Senate Select Committee on Financial Technology and Regulatory Technology

Australian Securities and Investments Commission
Answers to Questions on Notice

Question No	001
Topic	Digital and crypto assets
Committee Member	Senator Bragg
Reference	Hansard page 37

Question

CHAIR: There's no other information. I don't want to get too much into one particular fund; I don't think that's appropriate. But it's more that products like this—
Ms Armour: What sort of—
CHAIR: For digital assets or crypto based products, what is holding back these products from going to market if they're available in other comparable jurisdictions to retail investors?
Ms Armour: I guess that's another thing—
CHAIR: What is it exactly? It's not clear to me.
Ms Armour: It's not clear to me that they are available in the way that you're talking about—in other comparable markets. So that's the first thing.
CHAIR: Maybe you can provide that evidence on notice.
Ms Armour: I'm happy to provide evidence. We'll have to select the markets; we won't do a global search. But we're happy to provide that evidence. These products can be made available to Australians through our managed investment scheme regime. Australians can invest in these products in that way.
CHAIR: Okay—if you can take that on notice. You can probably do this through—what's it called—IOSCO or something? Is that what it's called?
Ms Armour: Yes.
CHAIR: You can probably give us something on notice about what the position is in comparable jurisdictions.
Ms Armour: We'll do it, but more abbreviated.
CHAIR: It's as far as you can.
Ms Armour: Yes. IOSCO is a-hundred-and-something countries, but we'll do something.
CHAIR: I understand that. Clearly, there has been a lot of correspondence and engagement with this committee on these questions, and we just want to try to present some of the information in the report.
Ms Armour: Sure.

Answer

We have answered this question in two parts. Part 1 addresses perceived barriers preventing retail access to digital assets or crypto based products. Part 2 provides a general comparison of the availability of crypto related products in Australia and in key overseas jurisdictions.

Part 1 Perceived barriers

Crypto-assets are available directly to retail investors in Australia through local digital currency exchanges and overseas based crypto-asset trading platforms. These products do not automatically benefit from all the safeguards provided under the Australian financial regulatory framework administered by ASIC such as upfront disclosure of the risks involved, access to dispute resolution services, or access to compensation funds[1]. The safeguards available depend on the rights and features of each individual crypto-asset. Each crypto-asset service provider or trading platform is

[1] However we note that some derivative products linked to crypto-assets, such as Bitcoin CFDs, may be subject to existing regulatory settings for derivatives

responsible for complying with all relevant Australian laws applicable to it. In this context, ASIC's role is to administer the framework set by Parliament in the *Corporations Act 2001* for the offer of financial products and services and the operation of financial market infrastructure. ASIC's approach to administering this framework is set out in ASIC Information Sheet 225 *Initial coin offerings and crypto-assets* (INFO 225) which provides information to assist the crypto industry to comply with their obligations under the *Corporations Act*. ASIC's approach to regulating crypto-assets is summarised in Supplementary Submission 14.2 to the Senate Inquiry. ASIC makes it clear in INFO 225, that whether a crypto asset is within or outside the financial regulatory framework depends on particular characteristics of the crypto-asset offering. This can cause uncertainty for investors and consumers as well as issuers and distributors of these assets. It is a policy matter for government whether or not there should be clarity on this issue.

Where firms seek to offer specific financial products involving crypto-assets within the Australian financial regulatory framework their proposals can involve ASIC. In working through specific business propositions, the product issuer and ASIC are able to identify additional steps that are needed to bring a financial product involving crypto-assets within the Australian financial regulatory framework. For example, in considering the proposal for an exchange traded product involving crypto-assets we identified that an Australian financial market licensee has yet to publicly consult, and develop a rule framework to facilitate an exchange traded product that would hold crypto-assets. Operating or listing rules on all of the Australian securities markets would need to be either developed or amended to include crypto-assets as approved underlying assets for exchange traded products such as exchange traded managed funds. This process would be subject to ASIC and Ministerial consideration.

Crypto-assets are not a homogenous asset class and each crypto-asset raises different considerations. As such, crypto-assets present unique challenges that can make it difficult to meet the safeguards in place to protect retail investors and Australian financial markets. For example, to ensure adequate investor and market safeguards within the Australian financial regulatory framework, the product issuer may need to identify how to:

- reliably price underlying crypto-assets that trade on multiple digital currency exchanges (market quality would be a consideration);
- hold and reliably audit crypto-assets in custody (this would include considering the control of private keys, wallet types or storage mechanisms, network or cyber security issues, insurance, auditing, and suspicious matter reporting processes);
- ensure any third-party service providers connected with the product (such as calculation agents, liquidity providers and authorised participants) have the appropriate competencies to deal with crypto-assets;
- ensure adequate risk management arrangements to manage crypto lifecycle events such as forks.

Part 2 General comparison of the availability of crypto related products in Australia and in key overseas jurisdictions

The broader crypto-asset marketplace is online and global and it is difficult (or even artificial) to draw boundaries between crypto products that are available in different jurisdictions. Globally, as at 25 February 2021, there were 8,484 different types of crypto-assets available via 831 crypto-asset trading platforms.[2]

ASIC is not aware of any retail financial products that have crypto-assets as a sole underlying asset that have been issued under the Australian financial regulatory framework (except on an incidental basis) whether on a unlisted or quoted basis. We are aware that Australian financial services licensees may be facilitating access to overseas funds that hold crypto-assets for wholesale or sophisticated investors.

[2] Coinmarketcap.com information accessed on 25 February 2021

In answering this question, ASIC sought information from the US Commodity Futures Trading Commission (CFTC), the US Securities and Exchange Commission (SEC), the Hong Kong Securities & Futures Commission (SFC), the Ontario Securities Commission (OSC), the Monetary Authority of Singapore (MAS) and the UK Financial Conduct Authority (FCA) about the availability of crypto related products in their jurisdictions. The appendix to the answer contains a summary of each regulator's response – with the exception of the FCA's, which we will forward when it is received.

In general, there is limited access to crypto-asset 'financial' products by retail investors in most of those jurisdictions. For example, the MAS has stated that financial products which are based on or otherwise reference crypto-assets are not suitable for most retail investors, and the FCA has banned the sale of derivatives and exchange traded notes (ETNs) that reference certain types of crypto-assets to retail consumers. However, in Ontario, there are seven investment funds with underlying crypto assets that trade on the Toronto Stock Exchange and in the USA there are a small number of trust products holding crypto-assets whose trust interests are traded in the over-the-counter-market and two quoted futures contracts that reference bitcoin.

Appendix

Overview

ASIC requested some information about the state of play of crypto-asset security and derivative markets in international jurisdictions for the Australian Senate Select Committee inquiry into fintech and regtech.

The questions and extractions of answers are set out below. Where there are references to currency, we have taken this as the local currency.

The response we have to date:

- United States of America | Commodity Futures Trading Commission | CFTC
- United States of America | Securities and Exchange Commission | US SEC
- Hong Kong | Securities & Futures Commission of Hong Kong | HK SFC
- Canada | Province of Ontario | Ontario Securities Commission | OSC
- Singapore | Monetary Authority of Singapore | MAS
- United Kingdom | Financial Conduct Authority | FCA

United States of America | Commodity Futures Trading Commission | CFTC

The Commodity Exchange Act (CEA) regulates the trading of commodity futures in the United States. The CEA establishes the statutory framework under which the CFTC operates. Under this Act, the CFTC has authority to establish regulations[3].

1. *What is the nature and scale of regulated financial products/securities/derivatives where the underlying is crypto-assets that are offered to retail clients in your jurisdiction? Further, please indicate if there are listed or quoted products. Do your financial markets rules contemplate potential listed or quoted products of this kind?*

   All CFTC-regulated virtual currency derivative contracts have been certified by the exchanges under the Commission's self-certification process[4]. The Commission has not approved a virtual currency product[5]. This is standard practice, as the vast majority of products are certified by the exchanges themselves. The Commission has not adopted any special certification process specific to virtual currencies. There was an advisory released for exchanges and clearinghouses highlighting the Commission's expectation for virtual currency derivative contracts.

   As with other products, the exchanges file rule amendments on things like position limits, large trader reporting levels, and other standard rules to support trading products. The clearing houses also adopted rules to support the clearing of these products. These were done through the normal process[6].

[3] https://www.cftc.gov/LawRegulation/CommodityExchangeAct/index.htm
[4] The text laying out the 40.2 process can be found at: https://www.law.cornell.edu/cfr/text/17/40.2.
[5] Under the 40.3 product approval process https://www.law.cornell.edu/cfr/text/17/40.3
[6] See the 40.6 process https://www.law.cornell.edu/cfr/text/17/40.6

Bitcoin and Ether are treated as commodities and subjected to the CFTC regulatory jurisdiction should they be traded in the derivatives markets. As such, the derivatives products the CFTC have seen have been based on Bitcoin and Ether. There are some listed derivatives of this kind available to both retail and wholesale clients in the form of 4 cash-settled and 4 physically-settled contracts.

2. *What is the nature and scale of regulated financial products/securities/derivatives where the underlying is crypto-assets that are offered to wholesale clients in your jurisdiction? Further, are there listed or quoted products that are not accessible to retail clients given suitability or other limitations – e.g.: future contracts.*

   There is a listed product available solely to wholesale clients on a CFTC regulated Swap Execution Facility (SEF) which has monthly and weekly options, a prepaid day-ahead swap and a prepaid day-ahead option. All these products are cleared, fully-collateralized and physically-settled into Bitcoin.

3. *To the extent not answered by the above, what is the nature and scale of current financial market platforms authorised to list or quote financial products where the underlying is crypto-assets?*

   In the US, under CFTC regulation, currently there are 4 trading venues that list derivatives on crypto products. To date, trading in virtual currency derivatives has been modest relative to futures contracts in other commodities. The most liquid derivative contract on BTC has open interest equivalent to roughly 50,000 BTC[7]. This contract accounts for the majority of the open interest in US listed virtual currency derivative contracts[8].

United States of America | Securities and Exchange Commission | US SEC

The SEC, an independent federal government agency, is responsible under the US federal securities laws for regulating the securities markets and enforcing federal securities laws, with the mission to protect investors, maintain fair, orderly, and efficient markets, and facilitate capital formation[9].

1. *What is the nature and scale of regulated financial products/securities/derivatives where the underlying is crypto-assets that are offered to retail clients in your jurisdiction? Further, please indicate if there are listed or quoted products. Do your financial markets rules contemplate potential listed or quoted products of this kind?*

   The US federal securities laws require all offers and sales of securities, including those involving a digital asset security, to either be registered under its provisions or to qualify for an exemption from registration. There are currently two trust products that are not registered as investment companies in the US and that hold BTC and ETH directly. The trust interests were initially sold in offerings that were not registered under the Securities Act of 1933 ("Securities Act") and subsequently began trading in the over the counter market and are not listed for trading on any national securities exchange in the US. The trust interests are now registered as a class of securities under the Securities Exchange Act of 1934 ("Exchange Act"), thus subjecting the trust issuer to the periodic reporting requirements of the Exchange Act. There are other trusts or

[7] Roughly $2.5B USD or $3.275B AUD

[8] weekly Commitments of Traders report provides some detail on the type of traders active in this product: https://www.cftc.gov/dea/options/financial_lof.htm

[9] https://www.sec.gov/about/what-we-do

similar entities of the same sponsor as well as other sponsors who are selling interests in trusts where the underlying assets are crypto-assets. Like the sale of the BTC and ETH retail trusts, the trust interests in these other trusts were and are being offered and sold pursuant to an exemption from registration under the Securities Act, but currently the trust interests themselves are not registered as classes of securities under the Exchange Act, and the trusts are not subject to the periodic reporting requirements of the Exchange Act. None of these trusts, whether traded over the counter or not yet traded, have any redemption features similar to an exchange traded fund.

There are a handful of open-end funds that may hold some portion (limited to 15% or so) of such funds in crypto assets– as permitted under existing US laws for registered trust products.

2. *What is the nature and scale of regulated financial products/securities/derivatives where the underlying is crypto-assets that are offered to wholesale clients in your jurisdiction? Further, are there listed or quoted products that are not accessible to retail clients given suitability or other limitations – e.g.: future contracts.*

   Please see answer to question 3 in relation to investments sold privately pursuant to an exemption from registration (as opposed to investments being publicly offered and sold to individuals such as retail investors).

3. *To the extent not answered by the above, what is the nature and scale of current financial market platforms authorised to list or quote financial products where the underlying is crypto-assets?*

   No registered national securities exchange in the US currently has listing standards that would allow the quoting and listing of digital assets that are securities but, as noted in response to question 1 above, there are trusts whose underlying assets are comprised of crypto-assets and whose trust interests are quoted for trading through alternative trading systems and in over the counter markets. However, please note, the SEC generally would not be provided detailed information about privately offered investments (those that have been offered and sold pursuant to an exemption from registration), offerings of crypto-assets that are not securities, and offerings of crypto-assets that are securities and are being sold/traded in violation of the US federal securities laws.

Hong Kong | Securities & Futures Commission of Hong Kong | HK SFC

The Securities and Futures Commission (SFC) is an independent statutory body set up in 1989 to regulate Hong Kong's securities and futures markets[10].

1. *What is the nature and scale of regulated financial products/securities/derivatives where the underlying is crypto-assets that are offered to retail clients in your jurisdiction? Further, please indicate if there are listed or quoted products. Do your financial markets rules contemplate potential listed or quoted products of this kind.*

[10] https://www.sfc.hk/en/Career/What-the-SFC-does#:~:text=The%20Securities%20and%20Futures%20Commission,Kong's%20securities%20and%20futures%20markets.&text=Operationally%20independent%20of%20the%20Government,transaction%20levies%20and%20licensing%20fees.

Under the HK legal and the SFC regulatory regime, only financial products with more than 10% underlying crypto-assets may require more considered regulatory restrictions. For example, there may be funds- with less than 10% crypto-assets underlying- selling to the public in HK. Although all funds selling to the public in HK are legally required to be authorised by the SFC, the funds are not obliged to disclose the specific asset details that constitute less than 10% of the total fund portfolio. Therefore, there is no detailed information on this.

If a security where the underlying is more than 10% crypto-assets and is offered to retail clients, it needs special approval. So far, there is no authorized of listed or quoted product in HK in this regard. There is an approved crypto fund manager in HK managing 2 crypto funds but those can only be sold to professional investors.

2. *What is the nature and scale of regulated financial products/securities/derivatives where the underlying is crypto-assets that are offered to wholesale clients in your jurisdiction? Further, are there listed or quoted products that are not accessible to retail clients given suitability or other limitations – e.g.: future contracts.*

   Please see the answer above

3. *To the extent not answered by the above, what is the nature and scale of current financial market platforms authorised to list or quote financial products where the underlying is crypto-assets?*

   There is no such platform in HK. There is an SFC-licensed virtual asset trading platform which provides trading venue to professional investors to trade bitcoins and security tokens.

Canada | Province of Ontario | Ontario Securities Commission | OSC

The Ontario Securities Commission (OSC) is an independent Crown corporation that regulates Ontario's capital markets by making rules that have the force of law and by adopting policies that influence the behaviour of capital markets participants[11].

1. *What is the nature and scale of regulated financial products/securities/derivatives where the underlying is crypto-assets that are offered to retail clients in your jurisdiction? Further, please indicate if there are listed or quoted products. Do your financial markets rules contemplate potential listed or quoted products of this kind?*

   Investment Funds: In Ontario, there are 7 investment funds (whose underlying assets are crypto assets) available to retail investors. This includes three recently launched exchange traded funds where the underlying crypto asset is Bitcoin and four closed-end mutual funds where the underlying crypto asset is Bitcoin or Ether. The approximate size of these investment products is $3 Billion CAD and interest in this space is growing rapidly. This includes issuers seeking to launch similar ETFs to those that have already launched or ETFs with exposure to other crypto assets.

