebates*, ASX Limited, 3 June 2010, www.asx.com.au/about/pdf/20100603_asx_fees_and_rebates.pdf.
[54] IRESS Media Release, *IRESS launches low-latency trading eco-system in Australia*, IRESS Market Technology, 29 October 2010, www.iress.com.au/news_detail.aspx?view=626.

Figure 6: Summary—Market liquidity, trading activity and costs title



Sources:

(a) World Federation of Exchanges, Monthly Statistics, http://www.world-exchanges.org/statistics/ytd-monthly.

(b) ASX Review, *Algorithmic trading and market access arrangements*, ASX Limited, 8 February 2010, www.asx.com.au/about/pdf/20100211_review_algorithmic_trading_and_market_access.pdf; J Grant, 'Smaller orders breed dark pools and higher post trade costs', *Financial Times*, 21 February 2010, www.ft.com/cms/s/0/9689e616-1f15-

11df-9584-00144feab49a.html; LSE Secondary Markets Statistics, *December 2009: Summary trading statistics*, London Stock Exchange, December 2009, www.londonstockexchange.com/statistics/historic/secondary-markets/dec-2009.xls.

(c) 'The cost of executing trades in 47 countries', *Institutional Investor*, November 2008, www.institutionalinvestor.com/Article.aspx?ArticleID=2043066; data include commissions, fees and market impact costs. We note that ASX reported that trade execution represented 0.45 bps in financial year 2009–10 (ASX 2010 Annual Report, p. 17).

(d) ASX Review, *Algorithmic trading and market access arrangements*, ASX Limited, 8 February 2010, www.asx.com.au/about/pdf/20100211_review_algorithmic_trading_and_market_access.pdf.

(e) ASX Market Announcement, *ASX fees and activity rebates*, 3 June 2010, www.asx.com.au/about/pdf/20100603_asx_fees_and_rebates.pdf.

(f) ASX Market Announcement, *ASX fees and activity rebates*, 3 June 2010, www.asx.com.au/about/pdf/20100603_asx_fees_and_rebates.pdf

(g) ASX Schedule of Fees, *Clearing and settlement: Effective 1 July 2010*, ASX Limited, June 2010, www.asxonline.com/intradoc-cgi/groups/participant_services/documents/information/asx_015359.pdf.

(h) ASX Schedule of Fees, *Clearing and settlement: Effective 1 July 2010*, ASX Limited, June 2010, www.asxonline.com/intradoc-cgi/groups/participant_services/documents/information/asx_015359.pdf; Reuters, *EMCF slashes European share clearing costs*, 30 June 2010, http://www.reuters.com/article/idUSLDE65T19F20100630; Chi-X Europe, *Best execution and the changing landscape of European equity markets*, September 2008, Slide 8, www.dbmf.dk/media(618,1030)/MPS_2008_-_CHI-X_pr%C3%A6sentation.ppt; Depository Trust & Clearing Corporation, 'Equities clearing—lowest fees in the world', www.dtcc.com/about/business/value_proposition.php.

D Overseas experience: Equity exchange markets

Key points

Regulatory reforms in the US, Europe and Canada have resulted in substantial competition for trading services in these markets.

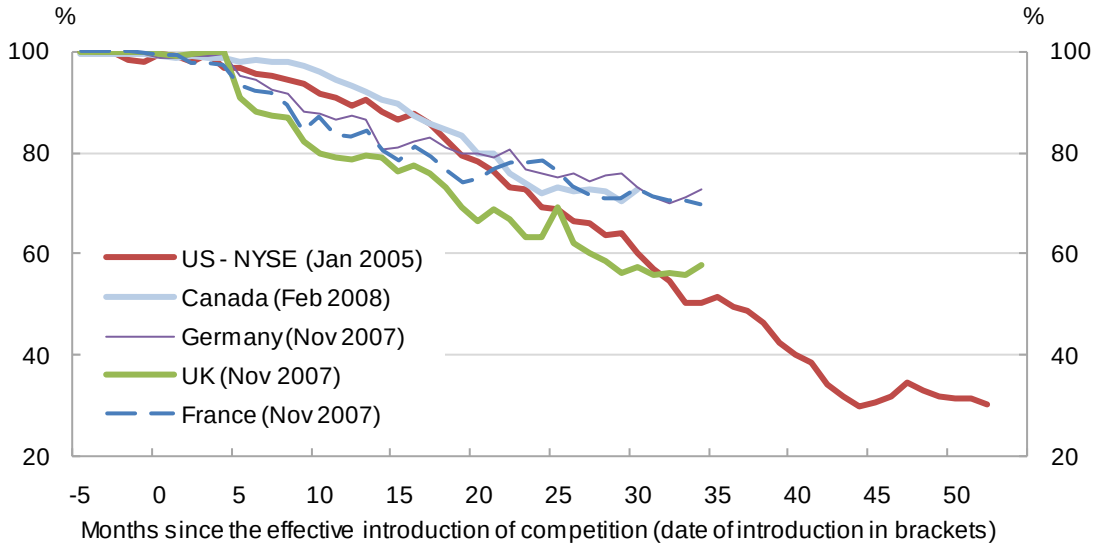
As new execution venues vie for order flow, there have been aggressive fee reductions and a substantial push for innovation in trading.

The 6 May 'flash crash' in the US has focused attention on the complexity of surveillance in a competitive market framework.

80 The different approaches taken to encourage competition and manage technological changes in the US, Europe and Canada provide valuable insights for the Australian market.

81 Regulatory reforms in the US, Canada and Europe[55] have resulted in substantial competition for trading services in these markets. As a consequence, incumbent exchange markets have lost significant market share over relatively short timeframes (Figure 7). For example, in the US, NYSE lost its dominant position following the introduction of Regulation National Market System (Reg NMS) in 2005 and now accounts for less than one-third of market share.

Figure 7: Market share of primary exchange markets following introduction of competition



Source: D. Perfumo, B. Steil, presentation at the Exchange Forum 2010, Federation of Euro-Asian Stock Exchanges London, UK, 1 June 2010.

[55] Regulation NMS and Regulation ATS in the US, the ATS regime in Canada and MiFID in Europe.

82 There has been a proliferation of new execution venues. In the US there are around 50 execution venues, in Europe over 100 venues and in Canada nine venues. In Europe and the US many of these venues are dark pools. The growth in new execution venues and dark trading has resulted in significant fragmentation of order flow.

83 We also note a growing trend of cross-border market operator consolidation:

(a) NYSE Euronext is the most recent merger in a chain of transactions for the Euronext Group. Euronext was formed following a merger of the Amsterdam Stock Exchange, Brussels Stock Exchange, and Paris Bourse in 2000. Euronext then acquired LIFFE (London International Financial Futures and Options Exchange) in 2001, and the Lisbon and Porto Stock Exchange in 2002. In 2007, Euronext and NYSE merged.

(b) Nasdaq merged in 2007 with the northern European OMX, which is itself an amalgamation of seven exchanges based in Baltic and Nordic countries.

84 Competitive forces have been instrumental in promoting innovation, as execution venues vie for order flow. In most cases, innovation has encompassed technological changes both in hardware and software frameworks—however, advances have also been made in the operational and pricing context. New pricing models have been implemented to attract different types of order flow. Venues frequently promote fee changes and fee 'specials' aimed at attracting order flow.

85 To some extent, there has been a re-mutualisation of the industry, with many of these new execution venues established by groups of market participants aimed at meeting their own trading needs (e.g. Alpha in Canada).

86 There are global trends to decouple the value chain in exchange market and equities services, unbundling the exchange market functions of listing, trading, clearing and data provision, and the broker functions of capital raising, trading and research.

87 The introduction of low-latency execution venues has given rise to a new class of traders—high-frequency traders (HFTs). High-frequency trading (HFT) is a subset of high-speed algorithmic trading. HFTs operate using a variety of trading strategies, but the most common strategy is electronic liquidity provision. These traders have become de-facto market makers, replacing the traditional market makers that have withdrawn capital as a result of the GFC. HFTs trade in very small order size and enter, amend and cancel large numbers of orders. They typically hold positions for very short time horizons (i.e. ending the day with a zero position). This has resulted in a significant reduction in order sizes, increases in order to trade ratios and large increases in the quantum of data for market monitoring and surveillance.

88 Emphasis on speed has led to the demand for co-location facilities and low-latency data feeds.

89 In some cases, the increased liquidity added by high-speed trading has led to a reduction in bid–ask spreads. However, this has occasionally been offset by reductions in depth and increases in search costs. This is particularly true in Europe, where fragmentation is compounded by a lack of consolidated data.

90 The 6 May 2010 ‘flash crash’ in the US has focused attention sharply on the complexity of surveillance in a competitive exchange market framework. In particular, it has highlighted the need for regulators to have access to full audit trail data to identify the causes of such events and, where necessary, modify regulations. It has also highlighted the need for a coordinated approach to any halts in trading and trade cancellations. See Table 6 for a summary of overseas experience.

Table 6: Summary of overseas experience with competing exchange markets

Issue	Lessons from overseas experience
1. Fragmentation of liquidity	Too much fragmentation and non-pre-trade transparent trading can reduce the quality of price formation on public pre-trade transparent markets. It is important to incentivise trading in pre-trade transparent execution venues and to limit the volume of dark trading.
2. Fragmentation of prices	Market forces will not necessarily lead to consolidation of prices across all markets. At a minimum, investors and listed companies should be able to access best bid and ask prices for each pre-trade transparent market and all post-trade information at reasonable cost, and regulators should play a role in delivering this outcome.
3. Best execution	With more choice and incentives for order flow, it is important to have a clearly defined best execution rule, which ensures client interests are protected. Investors must have sufficient access to information to allow them to monitor their broker's execution performance, and regulators must be able to monitor and enforce the best execution rules.
4. Consistent treatment	It is important that there is equivalent treatment for parties undertaking similar activities. This will limit opportunities for regulatory arbitrage.
5. Surveillance and risk controls	Surveillance across multiple markets increases the complexity of monitoring. Regulators need sufficient information, including about the origin of orders and trades. Standardised market integrity risk controls, such as circuit breakers, and cooperation are essential.
6. Reduction in trading fees	The growth in new execution venues has led to significant competition for order flow overseas, resulting in aggressive fee reductions for trading. New pricing models have been implemented to attract different types of order flows and there are frequent fee changes and fee 'specials' aimed at attracting order flow.
7. Significant reductions in bid–ask spreads	In Canada, bid–ask spreads fell from 15 bps in early 2008—when competition really began—to 10 bps by mid-2010.[56] These benefits started with the larger stocks and are flowing through to smaller stocks. In the US, 'reduced transaction costs have enabled a mutual fund investor to reasonably expect an investment balance that is perhaps 30% higher than what they could have expected only a decade ago'.[57] However, in some markets this has been offset by increased search costs. This is true in Europe where fragmentation is compounded by a lack of consolidated data. Retail clients benefit from improved prices as a result of tighter spreads and greater execution certainty offered by higher trading volumes.
8. Innovation	There has been considerable investment in technology throughout the entire trading cycle, which has improved the efficiency of markets and provided investors with new instruments and order types that may better serve their needs.
9. Clear regulatory framework	Regulators should set the full regulatory framework at the outset of the introduction of competition to maximise market integrity and to reduce the impact for industry of system changes.

[56] ITG Review, *Canadian market microstructure review second quarter 2010: Have some new HFT strategies come to town?*, Investment Technology Group (ITG), 20 July 2010, www.itg.com/news_events/papers/ITG-Canada-Market-Microstructure-Q2-2010.pdf. We note that it is unclear how much of this reduction was due to competition rather than other market developments.

[57] SEC, *Statement of George U Sauter*, Managing Director and Chief Investment Officer, the Vanguard Group, Inc., SEC Market Structure Roundtable, 2 June 2010, www.sec.gov/comments/4-602/4602-5.pdf.

6 May US 'flash crash'

91 The 6 May 2010 'flash crash' in the US was a reminder of the speed and interconnection of exchange markets, and the need for market operators and regulators to cooperate to deal with significant market movements. US equity markets experienced the worst price decline and reversal since 1929. The Dow Jones Industrial Average (DJIA) reached a low of 9.16% below the previous day's close, before recovering to close the day 3.2% lower. Individual stocks saw precipitous price falls, some reaching levels as low as US$0.01. The derivatives markets dropped in tandem, and actually led the fall.[58]

92 The volatility experienced on 6 May undermined market confidence. With more than 20,000 trades in the US cancelled and trading in some stocks dropping to $0.01, investors are likely to question the integrity of the market.[59]

The details

93 On 6 May the major equity indices in both the US futures and securities markets, each already down by over 4% from prior-day close, suddenly plummeted a further 5–6% in a matter of minutes, before rebounding almost as quickly.[60]

94 Over 20,000 trades across more than 300 securities were executed at prices more than 60% away from their values just moments before. Many of these trades were executed at prices of a penny or less, or as high as $100,000, before prices of those securities returned to 'pre-crash' levels. After the market closed, the exchange markets and the Financial Industry Regulatory Authority (FINRA) met and jointly agreed to cancel (or break) all such trades under their respective 'clearly erroneous' trade rules.[61] Many investors suffered losses.

95 During the fall, market operators responded in different ways. NYSE's circuit breakers slowed trading on its market but liquidity shifted to other markets that remained open. Furthermore, the various market operators did not have common trade cancellation arrangements.

96 Despite the prices of many individual securities falling dramatically, the 10% market-wide circuit breaker that was in place across US equity markets and some of the derivative markets was not triggered. This threshold is currently under review by the Securities and Exchange Commission (SEC).

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[58] Joint Report, *Findings regarding the market events of May 6, 2010*, US Commodity Futures Trading Commission (CFTC) and US Securities and Exchange Commission (SEC), 30 September 2010, www.sec.gov/news/studies/2010/marketevents-report.pdf.
[59] Joint Report, *Findings regarding the market events of May 6, 2010*, CFTC and SEC, 30 September 2010, www.sec.gov/news/studies/2010/marketevents-report.pdf.
[60] Joint Report, *Findings regarding the market events of May 6, 2010*, CFTC and SEC, 30 September 2010, p. 1, www.sec.gov/news/studies/2010/marketevents-report.pdf.
[61] Joint Report, *Findings regarding the market events of May 6, 2010*, CFTC and SEC, 30 September 2010, www.sec.gov/news/studies/2010/marketevents-report.pdf.

97 SEC Chairman Mary Schapiro stated that there was 'clearly a market failure' on 6 May and that individual investors had pulled back from participating in the equity markets since that date.[62]

98 The SEC and Commodity Futures Trading Commission (CFTC) identified a triggering event and a subsequent confluence of market conditions and trading strategies as the cause of this market disruption (Table 7).[63]

Table 7: 6 May 2010 triggering event and subsequent confluence of market conditions and trading strategies

Type	Description
Turbulence	US markets were unusually turbulent on 6 May 2010, with high market volatility and thin liquidity. Unsettling political and economic news concerning the European debt crisis contributed to this.
Trigger—automated execution of a large sell order in the E-mini, traded on the Chicago Mercantile Exchange (CME)	A large fundamental trader initiated a sell program of E-mini futures contracts valued at $4.1 billion as a hedge to an existing equity position. The sell program was executed via an automated execution algorithm that targeted trading volume only (i.e. without regard to price or time). This resulted in an extremely fast execution of 20 minutes where, usually, execution would take more than five hours.
High trading volume and fast price movement	The appearance of high trading volume is likely to have induced additional trading by HFTs and other traders in the futures market, as well as cross-market arbitrageurs (thereby affecting the securities markets). As liquidity was actually thin, prices moved very quickly—so fast that market participants usually providing buy-side liquidity were either unable or unwilling to supply sufficient liquidity to meet the demand.
Withdrawal of liquidity by market participants	Withdrawal of liquidity by market participants ensued in reaction to the sudden price declines in the E-mini and concerns about the integrity of its data and systems. Based on their respective individual risk assessments, market participants (including HFTs, market makers and liquidity providers) widened their quote spreads, while others reduced offered liquidity, and a significant number withdrew completely from the markets. Many internalisers also began routing their orders directly to the public exchange markets, further increasing selling pressure.
Stop loss orders and execution of trades at irrational prices	More than $2 billion in individual investor stop loss orders is estimated to have been triggered in the market drop. As liquidity completely evaporated in a number of individual securities and exchange-traded funds (ETFs), market participants instructed to sell (or buy) at market and found no immediately available buy (or sell) interest, resulting in trades being executed at irrational prices—some as low as one penny.
CME's Stop Logic Functionality	CME's Stop Logic Functionality triggered a halt in E-mini trading to prevent a further cascade of prices. Eventually, buy-side and sell-side interest returned and an orderly price formation process began to function.

[62] ML Schapiro, *Strengthening our equity market structure*, Address by SEC Chairman, Economic Club of New York, New York NY, 7 September 2010.
[63] Joint Report, *Findings regarding the market events of May 6, 2010*, CFTC and SEC, 30 September 2010, www.sec.gov/news/studies/2010/marketevents-report.pdf.

99 CME's Stop Logic Functionality was identified as an example of how pausing a market can be an effective mechanism to provide time for market participants to reassess their strategies, for algorithms to reset their parameters, and for an orderly market to be re-established. It is important that these pauses are harmonised across interconnected markets, including between securities and futures markets.

100 The SEC/CFTC further observed from 6 May that market participants' uncertainty about when trades would be cancelled affected their trading strategies and willingness to provide liquidity.[64]

Volatility controls for extreme market movements

101 Volatility controls are a form of mandated control that may contribute to confidence among investors. Volatility controls can be defined as a post-order control that prevents a certain order from being matched. They operate as a 'safety net' beyond order entry controls (such as filters). Volatility controls can operate at an individual stock level or on a market-wide basis.

102 Automated volatility controls are a quicker, more transparent, and fairer response to disorderly markets and anomalous trades than a response that relies on the exercise of human discretion. This also provides a level of comfort to investors that measures are in place to mitigate extreme market movements.

103 On 6 May, the various market operators had in place the following automated mechanisms to halt or slow trading in individual stocks:

(a) BATS Exchange (BATS) and NASDAQ Stock Market (Nasdaq) had collars for market orders; [65]

(b) NYSE had its liquidity replenishment points (LRP); [66] and

(c) CME had collars as well as its Stop Logic Functionality.[67]

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[64] Joint Report, *Findings regarding the market events of May 6, 2010*, CFTC and SEC, 30 September 2010, p. 7, www.sec.gov/news/studies/2010/marketevents-report.pdf.

[65] For example, BATS Rule 11.9(a)(2) specifies that if any portion of a market order that would otherwise execute at a price more than $0.50 or 5% worse than the national best bid and offer (NBBO) at the time the order initially reaches the exchange (whichever is greater) that order will be cancelled.

[66] NYSE utilises a hybrid floor/electronic trading model. When a price movement of a sufficient size is observed in a given stock, a 'speed bump' is triggered and trading in that stock is temporarily converted from an automated market to a manual action. Trading on NYSE in that stock will 'go slow' and pause for a time period to allow the designated market maker to solicit additional liquidity before returning to an automated market.

[67] CME automatically rejects orders priced and sized outside a range of reasonability. For example, on the E-mini S&P 500 futures contract, the price band is 12 points (approximately 1%) above and 12 points below the last executed trade. The maximum order size is 2,000 contracts. If orders are placed beyond these limitations, they are automatically rejected. These are designed to prevent clearly erroneous orders and 'fat finger' errors from entering the trading system.

Table 8: Common automated volatility controls

Type of volatility control	Description
Collars	Collars typically set price limits at which a 'limit down' is triggered, whereby the securities can only trade at or above that level for a period of time. Collars can limit the disruptive effect of anomalous trades. CME's collar operates for 10 minutes and, if the futures contract is still trading down after this period, there is a two-minute halt and then it is free to trade until the next limit down.
Go-slow mechanisms	Go-slow mechanisms, such as NYSE's LRP, trigger manual auctions in place of automated trading when particular securities suffer extreme price declines.
Circuit breakers	Circuit breakers, such as the single stock circuit breaker (SSCB) rules in the US, halt trading in particular securities for a specified period when the price of the securities varies outside a predetermined range of volatility. This is designed to give markets the opportunity to attract new trading interest or liquidity in a stock, establish a reasonable market price and resume trading in a fair and orderly fashion.

SEC policy responses

104 The SEC undertook two immediate policy responses to 6 May:

(a) to introduce new SSCB rules, on a pilot basis.

Exchange markets and FINRA are required to pause trading across the US in any Russell 1000 stock and a list of ETFs for five minutes when a 10% change in price is experienced in a five-minute interval.[68]

The rationale for the SSCBs is to give exchange markets the opportunity to attract new trading interest or liquidity in a stock, establish a reasonable market price, and resume trading in a fair and orderly fashion. SEC Chairman Schapiro stated that SSCBs were an essential first step, but could be improved. The SSCBs had already been triggered when a pause in trading was not warranted (e.g. errors in the printing of trades executed over the counter); and

(b) to work with market operators on harmonising rules for cancelling anomalous (termed 'clearly erroneous') trades and to increase the transparency of the process.

105 The SEC will evaluate the operation of the circuit breaker program and the new procedures for breaking anomalous trades during the pilot period. As part of its review, the SEC intends to assess whether the current circuit breaker approach could be improved by adopting or incorporating other mechanisms, such as a limit up/limit down procedure that would directly

[68] See SEC Press Release, *SEC approves new stock-by-stock circuit breaker rules* (Release No. 2010-98), SEC, 10 June 2010, and SEC Press Release, *SEC approves rules expanding stock-by-stock circuit breakers and clarifying process for breaking erroneous trades* (Release No. 2010-167), SEC, 10 September 2010.

prevent trades outside specified parameters, while allowing trading to continue within those parameters. Such a procedure could prevent anomalous trades from occurring, as well as limiting the disruptive effect of those that do occur. [69]

106 In September 2010, NYSE Euronext, Nasdaq OMX Group Inc and BATS Global Markets proposed new rules to mandate that market makers' bids and offers must be within 8% of the national best bid or offer.[70]

Canadian response

107 Canada's exchange markets were also affected by events, although the volatility was not as extreme as in the US.[71] The Investment Industry Regulatory Organization of Canada (IIROC) re-priced or cancelled a number of unreasonably priced trades that occurred during the event.