   In respect of these investment funds, they trade on the Toronto Stock Exchange and comply with all applicable investment fund rules (so there was no change to their operating rules to allow these products).

[11] https://www.osc.ca/en/about-us

Derivatives: Some dealers in Ontario offer the bitcoin futures listed on regulated U.S. exchanges to retail (and institutional) clients. However last records suggest volume was insignificant for both client types.

Crypto Asset Trading Platforms: Crypto asset trading platforms generally fall within two categories – those that trade crypto assets that are a digital representation of traditional securities (i.e., security tokens) and those that trade crypto assets such as Bitcoin, Ether, Litecoin, and other "commodity-type" crypto assets and stablecoins.[12]

Despite a large number of platforms that may operate or offer services to Canadians, there is only one platform registered with the OSC to date, that permits the trading of a "commodity crypto assets" (like bitcoin and ether). There is a growing interest in this subject-area, and the OSC actively engages with applicants.

The larger platforms (generally not located in Canada) have client accounts in the hundreds of thousands and the smaller platforms have client accounts in the few thousands. Trading volumes range from $100M to $500M per month for the larger platforms.

In March 2019, the Canadian provincial securities authorities (including OSC) published a proposed framework for crypto asset trading platforms.[13] These firms are expected to comply with existing regulatory requirements. However, this proposal is intended to be a tailored regulatory framework that addresses the novel features and risks of crypto asset trading platforms. As part of registering these platforms, terms and conditions may be placed on their registration to address the unique risks of the business model and an exemption from certain regulatory requirements may be granted to accommodate their business model. This framework addresses issues relating to custody, valuation, prospectus requirements, and appropriate risk disclosure.

Initial Coin Offerings: There have been a handful (less than 5) "regulated" initial coin offerings that have been conducted in Ontario.[14] However, the total raised capital has been minimal and interest in this space has largely dissipated since 2018.

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2. *What is the nature and scale of regulated financial products/securities/derivatives where the underlying is crypto-assets that are offered to wholesale clients in your jurisdiction? Further, are there listed or quoted products that are not accessible to retail clients given suitability or other limitations – e.g.: future contracts*.

   In Ontario, there is a limited number (under 5) of investment funds, intended for only institutional/high net worth investors, where the underlying is a crypto asset. One of these investment funds has approximately $20M in AUM (and invests in bitcoin, litecoin and ether). The OSC are also aware of a small number of crypto asset trading platforms that intend to offer trading services to only institutional and/or high net worth investors.

3. *To the extent not answered by the above, what is the nature and scale of current financial market platforms authorised to list or quote financial products where the underlying is crypto-assets?*

   Please see the responses above.

[12] https://www.osc.ca/sites/default/files/pdfs/irps/csa_20200116_21-327_trading-crypto-assets.pdf
[13] https://www.osc.ca/en/securities-law/instruments-rules-policies/2/21-402/joint-canadian-securities
[14] https://www.osc.ca/en/securities-law/instruments-rules-policies/4/46-307/csa-staff-notice-46-307-cryptocurrency-offerings; https://www.osc.ca/en/securities-law/instruments-rules-policies/4/46-308/csa-staff-notice-46-308-securities-law

Singapore | Monetary Authority of Singapore | MAS

The Monetary Authority of Singapore (MAS) is Singapore's central bank and integrated financial regulator. MAS promotes sustained, non-inflationary economic growth through the conduct of monetary policy and close macroeconomic surveillance and analysis. It manages Singapore's exchange rate, official foreign reserves, and liquidity in the banking sector[15].

1. *What is the nature and scale of regulated financial products/securities/derivatives where the underlying is crypto-assets that are offered to retail clients in your jurisdiction? Further, please indicate if there are listed or quoted products. Do your financial markets rules contemplate potential listed or quoted products of this kind?*

   MAS currently takes the view that financial products which are based on or otherwise reference crypto-assets are not suitable for most retail investors.

   However, MAS have taken a calibrated step to regulate crypto-derivative products that are listed and traded on Approved Exchanges, to ensure effective regulatory oversight over such entities. Currently, the only such regulated contract that is available to retail investors is the Bitcoin monthly futures. However, the target clientele for the contract is not retail investors. MAS has also issued guidance to intermediaries offering crypto-derivative products to put in place additional safeguards when dealing with retail investors – these include disclosures on the risks of trading in crypto-derivative products, not advertising such products to retail customers and collecting higher margins.

2. *What is the nature and scale of regulated financial products/securities/derivatives where the underlying is crypto-assets that are offered to wholesale clients in your jurisdiction? Further, are there listed or quoted products that are not accessible to retail clients given suitability or other limitations – e.g.: future contracts.*

   As above.

3. *To the extent not answered by the above, what is the nature and scale of current financial market platforms authorised to list or quote financial products where the underlying is crypto-assets?*

   As above.

United Kingdom | Financial Conduct Authority | FCA

We expect a reply soon and will forward when received.

[15] https://www.mas.gov.sg/who-we-are/What-We-Do

At the committee's public hearing on 12 March 2021, ASIC committed to providing the committee with copies of two ASIC studies on market cleanliness, which are attached below:

- Report 487: Review of Australian equity market cleanliness (August 2016).
- Report 623: Review of Australian equity market cleanliness 1 November 2015 to 31 October 2018 (July 2019).

ASIC
Australian Securities & Investments Commission

REPORT 487

Review of Australian equity market cleanliness

August 2016

About this report

In this report we seek to measure Australian equity market cleanliness with a focus on possible insider trading and information leakage ahead of material, price-sensitive announcements.

We applied a number of methods, evaluated their efficacy and examined their differences through time and across industry sectors, market capitalisation and announcement types.

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.

Disclaimer

This report does not constitute legal advice. We encourage you to seek your own professional advice to find out how the Corporations Act and other applicable laws apply to you, as it is your responsibility to determine your obligations.

Examples in this report are purely for illustration; they are not exhaustive and are not intended to impose or imply particular rules or requirements.

Contents

A Introduction

Key points

Market integrity is fundamental to well-developed financial markets. We consider it important to measure and monitor market cleanliness to provide an overview of market integrity in order to better inform our regulatory work.

In this report, we have measured Australian equity market cleanliness using a number of methods, evaluated their efficacy and examined their differences through time and across segments of the market. Specifically, we have:

- estimated an established measure of market cleanliness that has been widely applied in regulatory and academic settings;
- assessed changes in the established measure over time and evaluated the statistical significance of any changes in market cleanliness;
- developed and applied a new methodology for measuring market cleanliness; and
- conducted detailed analysis into these measures to examine their correlation and variation across listed equity market segments.

Background

1 Financial markets play a central role in the growth and prosperity of our economy by facilitating the raising of capital and the efficient allocation of resources and risks by investors.

2 Market integrity is fundamental to a well-developed financial market. Financial markets cannot fund the real economy without trust and confidence. Confidence in market integrity:

(a) encourages investor participation;

(b) contributes to liquidity;

(c) stimulates more competitive pricing; and

(d) leads to a lower cost of capital.

3 As Australia's corporate, market and financial services regulator, we are responsible for supervising trading activity of market participants on Australia's domestic licensed markets. One of our strategic priorities is the promotion of investor confidence through fair and efficient markets. Crucial to the pursuit of this priority is the surveillance and enforcement of market misconduct.

4 In markets where investors perceive they are at an unfair informational disadvantage they tend to protect themselves by reducing their exposure to the market or demanding a higher return, to compensate for the adverse selection risk they experience as a result of information asymmetry.

5 Reduced investor participation and confidence in markets can lead to lower turnover, higher cost of trading and inefficient allocation of capital from investors to entities seeking funding.

6 Empirical academic evidence suggests the mere existence of insider trading laws does not promote investor confidence or lower costs of capital. Rather, effective detection of insider trading and enforcement of insider trading laws are associated with lower cost of capital for listed companies across international markets.[1]

7 A 2002 study found that, in a sample of 103 countries, effective insider trading enforcement was associated with a lower cost of capital, ranging from 0.3%–7%.[2] For the financial year ended 30 June 2015, companies listed on ASX had a total market capitalisation of around $1.6 trillion and raised around $89 billion. A small change in the cost of capital can significantly affect listed companies' valuations and cost of funds.[3]

8 An earlier study of the relationship between information asymmetry and market participant behaviour concluded that participants would withdraw from a market if they faced severe information disadvantages—leading to lower asset valuation, liquidity and, in the most extreme cases, market failure.[4]

9 Given the significance of market integrity to financial markets and the broader economy, our strategic priority of ensuring fair and efficient markets is vitally important. As a result, we think it is important to measure the extent to which information leakage is impacting on the prices and trader's behaviour for securities on listed markets. Measures of this type are known as market cleanliness measures.

10 Overseas, securities market regulators have sought to measure the cleanliness of their markets. For example, the UK Financial Conduct Authority (FCA) conducted three market cleanliness studies for their listed securities markets over the past 13 years, and has estimated yearly updates on their market cleanliness measures.[5] A recent study by UK-based Intralinks Holdings, Inc. (Intralinks) applied a similar methodology to a number of international markets and found that Australia had one of the lowest indicators of information leakage ahead of mergers and acquisitions:

[1] Utpal Bhattacharya and Hazem Daouk, 'The world price of insider trading', *The Journal of Finance*, vol. 57 issue 1, February 2002, pp 75–108.
[2] Utpal Bhattacharya and Hazem Daouk, 'The world price of insider trading', *The Journal of Finance*, vol. 57 issue 1, February 2002, pp 75–108.
[3] For example, a 0.1% increase in cost of capital has the potential to decrease valuations by around $1.6 billion and increase cost of capital by around $89 million per year.
[4] George A. Akerlof, 'The market for 'lemons': Quality uncertainty and the market mechanism', *The Quarterly Journal of Economics*, Vol. 84, No. 3, August 1970, pp. 488–500.
[5] The FCA has cautioned against directly comparing the established market cleanliness measure between jurisdictions because each jurisdiction has different continuous disclosure regimes for determining the threshold at which disclosures must be made, see FCA, *Why has the FCAs market cleanliness statistic for takeover announcements decreased since 2009*, Occasional Paper Series 4, July 2014, pp 21–23.

see Intralinks, *Intralinks M&A Leaks Report*, 2015 (the Intralinks report) and Appendix 3.

11 We consider it important to measure and monitor macro-level market cleanliness—to provide an overview of market integrity through time and across listed equity market segments—in order to better inform our regulatory work.

Purpose and scope

12 In this report we have measured macro-level market cleanliness in our listed securities markets by estimating the extent of information leakage ahead of material, price-sensitive announcements (MPSAs). We applied a number of methods, evaluated their efficacy, and examined their differences through time and across segments of the market. Specifically, we:

(a) estimated equity market cleanliness using an established market cleanliness measure (similar to that used by the FCA), with minor adjustments (see Section B);

(b) assessed the established market cleanliness measure over time and evaluated any statistically significant changes (see Section C);

(c) developed and applied a new methodology for measuring market cleanliness (see Section D); and

(d) conducted detailed analysis into these measures across different industry sectors, market capitalisation quintiles and announcement types (see Section E).

Application of established market cleanliness measures

13 We applied an established market cleanliness measure to the Australian market that examines abnormal pre-announcement price movements (APPMs) ahead of MPSAs.

14 Price movements immediately before an MPSA—in the same direction and significantly different from normal volatility—can raise concerns about market integrity and efficiency. This established methodology has been widely applied by international financial market regulators, exchange market operators, industry think tanks and academics. We have sought to replicate the application of this methodology with minor adjustments. The result will form the basis for further analysis through time and across equity market segments (i.e. industry sectors, market capitalisation quintiles and announcement types).

15 Because of the reliance on APPMS, we have suggested the measure (i.e. APPMs as a percentage of MPSAs) can be indicative of an inefficient and potentially unfair market. APPMs may arise from either illegal conduct (e.g. insider trading or leaked information) or legal activity (e.g. tangible rumours,

speculation or significant demand–supply imbalances). We do not assert that misconduct such as insider trading must give rise to APPMs, or that APPMs only occur as a result of misconduct.

16 However, we consider APPMs do indicate an undesirable state of market integrity and efficiency as prices do not adjust instantaneously to new information when it is released through the proper channel.

17 Despite its limitations, this established market cleanliness measure is intuitively attractive and practical to apply. It can give regulators and industry stakeholders a broad indication of market integrity when applied consistently over time.

New measure of market cleanliness

18 We have developed an innovative new market cleanliness measure that is independent of the established measure, and removes any reliance on APPMs to indicate anomalous trading ahead of MPSAs.

19 The new measure is based on our market surveillance activity and made possible by our recent access to enhanced surveillance data through ASIC's Market Analysis Intelligence (MAI) system, which allows the identification of individual origin of order IDs (accounts): see Rule 5A.2.3 of the ASIC Market Integrity Rules (Competition in Exchange Markets) 2011 (ASIC Market Integrity Rules (Competition)).

20 We examined timely and profitable trading before MPSAs and identified accounts that demonstrated anomalous behavioural patterns compared to their historical trading behaviour and the trading behaviour of the market. This was inspired by how a surveillance analyst would screen for suspected insider trading. Analysis by a human analyst is typically more flexible, comprehensive, and cognisant of connections and evidentiary considerations: see paragraphs 73–74.

21 Instead of relying on the price impact of possibly suspicious trading, we look at the anomalous trading itself. Market cleanliness measures can then be constructed by looking at the percentage of accounts trading before MPSAs that demonstrate anomalous behavioural patterns, and the percentage of volume they traded. The details and parameters of the new methodology are outlined in Section D. We have also examined the measure using various cross-sectional breakdowns of listed equity market segments (i.e. industry sector, market capitalisation and announcement type) and the degree of correlation with the established measure: see Section E.

Summary of findings

22 Our sample period for the established market cleanliness measure includes each of the five years before and the five years after the transfer of market supervision to ASIC (i.e. 1 November 2005 to 31 October 2015) (the relevant period). Throughout the relevant period, we found a general improvement in market integrity, shown by the decrease in anomalous trading ahead of MPSAs.

23 Tests before and after 1 November 2010,[6] examine the statistical significance of any improvements in market cleanliness over time, after controlling for other explanatory variables. The results indicate a statistically significant improvement in market cleanliness.

24 We developed a new market cleanliness measure that examines trading by individual accounts leading up to MPSAs. The new market cleanliness measure correlates positively with the established market cleanliness measure, lending support to each other.

25 The new market cleanliness measure result for the year 1 November 2014 to 31 October 2015 indicates that roughly 62% of MPSAs exhibit no anomalous trading behaviour leading up to the MPSA, while around 5% of MPSAs contain more than 2% of accounts demonstrating anomalous trading patterns. Around 5% of MPSAs contain more than 12% of trading volume by accounts demonstrating anomalous trading patterns.

26 Analysis of the results indicate that:

(a) there has been a general decline in anomalous trading activity ahead of MPSAs over the relevant period, indicating an improvement in market integrity;

(b) larger capitalisation securities with greater liquidity tend to exhibit lower APPMs;

(c) established market cleanliness measures for securities in certain industries tend to be consistently higher or lower than others (see Section E);

(d) mergers and acquisitions tend to exhibit a lower percentage of APPMs, but more pre-announcement anomalous trading than other MPSAs;

(e) there has been no significant difference in pre-announcement anomalous trading and APPMs between positive and negative MPSAs; and

(f) the established and new market cleanliness measures are positively correlated with each other, suggesting that MPSAs with a higher measure of anomalous trading are more likely to exhibit APPMs.