108 IIROC undertook a regulatory review of the equity trading events of 6 May 2010. It confirmed that the Canadian exchange markets reacted rapidly to the US decline, with the onset of decline and eventual recovery lagging US markets by two minutes. The review found no evidence of erroneous orders, computer glitches or any futures or options trading that spurred the decline in the Canadian exchange markets. While a number of factors were identified that affected trading, no one factor was common to the trading in all of the 47 securities reviewed.[72]

Table 9: Factors identified by IIROC that affected trading in Canada on 6 May 2010

Type	Description
Volatile markets	On 6 May 2010, the markets were volatile, reflecting concerns over a number of world events.
Liquidity imbalance	IIROC's review revealed a mismatch of liquidity, with most of the securities reviewed exhibiting a dominance of sell liquidity from the opening of trading. The presence of this strong liquidity imbalance placed downward pressure on prices of the securities reviewed.
Electronic traders quickly withdrew from markets	After the sharp decline in the US indices, a number of electronic traders quickly withdrew from the Canadian markets, causing a dramatic and rapid decline in the already limited liquidity, and putting further pressure on prices.
Stop loss orders	The trigger of stop loss orders was a major contributor to the deepest price declines experienced by many of the less liquid securities reviewed.

[69] Joint Report, *Findings regarding the market events of May 6, 2010*, CFTC and SEC, 30 September 2010, p. 7, www.sec.gov/news/studies/2010/marketevents-report.pdf.
[70] 'Flash crash leads call to curb quotes', *Australian Financial Review*, 20 September 2010, p. 51.
[71] IIROC Review, *Review of the market events of May 6, 2010*, Investment Industry Regulatory Organization of Canada (IIROC), 9 September 2010, docs.iiroc.ca/DisplayDocument.aspx?DocumentID=C6CB526F93254DED9F4F98CDCB935FF3&Language=en.
[72] IIROC Review, *Review of the market events of May 6, 2010*, IIROC, 9 September 2010, pp. 3–5, docs.iiroc.ca/DisplayDocument.aspx?DocumentID=C6CB526F93254DED9F4F98CDCB935FF3&Language=en.

109 The IIROC review also found that:[73]

(a) when three Canadian exchange markets activated their volatility and erroneous trade controls, there was no evidence of a large-scale migration of orders to other exchange markets—unlike the US experience; and

(b) Canada's best price obligation (which requires all orders to be executed at the best prices that are available across all visible exchange markets) appears to have contributed to a more orderly price decline through the order book until all outstanding liquidity was exhausted. In the US, by contrast, the trade-through obligation is a 'top-of-book' requirement.

110 The IIROC review made the following conclusions and five recommendations:[74]

Table 10: IIROC recommendations—Review of 6 May 2010

Conclusion	Recommendation
The trading on 6 May demonstrated that aberrant or volatile trading in one jurisdiction can easily and very quickly spread to other jurisdictions.	The Canadian Securities Administrators (CSA) and IIROC should review the current market-wide circuit breaker to determine whether the current trigger levels are appropriate and whether an independent Canadian-based circuit breaker trigger level is required. Note: Work on this initiative has not yet commenced. As the North American financial markets are very interconnected and the current market-wide circuit breakers are based on those in the US that are under review, IIROC will work with the CSA and will consult with both Canadian exchange market participants and US regulators on this issue.
The use of automated trading has increased the speed of trading, which has also increased the speed at which market prices and volumes change and has dramatically increased the amount of market data.	IIROC staff with the CSA should investigate whether single stock circuit breakers in the form of temporary trading halts should be implemented in Canada. Note: This initiative is currently under way. IIROC will soon be issuing a request for comments on a single stock circuit breaker proposal.
The current price volatility controls on market trading at the exchange market level do not work as effectively as they should in a multimarket environment.	The CSA and IIROC staff should ensure that all exchange markets adopt volatility controls. The form and level of these controls should be reviewed to assess the degree to which they ought to be harmonised. Note: The CSA and IIROC staff are currently examining the next steps for volatility controls in the context of an electronic trading rule, and will recommend an appropriate course of action.

[73] IIROC Review, *Review of the market events of May 6, 2010*, IIROC, 9 September 2010, p. 5, docs.iiroc.ca/DisplayDocument.aspx?DocumentID=C6CB526F93254DED9F4F98CDCB935FF3&Language=en.
[74] IIROC Review, *Review of the market events of May 6, 2010*, IIROC, 9 September 2010, pp. 23–25, docs.iiroc.ca/DisplayDocument.aspx?DocumentID=C6CB526F93254DED9F4F98CDCB935FF3&Language=en.

Conclusion	Recommendation
The use of stop loss orders without limits (i.e. stop loss 'market' orders) can have a very detrimental impact on investors in volatile markets and should be used with caution.	All IIROC dealers should consider how to effectively manage stop loss orders in the current high-speed, multimarket environment. IIROC should also provide its registered representatives and clients, including those which enter their orders directly onto the exchange markets without personalised advice, with guidance on how to use the stop loss orders in this environment. Note: IIROC will issue guidance to dealer members and investors on the appropriate use of certain order types in a multimarket environment. IIROC will host an educational seminar for investors and interested market participants to help them understand the challenges of trading effectively in the new market environment.
The events surrounding 6 May have underscored that the procedures for the cancellation and re-pricing of trades should be reassessed and made more transparent so that all market participants understand the process and the controls on this surveillance activity.	IIROC should review the current erroneous and unreasonable price policies and procedures, taking into account the experience of 6 May. Note: The review is currently under way and will be published for comment when completed.

Experience in Australia

111 In Australia, the ASX equity exchange market was closed during the 6 May disruption in the US East Coast time zone. When the market opened, as usual, it took a strong signal from the end-of-day close in the US, rather than from the intra-day trading. Local traders assumed that, to some extent, the precipitous intra-day fall was an error that appeared to have been resolved by end of business.

112 In contrast, the ASX 24 SPI 200 futures contract was available for trading in US hours and reacted with volatility, although not to the same extent—few traders were immediately affected. The ASX 24 did not have automated circuit breakers and did not suspend trading. Prices did not hit the ASX 24's threshold to trigger trade cancellations in the SPI 200.

113 In general, Australian markets have not experienced market dislocation in the order of magnitude on the scale of 6 May in the US. Nevertheless, some recent events in Australia have proven disruptive (Table 11).

Table 11: Extreme price movement events in Australia

Date of event	Description of event
July 2007	The SFE three-year bond futures and 90-day bank bill futures reacted extremely and in opposite directions due to a market participant misreading the quarterly CPI data and trading on it. SFE cancelled 337 trades. A number of market participants took legal action against SFE for losses sustained (total claim $861,150). The claim largely related to SFE's cancellation of one leg of spread orders. The court case concluded in October 2009 and the court found in favour of SFE.
July 2008	A 'fat finger' error resulted in QBE Insurance Group Limited (QBE) shares trading down from around $23 to $0.02 within minutes. All trades at and below $22.20 were cancelled.
December 2008	The SFE SPI 200 futures contract rallied 207 points and fell back 129 points moments before the close. No trades were cancelled. It rallied 381 points at the open the next day and fell immediately by 352 points. Some trades were cancelled.
March 2009	Another 'fat finger' error in QBE drove prices from $15.70 to $0.004. The market recovered in one minute. All trades at $15.00 and below were cancelled.

114 In Australia, volatile market situations and erroneous trades have been handled by ASX Group on a case-by-case basis.

(a) ASX has powers to take the actions it considers necessary to ensure that its markets are fair, orderly and transparent, including suspending or halting trading, and cancelling or amending a transaction.[75] It has issued guidance on how it will use its powers in relation to trade errors, error disputes and cancellations.[76]

(b) ASX has the same powers in relation to the ASX 24 market.[77] In addition, the approach to cancellations in the ASX 24 market is to set out three possible price ranges into which a trade may fall: the no cancellation range, the qualifying error range (cancellation with counterparty agreement) and the mandatory cancellation range. A trade falls within the mandatory cancellation range, suggesting a disorderly market has occurred, when the difference between its price and the relevant reference price exceeds certain pre-set parameters. In that case, ASX will proceed to cancel that trade subject to specific exemptions set out in the procedures.[78]

115 ASX and ASX 24 do not impose any automated circuit breaker or price limits on their markets.

[75] See ASX Operating Rule 3100.
[76] ASX Guidance Note, *Trade errors, error disputes, and cancellations* (Guidance Note No. 14), ASX Limited, 31 March 2010.
[77] See ASX 24 Operating Rules 3200–3250
[78] See ASX 24 Procedures 3200–3220.

116 In October 2010, ASX Group issued a consultation paper on proposed changes to the trade cancellation policies for ASX and ASX 24.[79]

117 ASIC undertook some informal soundings with the industry after 6 May, including with parties in the US and Canada. In Australia, we specifically questioned whether existing controls are adequate to deal with events such as the 6 May 'flash crash'. We found:

(a) strong support for order entry controls at the market operator level to screen anomalous orders;

(b) general support for automated measures to address extreme price movements, such as volatility interruptions or trading collars;[80] and

(c) market participants want certainty and transparency around trade cancellations.

[79] ASX Public Consultation, *Trade cancellation policy*, ASX Limited, 6 October 2010, www.asx.com.au/about/pdf/20101006_trade_cancellation_policy.pdf.

[80] Collars typically set price limits at which a 'limit down' is triggered, whereby the securities can only trade at or above that level for a period of time. Collars can limit the disruptive effect of anomalous trades.

E Issues arising from likely changes to Australian equity market structure

Key points

The structure of the Australian equity exchange market continues to evolve as the result of new execution venues and the increased use of technology, which have driven the need for incumbent execution venues to update their systems and become more efficient.

Algorithmic trading, including high-frequency trading (HFT), has grown rapidly in recent years and raises new areas of interest for regulators.

The existence of multiple execution venues creates a need for the development of a best execution rule to ensure clients receive the best possible outcome.

Pre-trade and post-trade transparency are central to the fairness and efficiency of a market, and can significantly affect confidence, liquidity and quality of price formation. There has been a growth in trading in dark pools and the use of dark orders on pre-trade transparent execution venues.

In a multi-venue environment:

- the development and provision of consolidated pre-trade and post-trade information is critical;
- pegged orders that reference another execution venue pose risks;
- all execution venues must trade at the same economically significant minimum tick size; and
- issues may arise if new entrants operate longer trading hours than ASX.

118 The way in which exchange markets operate has evolved considerably in recent years. Exchange markets are now overwhelmingly electronic. Technology has dramatically improved the speed, capacity, cost and sophistication of trading functionality available to firms (Table 12). Spurred by the increasing demand by customers for remote and off-shore access, the means of accessing exchange markets have also changed considerably.

Table 12: Impact of technology

Topic	Impact of technology
Execution venues	Technology has transformed execution venues, which have progressed from manual trading floors to primarily electronic trading systems for matching orders (the NYSE floor is one of the few remaining physical trading floors, and even this has been downsized in recent years). This transformation has also extended to other technology, such as order routers at execution venue levels, physical connectivity and server network capacity.
Market participants	Market participants have needed to continually develop their systems to accommodate improvements in technology. For example, order management systems (OMSs), which manage and track order status, and execution management systems (EMSs), which direct and route orders to the appropriate execution venue, have required continual updating. OMSs have been developed by buy-side to manage workflow, and are typically integrated into portfolio management functions. As electronic trading has become more prevalent and sophisticated, EMSs have been developed to enable traders to manage how their orders are routed across multiple venues, and also to provide more sophisticated tools, such as algorithms to 'piece out' large orders, as well as some trade analytics.
High-frequency traders (HFTs)	The proposed introduction of PureMatch will attract HFTs to the market. This will lead to: • smaller order sizes; • more orders per trade; • narrower spreads; • increased volumes; • greater emphasis on latency; • a demand for increased execution venue capacity; • enhanced co-location facilities; • new order types; and • an increased demand for direct electronic access (DEA), which will give rise to a need to further consider market participant risk controls. Institutional investors may also need to increase their use of dark pools and algorithmic trading strategies.
DEA and co-location services	The growing reliance on algorithmic and electronic trading has been facilitated by the provision of new technology in the forms of DEA and co-location services. These developments have helped reduce market latency and allow new trading strategies to develop. There is a trend for execution venues providing co-location services to house the co-location facility away from the execution venue in a remote area, often in a secure facility provided by a data centre vendor/provider, along with connectivity providers. These new facilities feature high security, including back-up power generators, security against bomb threats and enhanced data access connectivity.

Topic	Impact of technology
Explosion of market data	Growth in trading volumes and emphasis on speed, due to factors such as additional execution venues and the influx of HFTs, add to increased data traffic. This increases the importance of data and data management. It also leads to capacity challenges. Capacity for handling market data is becoming a critical and challenging issue for IT departments. A key issue is the ability to process more data in less time. For example, Canadian equity exchange markets have seen a dramatic growth in speed and volume of trading, spurred in large part by the advent of automated or algorithmic trading and HFT strategies:[81] • IIROC monitored over 262 million trades last year—nearly double the number seen just two years earlier. • There has been significant growth in 'messages', which include quotes, orders and cancellations in addition to trades themselves. Four years ago, Canadian equity exchange markets handled an average of 10 million messages per day. Today they regularly handle more than 180 million messages each day, and traffic hit a one-day record of more than 330 million in May 2010. Based on forecasts provided by market participants, Canadian equity exchange markets may see message volumes escalate as high as 725 million per day by mid-2011.
Order routing	The launch of new ASX execution venues has required, and will continue to require, investors and market participants to make order routing decisions. In addition to ASX's proposal to launch a smart order router (SOR), it is likely that larger market participants will develop their own SOR tools.
Integrated service providers	There is an increasing trend for platform providers to provide end-to-end solutions or the ability to integrate across siloed systems. Platform providers can integrate their systems with existing systems, enabling their customers to manage orders across disparate systems.
Multi-asset global execution venues	Providers of OMSs/EMSs now span multiple asset classes, providing trade execution capability not just for equities but also often managing orders for options, futures and fixed income. In addition, these providers will access global markets, providing market data as well as connectivity for execution in markets around the globe.
Middle/back office	As trading has become more complex, and executions take place across multiple execution venues, dealers and their service providers have struggled to reduce post-trade costs in a number of ways, including: • trade compression—group trades at price levels; • trade aggregation—grouping trades across markets; and • broker-neutral trade aggregation—aggregation of trades by buy-side clients across multiple market participants for single ticket allocations to the custodian.

[81] IIROC Media Release, *IIROC backgrounder: Surveillance Technology Enhancement Platform (STEP)*, IIROC, 29 September 2010, docs.iiroc.ca/DisplayDocument.aspx?DocumentID=E43068FDCBEF492BBFE7986CF390A8BF&Language=en.

New or enhanced equity execution venues

119 Technology has driven the need for incumbent execution venues to update their systems and become more efficient. This has been particularly evident where traditional execution venues have been dominated by manual trading floors or slow trading technology. Technology has created opportunities for new execution venues to emerge, specifically catering for different classes of investors. This has been facilitated by a range of regulatory changes which have been introduced by international regulators over the past decade or more.

120 ASX has developed a range of new execution venues. These are complemented by new and existing crossing systems. Chi-X (subject to approval) will also compete with these existing venues. It is likely that other new entrants will emerge over time. The growth in the number of execution venues raises issues that are pertinent to the discussion of equity exchange market structure.

121 New execution venues have also introduced new market structure characteristics. For example, a number of new venues have moved away from the fee-per-trade pricing model to a maker–taker structure. Maker–taker pricing means that traders posting limit orders in the market receive a rebate for providing liquidity, and traders demanding liquidity via market orders pay a fee. This has allowed a number of new venues to attract substantial liquidity and order flow—in part, by facilitating the growth of HFT. This incentive for order flow highlights potential conflicts of interest because firms may be placing their own interests, in terms of rebates from certain market venues, ahead of their client's interests in obtaining best execution. Therefore, when factors other than execution quality are the primary reason for choosing a market participant or market, the obligation to obtain best execution has been compromised.

Algorithmic trading

122 One of the most significant recent developments in Australian and global equity exchange markets has been the dramatic growth in automated electronic trading. Developments in technology and execution venues have facilitated this growth.

123 There is no commonly agreed definition of algorithmic trading. We have characterised it in this report as electronic trading whose parameters are determined by strict adherence to a predetermined set of rules aimed at delivering specific execution outcomes. These parameters may include any one or more of volume, price, instrument, market, type, timing and news.[82]

[82] ASX Review, *Algorithmic trading and market access arrangements*, ASX Limited, 8 February 2010, www.asx.com.au/about/pdf/20100211_review_algorithmic_trading_and_market_access.pdf.

124 Algorithms were developed for use by the buy-side to manage orders and reduce market impact. Initially, algorithmic strategies were fairly simple in their goals and logic.

125 Over time, algorithms have become much more sophisticated and now are typically used to implement strategies that endeavour to mask both trade intent and activity. A further evolution of algorithms includes intelligent logic that learns from market activity and adjusts the trading strategy of the order based on what the algorithm perceives is happening in the market. New algorithms have been developed for the buy-side that seek to protect their orders from being 'gamed' by other algorithms.

126 While there is no standard classification of algorithmic trading strategies, there appear to be three broad functions: trade execution, strategy implementation and stealth/gaming (Table 13).

Table 13: Broad functions of algorithmic trading strategies

Name	Description of strategy
Trade execution algorithms	Designed to minimise the price impact of executing trades of large volumes of products by 'shredding' orders into smaller parcels and slowly releasing these into the market. This can involve iceberging,[83] pegging[84] and pinging orders.[85]
Strategy implementation algorithms	Designed to read real-time market data and formulate trading signals to be executed by trade execution algorithms. This may involve automatically rebalancing portfolios when certain pre-specified tolerance levels are exceeded, searching for arbitrage opportunities, automatic quoting and hedging in a market maker-type role, and producing trading signals from technical analysis.
Stealth/gaming algorithms	Designed to take advantage of the price movement caused when large trades are filled, and also to detect and outperform other algorithmic strategies.

High-frequency trading

127 Specialised forms of high-speed algorithmic trading are emerging—that is, the use of high-speed computer programs to generate, route and execute orders. High-frequency trading (HFT) is a subset of this. While there is not a commonly agreed definition of HFT, it is characterised by:

(a) the generation of large numbers of orders, many of which are cancelled rapidly; and

(b) typically holding positions for very short time horizons (i.e. ending the day with a zero position).

[83] An order that only exposes a small amount of the total order volume, with the remainder of the volume undisclosed.
[84] A specified quantity of a security set to track the best bid–offer on the primary market.
[85] An order that is sent out, held for several nanoseconds and then withdrawn in a search for liquidity and iceberg orders.

128 HFTs employ high-speed, low-latency technology infrastructures:

(a) they process direct market feeds to have access to the fastest market information available;

(b) they co-locate their servers in the data centres with the exchange market's matching engine to reduce access times;

(c) they develop their own sophisticated trading strategies to trade on a short-term basis; and

(d) they typically end the trading day with no carry-over positions that use capital.

129 ASX has announced plans for a new, even faster execution venue, called 'PureMatch', which is designed for HFTs and other users of high-speed trading technology.[86] The types of entities that may use this venue include proprietary firms (e.g. GETCO), proprietary trading desks within a multi-service market participant (e.g. Goldman Sachs) and hedge funds (e.g. Renaissance Technologies).

130 HFTs use a variety of trading strategies—however, at a basic level, they can be broken into three broad categories (Table 14).

Table 14: HFT trading strategies

Name	Description of strategy
Statistical arbitrage	These strategies seek to exploit pricing inefficiencies either between related products or markets. For example, HFTs may look for changes in correlations between companies in the same industry 'pairs trading' or a derivative and its underlying asset 'cross-asset arbitrage', or they may look for discrepancies in a portfolio of stocks, such as the price of an exchange-traded fund (ETF) and the underlying basket of stocks comprising the ETF.
Electronic liquidity providers (ELPs)	This strategy involves making a two-sided market with a view to profiting by earning the bid–ask spread. Often, these HFTs will 'layer the book' by placing multiple orders on the bid and the ask side of the market at different prices. This results in the generation of large numbers of orders and cancellations. Unlike traditional market makers, ELPs have no formal market-making obligations. They typically enter and exit their positions over a very short time horizon (e.g. over seconds, milliseconds or even microseconds). This strategy has been facilitated by maker–taker pricing models (discussed later in this section), which offer rebates to traders providing liquidity through limit orders.

[86] ASX Market Announcement, *ASX fees and activity rebates*, ASX Limited, 3 June 2010, www.asx.com.au/about/pdf/20100603_asx_fees_and_rebates.pdf.

Name	Description of strategy
Liquidity detection	This strategy seeks to decipher whether there are large orders existing in a matching engine by sending out small orders, or 'pinging', to look for where large orders might be resting. Some liquidity detection strategies are described as 'predatory' in nature. These include: • *pinging*—sending out large numbers of small orders with the intention of getting a fill or to gain information about electronic limit order books; • *sniper*—an algorithm that tries to detect 'hidden' liquidity by trading in round or odd lots until it completes or reaches an investor's limit price; and • *sniffing*—used to 'sniff out' algorithmic trading and the algorithms being used by sending a small portion of an order and waiting to see if it is hit. Sniffers attempt to outsmart many buy-side algorithmic techniques, such as iceberging.

131 HFT potentially provides benefits, such as contributing to price formation, keeping prices similar between venues, the provision of liquidity and the tightening of spreads (although potentially with lower depth at the best prices). It also raises a number of important issues, including questions about:

(a) fairness—HFT's speed of access to markets and data compared with other investors;

(b) the impact of HFT's speed and volume of order entry and cancellation on price formation;

(c) HFT's impact on long-term investor confidence in markets;

(d) HFT's impact on data and data management costs; and

(e) the necessary risk controls.

132 HFT is being considered by regulators around the world.[87] The impact of HFT on market integrity is also on the agenda of the International Organization of Securities Commissions (IOSCO).

Short selling

133 HFTs utilise short selling of securities in all the strategies discussed above to differing degrees. Australia has had a ban on naked short selling since September 2008, with some exceptions. While HFTs are not dependent on the ability to conduct naked short selling, the restrictions on this practice may increase the costs of some trading strategies and, therefore, reduce the profitability of HFT strategies in Australia.

[87] SEC Concept Release, *Equity market structure* (Release No. 34-61358) SEC, 14 January 2010; CESR Call for Evidence, *Micro-structural issues of the European equity markets* (CESR/10-142), CESR, 1 April 2010.

Growth in HFT

134 HFT activity has grown rapidly in recent years. There are a range of factors that have contributed to this growth (Table 15).

Table 15: Factors contributing to growth in HFT activity

Factor	Description
Low-latency trading systems	HFT strategies are increasingly viable on low-latency execution venues. As new low-latency venues have entered the market, and incumbent exchange markets have upgraded their trading technology, HFT strategies have proliferated.
Maker–taker pricing	New entrants in the US and Europe have introduced new pricing structures for trading services. The 'maker' rebates render HFTs' electronic market-making strategies more profitable. HFT activity is believed to be particularly strong in markets that offer large rebates.
High liquidity/low tick sizes/small trade sizes	Given that the HFT strategies described above require quick trading and large volumes, HFTs are more likely to be active in highly liquid securities. HFTs manage their risk by trading in small size and prefer to trade in stocks where the minimum tick size is small so that they can place orders at each incremental tick. Small minimum tick sizes also create more arbitrage opportunities.
Competitive markets	Competition between markets has created opportunities for HFTs as competing venues have been forced to offer more attractive rebates to attract order flow. Competition also drives innovation in technology, data and new order types that are attractive to HFTs. Further, multiple venues create more opportunities for arbitrage.
Trade-through protection	In the US, HFTs have been aided by the trade-through protection mandated by Reg NMS. Electronic market-making strategies benefit from the protection offered to the limit orders they post in displayed markets. This may help to explain the significantly higher estimates of HFT numbers in the US compared with Europe.

Impact of HFTs on market quality

135 The impact of HFTs on market quality has been discussed in media commentary around the world.[88] Some of this debate is driven by unsubstantiated anecdotes and misinformation. In reality, gaining an accurate understanding of the impact that HFTs have had on market quality is made difficult by the lack of data that publicly identifies orders and trades from HFTs. This undoubtedly contributes to misinformation.

[88] See for example: C Duhigg, 'Senator wants restrictions on high speed trading', *New York Times*, 25 July 2009; SEC Concept Release, *Equity market structure* (Release No. 34-61358), SEC, 14 January 2010; J Grant, 'Regulator calls for 'sanity checks' on automated trade', *FT.com*, 7 October 2010, www.ft.com/cms/s/0/055de5b2-d224-11df-8fbe-00144feabdc0.html.

Liquidity

136 HFTs are believed to offer significant liquidity to the market. To some extent, they have replaced traditional market makers, such as the NYSE specialist and the Nasdaq market maker.[89] The limited empirical evidence available so far is positive:

(a) A study of spreads in NYSE-listed stocks comparing spreads pre and post introduction of Reg NMS shows that the reduction in spreads in NYSE 100 stocks, where HFT firms are most active, was much larger than the reduction across all NYSE stocks.[90]

(b) A study of algorithmic trading on the Deutsche Boerse shows that algorithmic traders play a significant role in the market. They represent approximately half of the trading volume and contribute significantly to price formation. They add substantial liquidity to the market—they are more likely to consume liquidity when it is cheap (i.e. spreads are tight) and provide liquidity to the market when it is expensive (i.e. spreads are large). The study also finds no evidence that algorithmic traders contribute to volatility beyond making price formation more efficient.[91]

(c) The launch of trading by Chi-X in Dutch index stocks in 2007 created an HFT-friendly trading environment. Unlike the incumbent exchange market, Euronext, Chi-X did not charge for limit order modification nor executions, and offered a rebate to limit order providers. A study of this event shows that the arrival of HFTs led to a 29% reduction in spreads and a 13% reduction in volumes.[92]

Price formation

137 While it is generally accepted that many HFT strategies provide additional liquidity (e.g. electronic market making and arbitrage strategies), the quality of the liquidity has been criticised. Quality in this sense relates to:

(a) *accessibility*—the duration for which the liquidity is available. It is claimed that HFT can result in flickering orders that are often gone before they can be acted on (e.g. 'phantom' orders);

(b) *availability*—the lack of HFT liquidity in volatile trading conditions. HFT was criticised after the 6 May 'flash crash' for withdrawing liquidity when it was most needed. However, non-HFT market makers

[89] In fact, one of the world's largest HFTs recently assumed formal market making responsibilities on the NYSE: K Peterson & J Bunge, 'High-frequency trader Getco becomes NYSE market maker, *Wall Street Journal*, 12 February 2010.
[90] S Poser, 'High-frequency trading helps narrow quoted spreads', Exchanges Blog, 19 August 2009, viewed 2 August 2010, exchanges.nyse.com/archives/2009/08/hft.php.
[91] T Hendershott & R Riordan, 'Algorithmic trading and information', NET Institute Working Paper No. 09-08, September 2009, www.netinst.org/NET_Working_Papers.html.
[92] B Jovanovic & A Menkveld, 'Middlemen in limit order markets', Working Paper, New York University, 2010, www.econ.yale.edu/seminars/macro/mac10/jovanovic-100914.pdf.

also withdrew liquidity, as evidenced by the volume of 'stub' orders ($0.01) that were hit;[93] and

(c) *size*—HFT orders are often very small in size. This may result in larger orders having to transact with many small orders, which may affect overall transaction costs. In the US and Canada, regulators have imposed a minimum order size (e.g. 100 units) to discourage orders from reaching an economically insignificant size.

138 The analytical research on HFT is still emerging but, at this stage, does not generally support these concerns. For instance, preliminary research by Brogaard (2010), examining a large data set of HFT firms trading on Nasdaq, found that HFTs add substantially to the price formation process. Among other findings, it appears that HFTs:

(a) tend to follow a price reversal strategy, driven by order imbalances, and so tend to stabilise prices;

(b) do not seem to systematically front-run non-HFTs;

(c) rely on a less diverse set of strategies than do non-HFTs;

(d) change trading levels only moderately as volatility increases;

(e) provide the best bid and offer quotes for a significant portion of the trading day, but only around a quarter of the book depth, as do non-HFTs; and

(f) do not seem to increase volatility, and may in fact reduce it.[94]

139 While not specifically focusing on HFT, research conducted by Hendershott and Riordan (2009) on the effect of algorithms on price formation appears broadly positive, and found:[95]

(a) that algorithmic traders' liquidity-demanding trades play a more significant role in discovering the efficient price than human trades, with algorithmic trades imparting 40% more information than human trades;

(b) that algorithmic traders' quotes also play a larger role in the price formation process than human quotes;

(c) that there is no evidence that algorithmic trading contributes to volatility; and

(d) on testing whether algorithmic traders could exacerbate volatility by not supplying liquidity when it dries up, that the opposite was true. (It

[93] 'Stub' quotes are quotes placed far from prevailing trading prices. They are not intended to be executed, but merely to fulfil the obligations of market makers in the US.
[94] J Brogaard, *High frequency trading and its impact on market quality*, Conference of Empirical Studies Selection, 16 July 2010.
[95] T Hendershott & R Riordan, 'Algorithmic trading and information', NET Institute Working Paper No. 09-08, September 2009, www.netinst.org/NET_Working_Papers.html.

should be noted that the study only considered a two-week period in January 2008—so there was no extreme volatility.)

140 These results are supported by Hendershott, Jones and Menkveld (2010), who found that, as algorithmic trading grows, liquidity improves—this is shown through reduced quoted and effective spreads. They also found that quotes become more informative.[96]

141 HFT may also be distorting price formation if it creates an incentive for natural liquidity to shift into dark pools as a way of avoiding transacting with ever-decreasing order sizes. However, there has been no documented empirical evidence so far to support the possibility of this distortion.

Indirect costs

142 The increased volume and speed of data generation stemming from the growth of HFT may overburden existing systems' capacity and encumber the analysis of market data—including by end investors who use analysis to make investment decisions.

143 This means that market operators, market participants (including their middle and back offices), investors, data vendors and other parties will need to review their business continuity planning regularly to cater for increases in order traffic.

144 Order proliferation may also make it more difficult and costly for regulators to monitor exchange markets and detect misconduct.

145 The increases in data and data management costs represent a negative externality for the market. This has led some to argue that there is a need for fees for message traffic or for excessive cancellations. However, intense competition for market share and on trading fees means that it is unlikely that market operators will voluntarily introduce these types of fees.

HFTs and 6 May 'flash crash'

146 There has been concern over the role of HFTs on the market disruption of 6 May in the US. Some commentators have suggested that HFTs might have been the main driver of the sharp decline in futures contract prices.

147 However, the report (already discussed and referenced in this paper) published by the US SEC and CFTC on 30 September[97] suggests otherwise. The report highlights that the market disruptions of that day started with high selling pressure spurred by investor concerns about the European debt crisis. These were then compounded when a large institutional investor chose to

[96] T Hendershott, C Jones & A Menkveld, 'Does algorithmic trading increase liquidity?', *Journal of Finance*, forthcoming.
[97] Joint Report, *Findings regarding the market events of May 6, 2010*, CFTC and SEC, 30 September 2010, www.sec.gov/news/studies/2010/marketevents-report.pdf.

implement a large sell order in the futures market to hedge its equities portfolio. It used an algorithm that limited selling activity to 9% of the volume of the previous minute—without any reference to prices or time. This single order equated to US$4.1 billion, or some 75,000 E-mini futures contracts. This is a very large single order, especially considering that the average trading for the entire market had been around 10,000 E-mini contracts per minute earlier that day.

148 As prices declined in response to selling pressure, HFTs began to buy contracts with a view to implementing their high-turnover strategies, providing liquidity to the sellers. At the same time, non-HFT players also took advantage of the depressed prices (to take a directional exposure on futures or to cross-arbitrage between futures and cash equities markets). The combined effect of this was higher volumes, which in turn allowed the sell algorithm to place even more sell orders. Only later did HFTs—which had accumulated substantial long futures positions—begin to sell on a large scale to reduce their net exposures. The result of all this activity was a sharp price decline in the futures markets.

149 The disruption quickly crossed over to cash equities because some traders feared that the market was reacting to some factor they had overlooked and decided to sell as a precaution. In addition, cross-market arbitrageurs that had bought futures contracts hedged their positions by selling in the cash markets.

150 We note that the UK Treasury has recently commissioned a study into HFT because of concerns that a computer-generated error could have significant impact on the economy.[98]

Direct electronic access

151 For this report, direct electronic access (DEA) refers to access to a market by persons that are not direct participants of an exchange market. This access may be either through the market participant's infrastructure or completely non-intermediated (i.e. unfiltered access). Either way, DEA clients are not directly bound by the operating rules of the exchange market that they are accessing. In this report, we do not intend DEA to include direct access by retail clients through online broking services. This is because access arrangements differ and because, in these circumstances, the market participant usually retains residual discretion.

152 DEA is attractive because it enables clients to transmit their orders directly to an exchange market, giving them greater control over their trading decisions and reducing latency. It also enables prospective market users (and

[98] J Grant, 'UK Treasury to probe high-frequency trading', *Financial Times*, 29 September 2010.

their liquidity) to access the market sooner than it might take for them to receive membership.

153 However, DEA has the potential to allow users to access markets outside of the infrastructure and control of market participants. This challenges market participants' traditional risk management approaches and may make rule compliance and monitoring more difficult. It can also challenge the ability of markets to maintain fair and orderly trading conditions.[99]

154 There are three key risks to market participants:

(a) trading risk—where clients' conduct may not be compliant with the market operating rules and the market participant is responsible for the compliance of that conduct;

(b) credit risk—because the market participant is typically financially responsible for the trades of a client; and

(c) reputational risk—because it is the market participant's name (and identifier) that is attached to each trade.

155 DEA poses risks to markets through the potential misconduct of a client or the aberrant systems of clients that result in disorderly trading conditions. Another challenge surrounds the supervision of DEA clients based in other jurisdictions because it is more difficult to take disciplinary action against these clients for misconduct or creating a disorderly market.

156 Events like 6 May in the US illustrate the need for robust DEA controls.

157 IOSCO recently published principles for direct electronic access to markets, which are designed to manage the potential risks associated with DEA.[100]

158 European and US regulators have also recently consulted on DEA.[101] The SEC noted its concern that market access is not being appropriately and effectively controlled by all broker–dealers. Naked sponsored access (unfiltered access) is very common in the US. One estimate of naked access suggests that it accounts for 38% of the average daily trading volume in US exchange markets.[102] The same study estimates that naked access allows HFTs to execute a trade in 250–350 microseconds, compared with 550–750 microseconds for orders being submitted by sponsored access. In an environment where speed is paramount, it is obvious why HFTs prefer to

[99] SEC Concept Release, *Equity market structure* (Release No. 34-61358), SEC, 14 January 2010.
[100] IOSCO Report, *Principles for direct electronic access to markets* (IOSCOPD332), Technical Committee of IOSCO, 12 August 2010.
[101] SEC Proposed Rule, *Risk management controls for brokers or dealers with market access* (Release No. 34-61379), US Securities and Exchange Commission, 19 January 2010; CESR Call for Evidence, *Micro-structural issues of the European equity markets* (CESR/10-142), CESR, 1 April 2010.
[102] S Lee, *Land of sponsored access: Where the naked need not apply*, Aite Group, 14 December 2009, www.aitegroup.com/Reports/ReportDetail.aspx?recordItemID=619.

use naked access. The SEC proposals would ban it and require that broker–dealers put in place minimum order entry controls.

Order entry controls

159 ASX does not permit unfiltered sponsored access. Market participants are ultimately responsible for all orders submitted through their access to exchange markets. Market participants must have adequate systems to accommodate client order volumes and have sufficient order entry controls. Table 16 provides a list of common order entry controls.

Table 16: Examples of order entry controls

Behaviour	Alerts
Marking the close	Alerts users to unusual increases or decreases in volumes in the last minutes of trading.
Potential ramping	Real-time alerts if execution of a series of trades over a short time period generates an unusual price movement given the trading history of the security.
Layering of bids/asks	Identifies concurrent orders, if a market participant is present in a bid or ask schedule with a number of bids or asks for the same client at different price levels; and identifies whether further inquiries may be warranted to determine whether each of the bids or asks are legitimate orders.
Wash trades	Real-time alerts to capture trades where the same client reference is on both the buy-side and sell-side of a trade.
Entry and deletion of orders at auction	Identifies entry of a bid/ask for significant order volume during the opening or closing auctions—followed by deletions shortly before commencement of the auction.
Entry and deletion of orders in continuous trading	Identifies when a bid/ask for significant quantity is entered at or close to priority—immediately following which, a substantial order is executed on the opposite side of the market—and then the original order is deleted.
Entry of high closing bid/low closing ask	Identifies small volume buy/sell orders which are entered in the last minutes of trading, which increase/decrease best bid/ask to price higher/lower than the last trade price—establishing a higher/lower closing price.
Giving up priority	Identifies when a market participant enters an order for a significant quantity at a price away from priority, then cancels the order and re-enters the order.
Ramping	Identifies the execution of a series of trades over a short time, which generates unusual price movement.
Spoofing	Identifies the entry of significant numbers or large volumes of orders at best bid or ask price, which are then deleted within seconds of entry.

Co-location

160 The importance of speed for HFTs means that these firms prefer to locate their servers close to the servers of the execution venue. Execution venues typically rent space to market participants to enable them to place their servers in close physical proximity to the venue servers. This minimises network and other types of latencies between the market participant and the venue.

161 Co-location has received considerable regulatory and public scrutiny in the US and other markets. Questions have been asked about whether this practice is discriminatory and whether co-location fees should be regulated. Specifically, the issue is whether it is appropriate that market participants that are utilising co-location facilities receive market data faster than participants that do not acquire this facility.

162 Co-location is the modern-day equivalent of a trading floor. In the past, those on the floor had faster access to the market than others; today, those co-located with the exchange market have faster access. Execution venues should be able to offer co-location services to their participants for a fee. However, fee schedules should be clear and transparent, and access should be available to all parties on a non-discriminatory basis. The CFTC proposed a rule to this effect in June 2010.[103]

Maker–taker pricing models

163 The maker–taker pricing model was first introduced by the Island ECN in the US in 1998. The 'maker' component of the pricing model involved paying a rebate to limit order traders to incentivise them to provide or 'make' liquidity. The 'taker' component was the fee charged to liquidity demanders or 'takers'. Island's profit was the difference between the fee charged to the liquidity taker and the rebate paid to the liquidity provider. This model has now become common in markets around the world.

164 Since the introduction of Reg NMS, there has been significant competition on pricing across different execution venues in the US. In 2008 and 2009, there were changes in pricing models on a monthly basis as execution venues sought to compete for market share. Some markets, such as BATS, temporarily offered an inverted pricing model where they paid more in rebates for liquidity providers than they charged for taking liquidity. Markets also frequently offered bigger rebates to traders with higher overall trading volumes. These changes were often aimed at capturing HFT business.

[103] CFTC Press Release, *CFTC proposes rulemaking regarding co-location/proximity hosting services*, CFTC, 11 June 2010, www.cftc.gov/PressRoom/PressReleases/pr5832-10.html.

165 High-rebate pricing models are attractive to HFTs that use electronic market-making strategies because they increase their gross margin. For example, consider a scenario where a high-frequency trader offers to buy 100 shares at $20.00 and offers to sell 100 shares at $20.01. If these orders are the best priced orders on the market, and are filled, the HFT trader has risked $2,000 in capital and captures a spread of $1.00, representing a gross margin of 0.05%. Assuming that the market offers a rebate of 0.25 cents per hundred shares (a typical value for a high-rebate market), the HFT trader captures this rebate on both sides of the trade, increasing its revenue to $1.50, or 0.075%.

166 Other pricing models are attractive for other types of HFT strategies. For example, Direct Edge's EDGA execution venue offers no rebate for makers and charges no fees to takers. This type of pricing model is likely to be the first destination considered by market participant algorithms, such as VWAPs, seeking cheap liquidity. Therefore, HFTs will also be willing to trade on these execution venues because they are likely to offer a high probability of trading with less informed investors and, therefore, the HFTs will be satisfied with earning only the spread. HFTs, like other traders or investors, want to avoid trading with informed traders to reduce the risk of the market moving against them after they enter into a position.

167 A number of market operators have chosen to offer multiple execution venues with different types of pricing models to attract different types of market participants. For example, NYSE Euronext offers a classic high-rebate/high-take structure on NYSE Classic and a low-take model on NYSE Arca to attract take-sensitive order flow. Nasdaq and Direct Edge also offer two different pricing models. While maker–taker pricing offers significant incentives for liquidity provision, therefore enhancing overall market liquidity, it has the potential to create distortions and inefficiencies in the market. The three main issues raised by maker–taker pricing models are the following:

(a) There is potential for a redistribution of wealth away from liquidity demanders to liquidity providers. Rosenblatt Securities estimates the total rebates paid in the US to be US$4.59 billion, with some 80% of this amount going to HFTs. This represents the costs paid by investors that demand liquidity.[104]

(b) In the US, maker–taker rebates and fees are typically absorbed by the market participant, rather than passed on to clients. This has the potential to create conflicts of interest, because market participants may choose to route their orders to the execution venue that generates the maximum rebate rather than the one that achieves the best outcome for their client.

[104] Rosenblatt Securities, Summary of 'An in-depth look at high frequency trading', *Trading Talk*, 30 September 2009, hft.thomsonreuters.com/files/2009/11/Rosenblatt-HFTexcerpt4Reuters2.pdf.

(c) Prices on execution venues are typically quoted gross of fees. This means that, if there is substantial variation in the fees charged across execution venues, the execution venue offering the 'best price' gross of fees may not be the 'best price' net of them. This may distort trading decisions. The potential for distortion will be particularly large if there is no cap on trading fees.

Market making without obligations

168 In US markets, official exchange designated market makers have historically played an important role in equity exchange markets. However, the GFC and the introduction of Reg NMS have significantly reduced the role played by these market makers. HFT firms have, to a large extent, replaced these official market makers, and yet have no formal obligations to make markets.

169 Australia does not have a tradition of official market making in equities, given the order-driven CLOB of ASX. However, consideration should be given to how HFT firms that act in a manner similar to market makers should be regulated.

170 Current regulations in Australia ban naked short selling, subject to certain exemptions. This ban will make it more difficult for HFTs to execute market-making strategies. Therefore, consideration should be given to whether or not HFTs should be exempt from such a ban, and what criteria should be used for determining whether or not particular HFTs should be awarded an exemption.

171 Following 6 May, HFTs were criticised for withdrawing from the market when liquidity provision was most needed. However, without formal market-making obligations, HFTs will naturally withdraw from the market when risks increase.

172 Three large HFT firms have recently proposed to the SEC a set of rules for firms that are acting as de-facto market makers.[105] For example, they proposed requiring market makers to provide quotes to buy or sell a stock no more than 10% above or below the current price.

Best execution

173 Best execution is a seemingly simple concept. Macey and O'Hara (1997)[106] state that it refers to market participants 'receiving the most favorable terms available for their trades'. Despite its simplicity, this has been a highly

[105] Getco, Knight Capital and Virtu Financial.
[106] J Macey and M O'Hara, 'The law and economics of best execution', *Journal of Financial Intermediation*, vol. 6, 1997, pp. 188–223.

contentious issue in exchange markets. For example, there is considerable debate about whether 'best execution' is 'best price' or whether it should incorporate other factors such as speed, size and probability of execution. Further, if it is best price, there is an unresolved issue of whether this best price is net or gross of fees.

174 The implementation of best execution rules can have a significant impact on the nature and impact of competition in execution venues. Examination of these alternative approaches provides insights into the pros and cons of alternative models. It is important to note that best execution rules must be determined in conjunction with data consolidation issues.

175 Best execution is an important investor protection mechanism. Its purposes are to:

(a) ensure that firms do not place their own interests ahead of those of their clients (e.g. by exploiting information asymmetries between themselves and their clients);

(b) ensure that clients receive the best possible outcome; and

(c) promote market efficiency, more generally, by ensuring that orders are directed to the most efficient venue.

176 Although best execution is not dependent on a multimarket environment, it becomes more important with multiple exchange markets, because firms have more choice about where and how they execute client orders. See CP 145 for more detail.

177 For a range of reasons, a market participant may have incentives that differ from the client's and, therefore, may not send the order to the venue that offers the best outcome for the client.

178 While firms are subject to obligations to avoid conflicts between their interests and those of their clients, we believe it is important that they are subject to a clear, objective rule in relation to dealing on behalf of their clients.[107] It is also important that clients have access to information that allows them to assess whether a firm has satisfied its best execution obligation.