[6] 1 November 2010 was chosen to align with the start date of the new market cleanliness methodology (i.e. 1 November 2014). Origin of order IDs (accounts) came into effect on 28 July 2014 and three months of lead time in data collection is required to calculate the new market cleanliness measure, resulting in a start date of 1 November 2014.

B Measuring market cleanliness

Key points

In this section, we measure market cleanliness in the Australian equity market using an established methodology.

Our findings indicate that there has been a general improvement in market integrity over the 10 years to 31 October 2015 (the relevant period), as measured by the decreasing occurrence of APPMs ahead of MPSAs.

Methodology of the established market cleanliness measure

27 The methodology used to measure market cleanliness was applied in a regulatory setting by the UK Financial Services Authority (FSA) in 2006. Their analysis was broadly based on the identification of APPMs in security prices ahead of MPSAs from 2000–04. The FSA, and later the FCA, conducted two subsequent studies for the periods 2000–05 and 2002–13.[7]

28 In this report, we reviewed price-sensitive announcements that had a material effect on the market in the relevant period. We examined the change in the measure over the relevant period and evaluated the statistical significance of the change between the first half (i.e. 1 November 2005–31 October 2010) and the second half (i.e. 1 November 2010–31 October 2015).[8]

29 The rationale behind the established market cleanliness methodology is an intuitively simple one: see Figure 1. It is assumed that, in an efficient ('clean') market, security prices react instantaneously to announcements. Significant and abnormal price reactions ahead of an announcement may signal information leakage and be indicative of an 'unclean market'.

30 A broad indication of market cleanliness can be estimated from the proportion of MPSAs preceded by an APPM. An APPM occurs when:

(a) a positive MPSA is preceded by a positive abnormal return in the security; and

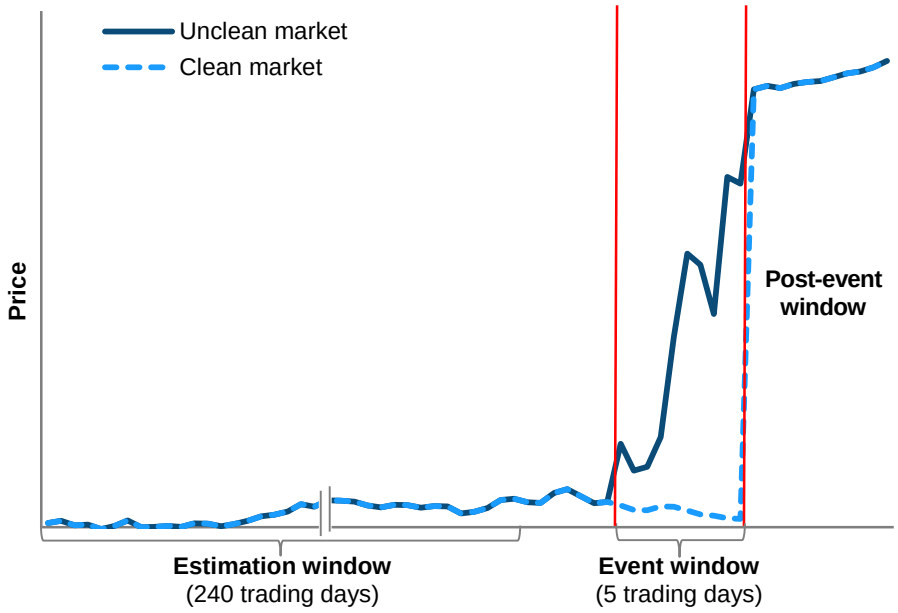
(b) a negative MPSA is preceded by a negative abnormal return in the security.

[7] FSA, *Measuring market cleanliness* (PDF 365 KB), Occasional Paper Series 23, March 2006. The FSA and the FCA carried out the study with minor adjustments to the methodology in *Updated measurement of market cleanliness* (PDF 366 KB), Occasional Paper Series 25, March 2007 and *Why has the FCAs market cleanliness statistic for takeover announcements decreased since 2009*, Occasional Paper Series 4, July 2014, respectively.

[8] We have replicated the FCA's application of this measure with minor adjustments. For example, three of the FSA and FCA market cleanliness studies used mergers and acquisitions and/or other types of material announcements. We included all material announcements, including mergers and acquisitions, because of the limited number of mergers and acquisitions that occur in the Australian market each year.

31 To implement the measure, we identified MPSAs that had statistically significant APPMs. We used the five trading days ahead of the MPSA as the event window to calculate the cumulative abnormal return (CAR) of the security. An estimation window of 240 trading days (250 to 10 trading days before the MPSA) was used as the benchmark for evaluating abnormality: see Figure 1.

Figure 1: Intuition of the traditional market cleanliness methodology



32 To identify abnormality in security price returns ahead of MPSAs, we first calculated security and market returns. The realised security return was then compared with how the security was expected to perform relative to the market.

Measuring market cleanliness

To calculate abnormal returns and estimate the established market cleanliness measure we took the following steps:

- Calculated the daily return ($R_{i,t}$) of security *i* on day *t* (where $P_{i,t}$ is the last adjusted price of security *i* on day t and $Div_{i,t}$ is the dividend of security *i* on day *t*).

$$R_{i,t} = \frac{P_{i,t} - P_{i,t-1} + Div_{i,t}}{P_{i,t-1}}$$

- Calculated the daily market return $R_{m,t}$ of the market (*m*) on day *t*. We used the All Ordinaries Accumulation Index (*XAO*)—which represents total returns, including dividends—as the proxy for the market.

$$R_{m,t} = \frac{XAO_{m,t} - XAO_{m,t-1}}{XAO_{m,t-1}}$$

- Calculated the contemporaneous beta of security *i* between the returns for individual securities ($R_{i,t}$) and the return to market ($R_{m,t}$).

$$\beta_i = \frac{COV_{i,m}}{VAR_m}$$

- Applied the beta to the capital asset pricing model (CAPM) to estimate the expected return ($E(R_{i,t})$) of the security, where $R_{f,t}$ is the risk free rate (*f*) on day *t*.

$$E(R_{i,t}) = R_{f,t} + \beta_i(R_{m,t} - R_{f,t})$$

- Calculated the abnormal return ($AR_{i,t}$):

$$AR_{i,t} = R_{i,t} - E(R_{i,t})$$

- The daily abnormal returns were aggregated for the event window to calculate the cumulative abnormal returns ($CAR_{i,n}$) ahead of the MPSA for the security (*i*) for *n* days ahead of the MPSA:

$$CAR_{i,n} = \sum_{j=1}^{n} AR_{i,t-j}$$

- We then looked at whether there was a statistically significant pre-announcement CAR in the 'right' direction for each individual announcement (i.e. a positive APPM for good news and a negative APPM for bad news) in our sample of MPSAs. To satisfy our statistical significance test, the CARs associated with the MPSA needed to be large enough that the probability they were driven by random volatility in the price of the security was extremely low (i.e. at or below 1%). To calculate this we applied the bootstrap methodology set out in Appendix 2.
- Calculated the measure of market cleanliness as the percentage of MPSAs preceded by APPMs.

$$Percentage\ of\ APPMs = \frac{No.of\ APPMs}{Total\ no.of\ MPSAs}$$

Limitations and interpretation

33 The established market cleanliness measure calculated using this methodology should be interpreted in the context of its limitations. Like earlier studies, we consider APPMs can be indicative of an unfair or inefficient market, without asserting that all insider trading gives rise to APPMs or that APPMs arise only as a result of insider trading. Trades can be executed in ways that minimise their price impact and APPMs can be caused by trading from leaked information or rumours.

34 To the extent an APPM is caused by rumours, an MPSA in the same direction as the APPM confirms those rumours. Although not insider trading, this is undesirable and could point to market efficiency and integrity

issues, as prices no longer adjust instantaneously when new information is released through the proper channels.

35 We also attempted to filter out mergers and acquisitions where the bidder increases its toehold in the target leading up to the announcement, to eliminate APPMs associated with bidder buying.

36 Despite the general reliance on APPMs as a traditional measure of market cleanliness, past studies have used outcomes from regulators to establish links between insider trading and price reactions ahead of MPSAs.

37 For example, in a 1992 study examining regulatory actions taken by the SEC, APPMs were identified ahead of merger and acquisition announcements where insider trading had occurred.[9] It was found that the market detects the possibility of informed trading and impounds this information into the price of the security. Specifically, the abnormal return on an insider trading day averages 3%,[10] and almost half of the APPMs observed before takeovers occurred on insider trading days. Both the amount traded by the insider and additional trade-specific characteristics (e.g. company size and liquidity) affected prices leading up to the announcement.

38 This lends some support to the theory that price movements immediately before an MPSA, in the same direction, and significantly different to normal prices movements, can be indicative of market misconduct such as insider trading. It is also widely accepted that insider trading can contribute to price impact even if it is through derivative instruments. This is because hedging and arbitrage transmit changes in the price of one instrument to the other.[11]

39 This report does not seek to prove whether insider trading will necessarily affect equity returns and lead to statistically significant APPMs. Only a proportion of APPMs are driven by insider trading and only a proportion of insider trading will give rise to APPMs. However, as long as the proportion of insider trading remains stable over time, the established market cleanliness measure is not invalidated.[12] Indeed, when applied consistently over time, the measure can give a broad indication of market integrity.

40 Because we have drawn our results from a subset of all MPSAs, we need to be cautious of drawing conclusions about changes in market cleanliness until we see a long-term trend in those changes. The results may be affected by a weakening or strengthening link between insider trading and price impact.

[9] Lisa K Meulbroek, 'An empirical analysis of illegal insider trading', *The Journal of Finance*, Vol. 47, No. 5, December 1992, pp 1661–1699.
[10] Lisa K Meulbroek, 'An empirical analysis of illegal insider trading', *The Journal of Finance*, Vol. 47, No. 5, December 1992, pp 1661–1699.
[11] Narayanan Jayaraman, Melissa B. Frye and Sanjiv Sabherwal, 'Informed trading around merger announcements: An empirical test using transaction volume and open interest in options market', *Financial Review*, Vol 36, Issue 2, May 2001, pp 45–75.
[12] FCA, *Why has the FCAs market cleanliness statistic for takeover announcements decreased since 2009*, Occasional Paper Series 4, July 2014.

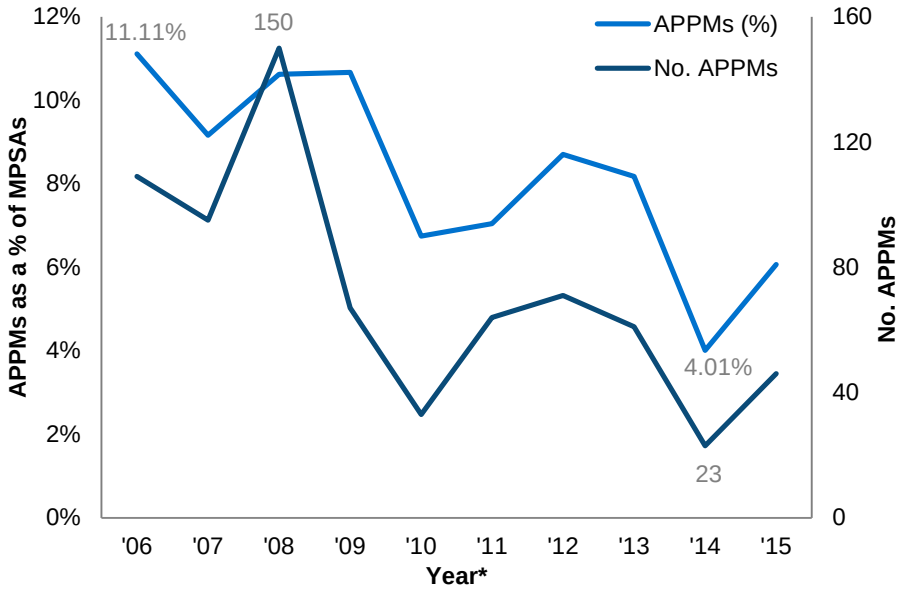
41 Insiders may be more cognisant to disguise their trades to minimise their price impact. On the other hand, high-frequency traders may become more adept at detecting the risk of adverse selection from traders with potentially superior information from order flow changes, which may exacerbate their price impact.

Established market cleanliness measure results

42 Factors other than market misconduct may cause an APPM ahead of MPSAs.[13] Our analysis also controlled for other price impact factors (e.g. liquidity, company size, market volatility and announcement type) of potentially informed trading in our logistic regression: see Section C.

43 Figure 2 shows market cleanliness in Australia based on our sample of MPSAs in the relevant period: see Table 7 in Appendix 1 for the underlying data used in this figure. Analysis of the established market cleanliness measure over the relevant period is encouraging. Despite a degree of volatility, we found a general decrease in anomalous trading (APPMs ahead of MPSAs) which suggests an improvement in market integrity over the relevant period.

Figure 2: Established market cleanliness measure



* Year ended 31 October.

Note: See Table 7 in Appendix 1 for the data used in this figure (accessible version).

[13] Like the FCA, we consider it is possible for significant non-insider trades to fall before an announcement and affect the market, or for individual investors to anticipate positive or negative developments in the absence of leakage, rumours or media speculation.

Data

44 To calculate the established market cleanliness measure we used data collected from a number of sources, including:

(a) daily price and volume data obtained from IRESS Limited;

(b) historical company announcement data and merger and acquisition data obtained from Morningstar Australasia Pty Ltd (Morningstar) and Bloomberg L.P. (Bloomberg); and

(c) changes in substantial shareholding data obtained from Morningstar.

45 We applied the following filters to arrive at our sample MPSAs for the relevant period:

(a) *Liquidity*: Securities needed to be actively traded and have positive trading volume for 180–240 trading days during the estimation window.

(b) *Price-sensitive announcements*: We obtained all company announcements that were marked 'price sensitive'. The data was required to contain the date, time, company and headline of the announcement.

(c) *MPSAs*: Not all company announcements marked 'price sensitive' are actually material—some announcements are marked 'price sensitive' by nature, irrespective of whether they cause a material price impact. Therefore, the sample was filtered by materiality.[14]

(d) *Announcement proximity*: The trading and price reaction ahead of an MPSA can be obscured by other MPSAs that closely precede it. If an MPSA is followed by another MPSA for the same security within 10 trading days, the latter was deleted from the sample. In the case of multiple MPSAs for a security in a short period of time, an MPSA was only included if there was no MPSA in the preceding 10 trading days for the same security.

(e) *Pre-merger bidder toehold purchase*: We filtered out isolated instances of pre-merger bidder toehold purchases which may affect target price. Changes in substantial shareholder notices data was collated and matched with all mergers and acquisitions. If the change in substantial shareholding involved the bidder increasing its holdings shortly before the merger and acquisition announcement, that announcement was excluded.

46 Table 1 shows a summary of company and announcement data, which reveals that the composition of the sample has not changed dramatically over the relevant period.

[14] The CAR (from two trading days before to one trading day after the announcement) needs to be significantly different from the mean four-day CAR in a bootstrapped sample from an estimation window. We deem the actual CAR to be statistically significant at the 1% level if it is less than or equal to the 100th most negative simulated CAR or greater than or equal to the 100th most positive simulated CAR.