179 On the face of it, best execution provisions in place overseas appear to be broadly alike (Table 17). Best execution provisions overseas all tend to require broker–dealers (not just market participants) and fund managers to take reasonable steps to execute client orders on terms most favourable to the client.

[107] J Macey & M O'Hara, 'Best execution regulation: From orders to markets', *Journal of Financial Transformation*, vol. 13, 2005, pp. 43–55. This article describes a case where Knight Securities LP defrauded its institutional customers by extracting excessive profits and failing to meet its duty to provide best execution.

Table 17: Best execution—Approaches in overseas jurisdictions

Jurisdiction	Broad approach
US	Seeks most favourable terms reasonably available under the circumstances for a customer transaction.
Canada	Diligently pursues the execution of each client order on the most advantageous terms for the client as expeditiously as practicable under prevailing market conditions.
Europe	Takes all reasonable steps to obtain the best possible result for client orders.

180 Despite the similarities of these approaches, there are vast differences in their implementation. In the US (and soon Canada),[108] the best execution rule is overlaid with a 'trade-through' obligation, which results in a 'best price' outcome; while in Europe, MiFID imposes a principles-based model, which enables firms to take account of factors other than just price.

'Trade-through' model—protecting best bid and offer

181 A 'trade-through' rule protects pre-trade transparent orders from being bypassed. It requires operators of execution venues to route orders to the market with the best displayed bid or offer. In practical terms, it embeds price–time priority across multiple pre-trade transparent execution venues, as 'broker–dealers' must execute against the best price or offer price improvement.[109] This is the same basis on which trades are executed on ASX's CLOB, subject to the exceptions for crossings. Price–time priority plays an important role in the fair, orderly and transparent operation of markets by:

(a) encouraging the display of limit orders, which should increase liquidity and contribute to price formation. Trades at prices that are inferior to displayed limit orders may discourage investors from displaying orders if they believe it is likely that such orders will be bypassed; and

(b) ensuring the fair execution of orders.

182 By their nature, such rules require that marketable orders will receive at least the best price displayed on any market.[110] In terms of best execution, a 'trade-through' rule means that, when a market participant chooses to route a client order to an execution venue, it must do so on the basis of best price.

[108] Trade-through rule is due to be implemented in Canada in February 2011. The Order Protection Rule, National Instrument 23-101 *Trading Rules*, (2010) 33 OSCB 787, 22 January 2010, www.osc.gov.on.ca/documents/en/Securities-Category2/rule_20100122_21-101_amd-21-101and23-101.pdf.

[109] We note that in the US where markets are able to trade at the best price on another market, time priority is not always achieved on a cross-market basis. The SEC is consulting on prohibiting 'trading at' the same price as the best bid or offer to embed both price and time priority: see SEC Concept Release, *Equity market structure* (Release No. 34-612258), SEC, 13 January 2010, p. 27.

[110] SEC Concept Release, *Equity market structure* (Release No. 34-61358), SEC, 14 January 2010, p. 27.

183 In the US, trade-through protection applies to the single best bid and offer (i.e. top-of-book protection). This rule (known as the Order Protection Rule, which forms part of Reg NMS) effectively creates an obligation to favour price over other factors. 'Broker–dealers' must execute any orders at a price at least as favourable as the broker–dealer's published bid or offer in any amount up to its published quotation size. There are several exceptions to the limit order display rule (Exchange Act Rule 11Ac1-4)—for example, for block trades over $200,000, or 10,000 shares, or the client may request that its order not be displayed.

184 To give effect to this rule, market centres[111] (including exchange markets, alternative trading systems (ATS) and OTC internalisers) are connected to one another and must have in place procedures reasonably designed to prevent trade-throughs. They must be able to route orders to the market centre displaying the best price at the time the order is received. Market participants typically also have their own order routers.

185 In its January 2010 concept release on equity market structure, the SEC raised the question of whether it should extend the protection to the full depth-of-book (i.e. all displayed prices) rather than the current top-of-book protection.[112] The SEC also questioned whether there should be a 'trade-at rule', which would prohibit any trading centre from executing an order at the same price as the national best bid and offer (NBBO) (i.e. it would need to improve on price).[113] This would provide time priority across markets. Final rules have not yet been made—however, the overwhelming response to these proposals, via comment letters to the SEC, has been that they would have significant negative implications for market quality.

186 In Canada all bids and offers are protected.[114] Market participants must make reasonable efforts to ensure client orders are executed at the best price.[115] Market participants are able to trade OTC but if the order is in sizes of 5,000 shares or below, they must improve on the displayed best price. This best price rule will be replaced on 1 February 2011 with a trade-through rule applied to market operators.[116] This would oblige market operators to be

[111] A market centre is 'any exchange market maker, OTC market maker, alternative trading system, national securities exchange, or national securities association'. An exchange market maker is defined as 'any member of a national securities exchange that is registered as a specialist or market maker'. An OTC market maker is defined as 'any dealer that holds itself out as being willing to buy from and sell to its customers, or others, in the United States, a national market system security for its own account on a regular or continuous basis otherwise than on a national securities exchange in amounts of less than block size'. Block size is US$200,000 or 10,000 shares.
[112] SEC Concept Release, *Equity market structure* (Release No. 34-61358), SEC, 14 January 2010.
[113] The NBBO is the best bid and best offer across all markets. The best bid and offer may be available on different platforms.
[114] The Order Protection Rule, National Instrument 23-101, *Trading Rules* (2010) 33 OSCB 787, 22 January 2010, www.osc.gov.on.ca/documents/en/Securities-Category2/rule_20100122_21-101_amd-21-101and23-101.pdf.
[115] IIROC Universal Market Integrity Rules 5.1 and 5.2, www.iiroc.ca/English/ComplianceSurveillance/RuleBook/Pages/UMIR.aspx.
[116] CSA Staff Notice, *Frequently asked questions about the Order Protection Rule and internationally locked or crossed markets—Part 6 of National Instrument 23-101 and Related Companion Policy* (23-309), Canadian Securities Administrators (CSA), 25 June 2010.

connected to one another, and to route orders to the market with the best price, as per the US model. However, unlike the US model, it will be full depth-of-book protection, meaning that all orders will be protected from trade-through.

187 A summary of aspects of the model is shown in Table 18.

Table 18: Trade-through model—Advantages and disadvantages

Advantages	Disadvantages
• The model reduces the firm's discretion on the choice of execution venue and, therefore, minimises the potential for conflicts of interest in filling orders. This should increase investor confidence, because it helps eliminate any perception of unfairness when an investor's order executes at a price that is inferior to the best displayed price, or when a trade occurs at a price that is inferior to the investor's displayed orders. • The model ensures execution priority for investors that are willing to expose their limit orders to the market. This protection is designed to encourage investors to post limit orders in the market, therefore enhancing liquidity. However, there is little empirical evidence to support the assumption that trade-through prohibitions in fact lead to an increase in limit order placements.[117]	• The model restricts the prices at which investors are able to trade, therefore representing a form of price control. It mandates that price is the most important criteria for all investors, which is not always the case. Some investors may be prepared to pay a premium to have a single fill or to execute quickly. Trade-through rules deny this choice, instead requiring that displayed orders be filled first. • The mandated linkages between markets required to operationalise a trade-through rule can be costly. Stoll (2001) argues that regulatory mechanisms designed to link execution venues potentially stifle competition and innovation by requiring that all markets conform to the linkage mechanisms.[118] Further, such links may fail in the longer term because there is little incentive for individual venues to enhance the quality and efficiency of these linkages. • In Canada, with full depth-of-book protection, large negotiated trades must be executed in the context of the NBBO, or trade with every displayed order up to the agreed price, which can result in higher overall transaction costs and may result in information leakage. It is possible that technology costs may increase because market participants have to scan the full book in every market before executing a trade. • Best price does not always result in the best overall cost outcome because there are differences in market pricing models. The SEC has tried to address this by capping market fees at US$0.30 per trade. However, there are still differences in incentives and rebates. Without a cap on trading fees, a best price rule based on gross, rather than net, prices is likely to lead to distorted outcomes.

[117] T Hendershott and C Jones ('Trade-through prohibitions and market quality', *Journal of Financial Markets*, vol. 8, 2005, pp. 1–23) found that relaxing the trade-through prohibition in three actively-traded ETFs did not adversely affect market quality. Further, prior to the introduction of Reg NMS, the Nasdaq did not have a trade-through rule and significant liquidity was still offered on this market. In contrast, AJ Menkveld and T Foucault ('Competition for order flow and smart order routing systems', *Journal of Finance*, vol. 63(1), 2008, pp. 119–158) found that higher rates of trade-throughs in new entrant markets in Europe coincided with less liquidity provision in these stocks.

Principles-based best execution obligation

188 A principles-based obligation permits market participants to take into account a range of factors (e.g. speed and likelihood of execution) and not just price[119] when executing client orders. This is the approach adopted under MiFID in Europe. For retail clients, the European Commission has clarified that the 'total consideration' received or paid by a client is the most important factor.[120] Total consideration is interpreted as price and the costs related to execution, including venue fees, clearing and settlement fees, and any other fees paid to third parties involved in the execution of the order.

189 This type of model places the obligation on market participants to ensure they are connected to appropriate venues, whereas the trade-through rule places the obligation on exchange markets to connect. In Europe, this has been achieved by SORs, which is the mechanism by which 'investment firms' connect to execution venues and route orders to the venue that best achieves predetermined parameters (e.g. price or market impact). Market participants are not required in Europe to connect to all execution venues and there has been some commentary about MiFID not delivering best price for investors.[121]

190 SORs are also used in the US as an order routing tool.

191 A summary of aspects of the model is shown in Table 19.

[118] H Stoll, 'Market fragmentation', *Financial Analysts' Journal*, vol. 56, 2001, pp. 16–20.
[119] Directive 2004/39/EC Markets in Financial Instruments Directive, Article 21, eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2004:145:0001:0044:EN:PDF.
[120] European Commission Directive 2006/73/EC Implementing MiFID, Article 44, eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2006:241:0026:0026:EN:PDF.
[121] For example, European Commission conference, *MiFID: One year on*, Brussels, 13 November 2008, http://ec.europa.eu/internal_market/securities/docs/isd/conference-summary_en.pdf.

Table 19: Principles-based model—Advantages and disadvantages

Advantages	Disadvantages
• Investors—particularly institutional investors—care about a range of factors other than just price. For example, an investor seeking to buy a large parcel of shares may be happy to trade off price for execution certainty and quick execution. A principles-based model enables investors to evaluate these trade-offs and then route orders to the venue that best caters for their needs. • There is a significant body of academic research that shows that large trades benefit from alternative trading mechanisms that allow them to execute at prices away from the current best price in the market. In the Australian context, Fong, Madhavan and Swan (2004)[122] show that the upstairs market for large trades, which allows trades to occur away from the best price, is complementary to the limit order book and that this mechanism allows large traders to achieve lower cost executions without having an adverse influence on overall liquidity. • Competition in overseas markets has been characterised by the growth of new venues offering a range of different trading technologies catering to different types of investors. For example, in overseas markets, Chi-X has focused on delivering a low-latency product, and Liquidnet has focused on facilitating large block trades. A principles-based model fosters innovation and system development, rather than forcing uniformity on all execution venues.	• If an investor chooses execution criteria other than price, limit orders that are in the book may be traded through. Therefore, being the best priced limit order in the book does not guarantee that the order will be executed. The risk is that this may discourage limit order placement and reduce liquidity. However, as outlined already, there is little empirical evidence to suggest this is a real problem. • Adopting a principles-based approach to best execution creates more discretion, therefore increasing the potential for agency problems between firms and their clients. It is important that clients are able to effectively assess their firms' execution performance—for example, their best execution policies and routing decisions. This requires that investors are able to access appropriate data and post-trade analytical tools. • A principles-based model also increases the potential for other conflicts. For example, in overseas markets, some execution venues have offered 'payment for order flow,' which means the firm receives compensation for directing orders to that venue. Under this model, it is important that inducements are either disclosed or passed on to the client. • Since MiFID was implemented in November 2007, European investors have questioned certain aspects of the best execution regime.[123] It has been argued that some markets are consistently providing better prices but that orders are frequently not being routed to those markets. Others claim that they are receiving a better outcome as a result, based on an assessment of factors other than price.

Current provisions in Australia

192 While there is not currently an explicit best execution obligation in Australia, Australian financial services (AFS) licensees must provide financial services efficiently, honestly and fairly and must manage conflicts of interest (s912 of the *Corporations Act 2001*). Additionally, execution on ASX is based on price–time priority, and market participants of ASX are obliged to act fairly and in due turn when dealing with client orders and to allocate transactions fairly: see ASIC Market Integrity Rules (ASX Market) 2010 Rules 5.1.3 and 5.1.5.

[122] K Fong, A Madhavan & P Swan, 'Upstairs, downstairs: Does the upstairs market hurt the downstairs?', Working paper, University of New South Wales, 14 April 2004.
[123] FSA Report, *MiFID supervisory priorities: Results of wholesale thematic review*, UK Financial Services Authority (FSA), January 2009, www.fsa.gov.uk/pubs/international/mifid_sup_priorities.pdf.

Proving quality of execution

193 For best execution rules to be effective, investors have to be able to obtain data to measure and verify the quality of their executions. This is particularly important where a principles-based best execution rule is applied. Investors need to be able evaluate the trade-off between different dimensions of execution quality, including price, speed, size and probability of execution.

194 In the US, the SEC introduced Rules 605 and 606 in 2000 to require mandatory and standardised public disclosure of order execution quality, and to promote visibility and competition on the part of market centres and broker–dealers (Table 20). Reporting requirements similar to Rule 605 have been proposed by the Canadian regulators[124] and, more recently, by the Committee of European Securities Regulators (CESR).[125]

Table 20: SEC Rules 605 and 606

Rule	Description
Rule 605 Monthly reporting by market centres	Under Rule 605, market centres that trade Reg NMS securities are required to make monthly electronic disclosures of information regarding execution quality on a stock-by-stock basis. An entity that acts as a market maker in different execution venues (e.g. as a specialist on a market exchange and as an OTC market maker) is considered to be a separate market centre for each execution venue. Rule 605 addresses liquidity measures, trading statistics, speed of execution, and certainty of execution. It includes: • the number of orders cancelled prior to execution and the number of orders executed; • the speed of execution; • realised and effective spreads; • the extent to which orders are executed with price improvement; • the extent to which orders are executed outside the quote; and • the extent of the price shortfall relative to the quote.
Rule 606 Quarterly reporting by broker–dealers	Rule 606 requires all broker–dealers that route orders in equity and option securities to make publicly available, on a quarterly basis, a report on their order-routing practices. The report must identify the significant venues to which customer orders are routed for execution, and disclose the material aspects of the broker–dealer's relationship with those venues.

[124] The Canadian regulators have considered a rule similar to Rule 605 in the past and have put it on hold; they continue to view that this information is important to provide tools for assessing and complying with the best execution obligation. Proposed Amendments to NI 21-101 Marketplace Operation and Companion Policy 21-101CP, (2007) 30 OSCB (Supp-3), 20 April 2007, www.osc.gov.on.ca/documents/en/Securities-Category2/rule_20070420_21-101_pro-amend.pdf; Amendments to National Instrument 21-101 Marketplace Operation, (2008) 31 OSCB 10136, 17 October 2008, www.osc.gov.on.ca/documents/en/Securities-Category2/rule_20081017_21-101_amd-21-101and23-101.pdf; Notice of Proposed Amendments to National Instrument 21-101 Marketplace Operation and National Instrument 23-101 Trading Rules, (2008) 31 OSCB 10033, 17 October 2008, www.osc.gov.on.ca/documents/en/Securities-Category2/rule_20081017_21-101_noa-21-101and23-101.pdf.

[125] CESR Technical Advice, *CESR technical advice to European Commission in the context of the MiFID Review: Equity markets* (CESR/10-802), CESR, 29 July 2010.

195 The reports must be uniformly disseminated to the public in a file downloadable from the internet. The report must be available within one month after the end of the month addressed in the report.

196 Studies have shown that these reports have exerted a positive impact on market quality (i.e. contributing to tighter spreads), and that execution venues reporting low execution costs and fast fills receive more order flow.[126]

Studies on SEC Rules 605 and 606

Boehmer, Jennings and Wei[127]

197 The study investigated whether brokers and traders use Rule 605 data in order-routing decisions. It showed that market centres reporting low execution costs and fast fills receive more order flow in subsequent months. The authors concluded that public disclosure of execution quality promotes competition for order flow.

198 The authors also examined the influence of Rule 606 data on order-routing behaviour. They found results consistent with brokers increasingly exploiting the decision to route orders to different venues. For example, they found an increase in the average number of trading venues used by brokers and an increase in the volatility of order-routing relationships (i.e. increased variation in the market share executed at each venue).

Zhao and Chung[128]

199 The study examined whether execution costs differ significantly between the pre- and post-Rule 605 periods. It compared the effective, quoted and realised spreads before and after implementation of the rule, using data on NYSE, AMEX, and Nasdaq stocks included in the execution quality report. In addition, it examined how Rule 605 has affected the quoted depth of NYSE and AMEX stocks.

200 The authors conjecture that greater competition for order flow (via execution quality) increases market centres' incentives to improve execution quality. Knowing that their execution quality for month *t* will become public information and better quality will bring more order flow, liquidity providers in each market centre have an incentive to improve their execution quality

[126] For example: X Zhao & KH Chung, 'Information disclosure and market quality: The effect of SEC Rule 605 on trading costs', *Journal of Financial and Quantitative Analysis*, vol. 42, 2007, pp. 657–82 and E Boehmer, R Jennings & L Wei, 'Public disclosure and private decisions: The case of equity market execution quality', *Review of Financial Studies*, vol. 20, 2007, pp. 315–58.
[127] E Boehmer, R Jennings & L Wei, 'Public disclosure and private decisions: The case of equity market execution quality', *Review of Financial Studies*, vol. 20, 2007, pp. 315–58.
[128] X Zhao & KH Chung, 'Information disclosure and market quality: The effect of SEC Rule 605 on trading costs', *Journal of Financial and Quantitative Analysis*, vol. 42, 2007, pp. 657–8.

for month *t*, despite the fact that execution quality for month *t* will be available to market participants only by the end of month *t+1*.

201 The results from the study show that, for the NYSE study sample, the average effective and quoted spreads declined by more than one and two cents, respectively, after implementation of Rule 605 (i.e. a 20% reduction in spreads). Although the quoted depth of NYSE stocks also declined, overall market quality is higher after implementation of the rule because the increase in liquidity associated with narrower quoted spreads is greater than the decrease in liquidity associated with smaller depths. The authors also found significant reductions in the AMEX and Nasdaq spreads.

202 Based on the results, the authors concluded that Rule 605 has exerted a positive impact on market quality and, thus, the SEC's goal to improve execution quality through more transparent markets has been achieved—that is, organisations generally perform better when they are closely monitored and their performance is disclosed. Knowing that their execution quality will become public information, and also that better execution quality can bring order flow, liquidity providers have an incentive to improve execution quality.

203 Although the study did not include the SEC Rule 606 reports, the authors commented that the implementation of SEC Rule 606, which was implemented at the same time as Rule 605, could have exerted complementary impacts on certain dimensions of market quality.

SEC analysis of Rules 605 and 606

204 The SEC produced a cost–benefit analysis of Rules 605 and 606 when it published the final rules[129] (Table 21).

[129] SEC Final Rule, *Disclosure of order execution and routing practices* (Release No. 34-43590), SEC, 17 November 2000.

Table 21: SEC cost–benefit analysis of Rules 605 and 606

Rule	Benefits	Costs
Rule 605 Monthly reporting by market centres	The SEC formed the view that the rule would bring benefits to broker–dealers and to investors. Broker–dealers would be better able to fulfil their best execution obligation, while investors would be better able to have meaningful input into how broker–dealers execute their orders. The SEC believes the rule will have the additional benefit of stimulating competition between market centres to improve the quality of their executions, given that market centres will seek to attract order flow by providing—and developing a reputation for providing—superior executions. Ultimately, the SEC believes the improvements in execution will benefit investors by leading to: • reduced trading costs; • increased trading quality; and • possible increases in trading volume.	SEC staff estimated the annual cost of compliance with Rule 605 at approximately US$21.8 million per year (comprising labour costs at the market centres for data collection and the costs of services provided by data vendors to generate the required reports).
Rule 606 Quarterly reporting by broker–dealers	The SEC formed the view that improved disclosure of order routing practices would: • result in better-informed investors; • provide broker–dealers with more incentives to obtain superior executions for their customer orders; and • thereby increase competition between market centres to provide superior executions.	SEC staff estimated the annual cost of compliance with the quarterly reporting requirement under Rule 606 at approximately US$6.4 million per year. In addition, they estimated the annual cost of compliance with the customer response requirement at approximately US$7 million per year.

205 The SEC's recent concept release[130] discussed the Rule 605 and Rule 606 order execution reports, and requested comments about whether Rules 605 and 606 should be updated to provide more useful information for investors and their brokers.

206 Many respondents to the SEC's concept release[131] noted that these reports:

(a) provide an important insight into execution quality;

(b) have led to improved and more consistent competition; and

(c) have been valuable comparative tools.

[130] SEC Concept Release *Equity market structure* (Release No. 34-61358), SEC, 14 January 2010.
[131] US Securities and Exchange Commission, 'Comments on File No. S7-02-10', www.sec.gov/comments/s7-02-10/s70210.shtml.

Some suggested that the reports should be updated to reflect finer time increments (e.g. milliseconds), provide an insight into non-pre-trade transparent orders and capture large transactions.

207 In an Australian context, these types of reports would not only allow investors to evaluate the quality of execution, but should also allow investors to evaluate the trade-off between different elements of execution quality, including price, speed, probability of execution and size.

Transparency

208 Transparency is defined as the ability of market participants to observe information about the trading process. There are two components of transparency: pre-trade and post-trade, each with specific features (Table 22).

Table 22: Transparency characteristics

Component	Description
Pre-trade transparency	Information on bids and offers are made publicly available before a trade occurs. This information can include: • the current best bid and ask price; • the depth of orders available at this price; • price and volume details of orders away from the best prices; • venue identification; and • market participant identification. Exchange markets differ in the levels of pre-trade transparency that are provided.
Post-trade transparency	Information is displayed after a trade takes place. This information includes: • price; • volume; • execution time; • report time; and • execution venue. In some exchange markets, there are delays in the display of post-trade information for certain types of trades.

Current transparency regime in Australia

209 ASX is a highly transparent market, both pre-trade and post-trade. Generally, the full depth of the order book is available to the market and trades are reported to the market immediately. The features of the current regime are outlined in Table 23.

Table 23: Current transparency regime in Australia

Component	Description
Pre-trade transparency	ASX requires orders to be displayed on the CLOB unless they fall within one of its exemptions, which include: • undisclosed orders—an exemption to disclose the volume of the order where the order involves a minimum value of $500,000;[132] • on-order book priority crossing—an on-order book crossing where an order can be executed at any size at or within the spread;[133] • block special crossing—an off-order book crossing where the resulting trade has a minimum value of $1 million;[134] • facilitated special size block special crossings;[135] • portfolio special crossing—an off-order book crossing where: – the broker acts as agent for both buyer and seller of the portfolio or, as principal, buys from or sells to the client; – the portfolio is made up of a number of purchases and/or sales of different equities; – the portfolio has a minimum aggregate size of $5 million; and – there are at least 10 purchases and/or sales of different equities with a minimum value of $200,000;[136] and • orders executed outside normal trading hours.[137]
Post-trade transparency	ASX makes information about transactions executed on its market public immediately and requires that its participants that trade off-order book also report immediately—or at least within 30 seconds.[138] Market participants are entitled to a delay for facilitated specified size block special crossings (i.e. for transactions above $15 million, $10 million $5 million or $2 million, depending on the security). In these circumstances, there is a delay prior to the opening on the next day for trades executed before 1 pm, and before 1 pm the next day for trades executed after 1 pm.[139] There is also a delay permitted for certain portfolio transactions. In these circumstances, there is a delay until prior to the opening on the next day for trades executed before 1 pm, and before 1 pm the next day for trades executed after 1 pm.

[132] ASX Operating Rule 4023 and Procedure 4023.
[133] ASX Operating Rule 4060 and Procedure 4060(1).
[134] ASX Operating Rules 4810, 4811 and Procedure 4810(2).
[135] ASX Operating Rules 4810, 4811 and Procedure 4810(2).
[136] ASX Operating Rules 4810, 4811 and Procedure 4810(3).
[137] ASX Operating Rule 4060 and Procedure 4060(4).
[138] ASX Operating Rule 3500.
[139] ASX Operating Rule 4810 facilitated specified size block special crossing and 4810 portfolios.

Why is transparency important?

210 Pre-trade and post-trade transparency are central to the fairness and efficiency of a market. Transparency has a significant impact on confidence, liquidity and quality of price formation.[140]

211 Publicly available information on bids and offers enables investors to identify trading opportunities and reduce the costs associated with finding liquidity. Transparency also contributes to investor confidence, therefore encouraging higher levels of participation in the market. This, in turn, increases liquidity and reduces market-related trading costs.

212 Pre-trade transparency is also imperative for efficient price formation. Private information is incorporated into prices through trading by informed traders. It is important that other investors observe this process to ensure that they adjust their trading behaviour to reflect this new information. If the trading process is not transparent, prices will be inefficient.

213 Academic evidence shows the importance of transparency to the price formation process. A study of trading on ASX in March 2000 shows that the display of the best bid and ask prices accounts for about 55% of the price formation. The depth of the order book is also valuable, with the orders between the second to tenth best prices accounting for around a further 23% of the price formation. The balance of the price formation comes from the post-trade display of trade prices.[141]

214 In markets with multiple execution venues, transparency is arguably even more important than in markets with a single execution venue. Where liquidity is fragmented across multiple venues, transparency is essential to ensure that investors are able to obtain a consolidated view of the multiple sources of liquidity. This allows investors to more efficiently search for and access liquidity. Consolidated information also allows issuers to monitor trading activity in their stocks.

215 Despite the benefits of transparency, there are some circumstances where too much transparency can adversely affect a market and the trader in terms of price volatility and higher execution costs. For example, if a large order is exposed to the market, this can result in significant price movements, where other investors act on the information and the price moves against the original order before it is filled. Alternatively, where a market participant has provided facilitation capital for a large institutional order, immediate disclosure of this trade may result in the market moving against the market participant before it is able to unwind its position. As a result, market

[140] IOSCO Report, *Transparency and market fragmentation* (IOSCOPD124), Technical Committee of IOSCO, November 2001.
[141] C Cao, O Hansch & X Wang, 'The information content of the open-limit order book', *Journal of Futures Markets*, vol 29(1), pp. 16–41.

participants may be less willing to provide facilitation capital. In these types of situations, exceptions to pre-trade and post-trade transparency are necessary.

216 Disclosure of volumes and price information about completed trades (post-trade transparency), like pre-trade transparency, contributes to price formation. But, importantly, post-trade transparency is an input to enable investors to assess execution quality and is an important component for transaction cost analysis.

217 It is important that post-trade transparency arrangements are harmonised across markets to prevent the possibility of regulatory arbitrage.

What is 'dark' liquidity?

218 Dark liquidity refers to orders and quotes that are not pre-trade transparent. Dark liquidity has existed for a long time, but the term itself is relatively new. Markets have historically provided a range of dark trading mechanisms to allow investors to execute trades without exposing their trading interest to the market. For example:

(a) bilateral negotiated transactions (i.e. 'upstairs' or OTC market);

(b) internalisation which occurs when market participants execute client orders against the market participant's own account or other client orders without exposing the orders to the public market (this is another form of OTC trading); and

(c) undisclosed or hidden orders on a pre-trade transparent execution venue. These orders interact with displayed orders but are non-transparent pre-trade.

219 Historically, dark liquidity has been limited to market participants dealing in large trade sizes. When large orders are displayed to the market, it creates the potential for imitation, front-running or quote-matching by opportunistic traders. This can result in unnecessary market volatility and increased trading costs for large traders. Dark liquidity reduces the possibility of having strategies leaked, allowing large traders to execute these trades more effectively.

220 More recently, dark liquidity has become more extensive. Regulations in the US and Europe have also allowed for the creation of new execution venues operating without any pre-trade transparency. These are referred to as dark pools. There has also been a growth in the use of dark orders on pre-trade transparent execution venues (referred to in this report and CP 145 as undisclosed orders). Dark pools and undisclosed orders are discussed separately below.

Dark pools

221 New technologies and trading strategies have made it more efficient to execute transactions without transparency. This has resulted in significant growth in the number of dark pools, which can be categorised as electronically accessible pools of non-transparent liquidity. Dark pools operate a range of different models. Mittal (2008) provides a taxonomy of dark pools (Table 24).[142] Public crossing networks and internalisation pools (or broker crossing pools) are referred to in this report and CP 145 as 'crossing systems'.

Table 24: Mittal's taxonomy of dark pools

Type of dark pool	Description
Public crossing networks	These are the traditional form of dark pool. They are generally only open to buy-side firms which connect directly to the venue. They generally impose minimum size requirements. These types of dark pools are referred to in this report and CP 145 as 'crossing systems'.
Internalisation pools (or broker crossing pools)	These are generally sell-side firms internalising their order flow. They may include both customer and proprietary order flow. More recently, some of these pools have introduced 'liquidity partners', which may result in direct access by other buy-side or sell-side firms. Access to these pools is generally determined by the operator. These types of dark pools are referred to in this report and CP 145 as 'crossing systems'.
Ping destinations	These generally allow only immediate-or-cancel orders (IOCs) from customers, which interact with the flows of the operator. These venues are generally operated by hedge funds or electronic market makers. The electronic market makers run quantitative models to determine whether the pool should accept or reject the IOC orders.
Exchange-based pools	These are exchange-run alternative venues, which operate like public crossing networks.
Consortium-based pools	These are a hybrid of public crossing networks and internalisation pools, and are operated via a consortium of firms rather than a single firm.

222 Execution prices on dark pools are usually set by reference to a displayed market (e.g. last traded price or midpoint price) or by negotiation at prices within the best bid and offer in a displayed market. Trades may occur on a continuous basis or at designated matching times.

223 Dark pools have become increasingly popular for institutional investors as the average size of trades in displayed markets has declined over time (e.g. the average trade size on ASX in cash equity products in 2007 was $23,092, compared with $9,961 in 2009).[143]

[142] H Mittal, 'Are you playing in a toxic dark pool? A guide to preventing information leakage', *Journal of Trading*, vol. 3, 2008, pp. 20–33.
[143] ASX Review, *Algorithmic trading and market access arrangements*, ASX Limited, 8 February 2010, www.asx.com.au/about/pdf/20100211_review_algorithmic_trading_and_market_access.pdf.

Undisclosed orders

224 Many markets offer partially undisclosed orders in pre-trade transparent venues (e.g. iceberg orders, which expose a small portion of the total order volume). More recently, some markets have completely undisclosed orders that sit in pre-trade transparent market order books but remain completely hidden to investors. Typically, these undisclosed orders have lower execution precedence than pre-trade transparent orders.

225 Like dark pools, undisclosed orders have the potential to minimise market impact costs because other market participants are unaware of their existence. They therefore limit the ability of other market participants to identify and trade ahead of the undisclosed order. While dark pools often restrict access to certain types of investors, undisclosed orders are typically accessible to all market participants and interact with the displayed liquidity.

226 Academic research suggests that using undisclosed rather than displayed orders leads to reduced average execution costs. However, undisclosed orders are also associated with a decreased probability of full execution and an increased average time for completion. Undisclosed orders are, therefore, useful for patient traders that wish to limit their execution costs.[144]

Growth in dark liquidity

227 New technologies and trading strategies have made it more efficient to execute transactions without submitting orders to a market that will display them (such as ASX's CLOB). Overseas, this has resulted in significant growth in the number of dark pools.

228 The use of dark pools is most pronounced in North America—in particular, in the US. The SEC has reported that:

> [t]here are approximately 32 dark pools that actively trade Regulation NMS stocks; they executed approximately 7.9% of share volume in Regulation NMS stocks in the third quarter in 2009.[145]

SEC staff have estimated that the combined volume percentage of dark ATSs and broker–dealer internalisers—at least in the US—has remained at approximately 20% over the past three years.[146]

229 According to CESR, more than 90% of trading on organised public markets in Europe was pre-trade transparent while, on a quarterly average, 8.9% of

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[144] H Bessembinder, M Panayides & K Venkataraman, 'Hidden liquidity: An analysis of order exposure strategies in electronic stock markets', *Journal of Financial Economics*, vol. 94, 2009, pp. 361–383.
[145] SEC Concept Release, *Equity market structure* (Release No. 34-61358) SEC, 14 January 2010, p, 18; quoted in IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010, p. 9.
[146] ER Sirri, *Keynote speech at the SIFMA 2008 Dark Pools Symposium*, Address by Director, Division of Trading and Markets, SIFMA 2008 Dark Pools Symposium, New York NY, 1 February 2008; quoted in IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010, p. 9.

all trading in European Economic Area (EEA) shares on regulated markets and MTFs were executed under MiFID pre-trade transparency waivers in 2009.[147] CESR, in its technical advice to the European Commission, has reported that, for the first quarter of 2010, 8.5% of all trading in EEA shares on regulated markets and MTFs was executed under MiFID pre-trade transparency waivers.[148] Furthermore, on a quarterly average, 1.15% of total EEA trading was executed in broker-operated crossing systems in 2009.[149] For the first quarter of 2010, this figure increased to 1.5%.[150]

230 In June 2009, CESR reported that market share of over-the-counter (OTC) trading had continuously fluctuated, with a slight upward trend, since the implementation of MiFID in November 2007. In the first quarter of 2009, approximately 30% of market share in all European Union shares by turnover was executed OTC.[151]

231 In Canada, the rules surrounding exchange markets allow for the introduction of dark pools, with the interest in dark liquidity slowly increasing. During the first quarter of 2010, the two dark pools in operation in Canada constituted approximately 0.8% and 1.5% of the volume and value traded respectively.[152]

232 There are relatively few dark pools in Australia when compared with Europe and the US. Most of the dark pools operating in Australia are broker crossing systems. In Australia, on-order book crossings (i.e. crossings below block size) accounted for around 13%, and off-order book crossings (i.e. block size crossings) for around 19%, of total trading in August 2010.[153] The on-order book crossing figure has remained reasonably constant over time—however, the off-order book crossing figure fluctuates. Due to data limitations, it is not possible to determine the proportion of these figures that is attributable to dark pools. It is reasonable to expect that a significant portion of the on-order book crossings, and some portion of the off-order book crossings, are executed in dark pools.

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[147] CESR Consultation Paper, *CESR technical advice to the European Commission in the context of the MiFID Review—Equity markets* (CESR/10-394), CESR, 13 April 2010, item 14; quoted in IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010, p. 9.
[148] CESR Technical Advice, *CESR technical advice to European Commission in the context of the MiFID Review—Equity markets* (CESR/10-802), CESR, 29 July 2010, p. 8; quoted in IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010, p. 9.
[149] CESR Consultation Paper, *CESR technical advice to the European Commission in the context of the MiFID Review—Equity markets* (CESR/10-394), CESR, 13 April 2010, item 107; quoted in IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010, p. 9.
[150] CESR Technical Advice, *CESR technical advice to European Commission in the context of the MiFID Review—Equity markets* (CESR/10-802), CESR, 29 July 2010, p. 34; quoted in IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010, p. 9.
[151] CESR Report, *Impact of MiFID on equity secondary markets functioning* (CESR/09-355), CESR, 10 June 2009, p.6.
[152] IIROC Notice, *Market share report for the first quarter of 2010* (10-0098); IIROC, 9 April 2010; quoted in IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010, p. 9.
[153] ASX Market Announcement, *ASX Group monthly activity report—August 2010*, ASX Limited, 6 September 2010, www.asx.com.au/about/pdf/20100906_asx_group_monthly_activity_report_august_2010.pdf.

233 The use of dark pools in Asia is currently limited. In Japan, there are a few crossing systems, which are considered the only forms of dark pools. As a result, their market penetration is estimated to be quite small, at about 0.5% of the total trades by value for 2009. In Hong Kong, dark pools are mainly crossing systems, which account for around 3–4% of the total market turnover. In Singapore, dark pools account for less than 0.3% of market turnover.[154]

234 The Technical Committee of IOSCO noted in its recent consultation report *Issues raised by dark liquidity*[155] that the same drivers of dark pool growth in the US and Europe (i.e. innovative execution venues and the search for low-cost, low-impact executions) could also drive growth in Canada, Australia and Asia.[156]

Regulatory issues surrounding dark liquidity and dark pools

235 The proliferation of dark pools and the growth in dark liquidity in the US and Europe have generated a great deal of public debate and regulatory scrutiny (Table 25). Regulators in the US, Canada and Europe are all considering the impact of dark liquidity on price formation, including price volatility and spreads, and the functioning of markets more generally.[157] In addition, IOSCO has recently released draft principles to address regulatory concerns about trading in dark pools and dark orders.[158]

236 In general terms, the regulatory debate has focused on the impact of dark liquidity on:

(a) ensuring sufficient displayed liquidity;

(b) the price formation process where there is a substantial volume of trading executed on dark pools and/or internalised;

(c) the potential fragmentation of information and greater liquidity search costs; and

(d) market integrity due to possible differences in access to markets and information.

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[154] IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010, p. 10.
[155] IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010.
[156] L Hilgers, 'Asia report: Leapfrogging dark pools', *Waters*, 2 June 2008, db.riskwaters.com/public/showPage.html?page=796008; quoted in IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010, p. 10.
[157] SEC Concept Release, *Equity market structure* (Release No. 34-613358), SEC, 13 January 2010; IIROC Notice, *Update on forum to discuss CSA/IIROC Joint Consultation Paper 23-404—'Dark pools, dark orders and other developments in market structure in Canada' and next steps* (10-0156), IIROC, 28 May 2010; CESR Technical Advice, *CESR technical advice to European Commission in the context of the MiFID Review—Equity markets* (CESR/10-802), CESR, 29 July 2010; Joint Consultation Paper, *Dark pools, dark orders, and other developments in market structure in Canada* (23-404), CSA and IIROC, 30 September 2009.
[158] IOSCO Consultation Report, *Issues raised by dark liquidity* (IOSCOPD336), Technical Committee of IOSCO, 27 October 2010.

Table 25: Impact of dark liquidity

Issue	Discussion of issue
Level of displayed liquidity	There have been numerous studies on internalisation and its impacts on displayed liquidity. Theory suggests that if uninformed orders are internalised, spreads in the primary market will increase.[159] This occurs because broker–dealers are typically only willing to internalise uninformed order flow. This means that there is an increase in the fraction of orders in the public market that are informed. As a result, the bid–ask spreads in the public market will widen on average because limit order providers will be unwilling to post limit orders because the risk of trading with an informed trader is increased. Therefore, even if the internalisers offer 'price improvement', investors may be worse off in the medium term. Empirical evidence supports this theory. For example, a study of the impact of a decision by the Toronto Stock Exchange (TSX) to disallow internalisation without price improvement found that this resulted in reduced bid–ask spreads.[160] A number of studies on internalisation on the US markets have shown that internalisation at best is neutral and at worst harmful to market quality.[161] The effect of internalisation on displayed liquidity is thought to be related to the fraction of volume that is internalised—although the tipping point at which internalisation goes from being benign to harmful is not yet known. Anecdotal evidence in the US markets suggests that the level of internalisation and dark trading has become too high. Order flow is directed through multiple dark pools (broker–dealer flow, internalisation pools and other dark pools) before it is directed to displayed markets. As a result, the order flow that is displayed is sometimes described as being 'toxic' because it comprises largely informed order flow. The incentives for displaying liquidity in public markets are significantly diminished as the internalisers and dark pools gain first access to the order flow.[162]
Price formation	The pre-trade display of bid and ask orders accounts for approximately 80% of price formation.[163] Therefore, orders executed without any pre-trade transparency diminish the quality of the price formation process. A recent study by Weaver (2010) examines the issue of internalisation and dark liquidity in the context of a more fragmented market by examining NYSE and Nasdaq in October 2009.[164] Weaver argues that internalisation may have a more significant adverse effect in a market with a higher level of fragmentation. The study shows that increasing volumes of off-order book trading have adversely affected price formation in the US. It has also led to a widening of spreads and a reduction of depth in the market (i.e. the volume of orders at each price point).

[159] D Easley, NM Keifer & M O'Hara, 'Cream-skimming or profit sharing? The curious role of purchased order flow', *Journal of Finance*, vol. 51, 1996, pp. 811–33.
[160] NL Larrymore & AJ Murphy, 'Internalization and market quality: An empirical investigation', *Journal of Financial Research*, vol. 32, 2009, pp. 337–363.
[161] See for example: B Battalio, J Greene & R Jennings, 'Order flow distribution, bid–ask spreads and liquidity costs: Merrill Lynch's decision to cease routinely routing orders to regional stock exchanges', *Journal of Financial Intermediation*, vol. 7, 1998, 338–58; HK Chung, C Chuwonganant & DT McCormick, 'Order preferencing and market quality on Nasdaq before and after decimalization', *Journal of Financial Economics*, vol. 71, 2004, pp. 581–612.
[162] The causes and issues associated with 'toxic' order flow are discussed in RA Bright's comment on SEC Concept Release *Equity market structure* (Release No. 34-61358), 23 June 2010, www.sec.gov/comments/s7-02-10/s70210-246.pdf.
[163] C Cao, O Hansch & X Wang, 'The information content of the open-limit order book', *Journal of Futures Markets*, vol. 29(1), 2009, pp.16–41.
[164] D Weaver, *Off-exchange reporting and market quality in a fragmented market structure*, Comment on Concept Release *Equity market structure* (Release No. 34-61358), 16 April 2010, www.sec.gov/comments/s7-02-10/s70210-127.pdf.

Issue	Discussion of issue
Fragmentation	Fragmentation of information and liquidity is likely to occur when there are many different pools of liquidity. The growing number of independent dark pools in the US and Europe is raising liquidity search challenges for market participants. In addition to the costs associated with connecting to many different pools, investment is required to route orders (or to 'ping' multiple pools) to find the hidden liquidity, which may have adverse impacts on market efficiency. In extreme market conditions, such as those of 6 May in the US, where there is a liquidity shortage, these search challenges may exacerbate the event as investors struggle to locate and access liquidity.
Fairness	Access to dark pools differs depending on the operator and structure of the dark pool. Generally, access to broker crossing systems is restricted to the clients of those brokers. Pools offered by third parties typically provide non-discriminatory access to a class of market participant (e.g. Liquidnet is limited to the buy-side).

Should there be a limit on the volume traded in the dark?

237 Pre-trade transparent markets can be said to provide a form of public good—namely, as the source of pre-trade and post-trade information. Pre-trade information is missing in dark pools. Facing an information deficiency, and the extra risk entailed, liquidity providers (those who post limit orders to pre-trade transparent equity markets) will become more risk averse and post prices that entail wider spreads. In the longer term, this is likely to lead to a deterioration in the pricing in the pre-trade transparent equity market (i.e. a widening in the spread), which acts as the reference price for trades in dark pools. As a result, when the investor trades in dark pools, the apparent gain made (being inside the reference price or at a lower transaction cost, or both) may involve an actual deterioration.

238 The current Australian equity market structure is based on a continuous auction as its economic model for price formation. This central auction process is important because it:

(a) establishes a reference price, which, in addition to its role in trading, is important for capital allocation decisions and capital raising; and

(b) creates a deeper pool of 'accessible' liquidity than would otherwise be available, which keeps spreads tight and costs down.

239 There are mechanisms other than a continuous auction process for forming prices (e.g. requesting quotes from market participants). However, these mechanisms can be less efficient than the auction process because they:

(a) require more intensive resources to search for prices;

(b) can expose clients to potentially worse prices (because incomplete information and greater uncertainty about prices mean market participants are more risk averse and quote wider spreads); and

(c) can enhance the incentives for market participants to route client orders to entities that provide the greatest incentives, or a bundled service for the market participant rather than for the client.

240 Trends indicate there is an inverse relationship between volatility and trading in dark pools.[165] High volatility drives activity from dark pools into pre-trade transparent markets, and low volatility encourages trading in dark pools. Accordingly, there remains an inherent dependency on the CLOB. If natural liquidity shifts away from the CLOB, and its processes and efficiency are undermined as a result, in the medium term there could be an adverse effect on those that use dark pools when they need to revert to the stability of the auction process.