Table 1: Company and announcement data over the relevant period

Year (ended 31 October)	Mean market cap.	Median market cap.	No. M&A	% of M&A	No. positive MPSAs	No. negative MPSAs	No. total MPSAs
2006	$2,347m	$131m	31	3.16%	618	363	981
2007	$4,641m	$155m	24	2.31%	591	446	1,037
2008	$9,092m	$159m	18	1.27%	683	729	1,412
2009	$2,161m	$122m	8	1.27%	373	255	628
2010	$2,172m	$150m	21	4.29%	286	203	489
2011	$1,705m	$144m	21	2.31%	538	371	909
2012	$1,272m	$130m	22	2.70%	453	363	816
2013	$1,608m	$147m	10	1.34%	403	343	746
2014	$1,845m	$206m	10	1.75%	298	275	573
2015	$2,671m	$127m	17	2.24%	396	362	758
Total	**$3,502m**	**$131m**	**182**	**2.18%**	**4,639**	**3,710**	**8,349**

C Evaluating change in market cleanliness

Key points

Our analysis in Section B suggests a general improvement in Australian equity market cleanliness over time. In order to draw any conclusions about the change in market cleanliness with a certain degree of confidence, we need to make sure the change is not due to random volatility, or wholly explicable by contemporaneous changes in other explanatory variables.

In this section, the event study shows that the improvement in market cleanliness is statistically significant, and remains statistically significant after controlling for other explanatory variables.

Event study

47 We conducted an event study to explore whether the level of anomalous trading differed before and after 1 November 2010 (the event). An event study involves empirically assessing changes in a certain variable around a particular point in time (i.e. the event). The results indicate a statistically significant improvement in market cleanliness.

Univariate test

48 A statistical univariate test evaluates the difference of a single statistic between two point estimates for a given confidence interval. We performed a univariate test to evaluate the statistical significance of a change between the aggregate APPM ratio before and after the transfer of market supervision.

49 We conducted our univariate test by estimating the z-statistic on the difference in the established market cleanliness measure between the first and second half of the relevant period (i.e. before and after 1 November 2010). This univariate test assumes that each announcement within a given group has the same chance of being an APPM, without accounting for any other explanatory variables.[15]

$$Z = \frac{P_1 - P_2}{\sqrt{PQ(n_1^{-1} + n_2^{-1})}}$$

50 If n_1 is the number of observations in group one, P_1 is the probability of an announcement being an APPM, $Q_1=1 - P_1$; $n_1P_1 \geq 5$ and $n_1Q_1 \geq 5$, where P and $Q=1 - P$ are the average proportion of both groups and the proportion is the actual proportion observed as opposed to the underlying probability.

[15] FCA, *Why has the FCAs market cleanliness statistic for takeover announcements decreased since 2009*, Occasional Paper Series 4, July 2014, p 8.

Logistic regression

51 To draw more meaningful regulatory observations about the change in the measure over the relevant period, we accounted for explanatory variables. By design, the established market cleanliness measure may be affected by naturally varying sample characteristics year-on-year.

52 For example, a year that contains more MPSAs by larger, more liquid, companies may indicate an improvement in aggregate market cleanliness because it is more difficult for any trading to result in significant price impact. Furthermore, some types of announcements, and announcements made by companies in certain industries, may be more or less prone to insider trading and information leakages. By accounting for them we can focus on the different probability of MPSAs being preceded by APPMs during different time periods.

53 We applied the following logistic regression model where the dependent variable is binary (i.e. whether the MPSA is preceded by APPM).

$$\begin{aligned}&\text{Logit}(P_{APPM}) = \log\left(\frac{P_{APPM}}{1-P_{APPM}}\right)\\&= \alpha_0 + \beta \log Average\ market\ capitalisation_{5\ days\ prior}\\&+\gamma \log Average\ daily\ volume_{5\ days\ prior}\\&+\partial\ Announcement\ type\\&+\delta\ Market\ volatility_{240\ days\ prior}\\&+\tau\ 2005{\sim}2010\ dummy\\&+\theta\ Industry\\&+\zeta\ Scheduled\\&+\epsilon_0\end{aligned}$$

54 The dependent variable in the equation, $\log(P_{APPM}/(1 - P_{APPM}))$, represents the logged odds of an MPSA being preceded by APPM. It is calculated as the logged odds ratio of the P_{APPM} to $1 - P_{APPM}$. An odds ratio of one indicates that an MPSA is as likely to occur with an APPM as without an APPM; if the odds ratio is greater than one, then an APPM is more likely to occur and vice versa.[16]

55 The explanatory variable of interest in the event study is the *τ 2005~2010 dummy* variable. All other things being the same, a statistically significant positive coefficient would indicate an improvement in market cleanliness, and vice versa.

56 The following explanatory variables were included:

(a) *Market capitalisation of the entity right before making the MPSA* ($\beta \log Average\ market\ capitalisation_{5\ days\ prior}$): Larger companies may have more resources devoted to punctual disclosure of information and

[16] FCA, *Why has the FCAs market cleanliness statistic for takeover announcements decreased since 2009*, Occasional Paper Series 4, July 2014, pp 21–23.

internal controls over insiders. Larger companies also tend to have greater liquidity.[17]

(b) *Trading activity* (γ log *Average daily volume* $_{5 \text{ days prior}}$): APPMs are typically accompanied by increased trading volume in the days leading up to the MPSAs.

(c) *Announcement type* (∂ *Announcement type*): Different types of inside information are generally known to different groups of insiders and also differ in their materiality. The more widely known and material the information, the higher likelihood of potential leakage and insider trading. The Intralinks report only used merger and acquisition announcements in their study—distinguishing between different types of MPSAs makes our results more informative.

(d) *Market volatility* (δ *Market volatility* $_{240 \text{ days prior}}$): Both the CAPM estimates and the bootstrapping results may be affected by differences in volatility, and need to be controlled for. The trailing index volatility, measured by its standard deviation, was used as a continuous proxy for this effect.

(e) *Industry* (θ *Industry*): The risk profile and information asymmetry of companies may vary across industries. Some industries may be more vulnerable to information leakage and insider trading than others.

(f) *Scheduled vs unscheduled MPSAs* (ζ *Scheduled*): The presence of the announcement on Bloomberg's schedule of upcoming announcements was used as a proxy indicator of the expected or unannounced nature of the company announcement. This measure does not include additional information on expected sentiment or direction of the announcement, only includes the known or unknown nature of a potentially significant upcoming announcement.

Event study results

57 Table 2 and Table 3 show the univariate and logistic regression results. Table 2 shows the difference of the market cleanliness statistics between the first and second half of the relevant period. Statistical significance of the difference is tested using a univariate z-test against a null hypothesis (H0) of APPM equivalence across both periods.

58 Under the assumptions of the univariate test, average market cleanliness has improved significantly and the null hypothesis could be rejected with a high degree of confidence. The z-statistic for the univariate test is at –4.89, which is statistically significant at the 0.01% level—this means the probability of the decreasing APPM being driven purely by random volatility is extremely low.

[17] FCA, *Updated measurement of market cleanliness* (PDF 366 KB), Occasional Paper Series 25, March 2007

Table 2: Univariate test results

Period (ended 31 October)	APPM	Non-APPM	MPSA	APPM%
2006–10	454	4,093	4,547	9.98%
2011–15	265	3,537	3,802	6.97%
Difference	–189	–556	–745	–3.01% (Z-statistic: –4.89)

59 A multivariate logistic regression was also performed to evaluate the statistical significance of the difference between the first and second half of the relevant period after controlling for other potentially explanatory variables: see Table 3. During the relevant period, we found a general decrease in anomalous trading ahead of MPSAs, indicating an improvement in market integrity. The results confirm a statistically significant improvement in market cleanliness. We also found that larger market capitalisation securities tend to be less leaky.

60 Both the trailing market volatility and event direction explanatory variables do not appear statistically significant, all other things being equal, in our logistic regression. No conclusion can be made about the effect, positive or otherwise, of these explanatory variables over the relevant period.

Table 3: Logistic regression results

Explanatory variables	Sensitivity coefficients	Standard. error	P value
(Intercept)	3.290	0.449	2.36E-13
Log. average daily volume	0.099	0.022	4.53E-06
Log. average market capitalisation.	–0.036	0.021	0.079
Trailing market volatility	0.268	0.260	0.302
Mergers and acquisitions dummy variable	–1.479	0.509	0.003
Positive MPSA dummy variable	0.023	0.080	0.772
Scheduled dummy variable	–0.679	0.171	6.84E-05
2005~2010 dummy variable	0.372	0.088	2.25E-05
Utilities sector dummy variable	0.369	0.265	0.164
Telecom sector dummy variable	–0.011	0.364	0.975
IT sector dummy variable	0.181	0.211	0.391

Explanatory variables	Sensitivity coefficients	Standard. error	P value
Financial sector dummy variable	–0.024	0.164	0.884
Healthcare sector dummy variable	0.048	0.180	0.790
Consumer staples sector dummy variable	–0.087	0.288	0.762
Consumer discretionary sector dummy variable	–0.135	0.186	0.467
Industrial sector dummy variable	0.179	0.152	0.242
Materials sector dummy variable	0.175	0.116	0.130

61 Surprisingly, merger and acquisition announcements had a statistically significant lower contribution to the APPM logistic regression than other MPSAs, despite being known by a greater number of people and entities before release. It is possible that there are tighter controls and procedures around confidential merger and acquisition information compared to other MPSAs. This result is supported by the Intralinks report which found that Australia has a low rate of leakages for mergers and acquisitions: see Appendix 3.

62 Another interesting observation is that scheduled MPSAs tend to be preceded by fewer APPMs than unscheduled MPSAs at a statistically significant level. This may indicate less information leakage and possible insider trading ahead of scheduled MPSAs despite the market being aware of their impending release. On the other hand, it is possible that market awareness of upcoming scheduled MPSAs may attract speculation and liquidity to that market, reducing the likelihood of APPMs arising from any informed trading.

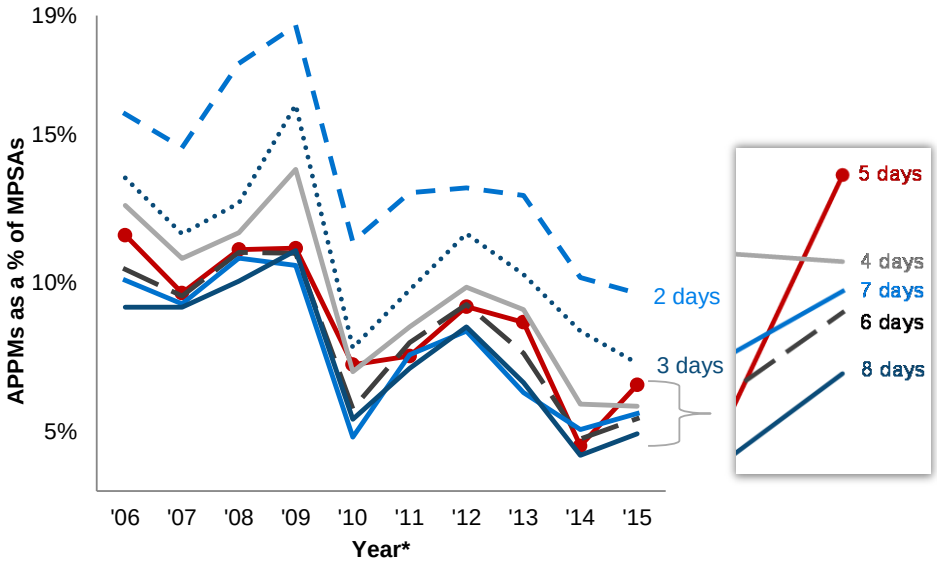
63 Indicator factors controlling for Global Industry Classification Standard (GICS) industry sectors did not present statistically significant coefficients within the logistic regression.

Robustness checks

64 To ensure our results are robust as to the choice of event window length, we have, in addition to a five day event window, carried out our analysis using two to eight day event windows. Our findings are presented in Figure 3 and confirm the robustness of our results.[18]

[18] Further robustness checks using other parameters and model specifications were also performed and confirmed that market cleanliness has been gradually improving over time.

Figure 3: Robustness of the results using 2–8 day event windows



* Year ended 31 October.

65 Past studies applying the established market cleanliness methodology chose different event windows to capture abnormal price reactions ahead of MPSAs. For example, the FCA used a two-day event window, while other studies used a five-day event window.[19] Based on the experience of ASIC surveillance staff we decided to use an event window of five trading days.

66 There are trade-offs with all parameter specifications, particularly for the length of the event window. The longer the window, the more difficult it is to detect statistically significant returns, while a shorter window may not capture enough relevant trading ahead of MPSAs.

[19] George Bulkley and Renata Herrerias, *Stock returns following profit warnings* (PDF 682 KB), 04/02, University of Exeter Xfi Centre for Finance & Investment, 2002.

D New measure of market cleanliness

Key points

In this section, we outline and apply an innovative measure of market cleanliness that is independent of the conventional measure and removes any reliance on APPMs to indicate anomalous trading ahead of MPSAs.

We examine the percentage of accounts trading ahead of MPSAs that were not only timely and profitable, but also demonstrated potentially suspicious behavioural patterns.

Proposed new market cleanliness measure

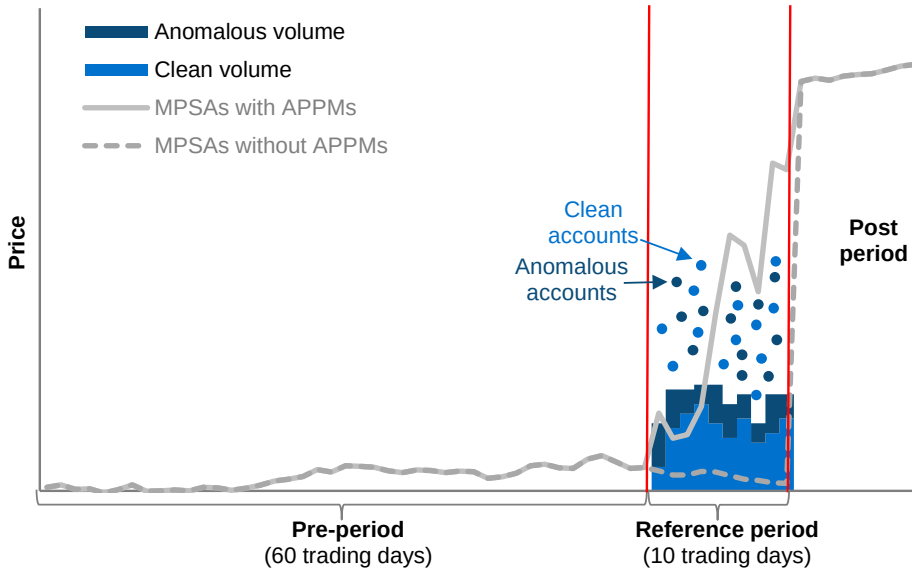
67 The new market cleanliness measure eliminates the dependence on APPMs as a measure of market cleanliness. Instead of relying on the price impact of potentially suspicious trading, the new measure examines the anomalous trading itself.

68 There are a number of limitations and caveats to the traditional methodology: see paragraphs 33–41. For example, market misconduct (e.g. insider trading) may not cause meaningful price impact and result in APPMs. It may also be possible for insiders to trade in ways that disguise price impact.

69 Where securities are volatile, it is difficult to distinguish what is abnormal. Even where there is no price movement we are still concerned with illegal and unfair activity. Therefore, in addition to price reactions, advanced market surveillance systems should examine the nature and pattern of trading by each account over time.

70 As shown in Figure 4, we attempt to distinguish between different types of trading by accounts ahead of MPSAs. Based on their timeliness, profitability and trading patterns, some accounts stand out as potentially suspicious and warrant further inquiries. We do not require an APPM to identify anomalous trading associated with an MPSA.

Figure 4: New market cleanliness methodology intuition



Data

71 The new market cleanliness measure is made possible because of our recent access to enhanced surveillance data that allows the identification of individual accounts: see Section E of Consultation Paper 168 *Australian equity market structure: Further proposals* (CP 168) and Rule 5A.2.3 of the ASIC Market Integrity Rules (Competition).

72 The data used to calculate the new market cleanliness measure in this section is collected using ASIC's MAI surveillance system. The requirement for market participants to provide accounts in the regulatory data feed came into effect on 28 July 2014. This report implements the new measure for one calendar year from 1 November 2014 to 31 October 2015. All other data has been gathered from the same sources as Section B.

Methodology of the new market cleanliness measure

73 We examined timely and profitable trading in the right direction before MPSAs and identified accounts that demonstrate highly anomalous trading behaviour when compared to their historical trades and trading by rest of the market. This is consistent with how a surveillance analyst would screen for suspected insider trading for further analysis.

74 For example, the methodology attempts to identify traders who exhibit various combinations of certain characteristics, including (but not limited to) traders who:

(a) have not traded the security of interest for an extended period of time, but have suddenly started aggressively trading in the security of interest just ahead of the MPSA;

(b) changed from historical trading and portfolio diversification behaviours to increased trading and position concentration in the security of interest just ahead of the MPSA;

(c) significantly increased the size of trading in the security of interest just ahead of the MPSA; and/or

(d) made a material profit as a result of the timely trading.

75 The reference period used was the 10 trading days leading up to the MPSA. Unlike the established market cleanliness measure that uses end-of-day data, the new market cleanliness measure uses intraday data to measure returns and trading around the MPSA. If the MPSA is announced intraday, the measure looks at all intraday trading leading up to the MPSA and the 10 trading days before it (the reference period). The pre-period for evaluating historical account behaviour is 60 trading days before the reference period (i.e. –11 to –70 trading day before the MPSA).

76 We isolated accounts that not only traded timely and profitably during the reference period, but had notably diverged from how they had behaved historically during the pre-period and/or how the rest of the market behaves. In doing so, we measured the extent and intensity of anomalous trading (rather than price reaction) ahead of MPSAs.

77 This was done by systematically filtering timely buying or selling, profitability, the ratio of trading in the relevant security to the entire portfolio during the pre-period compared to the reference period, and abnormal trading volume. For example:

(a) A large average stock-to-portfolio ratio in the reference period indicated that the account bought a concentrated stake in the relevant security or liquidated existing holdings in the portfolio to buy the relevant security ahead of a positive MPSA.

(b) A much lower average stock-to-portfolio ratio in the pre-period showed that the account historically traded a diversified range of securities.

(c) The account accumulated a much larger stake in the relevant security during the reference period compared to what it bought during the pre-period.

(d) The accumulated relevant security during the reference period was substantial, relative to its historical trading in other securities.

(e) The total profit from trading ahead of the MPSA was significant.

78 The exact quantitative thresholds and parameters used to generate the new market cleanliness measure are designed to profile and stylise general sets of trading patterns informed by our internal surveillance activity. Like APPMs in the traditional market cleanliness methodology, the new measure provides an indication of possible undesirable activity (e.g. insider trading and information leakage) while not asserting that the entire measure is

attributable to such conduct. We apply a flexible, robust and detailed analysis process in our business-as-usual (BAU) surveillance that goes beyond quantitative thresholds and parameters in many aspects. We are constantly seeking to:

(a) alter and test our alerting and analysis parameters for robustness; and

(b) conduct various thematic reviews to detect insider trading, market manipulation and other types of market misconduct.

New market cleanliness measure

Measures of market cleanliness can be estimated using the following:

- *New market cleanliness measure 1*: Percentage of accounts demonstrating timely and anomalous trading ahead of the MPSAs.

$$Suspicious\ accounts\ \% = \frac{No.of\ accounts\ with\ anomalous\ trading\ ahead\ of\ MPSA_i}{Total\ no.of\ accounts\ ahead\ of\ MPSA_i}$$

- *New market cleanliness measure 2*: Percentage of volume traded using the accounts ahead of the MPSAs.

$$Suspicious\ vol.\ \% = \frac{Vol.traded\ by\ anomalous\ accounts\ ahead\ of\ MPSA_i}{Total\ vol.\ ahead\ of\ MPSA_i}$$

79 In the future, as we continue to accumulate enhanced surveillance data using MAI, an analysis of the new market cleanliness measure can be constructed to track the percentage of MPSAs that exhibit high concentrations of anomalous accounts and/or anomalous trading volume over time (as we have done with the established market cleanliness measure).

New market cleanliness measure results

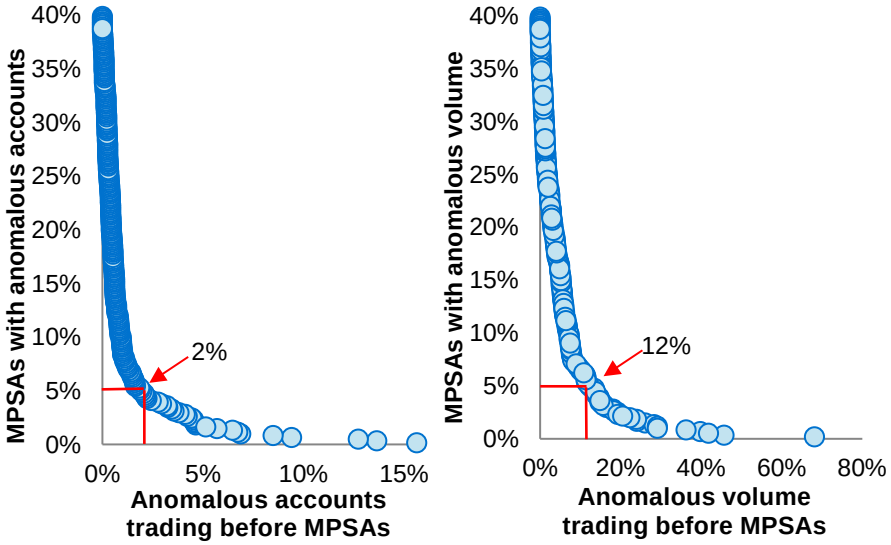
80 The new market cleanliness measure for the year 1 November 2014 to 31 October 2015 indicates that roughly 62% of MPSAs exhibit no anomalous trading behaviours at the account level.

81 Of the 38% of MPSAs that had some level of anomalous trading, around 5% contained more than 2% of accounts demonstrating anomalous trading patterns ahead of the announcement—and around 5% of MPSAs contain more than 12% of volume traded by anomalous accounts: see Figure 5.[20]

82 Figure 5 shows that accounts engaging in anomalous trading make disproportionately larger trades at each level of the cumulative distribution.

[20] Despite the abnormal pattern of the timely and profitable trading ahead of the MPSAs, a proportion of this trading is purely coincidental and due to random luck: see Appendix 4 for a discussion of unlucky trading ahead of MPSAs.

Figure 5: Cumulative distribution of MPSAs by percentage level of anomalous trading



Note: See Table 8 in Appendix 1 for a sample of the data used in this figure (accessible version).

83 This measure is subject to the strictness of our quantitative filters that deem trading patterns as timely, profitable and anomalous, based on our BAU surveillance activities. We have conducted various sensitivity and robustness checks by altering some of the parameters (see paragraph 77) and applying different model specifications in our day-to-day surveillance.

84 Further analysis of how these measures evolve over time can be conducted as the MAI accounts are accumulated in the future. See Section E for our analysis of the differences in the new and established market cleanliness measures across industry sectors, market capitalisation and announcement types.

E Analysis by industry sector, market capitalisation and announcement type

Key points

This section shows the results of our analysis of the established and new market cleanliness measures and examines any differences across industry sectors, market capitalisation quintiles and announcement types.

We found that:

- certain industries and announcement types consistently exhibited better or worse market cleanliness;
- larger companies exhibited better market cleanliness than smaller companies; and
- the new market cleanliness measure correlates positively with the established market cleanliness measure, lending support to each other.

Analysis of the established market cleanliness measure

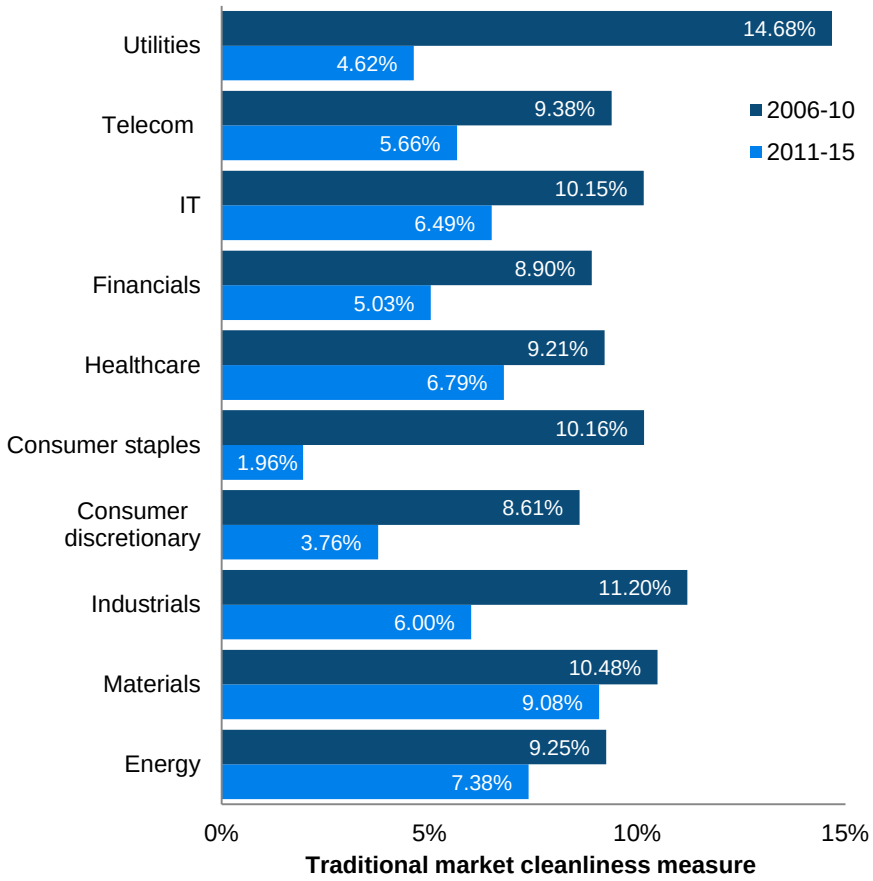
Industry sector

85 To examine market cleanliness across industry sectors we used the 10 sectors that make up the structure of GICS (i.e. energy, materials, industrials, consumer discretionary, consumer staples, healthcare, financials, information technology (IT), telecommunication services (telecom) and utilities). We grouped the announcements made by companies in each industry sector to explore whether there were any industry-specific factors driving variation in the traditional market cleanliness measure over the relevant period.

86 Our analysis of the sectors using the traditional measure indicates that all sectors experienced an improvement in market cleanliness in the first half (i.e. 2006–10) compared to the second half (i.e. 2010–15) of the relevant period: see Figure 6.

87 The utilities sector showed the biggest improvement in market cleanliness followed by consumer staples. Year-on-year analysis identified the utilities, materials and industrials sectors as demonstrating the highest number of APPMs ahead of MPSAs: see Table 9 in Appendix 1. The measures are consistently elevated for the materials and industrials sectors, while demonstrating more year-on-year variation in utilities. Specifically, we found that small capitalisation utilities securities experience frequent APPMs ahead of MPSAs.

Figure 6: Established market cleanliness measures by industry sector



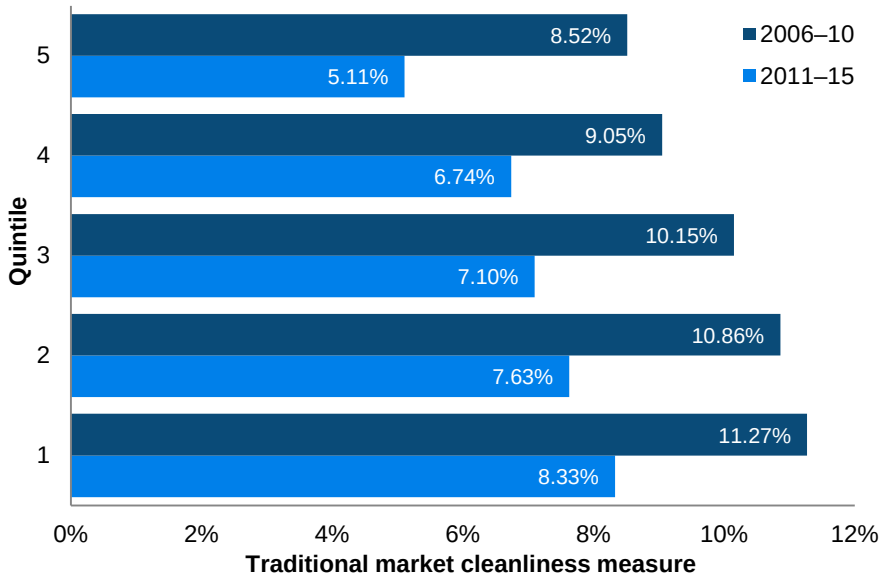
Note: See the rows labelled 2006–10 and 2011–15 in Table 9 in Appendix 1 for the data used in this figure (accessible version).

Market capitalisation quintiles

88 To examine market cleanliness by company size we grouped companies into quintiles according to their market capitalisation—quintile one being the 20% of companies with the smallest market capitalisation and quintile five being the 20% of companies with the largest market capitalisation. Market capitalisation for each company was determined using the average market capitalisation for the five days before the MPSA.

89 Our analysis of market cleanliness by market capitalisation quintile indicates that all quintiles experienced an improvement in market cleanliness, when comparing the first half of the relevant period to the second half: see Figure 7.

Figure 7: Established market cleanliness measure by market capitalisation quintile



Note: See the rows labelled 2006–10 and 2011–15 in Table 10 in Appendix 1 for the data used in this figure (accessible version).

90 Consistent with our findings in Section C, the results indicate that APPMs are less frequent for larger companies than smaller companies: see Table 10 in Appendix 1 for the year-on-year results of the established market cleanliness measure across the quintiles.

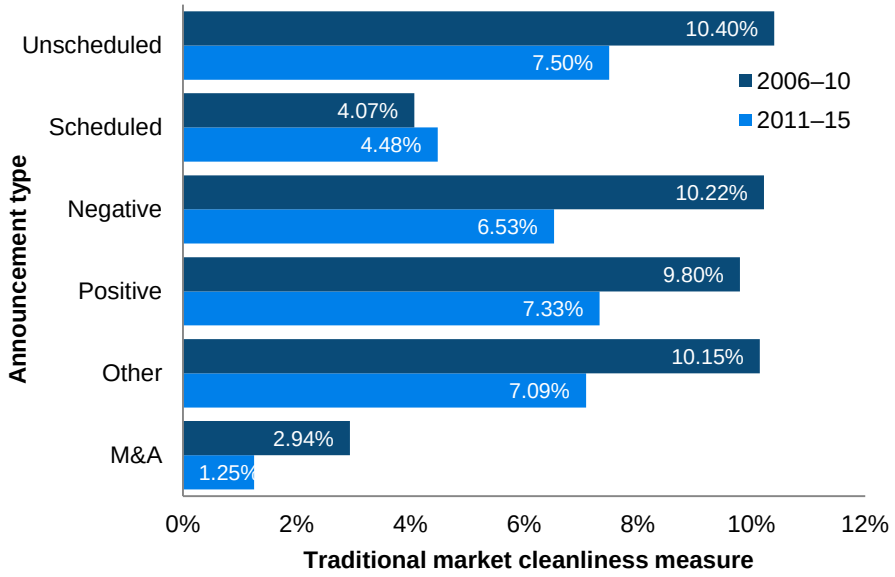
91 This may be because larger companies have more resources devoted to compliance with continuous disclosure and management of confidential information. Larger companies also tend to have greater liquidity, which can limit the price impact of anomalous trading ahead of announcements.