241 While full pre-trade transparency for all orders is not optimal, the growth in the proportion of dark trading and the issues outlined above suggest that restrictions on the level of dark trading may be necessary. The main objective is to limit the total amount of trading being executed in the dark. However, given the proliferation of execution venues, it is necessary to impose restrictions at a market or trade level that will help maintain a reasonable balance between pre-trade transparent orders and volumes executed in the dark for the overall market (Table 26).

242 There is little empirical evidence to indicate a volume threshold at which dark pools begin to have a negative impact on liquidity and price formation:

(a) A study of the decision by the US ECN Island (Island) to 'go dark' in three actively traded ETFs in 2002 in response to new regulations showed that price formation declined and transactions costs increased following the decision.[166] However, at the time, Island was the dominant market in these securities, representing close to 40% of volume and 60% of trades. Following this change, Island lost significant market share to the displayed venues. When Island began redisplaying its quotes about a year later, it no longer held a dominant position in the market. The increase in transparency resulted in enhanced price formation and lower costs on Island to a much lesser extent than the original change. This study indicates that very high levels of dark trading will have an adverse affect on liquidity and price formation, but does not identify the market share that dark pools must capture before this becomes problematic.

(b) Studies by Nasdaq suggest that market quality may begin to degenerate when internalisation levels reach 40% or more.[167]

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[165] Rosenblatt Securities, 'Let there be light', *Trading Talk*, 28 October 2010, http://www.rosenblattsecurities.com/lettherebelight_details.aspx?id=130. Rosenblatt Securities has tracked the relationship between volatility and the market share of US dark pools and noted that for much of the past two years that relationship has been one of inverse correlation.

[166] T Hendershott & C Jones, 'Island goes dark: Transparency, fragmentation and regulation', *Review of Financial Studies*, vol. 18, 2005, pp. 743–93.

[167] J D'Antona, Jr, 'Nasdaq frets over internalization', *TradersMagazine.com*, 24 February 2010, www.tradersmagazine.com/news/nasdaq-internalization-dark-pools-level-direct-edge-sec-105265-1.html; F Hatheway,

243 Restricting the volume executed in the dark can be achieved by the mechanisms in Table 26. In addition to these mechanisms, a strict trade-through rule protects orders and, therefore, should also act to encourage higher levels of displayed liquidity in pre-trade transparent books.

Table 26: Mechanisms to restrict the proportion of volume executed in the dark

Mechanism	Description
Minimum size requirements	Given that dark pools are aimed at facilitating the execution of large blocks with minimum information leakage, minimum size thresholds should be set to ensure these objectives can be met. In Europe and the US, minimum size requirements for trading in dark pools are determined by the venues themselves. As a result, there is no market level minimum order size for dark pool trading. A recent study by Investment Technology Group (ITG)[168] has shown that there is significant variation in the level of adverse selection in dark pools. This study suggests that the decision by some dark pools to allow HFTs to participate in their pools has reduced average trade sizes and increased adverse selection costs for block traders. This research suggests that imposing minimum size requirements may ensure that dark pools serve the intended purpose of reducing market impact costs for large traders. The current ASX upstairs crossing market is essentially the combination of many dark pools operated by brokers. Therefore, if minimum size requirements are imposed on other dark pools, these pools are likely to offer an alternative venue for executing large orders. This may help to foster competition and innovation of new services and technology to cater for the needs of institutional investors.
Display requirement thresholds	Debate in the US has also focused on the volume threshold at which dark pools must publicly display and provide access to their best prices via the consolidated tape. The threshold is currently set at 5%. This means that, if a particular dark pool executes more than 5% of volume in a given stock, that venue must begin contributing its prices to the consolidated tape. The SEC is considering lowering this threshold to 0.25%.[169] However, imposing restrictions on the level of dark trading by individual venues does not address the risk that overall market levels of dark volume will reach a level that adversely affects price formation on pre-trade transparent markets. Further, these thresholds can easily be circumvented through the creation of new, linked dark pools. The need for a display requirement threshold is also reduced if dark pool trading is restricted to large block traders.

Testimony of Dr. Frank Hatheway, Chief Economist, NASDAQ OMX, Senate Banking, Housing and Urban Affairs Committee, Securities, Insurance and Investment Subcommittee, Wednesday, October 28, 2009, Testimony presented to US Senate Committee on Banking, Housing and Urban Affairs, 28 October 2009, banking.senate.gov/public/index.cfm?FuseAction=Files.View&FileStore_id=7fea4a79-e829-44d6-831f-44c7e1640e4d.

[168] N Saraiya & H Mittal, *Understanding and avoiding adverse selection in dark pools*, Investment Technology Group, 1 November 2009, www.itg.com/news_events/papers/AdverseSelectionDarkPools_113009F.pdf.

[169] SEC Proposed Rule, *Regulation of non-public trading interest* (Release No. 34-60997), US Securities and Exchange Commission, 21 October 2009.

Other transparency issues identified in overseas markets

Indications of interest

244 One of the contentious issues in the US is the use of indications of interest (IOIs) by dark pools. Of particular concern is the use of 'actionable' IOIs that are disseminated to selected market participants. Actionable IOIs alert these market participants to the fact that the dark pool has a trading interest in a particular share, and usually discloses the side (buy or sell), size and price. This information is not available to the public. Depending on the nature of information in the IOI, there is a risk that it may be used by the recipient to game or trade ahead because recipients are generally under no obligation to execute IOIs.

245 This issue is not currently relevant in Australia. However, there has been debate in the US and Europe about whether IOIs should be displayed. It has been argued that IOIs create a two-tiered level of access to information about best prices and volumes. This may also discourage the public display of liquidity. We consider it important that liquidity either remains dark to all parties or is disclosed to the whole market.

Monitoring and surveillance

246 In the US and Europe, the pre-trade activities of market participants trading on dark pools are non-transparent not only to the market, but also to the regulators. This means that it is not possible for regulators to monitor behaviour on these venues and to ensure that they are free from manipulation and/or principal–agent conflicts.

247 As dark pools in Australia are pre-trade non-transparent to ASIC, it is important to put in place guidelines to minimise potential abuses. These guidelines may include restricting dark pool trading to orders above a certain size, therefore ensuring only professional investors are able to trade on these venues. If internalisation of retail order flow is permitted, clear guidelines should be set out ensuring these client orders are given priority over proprietary orders.[170]

Consolidation of pre-trade and post-trade information

248 There is a risk that fragmentation of trading data across markets may hinder price formation if a consolidated view of pricing is not easily available. This is because investors may not see all of the information that is relevant to

[170] CP 145 proposes market integrity rules that will require a market operator and a market participant operating dark pools to report to ASIC monthly on the nature of the dark pool, including how orders interact, how the price is determined, the access criteria and whether the dark pool operator's proprietary flow is able to interact with client flow and how conflicts are managed.

make an informed investment decision, and price discrepancies between markets might last longer than they otherwise would. This may result in some investors trading at a less advantageous price because they do not have access to full price information. Fragmented information may also affect the ability of companies to keep track of trading activity in their stock.

249 Access to timely market information is imperative to enable firms to find liquidity and to fulfil their best execution obligation. Pre-trade transparency and post-trade transparency are generally regarded as central to both the fairness and efficiency of a market and, in particular, to its liquidity and quality of price formation.

250 We consider that a consolidated source of trade information that is available for a reasonable price to all users is a valuable public good, and a fundamental element of a fair, orderly and transparent market.

251 A consolidated view of pre-trade and post-trade information would:

(a) be a price formation vehicle for traders not reliant on speed;

(b) facilitate best execution monitoring and evidencing;

(c) facilitate data integrity checks;

(d) facilitate transaction cost analysis;

(e) be used for surveillance purposes by ASIC; and

(f) be a source for listed companies to monitor trading activity in their stocks.

252 International experience suggests that the development and provision of consolidated pre-trade and post-trade information is critical for the effective and efficient operation of a competitive equity market (Table 27).[171] In Canada and Europe, regulators initially resisted mandating the consolidation of market information. However, no 'market' response has provided effective consolidation of trading information. It has ultimately been left to the regulators to facilitate the provision of a consolidated tape.[172]

[171] CESR Press Release, *CESR proposes changes to MiFID to improve securities markets' functioning, transparency and investor protection* (CESR/10-926), CESR, 29July 2010.
[172] It should be noted that CESR in Europe is now proposing the establishment of a not-for-profit consolidated tape.

Table 27: Consolidation arrangements in overseas jurisdictions

Jurisdiction	Description of arrangements
US	The US has mandated consolidated pre-trade and post-trade tapes.
Canada	Initially, data vendors did not capture data from all venues and the cost of firms building their own consolidated feeds was considerable. Canada has since mandated consolidated information, and TSX was recently awarded the role of consolidated tape provider.[173]
Europe	In Europe, market forces have struggled to deliver accurate, reliable and cost-effective consolidated information to investors. The problems include: • issues with information vendors locating and accessing data in real time, particularly from firms trading away from a regulated market or an MTF. This has meant that not all trading information is visible to investors; • data integrity issues. A lack of common standards for addressing erroneous, duplicative and incomplete information has undermined the quality of trade information. Many investors are electing to rely on a subset of data—typically, data published by exchange markets, which is considered more reliable, but may only represent 60–70% of trading in a particular security; and • the cost of consolidated information, which has also been a significant issue. MiFID has brought about significant fragmentation of trading in the more liquid shares in Europe. Fees for data reflect the additional connection costs by information vendors and the higher cumulative cost of fees charged by exchange markets, MTFs and trade reporting services, compared with pre-MiFID fees. It has been argued that these issues have hampered the ability to monitor best execution performance, and many market participants in these jurisdictions (particularly the buy-side, such as fund managers) are calling for a consolidated tape. The CESR recommended in its July 2010 advice on amendments to MiFID that the European Commission mandate a post-trade tape.[174]

Pegged orders

253 Globally, some execution venues have introduced pegged orders (also referred to as reference priced orders) that are priced and re-priced to a reference price—such as the national, or particular execution venue's, best bid/offer, or midpoint of the current best bid/offer, or volume weighted price. This type of order allows investors to have their order continuously tracking the best bid/offer or midpoint of the chosen execution venue or national execution venues. The order follows the trend of the execution venue in real time. In effect, this type of order allows an order to automatically stay on the best bid or offer, rather than requiring market participants to continuously change their orders manually, or rely on their own algorithms, to do so. It also allows market participants to nominate the midpoint as the reference price.

[173] CSA Staff Notice, *Information processor for exchange-traded securities other than options* (21-309), CSA, 5 June 2009.
[174] CESR Technical Advice, *CESR technical advice to European Commission in the context of the MiFID Review—Equity markets* (CESR/10-802), Committee of European Securities Regulators, 29 July 2010.

254 There are risks attached with having orders pegged to prices in one market. For example, if trading on the execution venue to which the order is referenced is disrupted, the price of the pegged order will be affected.[175] If the specified reference price becomes unavailable, trading using pegged orders would need to be suspended until a reliable reference price is re-established.

255 This issue can be mitigated by using a consolidated tape as a point of reference. However, issues may still arise if there are only two execution venues and trading on one of those venues is disrupted.

256 One way of addressing this is to ensure that execution venues have arrangements in place to ensure the reliability of their specified reference price, and appropriate procedures for when that reference price is unavailable.

Tick sizes

257 Tick size represents the minimum amount by which share prices are allowed to vary. It determines the prices at which orders may be entered. Orders may only be entered at prices that are evenly divisible by the minimum tick size.

258 The minimum tick size influences the willingness of investors to place limit orders in the market. In most markets, orders are executed according to price then time priority. This means that to gain execution priority over an order that is already displayed in the market, an investor must improve the price by the minimum tick size. If the minimum tick size is economically insignificant, time precedence does not matter because an investor can gain execution priority by offering an economically insignificant price improvement.

259 Very small tick sizes may therefore discourage investors from placing limit orders because their order is offered little protection from other traders stepping ahead. As a result, very small tick sizes can have a detrimental effect on market depth (i.e. liquidity) at each price point because investors may be less willing to expose their orders in the order book. Very small tick sizes may also result in frivolous 'negotiation' and increased message traffic as investors converge on an execution price.

260 In a multi-venue environment, ensuring that all execution venues—both pre-trade transparent and dark—are required to trade at the same economically significant minimum tick size is important for ensuring that dark execution

[175] For example, the London Stock Exchange (LSE) experienced a seven-hour outage in September 2008, a one-hour outage on 14 October 2009, a partial outage on 9 November 2009, and a complete outage on 26 November 2009. These outages affected the ability of execution venues to price orders by reference to the LSE during the outage period.

venues are not able to attract order flow by offering economically insignificant price improvement. Allowing dark pools to trade in increments less than the minimum tick size will discourage liquidity provision via limit orders on pre-trade transparent execution venues.

261 However, tick sizes that are too high can lead to unnecessarily high transaction costs. The tick size represents the minimum transaction costs incurred to execute immediately.

262 Therefore, there is a trade-off between minimising transaction costs and ensuring that the tick size is sufficiently large to encourage investors to post limit orders.

263 In a multimarket environment, it is also important to ensure that tick sizes are harmonised across markets to avoid competition based on economically insignificant tick sizes.

How should tick sizes be determined?

264 Academic theory suggests that the optimal tick size is influenced by a range of factors, including price volatility, uncertainty about asset values, competition between liquidity suppliers (either limit order traders or market makers), price and trading volumes. Ideally, tick sizes should be positively related to volatility, uncertainty about asset values and prices, and inversely related to competition between liquidity suppliers and trading volumes.[176]

265 In many markets, including Australia, tick sizes are set as a function of price. Higher-priced shares have higher tick sizes. However, there is substantial variation in the tick size as a proportion of price (relative tick size) both within and across markets. For example, in Australia, the relative tick size for a share priced at A$1.00 is 0.5%, compared with 0.02% for a share priced at A$50.

266 Variations in tick sizes across shares and changes in tick size through time provide opportunities to study the impact of tick size on liquidity. There are many academic studies that have examined these issues.[177] Although these

[176] See for example: D Seppi, 'Liquidity provision with limit orders and a strategic specialist', *Review of Financial Studies*, vol. 10, 1997, pp. 103–50; LE Harris, 'Minimum price variations, discrete bid–ask spreads, and quotation sizes', *Review of Financial Studies*, vol. 7, 1994, pp. 149–78.

[177] See for example: C Comerton-Forde & M Aitken, 'Do reductions in tick size affect market liquidity', *Accounting and Finance*, vol. 45, 2005, pp. 171–84 (for a study of tick sizes on the ASX); MA Goldstein & KA Kavajecz, 'Eighths, sixteenths, and market depth: Changes in tick size and liquidity provision on the NYSE', *Journal of Financial Economics*, vol. 56, pp. 125–49 and C Jones & M Lipson, 'Sixteenths: Direct evidence on institutional trading costs', *Journal of Financial Economics*, vol. 59, 2001, pp. 253–78 (for an analysis of the US market); ST Lau & TH McInish, 'Reducing tick size on the Stock Exchange of Singapore', *Pacific-Basin Finance Journal*, vol. 3, 1995, pp. 485–96 (for an analysis of a tick size reduction on the Stock Exchange of Singapore); JM Bacidore, 'The impact of decimalization on market quality: an empirical investigation of the Toronto Stock Exchange', *Journal of Financial Intermediation*, vol. 6, pp. 92–120 and HJ Ahn, CQ Cao & H Choe, 'Decimalization and competition among stock markets: Evidence from the Toronto Stock Exchange cross-listed securities', *Journal of Financial Markets*, vol. 1, 1998, pp. 51–87 (for the Toronto Stock Exchange); and

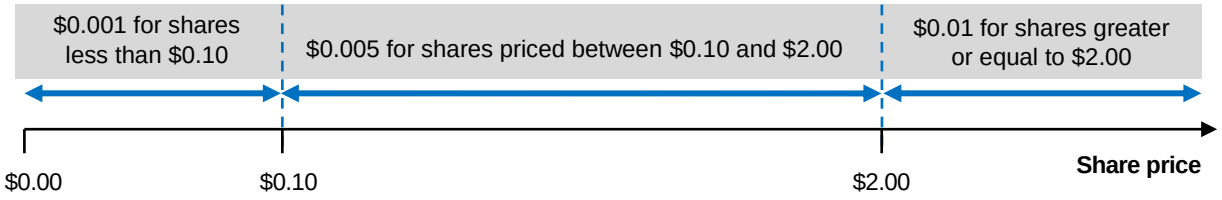
studies do not always produce consistent results, they have generally shown that reductions in tick size lead to reductions in spreads. Evidence on depth and, therefore, overall liquidity is mixed.

267 The variation in results is likely to be due to variations in trading volume and the extent to which bid–ask spreads were constrained by their minimum tick size prior to the change. For example, if a share trades at its minimum tick size most of the time, then the tick size restricts competition between orders and forces an artificially wide spread. In this situation, a reduction in tick size is likely to lead to lower spreads without any adverse impact on depth. In contrast, if a share typically trades at a spread much higher than its minimum tick size, the reductions in tick sizes are likely to lead to wider spreads and reductions in depth. Similarly, high-volume shares are more likely to benefit from tick size reductions than low-volume shares.

Current tick size rules in Australia and overseas

268 ASX currently has in place tick sizes which vary depending on the price of the share (Figure 8).

Figure 8: Current ASX tick size rules



269 In 2009, ASX informally consulted on broadening the middle tier from an upper limit of $2.00 to $20.00 because the shares that fall within this band could benefit from price improvement. The feedback was generally supportive.

270 We note that increasing the threshold of the middle tier may result in more effort for parties that manually enter orders relating to ASX shares that are priced between $2.00 and $20.00. This is because the increment will increase from two decimal places to three. This may increase the risk of 'fat finger' entries. This will affect approximately 250 ASX-listed shares that are priced between $2.01 and $20.00.

271 In overseas jurisdictions where there are competing market operators, harmonised minimum tick sizes are in place (Table 28).

D Bourghelle & F Declerck, 'Why markets should not necessarily reduce the tick size', *Journal of Banking & Finance*, vol. 28, pp. 373–98 (for Euronext Paris).

Table 28: Overseas jurisdictions—Tick sizes

Jurisdiction	Description
US	Reg NMS prohibits markets from displaying, ranking, or accepting quotations in shares that are priced in an increment of less than US$0.01. Shares priced at less than US$1.00 have an increment of US$0.0001.
Canada	Canada's Universal Market Integrity Rules set a minimum price increment of C$0.005 for a price of less than C$0.50. Other tick sizes are set by the relevant exchange markets.
Europe	Regulators in Europe have not harmonised tick sizes. The Federation of European Securities Exchanges has developed standards adapted from the existing models across Europe—typically based on a tick being a percentage of prices.[178]

Longer trading hours

272 In a multimarket environment, trading hours of new exchange markets may differ from the current normal trading hours on the ASX exchange market. This may raise some coordination and monitoring issues (Table 29).

Table 29: Issues arising from longer trading hours

Issue	Discussion
Coordination of trading halts for news and other corporate developments	The ASX Compliance Issuers unit is responsible for monitoring compliance with Listing Rule 3.1[179]—the requirement for listed entities to make timely continuous disclosure of material information that might affect the price or value of their securities. Listed entities are required to make their announcements via the ASX company announcements office. The ASX company announcement office (CAO) is open between 8.30 am to 7.30 pm AEST[180] to enable issuers to make price sensitive announcements. Companies can lodge announcements via ASX Online 24 hours a day, seven days a week for processing during opening hours. The coordination of trading halts is not expected to be affected by longer trading hours. ASX's current process already allows for a stock, which is the subject of a major company announcement such as takeovers and capital raisings, to be placed in a trading halt during CAO opening hours. Special crossings may take place off-order book at any time.[181]

[178] Federation of European Securities Exchanges, 'Tick size regimes', www.fese.eu/en/?inc=cat&id=34.
[179] Except in relation to ASX securities, where ASIC plays this role.
[180] It is open from 8.30 am to 8.30 pm for those periods of the year when daylight saving time applies in Sydney but not in Western Australia.
[181] Special crossings are not permitted during a scheme or takeover.

Issue	Discussion
Monitoring and surveillance of listed entities with the continuous disclosure requirement outside ASX's normal trading hours	ASX has an obligation to monitor compliance with Listing Rule 3.1 at all times. The ASX Compliance Surveillance unit monitors trading to identify situations where trading may be taking place in a listed entity but the market is not fully informed. In such cases, the Surveillance unit will notify the Issuers unit of the existence of any alerts. If necessary, the Issuers unit will then contact the listed entity and request any undisclosed information that the ASX listing rules requires to be disclosed.[182]
Determination of an appropriate benchmark/ reference price for valuation purposes	If there is no closing price auction across multiple exchange markets at a common time, there could be issues around how closing prices will be determined and the potential manipulation to artificially inflate or deflate the closing price of a security. Benchmarking may also become an issue if the opening and closing prices differ between the exchange markets and when trading occurs outside the trading hours of the primary exchange market (i.e. ASX). This is likely to have an impact on the reference price used for valuation, such as the valuation of portfolios at the close of each business day, the calculation of VWAP[183] and the determination of margin loan LVRs (loan-to-value ratios). In Canada, the determination of an appropriate benchmark by market participants, traders and portfolio managers for a particular trade is becoming more complex—however, traders and portfolio managers tend to base their VWAP and Arrival Price benchmarks on the consolidated data (i.e. data that includes all execution venues). In Europe, different methodologies are currently being applied to determine VWAP.

273 The trading of stocks across different jurisdictions highlights the need for cross-border coordination and harmonisation of rules. For instance, the dominant trading volume in some Canadian stocks has been recorded in US exchange markets, which means that circuit breakers have to be harmonised across the two jurisdictions.

[182] ASIC undertakes these functions in connection with ASX securities.
[183] The ASX VWAP is currently used for the pricing of Dividend Reinvestment Plan issues as well as Employee Share and Option Plans.

F Likely market developments in Australia

Key points

Australia has already seen some technological progress in the cash equity sector.

Further advancement and higher levels of efficiency can be attained under the right framework for competition between exchange markets.

The benefits to the economy and the equities industry from competition are likely to outweigh the costs of order flow fragmentation—again, under the right framework.

The threat of competition has already generated some benefits to investors and market participants. However, if the idea of competition were to be discarded, a rational reaction for any incumbent market may be to return to monopolistic profitability by raising fees and cutting investment.

Under the right framework, competition among exchange markets is consistent with the goals of increasing confidence in markets, facilitating international capital flows and integrating Australia into global finance.

274 The proposed rules framework in CP 145 will significantly influence the impact that competition has on the Australian exchange market. ASIC has an opportunity to establish a benchmark and robust regime for competitive exchange markets in Australia. However, this will require all market participants to focus on the medium-term public benefits from ensuring confidence in the integrity of the price formation process, and the robustness and liquidity of our markets. If we successfully translate the lessons from overseas markets for the quality of market outcomes, we should be able to maximise the benefits of competition and minimise the costs of fragmentation.

275 Given the framework proposals outlined in CP 145, our current best view is that the following developments in market structure and behaviour are likely to occur in Australia (Table 30).

Table 30: Likely changes resulting from market developments and competing exchange markets

Change	Description of change
More exchange markets	In addition to Chi-X, there are likely to be one or two other markets offering pre-trade transparent execution venues. We expect competition between these execution venues will lead to reductions in trading fees and innovation in the way in which fees are charged (e.g. maker–taker pricing, fee discount periods and volume rebates). There is also likely to be innovation in the types of orders (e.g. hidden orders) and trading mechanisms.
Growth in HFT and other high-speed trading	Multiple low-latency, pre-trade transparent execution venues will create trading opportunities for new types of traders, particularly HFTs. In overseas markets, a large portion of this trading is by electronic liquidity providers. This is also likely to occur in Australia. HFT will likely result in further reductions in average order sizes in pre-trade transparent venues; many more orders per trade; increased trading volume; tightening of spreads, although potentially with lower depth at the best prices; and greater deployment of intermarket arbitrage strategies. This is likely to place increased pressure on institutional buy-side firms to use algorithms in pre-trade transparent markets and seek block liquidity in dark pools. In the absence of a US-style 'trade-through' rule,[184] growth in HFT volume is likely to be lower than has been observed in US markets. Growth of HFT in Australia is also likely to be constrained by the ban on naked short selling.
Demand for co-location services	An increased focus on speed will lead to increased demand for co-location services. Execution venues may build or outsource the operation of data centres. Adequate transparency and disclosure of pricing and access rules for these data centres will aid in ensuring fair access concerns are addressed.
Enhanced reliance on technology and data	Market participants will face new challenges in developing technology that allows them to connect to multiple markets. This will lead to new demand for, and supply of, technology services, including smart order routers, trading algorithms, middle and back office order management, execution quality analytical tools and risk controls (e.g. for market operators and for market participants offering direct electronic access to clients). Technology will increasingly become a barrier to entry, although it is expected that low-cost solutions will be offered to smaller participants. The accuracy and speed of access to pre-trade and post-trade data will become increasingly important, as will the impact of increasing volumes on system capacity.
More dark pools/ internalisation	The dark pool execution venues currently operating in Australia are also likely to face competition from new entrants. Indeed, we are already seeing movement in this space. This will include additional market participant crossing systems. However, given our proposed size restrictions on dark trading (see Table 7 of CP 145), we anticipate the number of dark venues will not proliferate to the same extent they have in the US and Europe, and will perform more of their traditional role of facilitating execution of large market impact orders.
Need for a mechanism to consolidate fragmented pre-trade and post-trade information	Fragmentation of market data will be minimised through the provision of consolidated prices. A consolidation mechanism will help ensure fair and efficient price formation. It also ensures small investors have access to information at a reasonable cost. However, institutions and proprietary traders will likely invest in low-latency data feeds provided directly from exchange markets. Without a clear mechanism for delivering consolidated prices, it is likely that Australian investors will experience the same problems as those observed in Europe, including high data costs and high search costs.

[184] A trade-through rule protects displayed bids and offers from being bypassed.

Change	Description of change
Need for harmonised tick sizes[185]	Standardisation of tick size rules across execution venues will prevent market operators from competing on tick sizes, reducing the possibility for market participants to step ahead of limit orders by an economically insignificant amount.
Need for market operator cooperation	Cooperation is essential for fair, orderly and transparent markets. Standardisation of trading halts across execution venues will also reduce the potential for the types of problems that arose in the US on 6 May.
Greater complexity of market surveillance/ supervision	There will be greater challenges for ASIC in market surveillance. Surveillance across multiple execution venues will increase the complexity of monitoring the market. Data management needs will increase (due to both increased volumes and complexity). Functionality will be required to monitor HFT strategies and dark pool trading. Market participant compliance operations will experience a similar increase in the complexity of their business.
Competition in other ways	There is the potential for competition in other ways—for example, competition in clearing services, listings, data services and cross-border trading.
New types of products	Lower transaction costs, increased market depth and lower latencies facilitate the creation of new products. For example, there is a trend towards index products, including exchange-traded funds.
Increased international integration	Lower transaction costs, increased market depth and lower latencies facilitate international capital flows, more closely linking the Australian equity market with international venues.
Consolidation of execution venues	Whether or not the ASX and SGX merger is approved and proceeds, consolidation of some current and future execution venues (including cross-border) can be expected to occur in the future. Such consolidation is a global trend.
Benefits for retail investors	Retail clients will obtain improved prices as a result of tighter spreads, greater execution certainty offered by higher trading volumes and product innovations.
Benefits to companies may vary	It is possible that the net benefits to companies may differ by their size. It is anticipated that competition will initially be limited to ASX 200 companies. Therefore, initially, there will be little or no impact on trading for companies outside this group. However, liquidity may increase, especially for larger companies, which may facilitate capital raising. As was the case in Canada, it is possible more liquidity will shift to smaller companies over time. However, if there is a tendency towards greater price volatility, it may be harder to raise additional capital.

Benefits and costs

276 The benefits to the economy and the equities industry from competition are likely to outweigh the costs of order flow fragmentation, which include those of increased surveillance, technology and information. The net benefit will be positive if competition is introduced with the proposed rules framework

[185] A tick size is the minimum amount by which share prices are allowed to vary.

protecting the volume of orders flowing to pre-trade transparent execution venues. This conclusion is borne out by experience overseas and academic studies.

277 To some extent, the beneficial influence of competition has already started in Australia. The theory of contestable markets shows how, in some cases, just the threat of competition may be enough to compel incumbents to adopt a less monopolistic stance. Indeed, the possibility of competition in Australia has arguably prompted ASX to reduce some transaction costs, invest in technology and innovate in the provision of exchange market facilities. In July 2010, ASX reduced trade execution fees and discontinued the large market participant rebate to ensure that 'all customers, big or small, receive the pricing benefit up front'.[186] The exchange operator is also investing in new technology (including to allow low-latency trading facilities) and creating new execution venues to cater for the needs of specific types of investors.

278 These benefits, however, may only be maintained as long as the threat of competition remains. If the idea of competition is discarded, the rational reaction for any incumbent market may be to return to monopolistic profitability by raising fees and reducing investment in research and innovation.

279 We expect competition between exchange markets, under the proposed regulatory framework described in CP 145, will bring benefits to the Australian economy and the equity market, including innovation, maintained or improved market quality (e.g. depth, liquidity and price formation) and more choice in execution venues as well as lower costs (i.e. tighter spreads and lower transaction costs) for investors.

280 The proposed regulatory framework seeks to balance the efficiencies and dynamism that can be expected to flow from competition with our objectives to build confidence in the integrity of our capital markets, protect investors and facilitate international capital flows. In particular, the proposed regulatory framework seeks to add to market depth and liquidity (and so limit or reduce indirect market impact costs) on pre-trade transparent markets on a sustained basis, enhance market price formation and increase capital raising capacity.

281 However, it has been, and remains, hard to quantify the gross benefits and gross costs, and to arrive at an estimate of net benefits. Most studies of the benefits and costs of competition have shortcomings because the introduction of competition in most countries came around the time when

[186] A Bell, 'ASX cuts fees as trading volumes soar', *The Age*, 3 June 2010, news.theage.com.au/breaking-news-business/asx-cuts-fees-as-trading-volumes-soar-20100603-x4qk.html; M Mcnamara, 'ASX cuts fees as Chi-X prepares to enter the market', *Business Review Australia*, 3 June 2010, www.businessreviewaustralia.com/blogs/finance/asx-cuts-fees-chi-x-prepares-enter-market.

market volatility was beginning to rise in the lead-up to the GFC. It is almost impossible to control for the effect of the GFC on spreads and depths, and isolate the changes caused by competition alone.

282 Similarly, it is difficult to separate out the impact of technological improvements. For instance, when we look at Canada—a jurisdiction in many respects similar to Australia—brokerage firm ITG found that bid–ask spreads fell from 15 bps early in 2008 (when competition really began) to 10 bps by mid-2010, despite the GFC.[187] It is unclear how much of this cost reduction was due to competition rather than technology and other market pressures.

283 One of the more useful studies is Foucault and Menkveld (2008), because it precedes the GFC by a few years.[188] They studied the introduction of competition in Dutch index stocks listed on Euronext when London Stock Exchange (LSE) began offering trading services in these stocks in October 2003. It is relevant for Australia because it studied a single electronic exchange market facing competition from a new electronic exchange market, and it studied an exchange market that did not impose trade-through restrictions. However, there was limited use of smart order routers at the time, so the benefits of competition are potentially understated.

284 Looking at bid–ask spreads and depth for a short period of time before and after this event, and controlling for factors that are known to influence spreads and depth, such as volume and volatility, the authors show significant increases in depth at both the best prices and up to four price steps away from the best prices. Depth at best prices increased by between 35% and 50%, and at the best four prices, between 35% and 78%. Spreads were unchanged, except for in the most active stocks where they fell by about 15%. These results suggest competition had a positive effect on overall liquidity.

285 One thing to note is that, at the same time, Euronext reduced its trading fees by 50% (driven by the commencement of competition). This change would therefore also have contributed to the growth in depth.

286 Based on this and the experience in other countries, we expect bid–ask spreads to narrow and market depth to improve in Australia. It is difficult to gauge the balance between pricing and depth, or the extent of the likely improvements.

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[187] ITG Review, *Canadian market microstructure review second quarter 2010: Have some new HFT strategies come to town?*, Investment Technology Group, 20 July 2010, www.itg.com/news_events/papers/ITG-Canada-Market-Microstructure-Q2-2010.pdf.

[188] T Foucault & A Menkveld, 'Competition for order flow and smart order routing systems', *Journal of Finance*, vol. 63, 2008, pp. 119–58.

287 Against such benefits, there would be costs—especially relating to technological adjustments, information consolidation and added supervision needs.

288 There will, of course, be winners and losers with the changes in Australia's equity market as a result of competition (Table 31).

Table 31: Likely impact on players

Player	Likely impacts
Current market participants	Some current industry players will thrive in the new conditions, while others will find the environment extremely challenging. Those with the technology and volume to gain full benefit from the multiplicity of execution venues may experience lower costs and new business/trading opportunities.
New entrants	We expect new entrants to emerge with business models specialising in advanced electronic trading (including some high-frequency traders (HFTs) and algorithmic traders).
Incumbent exchange market	The incumbent exchange market (i.e. ASX) is likely to lose market share. However, if total trading activity increases as a result of competition, ASX's trading activity may actually increase. International experience suggests that competition will place significant downward pressure on trading fees. In 2009–10, 30.9% of ASX's operating revenue related to trading in cash equities (Figure 2).[189]
Data aggregators	There may be increased scope for data aggregation and for adding value in terms of fast real-time reporting and market analysis.
Technology providers	Firms with the capacity to produce hardware and software to assist with high-speed trading, and data aggregation and processing, may encounter greater scope to operate in Australia.
Issuers	The net benefits may differ by size of issuer. Liquidity may increase—especially for larger companies—which may facilitate capital raising. However, if there is a tendency towards greater price volatility, it may be harder to raise additional capital.
Retail investors	Retail investors may benefit from cost savings and improved access to derivative products. The greatest benefits for retail investors are likely to accrue indirectly through their investments in superannuation and other managed funds.

289 In addition, although we expect much of the new style of trading will be extremely price sensitive and charged at a lower rate than current industry practice, the likely growth in the value of turnover is a significant benefit arising from the introduction of competition.

[189] ASX Annual Report, *Annual Report 2010*, ASX Limited, 19 August 2010, p. 13, www.asx.com.au/about/pdf/asx_annual_report_2010.pdf.

Issuers

290 It is possible that the net benefits to issuers may differ by size of issuer. It is anticipated that competition for trading will initially be limited to ASX 200 companies. Initially, therefore, there will be little or no impact on trading for companies outside this group. Liquidity may increase—especially for larger companies—which may facilitate capital raising, for example, through rights issues or placements. However, if there is a tendency towards greater price volatility, it may be harder to raise additional capital.

291 There are anecdotal claims (e.g. in Canada and the US) that very small companies are adversely affected in their fundraising capacity as a result of increased competition, HFT activity, lower brokerage commissions, reduced research coverage and the trend towards the use of dark pools rather than pre-trade transparent execution venues. We propose to guard against the trend towards dark trading by seeking to impose a size threshold below which trades cannot go to dark pools. In relation to HFT activity, we note that HFTs do not typically hold overnight positions and, therefore, HFT activity is likely to have minimal negative impact on the share register of listed companies.

Retail investment

292 Competition can potentially bring a number of benefits to retail investors and the economy in general. Overseas jurisdictions that have adopted competition in cash equity exchange markets have seen significant reductions in exchange market fees as new exchange markets compete for market share. This can translate into lower brokerage fees if market participants pass on the reductions in exchange market fees as execution venues compete for volume. There is already a reasonable level of competition among retail market participants in Australia and, therefore, it is reasonable to expect that cost savings will be passed on to clients—at least partially. Overseas jurisdictions have also experienced reductions in bid–ask spreads, which reduce the costs of trading for retail investors.

293 Retail investors may also gain improved access to derivative instruments, such as options, futures and contracts for difference (CFDs). An increase in the number of venues where trading can take place (on exchange markets or via crossings) may allow derivative market makers to hedge their residual exposures more easily and cheaply. At the margin, this could translate into lower costs of trading in these products.

294 Like other investors, retail clients may also benefit from the development of new technologies. For instance, it is possible that some market participants may extend to retail clients the technologies that allow fast computerised trading on exchange markets. For the time being, these technologies are still

expensive and accessible only to large institutional clients. However, as is usually the case, the cost of new technologies may decline over time and their adoption proliferate.

295 The greatest benefits for retail investors are likely to accrue indirectly through their investments in superannuation and other managed funds. Retail investors' direct exposure to shares is small by comparison with their indirect exposure. As at mid-2010, retail investors had around $230 billion in directly held shares.[190] This compares with around $670 billion that retail investors held in equities through superannuation alone—excluding non-super managed funds.[191] In addition to reductions in spreads, these funds will potentially benefit from increased depth, leading to lower market impact costs.

296 All the benefits described above will make the link between savers and borrowers more efficient. By improving the allocation of capital from investors to companies that seek funds for projects, competition among exchange markets in the long run may facilitate economic growth.

Linkages with derivative markets

297 The derivatives more often associated with equities—options, futures and CFDs—are essential instruments for trading and hedging. Linkages between cash equities and derivative markets are multiple and strong. Cash equity market traders and market participants use derivatives to hedge cash positions, implement complex trading strategies or add leverage to portfolios.

298 Conversely, market participants and market makers in derivatives often hedge their exposures through the underlying cash market. In addition, some traders operate in both markets, taking directional exposures or arbitraging across asset types. These direct linkages are supplemented by less direct ties, in that both cash and derivative markets are affected in similar ways by economic developments, shifts in confidence and policy actions.

299 In the 2009–10 financial year, turnover in equity-related futures and options contracts amounted to $1.6 trillion.[192] This was 20% higher than the turnover

[190] Household's holdings of shares and equity other than units in trusts (Australian Bureau of Statistics, '5323.0—Australian National Accounts: Financial Accounts, Jun 2010', table 20, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5232.0Jun%202010?OpenDocument).
[191] Superannuation and life office equity holdings excluding units in non-financial investment funds and money market funds (Australian Bureau of Statistics, '5323.0—Australian National Accounts: Financial Accounts, Jun 2010', table 20, www.abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/5232.0Jun%202010?OpenDocument) plus listed and unlisted share holdings of self managed superannuation funds (ATO Statistical Report, *Self managed super fund statistical report–June 2010*, Australian Tax Office, 25August 2010).
[192] AFMA Report, *AFMA 2010 Australian financial markets report*, Australian Financial Markets Association, 27 September 2010, www.afma.com.au/afmawr/_assets/main/lib90013/2010%20afmr.pdf.

of the underlying cash equity market itself. Listed CFD markets are comparatively small, with the value of open positions on equity-related contracts being around $114 million as at mid-2010.[193]

300 It is expected that competition among cash equity exchange markets will have a low impact, if any, on derivatives. At the margin, it is possible that competition could somewhat improve trading conditions and pricing in these products. Some possible impacts are discussed below.

301 If competition brings about greater liquidity and depth in cash equity exchange markets, price movements when large orders are implemented could be reduced. In turn, a decline in short-term stock price volatility could reduce option premiums as well as futures and CFD margins.

302 If competition also leads to tighter bid–ask spreads, equity price movements that result when the spread is crossed may also eventually narrow. This could further reduce premiums and margins in derivative products.

303 An increase in the number of execution venues in cash equity exchange markets and the greater use of crossing systems may also make it easier and cheaper for derivative market makers to hedge exposures. This could reduce costs and facilitate market making in derivative products.

304 To some extent, these envisaged lower-volatility benefits could be offset if a proliferation of automated trading were to lead to more numerous and sharper price disruptions—or if market fragmentation turned out to be excessive. However, the probability of sustained negative impacts arising from these factors appears small, according to overseas experience.

305 The events of 6 May in the US show that temporary disruption in one market can flow onto others. In this instance, the disruption was seen first in the futures markets and then crossed over to cash equity trading. However, there is no particular reason why the sequence of action could not also go in the other direction. With this in mind, it is essential that controls put in place in cash equity exchange markets to address erroneous orders and volatile trading conditions be coordinated with similar mechanisms in derivatives markets.

[193] This figure equates to 0.01% of the cash equities market capitalisation at the same time. There is also an over-the-counter CFD market, for which data is not regularly available.

The exchange market structure with competition

306 Figure 9 shows the structure of the equity market that may emerge as a result of the regulatory framework for competition that we are proposing in CP 145. We have taken a technological focus for this figure. Compared with Figure 3, the proposed structure has:

(a) a more developed order management stage;

(b) a greater role for execution venues other than ASX's CLOB; and

(c) a more important role for data aggregation and dissemination.

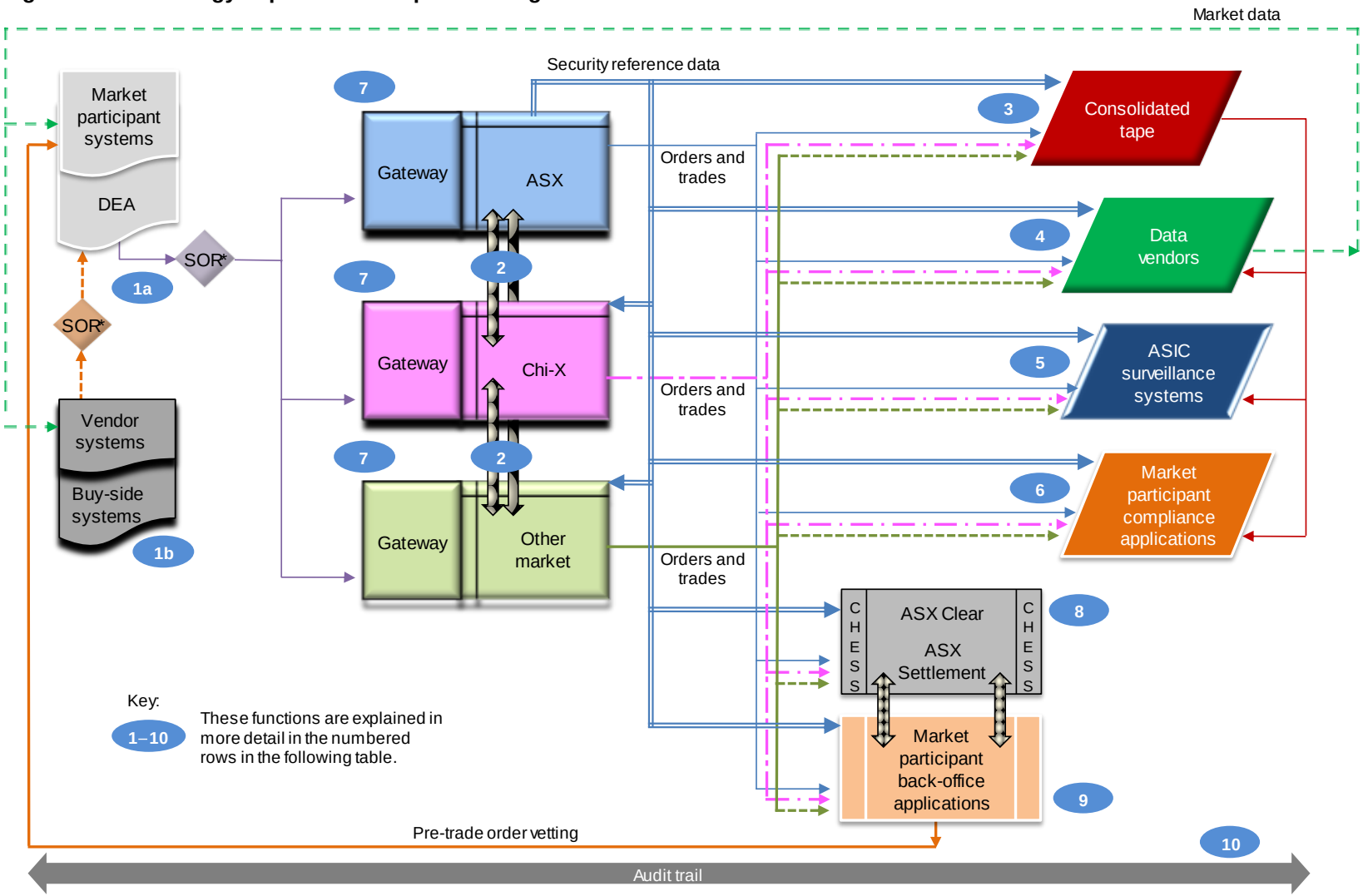
307 Some movement towards the possible structure is likely, even without the introduction of formal competition between market operators. Furthermore, the diagram does not purport to identify the extent or outer boundaries of the changes. The competitive landscape will be dynamic—not restricted to the introduction of competition between exchange markets, but also creating increased demands and opportunities for data vendors and technology suppliers, and possible competition in clearing services. The direction and extent of the changes will have to be kept under review.