Announcement type

92 We also examined how the established market cleanliness measure varied by announcement type. Surprisingly, merger and acquisition announcements had less APPMs than other MPSAs despite typically being known by a greater number of people and entities ahead of release. This result is supported by data from the Intralinks report, which found that Australia has a low rate of leakages for mergers and acquisitions: see Appendix 3.

93 Figure 8 shows that there is little difference between positive MPSAs and negatives MPSAs. All announcement types except for scheduled MPSAs experienced an improvement in market cleanliness, when comparing the first half of the relevant period to the second half—however, the increase in scheduled MPSAs was not statistically significant: see Table 11 in Appendix 1 for the year-on-year results of the established market cleanliness measure by announcement type.

Figure 8: Established market cleanliness measure by announcement type



Note: See the rows labelled 2006–10 and 2011–15 in Table 11 in Appendix 1 for the data used in this figure (accessible version).

Analysis of the new market cleanliness measure

94 We performed a similar analysis of the new market cleanliness measure (for the period 1 November 2014 to 31 October 2015) across industry sectors, market capitalisation quintiles and announcement types: see paragraphs 95–107.

How to interpret Figure 9 to Figure 13

Figure 9 to Figure 13 show the percentage of MPSAs by level of anomalous trading (i.e. the percentage of MPSAs that contain some anomalous trading *below* a certain level, as broken down by industry sector, market capitalisation and announcement type):

- the horizontal (*x*) axis shows the threshold percentage of accounts that demonstrate anomalous trading ahead of the MPSAs; and
- the vertical (*y*) axis shows the accumulated percentage of MPSAs with some anomalous trading accounts *below* a certain threshold.

Unlike Figure 5, which shows the cumulative percentage of MPSAs by level of anomalous trading *above* a certain level, Figure 9 to Figure 13 show the cumulative percentage of MPSAs with anomalous trading *below* a certain level. (e.g. Figure 11 shows that 11% of MPSAs in the smallest quintile of securities had some anomalous trading by 4% or less of accounts).This approach was taken to provide visual clarity by avoiding the overlapping of converging curves towards zero.

Generally:

- a curve with a steeper gradient indicates more MPSAs with a lower percentage of accounts exhibiting anomalous trading;

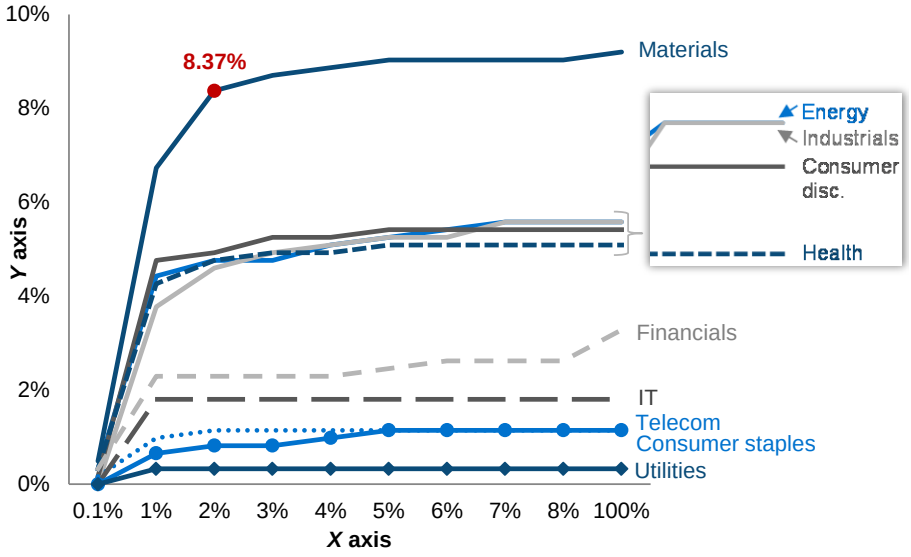
- a curve with a more gradual gradient indicates more MPSAs with a relatively higher percentage of accounts exhibiting anomalous trading; and
- the terminating point of each curve indicates the total percentage of MPSAs that are preceded by *any* level of anomalous trading.

Industry sectors

95 Our analysis of industry sectors using the new market cleanliness measure found that the materials sector contributed the most MPSAs preceded by some level of anomalous trading (followed by energy, industrials, consumer discretionary and healthcare): see Figure 9. This is somewhat consistent with anecdotal evidence observed in our day-to-day surveillance of the market. Figure 9 shows that the materials sector contributed 8.37% of MPSAs with some anomalous trading by 2% or less of accounts.

96 The results in Figure 9 represent each sector's contribution to total MPSAs. This figure is significantly affected by the market size and announcement activity specific to each sector.

Figure 9: New market cleanliness measure by industry sector



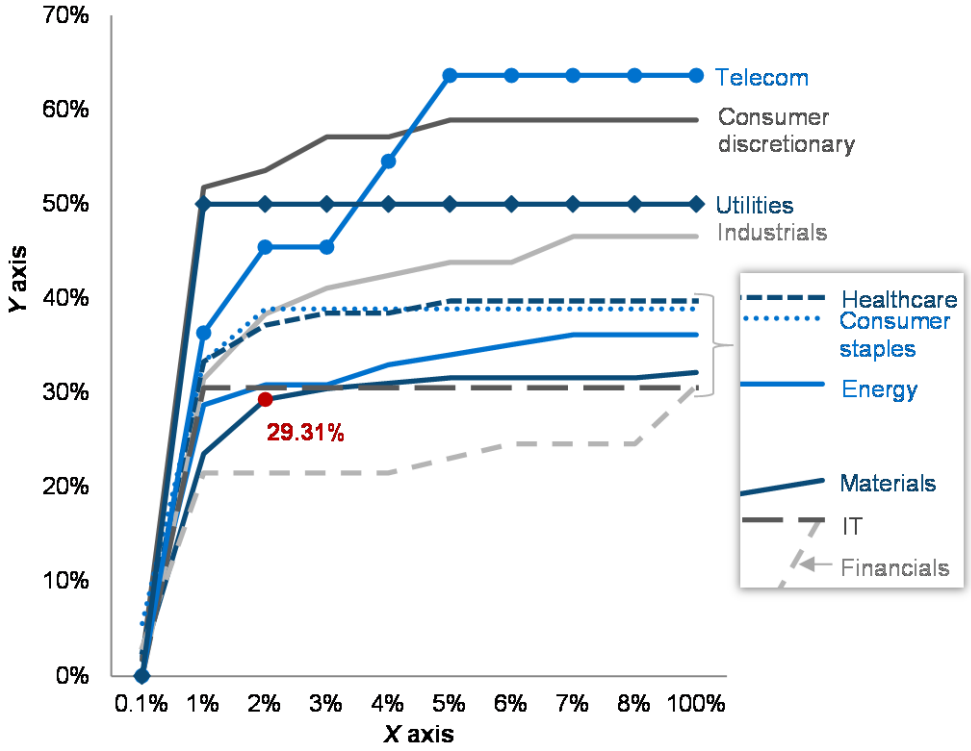
***X* axis**: Threshold percentage of accounts that demonstrate anomalous trading.

***Y* axis**: Accumulated percentage of MPSAs with some anomalous trading accounts below a certain threshold.

Note: See Table 12 in Appendix 1 for the data used in this figure (accessible version).

97 Figure 10 shows the concentration of MPSAs that are preceded by some level of anomalous trading within each industry sector (i.e. the percentage of MPSAs in that sector that have some level of anomalous trading). Figure 10 shows that 29.31% of MPSAs in the materials sector had some anomalous trading by 2% or less of accounts. Telecommunication services, consumer discretionary and utilities have higher concentrations of potentially leaky material announcements within their sectors.

Figure 10: MPSAs preceded by some level of anomalous trading by industry sector



X axis: Threshold percentage of accounts that demonstrate anomalous trading.

Y axis: Accumulated percentage of MPSAs with some anomalous trading accounts below a certain threshold.

Note: See Table 13 in Appendix 1 for the data used in this figure (accessible version).

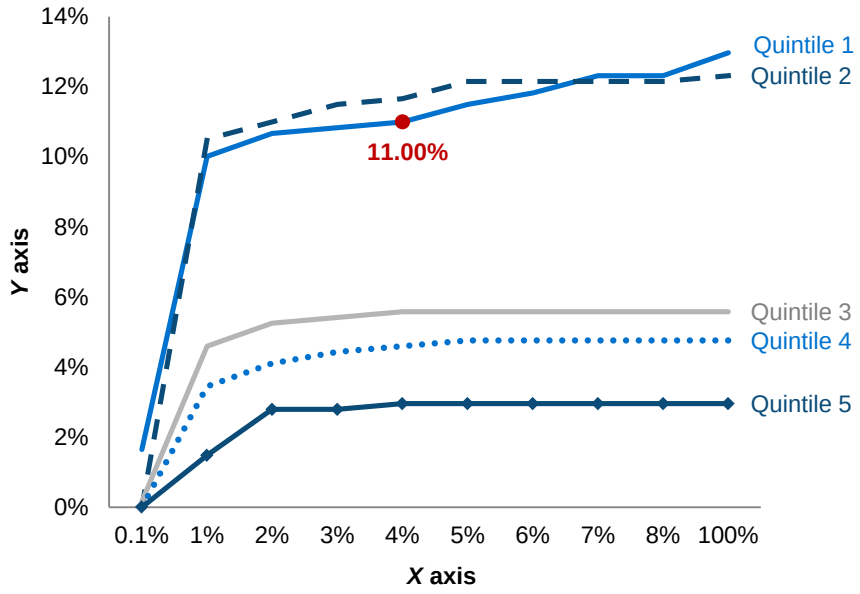
Market capitalisation quintiles

98 Smaller market capitalisation securities have a consistently higher percentage of MPSAs preceded by some level of anomalous trading than larger market capitalisation securities: see Figure 11.

99 This confirms the results in Section C and paragraphs 88–91 using the established market cleanliness measure, which relies on APPMs. It also supports the notion that APPMs in smaller capitalisation securities probably occur because of anomalous trading, rather than price volatility and limited liquidity.

100 Figure 11 shows each quintile's contribution to total leaky MPSAs and indicates that the concentration of leaky MPSAs within each quintile is consistent: see Table 14 in Appendix 1 for a comprehensive analysis of the new market cleanliness measure for each quintile.

Figure 11: New market cleanliness measure by market capitalisation quintile



***X* axis**: Threshold percentage of accounts that demonstrate anomalous trading.

***Y* axis**: Accumulated percentage of MPSAs with some anomalous trading accounts below a certain threshold.

Note: See Table 14 in Appendix 1 for the data used in this figure (accessible version).

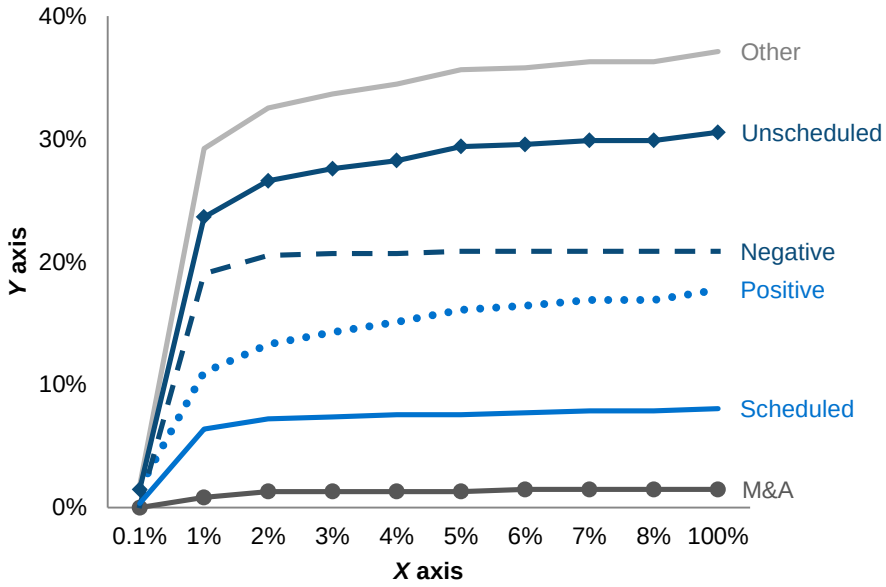
Announcement type

101 The new market cleanliness measure indicates that mergers and acquisitions only contributed to a small percentage of total MPSAs preceded by anomalous trading: see Figure 12. This is mainly because of the limited number of mergers and acquisitions compared to all other MPSAs.

102 We found that there were an approximately equal number of positive and negative MPSAs. Positive MPSAs contribute to a slightly smaller percentage of MPSAs preceded by some level anomalous trading, while negative leaky MPSAs tend to have a smaller concentration of anomalous trading.

103 There was also a higher number of unscheduled MPSAs compared to scheduled MPSAs in the relevant period. This drove the contribution of unscheduled MPSAs to total unclean MPSAs: see Table 15 in Appendix 1 for a comprehensive analysis of the new market cleanliness measure for each announcement type.

Figure 12: New market cleanliness measure by announcement type



***X* axis**: Threshold percentage of accounts that demonstrate anomalous trading.

***Y* axis**: Accumulated percentage of MPSAs with some anomalous trading accounts below a certain threshold.

Note: See Table 15 in Appendix 1 for the data used in this figure (accessible version).

104 Figure 13 shows the concentration of MPSAs preceded by anomalous trading for each announcement type (i.e. the percentage of MPSAs for a given type of announcement that had some level of anomalous trading).

105 Contrary to previous findings using the established market cleanliness measure, a higher percentage of mergers and acquisitions exhibited some degree of anomalous trading, albeit not necessarily leading to APPMs.

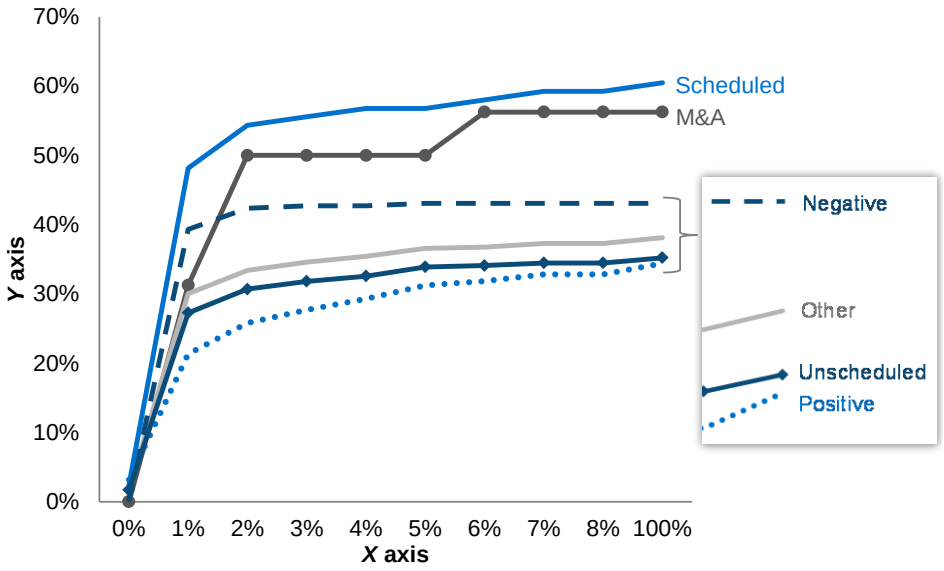
106 We also found contradictory results for scheduled versus unscheduled MPSAs. While scheduled MPSAs demonstrate lower APPMs (see Section B), a higher percentage of scheduled MPSAs are preceded by some abnormal trading—although the concentration of abnormal trading is low.

107 This could have two possible explanations:

(a) a higher percentage of scheduled MPSAs are preceded by anomalous trading, but those trading failed to create any APPMs due to increased speculation and liquidity ahead of the scheduled MPSAs; or

(b) the abnormal trading that we picked up was the increased speculation.

Figure 13: MPSAs preceded by some level of anomalous trading by announcement type



X axis: Threshold percentage of accounts that demonstrate anomalous trading.

Y axis: Accumulated percentage of MPSAs with some anomalous trading accounts below a certain threshold.

Note: See Table 16 in Appendix 1 for the data used in this figure (accessible version).

Correlation between the new and established measures

108 We decided to examine the correlation between the established market cleanliness measure (i.e. odds of an APPM) and the new market cleanliness measure (i.e. concentration of anomalous trading ahead of MPSAs) to determine whether the measures were independent, complementary or contradictory to each other.

109 The simple correlation analysis in Table 4 and Table 5 showed the new market cleanliness measure to be positively correlated with the established market cleanliness measure. This suggests that MPSAs preceded by higher concentrations of anomalous trading tended to have a higher probability of also demonstrating APPMs.

110 This supports the use of APPMs as a measure of market cleanliness, and the introduction a new methodology that directly identifies the anomalous trading.

Table 4: Univariate correlation between APPMs and anomalous volume

Explanatory variable	Estimate	Standard. error	P value
(Intercept)	-2.778	0.158	<2e-16
Anomalous volume (%)	3.380	1.683	0.045

Table 5: Univariate correlation between APPMs and anomalous accounts

Explanatory variable	Sensitivity coefficient	Standard. error	P value
(Intercept)	-2.912	0.170	<2e-16
Anomalous accounts	5.676	0.010	0.00091

111 To further examine this relationship, we looked at whether this positive correlation holds after controlling for other explanatory variables. To do this we used a logistic regression similar to the one in Section C.

112 The τ *2005~2010 dummy* variable in Section C is replaced by the new market cleanliness measure (NMCM). The coefficient of interest is rho (ρ).

$$\begin{aligned}\text{Logit}(\text{P}_{\text{APPM}}) &= \log\left(\frac{\text{P}_{\text{APPM}}}{1-\text{P}_{\text{APPM}}}\right)\\ &= \alpha_0 + \beta\, Log\ Average\ market\ capitalisation_{5\ days\ prior}\\ &+ \gamma\, Log\ average\ daily\ volume_{5\ days\ prior}\\ &+ \delta\, Market\ volatility_{240 day\ estimation\ \ window} + \rho\, NMCM + \epsilon_0\end{aligned}$$

113 The final year of data from the APPM data set was aligned with the corresponding NMCM data (including number of suspicious accounts preceding an MPSA and their percentage contribution to volume), on a per-security and announcement basis, in order to appropriately evaluate the correlation between both measures.

114 These coefficients represent the level of correlation between the presence of anomalous trading behaviour and the occurrence of an APPM. All other things being equal, a positive coefficient would indicate an increase in the NMCM, indicating a higher expected probability of an APPM.

115 The results indicate the new market cleanliness measure is positively correlated with the established market cleanliness measure after accounting for the relevant explanatory variables: see Table 6. This correlation is statistically significant, based on sample data from the relevant period, and provides further evidence that the new and established market cleanliness measures lend support to each other.

Table 6: Established versus new market cleanliness measure logistic regression

Explanatory variables	Sensitivity coefficients	Standard. error	P value
(Intercept)	–3.56	2.10	0.089
Log. average daily volume	0.28	0.10	0.006
Log. average market capitalisation.	–0.14	0.08	0.076
Trailing market volatility	–1.21	3.77	0.748

Explanatory variables	Sensitivity coefficients	Standard. error	P value
Mergers and acquisitions dummy variable	–0.21	1.08	0.844
Positive MPSA dummy variable	–0.27	0.37	0.458
Number of suspicious accounts	0.04	0.01	0.003
Percentage of volume done by suspicious accounts	4.53	1.90	0.017

Appendix 1: Accessible versions of figures

116 This appendix provides accessible table data for the figures in this report.

Table 7: Established market cleanliness measure

Year (ended 31 October)	APPM	Non-APPM	MPSA	APPM%
2006	109	872	981	11.11%
2007	95	942	1037	9.16%
2008	150	1262	1412	10.62%
2009	67	561	628	10.67%
2010	33	456	489	6.75%
2011	64	845	909	7.04%
2012	71	745	816	8.70%
2013	61	685	746	8.18%
2014	23	550	573	4.01%
2015	46	712	758	6.07%
Total	**719**	**7,630**	**8,349**	**8.61%**

Note: This is the data contained in Figure 2.

Table 8: Cumulative distribution of MPSAs by percentage level of anomalous trading

Threshold % of anomalous account or volume	Anomalous accounts	Anomalous volume	Ratio of volume and accounts
35%	0.10%	0.34%	3.58
30%	0.22%	1.03%	4.67
25%	0.33%	1.81%	5.53
20%	0.46%	3.22%	7.07
15%	0.61%	5.18%	8.46
10%	0.94%	7.19%	7.66
5%	1.96%	12.35%	6.30
0%	15.63%	68.14%	4.36

Note 1: Anomalous accounts, anomalous volume and ratio of volume and accounts are represented as a cumulative percentage of MPSAs with anomalous trading above a certain threshold.

Note 2: This a summary of the data contained in Figure 5.

Table 9: Established market cleanliness measures by industry sector

Year (ended 31 October)	Energy	Materials	Industrials	Consumer disc.	Consumer staples	Healthcare	Financials	IT	Telecom services	Utilities
2006	10.49%	12.54%	8.33%	9.80%	13.33%	14.12%	7.14%	8.33%	22.73%	13.04%
2007	10.34%	8.72%	12.37%	9.52%	16.13%	4.48%	4.35%	10.77%	10.00%	14.81%
2008	10.04%	11.05%	9.15%	9.90%	0.00%	10.39%	11.52%	14.89%	0.00%	20.00%
2009	6.06%	11.35%	17.02%	5.88%	12.00%	11.11%	12.63%	6.25%	0.00%	5.56%
2010	6.45%	8.00%	10.17%	0.00%	6.25%	4.00%	2.70%	4.76%	0.00%	18.18%
2011	7.37%	8.24%	1.14%	4.48%	6.25%	9.84%	6.33%	12.90%	0.00%	6.67%
2012	4.93%	12.40%	10.20%	3.92%	0.00%	5.56%	2.00%	9.68%	0.00%	6.25%
2013	12.06%	8.03%	6.12%	9.52%	0.00%	7.69%	6.00%	5.56%	16.67%	0.00%
2014	3.26%	5.70%	2.82%	2.60%	0.00%	1.96%	6.78%	3.23%	11.11%	0.00%
2015	8.24%	8.70%	8.42%	1.83%	3.33%	7.53%	4.00%	3.57%	0.00%	7.69%
2006–10	9.25%	10.48%	11.20%	8.61%	10.16%	9.21%	8.90%	10.15%	9.38%	14.68%
2011–15	7.38%	9.08%	6.00%	3.76%	1.96%	6.79%	5.03%	6.49%	5.66%	4.62%
Difference	–1.86%	–1.41%	**–5.20%**	**–4.85%**	**–8.20%**	–2.42%	**–3.87%**	–3.67%	–3.71%	**–10.06%**
Weighted avg.	8.39%	9.83%	8.74%	6.23%	6.52%	8.07%	7.44%	8.38%	7.69%	10.92%

Note 1: The difference between the first and second half of the relevant period is statistically significant for industrials, consumer discretionary and consumer staples (at 1%) and for financials and utilities (at 5%) (**shown in bold**).

Note 2: The rows labelled 2006–10 and 2011–15 show the data contained in Figure 6.

Table 10: Established market cleanliness measures by market capitalisation quintile

Year (ended 31 October)	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
2006	15.31%	13.57%	7.54%	9.74%	8.94%
2007	12.44%	6.86%	8.29%	9.22%	8.74%
2008	11.04%	9.95%	10.24%	11.07%	10.59%
2009	6.37%	17.65%	15.63%	7.45%	5.31%
2010	8.24%	7.26%	11.83%	3.06%	3.37%
2011	10.06%	6.00%	6.81%	6.52%	6.29%
2012	14.37%	9.76%	8.74%	8.07%	1.42%
2013	4.58%	8.19%	10.46%	9.04%	8.00%
2014	3.33%	6.09%	4.51%	3.51%	2.48%
2015	5.84%	8.09%	4.20%	5.59%	6.63%
2006–10	11.27%	10.86%	10.15%	9.05%	8.52%
2011–15	8.33%	7.63%	7.10%	6.74%	5.11%
Difference	**–2.94%**	**–3.23%**	**–3.05%**	**–2.31%**	**–3.41%**
Weighted avg.	10.07%	9.34%	8.68%	7.96%	7.01%

Note 1: The difference between the first and second half of the relevant period is statistically significant for quintile 5 (at 1%), and for quintile 1, quintile 2, quintile 3 and quintile 4 (at 5 %) (**shown in bold**).

Note 2: The rows labelled 2006–10 and 2011–15 show the data contained in Figure 7.

Table 11: Established market cleanliness measures by announcement type

Year (ended 31 October)	M&A	Other	Positive	Negative	Scheduled	Unscheduled
2006	6.45%	11.26%	11.65%	10.19%	8.00%	11.28%
2007	4.17%	9.28%	8.46%	10.09%	3.23%	9.54%
2008	0.00%	10.76%	8.49%	12.62%	4.71%	11.00%
2009	0.00%	10.81%	12.60%	7.84%	2.22%	11.32%
2010	0.00%	7.05%	8.04%	4.93%	1.89%	7.34%
2011	0.00%	7.21%	6.69%	7.55%	5.93%	7.21%

Year (ended 31 October)	M&A	Other	Positive	Negative	Scheduled	Unscheduled
2012	0.00%	8.94%	9.93%	7.16%	3.17%	9.71%
2013	0.00%	8.29%	8.68%	7.58%	8.80%	8.05%
2014	0.00%	4.09%	4.03%	4.00%	0.86%	4.81%
2015	5.88%	6.07%	6.31%	5.80%	3.80%	6.79%
2006–10	2.94%	10.15%	9.80%	10.22%	4.07%	10.40%
2011–15	1.25%	7.09%	7.33%	6.53%	4.48%	7.50%
Difference	–1.69%	**–3.05%**	**–2.47%**	**–3.69%**	0.42%	**–2.89%**
Weighted avg.	2.20%	8.75%	8.69%	8.52%	4.36%	9.17%

Note 1: The difference between the first and second half of the relevant period is statistically significant for other, positive, negative and unscheduled announcements (at 1%) (**shown in bold**).

Note 2: The rows labelled 2006–10 and 2011–15 show the data contained in Figure 8.

Table 12: New market cleanliness measure by industry sector

Threshold % of anomalous accounts trading before an MPSA	Energy	Materials	Industrials	Consumer disc.	Consumer staples	Healthcare	Financials	IT	Telecom	Utilities
0.1%	0.33%	0.49%	0.00%	0.16%	0.16%	0.33%	0.33%	0.00%	0.00%	0.00%
1%	4.43%	6.73%	3.78%	4.76%	0.99%	4.27%	2.30%	1.81%	0.66%	0.33%
2%	4.76%	8.37%	4.60%	4.93%	1.15%	4.76%	2.30%	1.81%	0.82%	0.33%
3%	4.76%	8.70%	4.93%	5.25%	1.15%	4.93%	2.30%	1.81%	0.82%	0.33%
4%	5.09%	8.87%	5.09%	5.25%	1.15%	4.93%	2.30%	1.81%	0.99%	0.33%
5%	5.25%	9.03%	5.25%	5.42%	1.15%	5.09%	2.46%	1.81%	1.15%	0.33%
6%	5.42%	9.03%	5.25%	5.42%	1.15%	5.09%	2.63%	1.81%	1.15%	0.33%
7%	5.58%	9.03%	5.58%	5.42%	1.15%	5.09%	2.63%	1.81%	1.15%	0.33%
8%	5.58%	9.03%	5.58%	5.42%	1.15%	5.09%	2.63%	1.81%	1.15%	0.33%
>8%	5.58%	9.20%	5.58%	5.42%	1.15%	5.09%	3.28%	1.81%	1.15%	0.33%

Note 1: The data in the columns labelled energy, materials, industrials, consumer discretionary, consumer staples, healthcare, financials, IT, telecom and utilities shows cumulative MPSAs with anomalous trading below a certain threshold. This includes only MPSAs with some degree of anomalous trading.

Note 2: This is the data contained in Figure 9.

Table 13: MPSAs preceded by some level of anomalous trading by industry sector

Threshold % of anomalous accounts trading before an MPSA	Energy	Materials	Industrials	Consumer disc.	Consumer staples	Healthcare	Financials	IT	Telecom	Utilities
0.1%	2.13%	1.72%	0.00%	1.79%	5.56%	2.56%	3.08%	0.00%	0.00%	0.00%
1%	28.72%	23.56%	31.51%	51.79%	33.33%	33.33%	21.54%	30.56%	36.36%	50.00%
2%	30.85%	29.31%	38.36%	53.57%	38.89%	37.18%	21.54%	30.56%	45.45%	50.00%
3%	30.85%	30.46%	41.10%	57.14%	38.89%	38.46%	21.54%	30.56%	45.45%	50.00%
4%	32.98%	31.03%	42.47%	57.14%	38.89%	38.46%	21.54%	30.56%	54.55%	50.00%
5%	34.04%	31.61%	43.84%	58.93%	38.89%	39.74%	23.08%	30.56%	63.64%	50.00%
6%	35.11%	31.61%	43.84%	58.93%	38.89%	39.74%	24.62%	30.56%	63.64%	50.00%
7%	36.17%	31.61%	46.58%	58.93%	38.89%	39.74%	24.62%	30.56%	63.64%	50.00%
8%	36.17%	31.61%	46.58%	58.93%	38.89%	39.74%	24.62%	30.56%	63.64%	50.00%
>8%	36.17%	32.18%	46.58%	58.93%	38.89%	39.74%	30.77%	30.56%	63.64%	50.00%

Note 1: The data in the columns labelled energy, materials, industrials, consumer discretionary, consumer staples, healthcare, financials, IT, telecom and utilities shows cumulative MPSAs with anomalous trading below a certain threshold reweighted to a proportion of that sector's MPSA announcement total. This includes only MPSAs with some degree of anomalous trading.

Note 2: This is the data contained in Figure 10.

Table 14: New market cleanliness measure by market capitalisation quintile

Threshold % of anomalous accounts trading before an MPSA	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
0.1%	1.64%	0.00%	0.16%	0.00%	0.00%
1%	10.02%	10.51%	4.60%	3.45%	1.48%
2%	10.67%	11.00%	5.25%	4.11%	2.79%
3%	10.84%	11.49%	5.42%	4.43%	2.79%
4%	11.00%	11.66%	5.58%	4.60%	2.96%
5%	11.49%	12.15%	5.58%	4.76%	2.96%
6%	11.82%	12.15%	5.58%	4.76%	2.96%
7%	12.32%	12.15%	5.58%	4.76%	2.96%
8%	12.32%	12.15%	5.58%	4.76%	2.96%
>8%	12.97%	12.32%	5.58%	4.76%	2.96%

Note 1: The data in the columns labelled quintile 1, quintile 2, quintile 3, quintile 4 and quintile 5 shows cumulative MPSAs with anomalous trading below a certain threshold. This includes only MPSAs with some degree of anomalous trading.