308 In summary, what we are seeking to put in place is a regulatory framework within which competition can occur that maximises the benefits and minimises the costs of market fragmentation, and thus supports the public good aspects of exchange markets, as described in Section B.

Technology

309 From the point of view of technology, the current market structure still has to develop further if the full benefits of competition are to be achieved. Table 32 discusses the gaps between the current framework and a framework that would be capable of supporting competition.

Figure 9: Technology impacts of multiple exchange markets



* Smart order routing (SOR) is an automated process of scanning various execution venues to determine which venue will deliver the best outcome on the basis of predetermined parameters.
Note: Market participant systems could include dark pools and bilateral trading.

Source: ASIC

Table 32: Technology gap analysis

	Functionality	Systems	Gaps—Changes required	Comments
1a	Order routing	Market participant systems	Market participants that use their own order management systems may need to develop smart order routing (SOR) capability to connect to new markets they wish to access. These routers assess current market quotes and then route orders based on predefined parameters, including requirements for best execution.	Required for market participants to be able to access new markets. • Order routing is only required to connect to those markets that a market participant determines it should access in accordance with its best execution policy. • Global dealers (e.g. UBS, Citi Group, Merrill Lynch and ITG) have already developed SOR technology in other markets (e.g. US, Europe and Canada). This technology could be adapted to connect to new Australian markets and will need logic/parameters defined to route in accordance with Australian regulatory requirements. • Most vendors have developed this technology in other markets. This technology will need to be adapted to connect to new Australian markets and will need logic/parameters defined to route in accordance with Australian regulatory requirements. • A small number of 'Australian only' vendors may choose to develop or procure their own technology.
1b	Order routing	Access vendors (e.g. IRESS, Fidessa, Sungard)	Access vendors are likely to offer SOR capability to assess current market quotes and then route orders based on predefined parameters, including requirements for best execution.	
2	Trading	Market operators	Market operators may provide routing to other markets as a value-add service—this could be used by small market participants if they do not have access to routing facilities or do not wish to pay for them. Synchronised clocks.	Optional—markets may add this functionality as a value-add service. Required—markets should be required to synchronise their clocks to facilitate data consolidation.

	Functionality	Systems	Gaps—Changes required	Comments
3	Data feeds	Consolidated tape	We propose that market participants trading OTC (including via crossing systems) must provide pre-trade and post-trade data to market operators. All market operators should provide pre-trade and post-trade data to the consolidated tape(s)—if the consolidated tape provider(s) is one of the current data vendors, then market operators may already be sending the required data to the provider.	Required—market operators should send pre-trade and post-trade information to the consolidated tape, with: • timing to be specified by ASIC; and • market participants trading OTC to send trade reports to a market operator. ASIC will define the minimum data requirements.
4	Market data	Data vendors	Data vendors will need to accept feeds from either the consolidated tape provider or receive direct feeds from each market operator. Vendors will need to either show the national best bid and offer (NBBO) calculated by the consolidated tape provider(s) or develop a consolidated quote to indicate NBBO. Note: Some market participants may consolidate their own data, which may vary from the consolidated NBBO because they may not subscribe to all markets and there may be latency.	Required—market operators should publish their data to data vendors, with timing to be specified by ASIC. ASIC is seeking feedback on whether the consolidated tape operator(s) should be regulated.
5	Regulatory	ASIC supervision	All markets operators will be required to provide pre-trade and post-trade data to regulators (maybe via a consolidated trade provider). Note: See No. 7 below for additional data requirements for all market operators. ASIC will consolidate data from multiple execution venues or take a consolidated data feed to provide a complete view of trading patterns across execution venues.	Required—market operators should provide pre-trade and post-trade data to ASIC. ASIC will define the data requirements. Required—for implementation.
6	Regulatory	Market participant compliance applications	Market participants should consolidate data from execution venues or take a consolidated data feed to provide a complete view of trading patterns across all execution venues accessed by the market participant.	Optional or required—may not be required for implementation, depending on the volumes traded on new execution venues.

	Functionality	Systems	Gaps—Changes required	Comments
7	Regulatory	Trading gateway	Data fields will need to be added—fields and timing are subject to consultation. Market operators may need to incorporate and display additional order and trade data, as described above.	Required by ASIC for enhanced market supervision. Timing will be set after consideration of the responses to CP 145.
8	Post trade	ASX clearing systems	ASX Clear will need the ability to record and net trades across multiple execution venues.	Required for the introduction of competition.
		ASX settlement systems (CHESS)	ASX Settlement will need the ability to settle trades and novated transactions with settlement participants for all market participants.	Required for the introduction of competition.
9	Post trade	Back office service providers	Back office systems providers will need to modify systems to include the capability to identify each execution venue, and will need to be able to accept trade files from all execution venues. Back office system providers will also need to be able to identify trade execution by execution venue (e.g. volume and price traded on each execution venue).	Required for the introduction of competition.
10	Audit trail	Market participant trading Middle and back office systems	We are considering whether market-wide unique client identifiers are required.	Scope and timing will be set after consideration of the responses to CP 145.

Key terms

Term	Meaning in this document
10-second (priority crossing) rule	A now-repealed rule that only permitted a priority crossing to be effected when the second bid or offer was entered into the execution venue at least 10 seconds after the first
ACCC	Australian Competition and Consumer Commission
ADV (average daily volume)	The number of shares traded per day, averaged over a time period (e.g. annual average)
AFS licensee	A person who holds an Australian financial services licence under s913B of the Corporations Act Note: This is a definition contained in s761A of the Corporations Act.
agency	Where a market participant acts on behalf of a client
aggregate consideration	The combined price of a basket (or portfolio) of products acquired and/or sold in a transaction
aggressive liquidity taker	A trader who actively trades on existing bids and offers
algorithm/algorithmic trading	Electronic trading activity whose parameters are set by predetermined rules aimed at delivering specific execution outcomes
allowable tolerance	A permitted margin of difference between the time on an entity's clock and the time on the Universal Time Clock
AOP (automated order processing)	Orders generated by a system
AQUA products	Product quotations on ASX under the AQUA Rule framework
arbitrage	The process of seeking to capture pricing inefficiencies between related products or markets
ASIC	Australian Securities and Investments Commission
ASIC-approved data consolidator	An entity approved by ASIC to consolidate and publish pre-trade and post-trade market data
ASX	The exchange market known as the Australian Securities Exchange
ASX Best	An ASX smart order router which enables ASX participants to route orders to ASX for execution within the expanded ASX execution venue offering
ASX Clear	The ASX clearing facility and central counterparty for cash market products and predominantly equity-related derivatives

Term	Meaning in this document
ASX Group	The ASX group of companies
ASX operating rules	ASX Limited's new operating rules, which replace the pre-existing ASX market rules
ASX Settlement	The ASX settlement system and electronic securities depository for equity and equity-related products
ASX 200	A collective name for the largest 200 shares listed on the ASX by market capitalisation
ASX 24	The exchange market formerly known as the Sydney Futures Exchange (SFE), operated by ASX Limited
ASX Limited	The market operator of ASX
ATS (alternative trading system)	In the US and Canada, an ATS is a facility for bringing together purchasers and sellers of products, but it is not a formal securities exchange
AUSTRAC	Australian Transaction Reports and Analysis Centre
Australian market licence	Australian market licence under s795B of the Corporations Act that authorises a person to operate a financial market
AXE-ECN	AXE-ECN Pty Limited
BATS	Better Alternative Trading System
best bid or offer	The best available buying price or selling price
best execution	Where a market participant achieves the best trading outcome for its client
BIC (Bank Identification Code)	A standard format of bank identifier codes approved by the International Organization for Standardization
bid–ask spread	The difference between the best bid and the best offer
block special crossing	An off-order book crossing which may be agreed at any price, where the consideration is at least $1 million
block trade	A proposed pre-trade transparency exception where the consideration for the trade is not less than $1 million for approximately 25 equity market products and $500,000 for all other equity market products
bps	Basis points
breach reporting obligation	As defined in s912D of the Corporations Act
broker–dealer	A term used in the US and Canada to refer to a company or other organisation that trades products for its own account or on behalf of its customers

Term	Meaning in this document
bundling	The practice of market participants and other service providers providing other services, such as advice, research and analytical tools, in conjunction with trade execution
buy-side	A term referring to advising institutions typically concerned with buying, rather than selling, assets or products. Private equity funds, mutual funds, unit trusts, hedge funds, pension funds and proprietary trading desks are the most common types of buy-side entities
capital formation	A method for increasing the amount of capital owned or under one's control, or any method in utilising or mobilising capital resources for investment purposes
CDI (CHESS Depository Interest)	Non-Australian companies use CDIs as an instrument to support electronic registration, transfer and settlement of their products listed on ASX
CentrePoint	An ASX-operated venue that references the midpoint of the bid–ask spread on the ASX Central Limit Order Book
CESR	Committee of European Securities Regulators
CFTC (Commodity Futures Trading Commission)	An independent agency with the mandate to regulate commodity futures and options markets in the US
Chi-East	A pan-Asian dark pool operated as a joint venture between Chi-X Global and SGX
Chi-X	Chi-X Australia Pty Limited
circuit breaker	A mechanism that pauses trading in a product if it exhibits extreme price movement in a defined period of time. Circuit breakers can either apply to individual products or can be market-wide, based on an index's movement
clearly erroneous trade	A trade that deviates so substantially from current market prices that it is considered to be done in error
CLOB (central limit order book)	A central system of limit orders, where bids and offers are typically matched on price–time priority
CME	Chicago Mercantile Exchange Inc.
co-location	Where participants locate their trading systems with the exchange matching engine in a single data centre
compensation scheme	Compensation arrangements in place under the Corporations Act to meet certain claims arising from dealings between investors and market participants
consolidator	See data consolidator

Term	Meaning in this document
consolidated tape	A combined view of pre-trade and post-trade information from multiple markets and execution venues
continuous disclosure	The timely disclosure of information which may affect product values or influence investment decisions, and information in which product holders, investors and markets have a legitimate interest
Corporations Act	*Corporations Act 2001* (Cth), including regulations made for the purposes of that Act
Corporations Regulations	Corporations Regulations 2001
covered short sale	A short sale relying on an existing securities lending arrangement to have a presently exercisable and unconditional right to vest the products in the buyer at the time of sale
CP 145	ASIC consultation paper *Australian equity market structure: Proposals*, released 4 November 2010
crossing/crossed transaction	A type of order where the broker for a buyer and seller are the same. The broker may be acting on behalf of buying and selling clients, or acting on behalf of a client on one side of the trade and as principal
crossing system	An electronically accessible pool of dark liquidity offered by brokers and third parties that automatically matches client orders together or matches client orders against the broker's own account
dark liquidity/hidden liquidity	Non-pre-trade transparent orders
dark order	An order that is not pre-trade transparent
dark pool	Non-pre-trade transparent electronically accessible pools of liquidity
data centre	A facility used to house computer systems, matching engines, exchange servers, co-location facilities and other computer hardware and software
data consolidator	An entity that combines data from various execution venues to produce a consolidated view of order and/or trading information for use by investors
data feed	An electronic mechanism for investors to receive a stream of information from data sources
DEA (direct electronic access)	Access to markets via the infrastructure of a market participant
DEA channel	An access point to an exchange engine for an entity using DEA

Term	Meaning in this document
depth of book	Where every order for every market participant is displayed. A 'deep book' has many orders at many different price points
ELP (electronic liquidity provider)	Typically, HFTs or algorithmic traders who attempt to profit by providing continuous two-sided quotes for liquid securities on an unofficial basis to capture the bid–ask spread of a product
equity market	The market in which shares are issued and traded, either through exchange markets or OTC markets
equity market products	For the purposes of this consultation paper or report, shares, managed investment schemes and CHESS Depository Interests (CDIs) admitted to quotation on ASX
exchange market	For the purpose of this consultation paper or report, a market that enables trading in listed products, including via a 'central limit order book' Not all exchange markets offer primary listings services
execution quality report	A proposed report by execution venues on liquidity measures, trading statistics and other relevant data
execution venue	An execution venue is a facility, service or location on or through which transactions in equity market products are executed and includes each individual order book maintained by a market operator, a crossing system and a participant executing a client order against its own inventory otherwise than on or through an order book or crossing system
facilitated specified size block special crossing	An existing ASX exception from post-trade reporting permitting a delay for transactions above $15 million, $10 million, $5 million or $2 million, depending on the product
financial market	As defined in s767A of the Corporations Act. It encompasses facilities through which offers to acquire or dispose of financial products are regularly made or accepted
financial product	Generally a facility through which, or through the acquisition of which, a person does one or more of the following: • makes a financial investment (see s763B); • manages financial risk (see s763C); and • makes non-cash payments (see s763D) Note: See Div 3 of Pt 7.1 of the Corporations Act for the exact definition.
FINRA	Financial Industry Regulatory Authority

Term	Meaning in this document
'flash crash'	The 'flash crash' of 6 May 2010 involved an extraordinary rapid decline and recovery in US equities and futures markets triggered by a large sell order in the futures market on a day where the markets were already affected by unsettling political and economic news
fragmentation	The spread of trading and liquidity across multiple execution venues
front-running	The practice of transacting on one's own behalf before implementing a client's instructions
FSG	Financial Services Guide
fundamental investor	A person that buys or sells a security based on an assessment of the intrinsic value of the security
HFT (high-frequency trading)	While there is not a commonly agreed definition of HFT, we characterise it in this consultation paper and the report as: • the use of high-speed computer programs to generate, route and execute orders; • the generation of large numbers of orders, many of which are cancelled rapidly; and • typically holding positions for very short time horizons and ending the day with a zero position
HFTs	High-frequency traders
hidden order	An undisclosed order which does not have time priority
high-speed trading	A specialised form of algorithmic trading characterised by the use of high-speed computer programs
HIN	CHESS Holder Identification Number
IIROC	Investment Industry Regulatory Organization of Canada
iceberg order	An order that only exposes a small amount of the total order volume, with the remainder of the volume undisclosed
indirect market participant	A broker that is not itself a market participant, but that accesses the market through a market participant
inside information	As defined in s1042A of the Corporations Act
Instinet	Instinet Incorporated, the parent company of the Instinet group of companies
internalisation	Trading a client order against a market participant's own account
investment firm	An entity defined under MiFID whose regular occupation is to provide investment services and/or perform investment activities on a professional basis
IOSCO	International Organization of Securities Commissions

Term	Meaning in this document
IP address	Internet protocol address
IRESS	IRESS Market Technology Limited
issuer	A company that has issued shares
ITG POSIT	A buy-side crossing pool operated by ITG
large trader reporting system	A proposed US reporting system that requires traders who engage in substantial levels of trading activity to identify themselves to the SEC through a filing with the Commission. A large trader does transactions in exchange-listed securities equal to or exceeding two million shares or $20 million during any day, or 20 million shares or $200 million during any calendar month
latency	An expression of how much time it takes for data to get from one point to another
limit order	An order for a specified quantity of a product at a specified price or better
liquidity	The ability to enter and exit positions with a limited impact on price
Liquidnet	Liquidnet Australia Pty Limited
LSE	London Stock Exchange
maker–taker pricing	A pricing scheme used by some execution venues which rewards price makers (limit orders) with a rebate, while price takers (market orders) pay a fee
managed investment scheme	As defined in s9 of the Corporations Act
market impact	The cost incurred when the price of execution is different from the target price
market integrity rules	Rules made by ASIC, under s798G of the Corporations Act, for trading on domestic licensed markets
market licence	An Australian market licence
market maker	An entity that provides a required amount of liquidity to a market, and takes the other side of trades when there are short-term buy and sell imbalances in customer orders in return for rebates and/or various informational and trade execution advantages
market manipulation	As defined in Pt 7.10 of the Corporations Act
market operator	A holder of an Australian market licence
market order	An order at the best price currently available
market participant	As defined in s761A of the Corporations Act

Term	Meaning in this document
MAS	Monetary Authority of Singapore
MiFID	Markets in Financial Instruments Directive
MTF (multilateral trading facility)	A multilateral system operating in the European Economic Area that is operated by an investment firm or a market operator, which brings together multiple third-party buying and selling interests in financial instruments—in the system and in accordance with non-discretionary rules—in a way that results in a contract in accordance with the provisions of Title II of the European Markets in Financial Instruments Directive
naked short sale	The practice of short selling securities without a securities lending arrangement
Nasdaq OMX	National Association of Securities Dealers Automated Quotations—a US securities exchange
NMI	National Measurement Institute
non-professional client	A person who is not a professional investor
NTP	Network Time Protocol
NYSE Euronext	New York Stock Exchange—a US securities exchange
off-order book trading	Trading that takes place away from a CLOB and that is not pre-trade transparent. It is often referred to as 'dark liquidity' or 'upstairs trading'. It includes bilateral OTC trades and trades resulting from a broker matching client orders or matching a client order against the participant's own account as principal. When this type of trading is done in an automated way and is part of a pool of liquidity, it is referred to as a 'dark pool'
opening price auction	A market phase which occurs before a normal trading session where opening prices are established through an electronic auction. Orders can be entered during the auction but no matching occurs
operating rules	As defined in s761A of the Corporations Act
order book	A list of unexecuted orders available to be matched for each product used by execution venues to record the interest of buyers and sellers in a financial instrument
order-driven market	An auction market in which prices are determined by the publication of orders to buy or sell shares
origin-of-order information	A type of order category that identifies trading capacity and, if relevant, the type of client
OTC	Over-the-counter

Term	Meaning in this document
passive market maker	A trader who uses HFT strategies involving the automated generation of non-marketable resting orders providing liquidity to the market at specified prices
pegged order	A specified quantity of a product set to track the best bid and offer on the primary market
PIN	UBS's Price Improvement Network
portfolio trade	A trade that includes at least 10 purchases or sales, the firm acts as agent for both the buyer and seller of the portfolio or as principal buys from or sells to the client, and the consideration of each is not less than $200,000 and the aggregate consideration is not less than $5 million
post-trade transparency	Information on executed trades made publicly available after trades occur
pre-trade transparency	Information on bids and offers being made publicly available before trades occur (i.e. displayed liquidity)
price formation	The process determining price for a listed product through the bid and offer trading process of a market
price sensitive information	Information about a company that will have, or can be expected to have, an impact on the price of that company's products
price–time priority	A method for determining how orders are prioritised for execution. Orders are first ranked according to their price; orders of the same price are then ranked depending on when they were entered
priority crossing	A type of on-market ASX crossing that is transacted at or within the spread with time priority
professional investor	As defined in s9 of the Corporations Act
proprietary trader	A trader who is trading on their own behalf
PureMatch	A high-speed ASX execution venue for ASX 200 shares aimed at HFTs which will run parallel to ASX's CLOB
quote-driven market	An electronic exchange system in which prices are determined from quotations made by market makers or dealers
Reg NMS (Regulation National Market System)	New substantive rules designed to modernise and strengthen the regulatory structure of the US equities markets
Reg ATS (Regulation Alternative Trading System)	Section 242.3 of US 17 Code of Federal Regulation. It governs the operation of alternative trading systems in the US

Term	Meaning in this document
REP 215	ASIC report *Australian equity market structure*, released 4 November 2010
RG 214	An ASIC regulatory guide (in this example numbered 214)
Rule 605/606	Execution quality and order routing statistical reports which are required to be made public periodically by market centres and broker–dealers
S&P/ASX 200 Index	An index of the largest 200 shares listed on ASX by market capitalisation
s912 (for example)	A section of the Corporations Act (in this example numbered 912), unless otherwise specified
sell-side	A term that describes firms that sell investment services to the buy-side, or corporate entities, including broking–dealing, investment banking, advisory functions and investment research
SEC	US Securities and Exchange Commission
settlement	The exchange of payment for purchased securities
SFE (Sydney Futures Exchange)	The market formerly known as Sydney Futures Exchange (now ASX 24)
SGX	Singapore Exchange Ltd
short sale transaction	The practice of selling financial products that are not owned by the seller, with a view to repurchasing them later at a lower price. Short sales can be naked or covered
Sigma X	A dark pool crossing system and ATS that provides execution and liquidity to Goldman Sachs' clients on a global basis
SOR (smart order router)	An automated process of scanning various execution venues to determine which venue will deliver the best outcome on the basis of predetermined parameters
spread	The difference between the best bid and offer prices
SRN	Security Reference Number
SSCB	Single stock circuit breaker
stub	The residual volume from a partly filled order
suspicious activity reporting	A requirement for a market participant to notify ASIC if it has reasonable grounds to suspect that a person is trading with insider information, engaging in manipulative trading or front-running
synchronised clock	A system time clock that matches a reference source clock
TAS	ASX Trade Acceptance Service

Term	Meaning in this document
tick size	The minimum amount by which share prices are allowed to vary
top-of-book	The single best bid and offer
total consideration	The total price and execution costs incurred, including market fees and clearing and settlement fees
TradeMatch	A new ASX low-latency execution venue offering trade execution services for all ASX-listed products
trade-through	A model and rule that embeds price–time priority across multiple pre-trade transparent venues to protect displayed bids and offers from being bypassed
trade confirmation	A legal document provided to clients which sets out the terms of an executed trade
trade report	An electronic message created when a trade is executed, detailing the terms of the trade
trading halt	A temporary pause in the trading of a product for a market-integrity-related reason, such as when an announcement of price sensitive information is pending
two-sided quote	A quote to buy and sell
UMIR	Canadian Universal Market Integrity Rules
undisclosed order	A non-pre-trade transparent order
unfiltered access	A form of DEA where the market participant that is providing the market access does not have filters in place
Universal Time Clock	A clock that is referenced to UTC (AUS)
UTC (AUS)	Coordinated Universal Time for Australia
volatility	Fluctuation in a product's price
volatility control/ collar	A set price limit whereby a product can only trade at or above (or at or below) that level for a period of time. These controls can limit the disruptive effect of anomalous trades
VolumeMatch	An ASX-operated venue that facilitates the matching of anonymous large orders with reference to the last price on the ASX CLOB