Note 2: This the data contained in Figure 11.

Table 15: New market cleanliness measure by announcement type

Threshold % of anomalous accounts trading before an MPSA	M&A	Other	Positive	Negative	Scheduled	Unscheduled
0.1%	0.00%	1.81%	1.64%	0.16%	0.33%	1.48%
1%	0.82%	29.23%	11.00%	19.05%	6.40%	23.65%
2%	1.31%	32.51%	13.30%	20.53%	7.22%	26.60%
3%	1.31%	33.66%	14.29%	20.69%	7.39%	27.59%
4%	1.31%	34.48%	15.11%	20.69%	7.55%	28.24%
5%	1.31%	35.63%	16.09%	20.85%	7.55%	29.39%
6%	1.48%	35.80%	16.42%	20.85%	7.72%	29.56%
7%	1.48%	36.29%	16.91%	20.85%	7.88%	29.89%
8%	1.48%	36.29%	16.91%	20.85%	7.88%	29.89%
>8%	1.48%	37.11%	17.73%	20.85%	8.05%	30.54%

Note 1: The data in the columns labelled M&A, other, positive, negative, scheduled and unscheduled shows cumulative MPSAs with anomalous trading below a certain threshold. This includes only MPSAs with some degree of anomalous trading.

Note 2: This the data contained in Figure 12.

Table 16: MPSAs preceded by some level of anomalous trading by announcement type

Threshold % of anomalous accounts trading before an MPSA	M&A	Other	Positive	Negative	Scheduled	Unscheduled
0.1%	0%	2%	3%	0%	2.47%	1.70%
1%	31%	30%	21%	39%	48.15%	27.27%
2%	50%	33%	26%	42%	54.32%	30.68%
3%	50%	35%	28%	43%	55.56%	31.82%
4%	50%	35%	29%	43%	56.79%	32.58%
5%	50%	37%	31%	43%	56.79%	33.90%
6%	56%	37%	32%	43%	58.02%	34.09%
7%	56%	37%	33%	43%	59.26%	34.47%
8%	56%	37%	33%	43%	59.26%	34.47%
>8%	56%	38%	34%	43%	60.49%	35.23%

Note 1: The data in the columns labelled M&A, other, positive, negative, scheduled and unscheduled shows cumulative MPSAs with anomalous trading below a certain threshold reweighted to a proportion of that event type's MPSA announcement total. This includes only MPSAs with some degree of anomalous trading.

Note 2: This the data contained in Figure 13.

Appendix 2: Summary of bootstrap methodology

117 We applied the bootstrap methodology in Table 17 to assess whether the CAR associated with a particular announcement was significant or not.

Table 17: Bootstrap methodology used to calculate the established market cleanliness measure

Step 1	For each announcement we took the data for daily security returns for the 240 trading days ending 10 days before that announcement. We then calculated the abnormal return for each of the 240 days as the difference between the expected and actual return for each day.
Step 2	We looked at the significance of a CAR (–2 to +1 trading days to determine announcement materiality, and –5 to –1 trading days to determine APPMs) and drew (four one-day abnormal returns to determine announcement materiality and five one-day abnormal returns to determine APPMs) from the set of 240, at random, and summed them to calculate a bootstrap-simulated CAR.
Step 3	We repeated this exercise 10,000 times yielding 10,000 bootstrap-simulated CARs.
Step 4	We compared the actual CARs associated with the announcement with the 10,000 bootstrap-simulated CARs. We deemed the actual CAR to be statistically significant at the 1% level if it was: • less than or equal to the 100th most negative MPSAs; or • greater than or equal to the 100th most positive MPSAs.

Appendix 3: Summary of the Intralinks report

118 Commissioned by Intralinks and conducted by the M&A Research Centre at Cass Business School, the Intralinks report examined more than 4,475 mergers and acquisitions from 2009–14 for evidence of information leakage about the deals before their public announcement.

> Note: See also Philip Whitchelo, *Globally, M&A deal leaks are at a six-year low*, Intralinks, 20 November 2015.

119 The study found a general improvement in market cleanliness over the six-year sample period, with Australia having one of the lowest indicators of information leakage ahead of mergers and acquisitions compared to other international jurisdictions. Intralinks and Cass Business School have suggested the global improvement is due to stronger regulatory enforcement, tighter internal governance, and increased risks to a transaction when leaking a deal.

Table 18: Percentage of leaked deals in target primary listing countries

Target primary listing country	2009	2010	2011	2012	2013	2014	Avg.
Hong Kong	40.0%	26.7%	9.5%	7.1%	13.3%	22.2%	18.6%
India	20.0%	8.8%	16.7%	6.7%	23.8%	15.8%	15.2%
United Kingdom	15.3%	21.0%	8.3%	10.8%	26.3%	5.3%	14.1%
Germany	0.0%	18.2%	14.3%	12.5%	22.2%	0.0%	10.3%
South Korea	2.9%	12.0%	13.3%	16.2%	13.0%	2.9%	9.7%
United States	6.0%	5.4%	9.7%	3.1%	7.7%	8.0%	6.6%
France	7.1%	0.0%	2.9%	5.0%	12.0%	10.0%	6.2%
Canada	14.0%	2.6%	1.9%	4.8%	1.8%	7.7%	5.6%
Norway	0.0%	7.7%	30.0%	0.0%	0.0%	0.0%	5.6%
Japan	6.2%	8.0%	3.5%	3.0%	1.9%	0.0%	4.4%
Australia	3.8%	6.3%	2.0%	3.9%	0.0%	2.0%	3.5%

120 Globally, there appears to be a declining trend in leaked deals as a percentage of all deals over the past six years.

121 Geographically, deals in Europe, the Middle East and Africa showed the highest six-year average percentage of leaked deals, whereas North America showed the lowest.

122 The top two locations for leaked deals were Hong Kong (18.6%) and India (15.2%). Australia had the lowest average percentage of leaked deals over the period, at 3.5%, while the United States, at 6.6%, had the median percentage of leaked deals.

123 Over the period, the median takeover premium for targets in completed leaked deals was 51.2% compared to 29.2% for non-leaked deals, a difference of 22 percentage points. This may be because leaked deals have a higher tendency to attract rival bids. Leaking a deal also appears to increase the period between announcement and completion of the deal, and attract increased attention from the media and regulators.

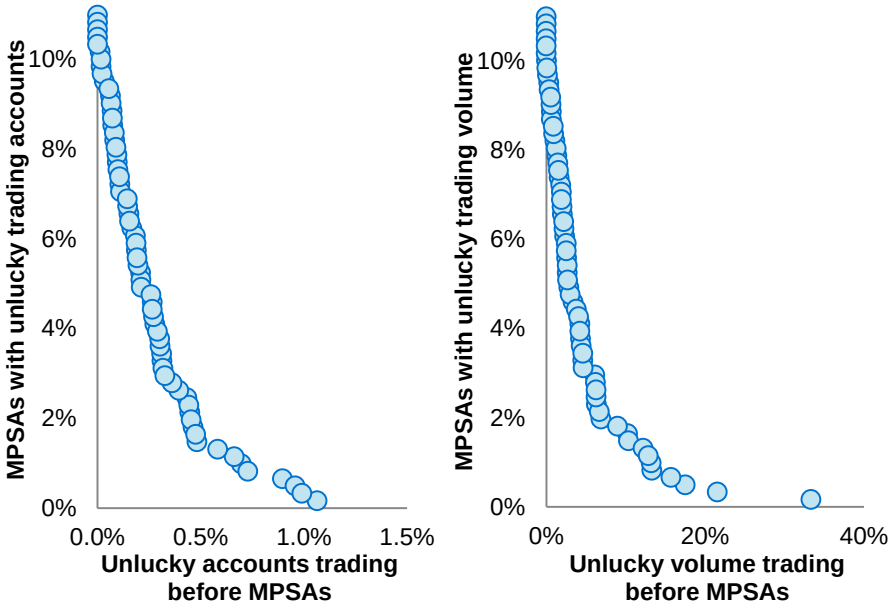
Appendix 4: Unlucky traders

124 We explored the role that luck plays in accounts being deemed anomalous by examining the percentage of unlucky traders ahead of MPSAs.

125 Unlucky trader are traders that exhibit similar trading patterns ahead of MPSAs as suspicious and profitable traders, but who trade in the opposite direction. Figure 14 shows the cumulative distribution of unlucky traders: see Figure 5 for the cumulative distribution of anomalous traders.

126 Although 'luck' in financial markets may not be 'symmetrical' (i.e. the proportion of lucky and unlucky traders are not equivalent), the proportion of unlucky traders could provide a rough indication of the role that luck may play. We observed that unlucky traders represent a much smaller proportion of trading ahead of MPSAs than timely, profitable and anomalous traders (i.e. lucky and informed). However, it is worth noting that there is limited overlap between the MPSAs that contain abnormal trading in both the right and wrong directions.

Figure 14: Cumulative distribution of MPSAs by percentage level of unlucky trading



Key terms

Term	Meaning in this document
account (origin of order ID)	For each side (buy and/or sell) of the order or transaction where the participant acts as agent for a client, a unique notation, code or number used by the participant to identify the person on whose instructions the order is submitted or transaction was executed
adverse selection	Process where undesired results occurs for one party of the transaction when buyers and sellers have access to different/imperfect information
APPM	Abnormal pre-announcement price movement
ASIC	Australian Securities and Investments Commission
ASIC Market Integrity Rules (Competition)	ASIC Market Integrity Rules (Competition in Exchange Markets) 2011—rules made by ASIC under s798G of the Corporations Act that are common to markets dealing in equity market products quoted on ASX
ASX	ASX Limited or the exchange market operated by ASX Limited
bootstrapping	The process of estimating properties of an estimator by measuring those properties when sampling from an approximating distribution. One standard choice for an approximating distribution is the empirical distribution function of the observed data
CAPM	Capital asset pricing model
CAR	Cumulative abnormal return
Corporations Act	*Corporations Act 2001*, including regulations made for the purposes of that Act
cost of capital	The rate of return required to persuade an investor to make a given investment, which is equivalent to the rate of return the company promises to generate in order to raise capital
established market cleanliness measure	Market cleanliness measure based on APPMs in the security ahead of MPSAs
FCA	Financial Conduct Authority (UK)
financial market	As defined in s767A of the Corporations Act, a facility through which offers to acquire or dispose of financial products are regularly made or accepted
FSA	Financial Services Authority (UK)

Term	Meaning in this document
GICS	Global Industry Classification Standard, an industry taxonomy developed in 1999 by MSCI Inc. and Standard & Poor's Financial Services LLC.
high-frequency trading	There is no internationally agreed, formal definition of high-frequency trading. For the purposes of this report, we have used the description provided by IOSCO: see paragraph 27 in Report 452 *Review of high-frequency trading and dark liquidity* (REP 452)
information asymmetry	A situation where one party in a transaction has more or superior information compared to another
Intralinks	Intralinks Holdings, Inc.
Intralinks report	*Intralinks M&A Leaks Report*, 2015
IOSCO	International Organization of Securities Commissions
logistic regression	Regression model where the dependent variable is binary (yes/no) or discretely categorical (win/draw/lose)
MAI	ASIC's Market Analytics and Intelligence surveillance system
market cleanliness	Measure of market integrity based on the perceived indicators of insider trading and information leakage ahead of MPSAs
MPSA	Material, price-sensitive announcements
new market cleanliness measure	Market cleanliness measure based on anomalous trading behaviour by accounts ahead of MPSAs
relevant period	1 November 2005 to 31 Oct 2015
SEC	Securities and Exchange Commission (US)
stock-to-portfolio ratio	The time-weighted proportion of the relevant security to the entire portfolio of securities accumulated by an entity during a period of time.

ASIC
Australian Securities & Investments Commission

Review of Australian equity market cleanliness

1 November 2015 to 31 October 2018

Report 623 | July 2019

About this report

This report sets out the findings of our review of Australian equity market cleanliness for the period 1 November 2015 to 31 October 2018. It focuses on possible insider trading and information leaks ahead of material, price-sensitive announcements.

We applied two different methodologies to measure market cleanliness. This report examines the results across industry sectors, market capitalisation and announcement types.

Contents

About ASIC regulatory documents

In administering legislation ASIC issues the following types of regulatory documents: consultation papers, regulatory guides, information sheets and reports.

Disclaimer

This report does not constitute legal advice. We encourage you to seek your own professional advice to find out how the Corporations Act and other applicable laws apply to you, as it is your responsibility to determine your obligations. Examples in this report are purely for illustration; they are not exhaustive and are not intended to impose or imply particular rules or requirements.

Overview

This report summarises the results of our review of market cleanliness in the Australian equity markets for the three years to 31 October 2018. We found that Australian equity markets continued to operate with a high degree of integrity.

Maintaining the integrity of Australia's equity markets is essential to ensure a fair, strong and efficient financial system for all Australians. Confidence in the integrity of Australia's equity markets:

- encourages investor participation
- contributes to liquidity
- stimulates more competitive pricing
- lowers the cost of capital.

However, markets can't operate with a high degree of integrity unless the information they run on is fairly accessible. That is why market cleanliness is essential to investor confidence. In a clean market, prices react immediately after new information is released through the proper channels available to the public.

Insider trading and information leaks ahead of major announcements can create false markets and affect market integrity. Reduced confidence in market integrity discourages investors from risking their savings by investing in an unfair market. This can lead to lower turnover, higher cost of trading and inefficient allocation of capital.

Measuring market cleanliness

Our review measured Australian equity market cleanliness for the period 1 November 2015 to 31 October 2018. It focused on possible information leaks and insider trading ahead of material price-sensitive announcements (MPSAs).

We used two methods to measure market cleanliness:

- the 'established methodology'—widely used by international regulatory counterparts and academics—relies on abnormal pre-announcement price moves (APPMs) in a relatively short window (e.g. five days) ahead of MPSAs to indicate possible information leaks and/or insider trading
- the 'internal methodology', developed by ASIC, measures the concentration of timely, profitable and suspicious trading ahead of MPSAs to more directly assess market cleanliness. This measure recognises that insider trading may not result in APPMs and that trading may occur in a longer window (e.g. 10 days) before an MPSA.

The high-level logic of both methodologies is discussed in this report. However, for detailed conditions and design features for each of the methodologies, see Report 487 *Review of Australian equity market cleanliness* (REP 487).

Findings

We found that:

- the overall cleanliness of the market fluctuated between 2015 and 2018—despite a deterioration in 2016, market cleanliness improved in 2017 and 2018 to settle around 2015 levels
- on average, 0.6% of accounts that traded before an MPSA were deemed suspicious. Suspicious accounts profitably traded on average 5.1% of the volume before each announcement
- while the percentage of suspicious accounts remained stable over the period, the volume traded by those accounts appears to have increased
- on the whole, there was more suspicious trading before announcements related to mergers and acquisitions (M&As) than for other announcement types. However, the suspicious trading was generally accompanied by less abnormal price reactions
- there was more suspicious trading and abnormal price reactions before unscheduled announcements than scheduled announcements. Suspicious trading and/or abnormal price reactions before unscheduled announcements were less likely to be driven by normal speculation than scheduled announcements
- announcements by smaller companies were more likely to appear unclean. Many of these smaller companies were in the materials sector.

What next?

In light of these results, we will continue to strengthen our surveillance of listed equity markets. We are examining practical ways of using the internal market cleanliness measure to supplement misconduct detection. Monitoring the historical accumulation of anomalous trading patterns ahead of MPSAs will further enhance our market supervision work and inform our regulatory focus. In future, we aim to increase our monitoring of brokers with high concentrations of anomalous order flow and clients, or groups of clients, that exhibit repeat patterns of anomalous trading.

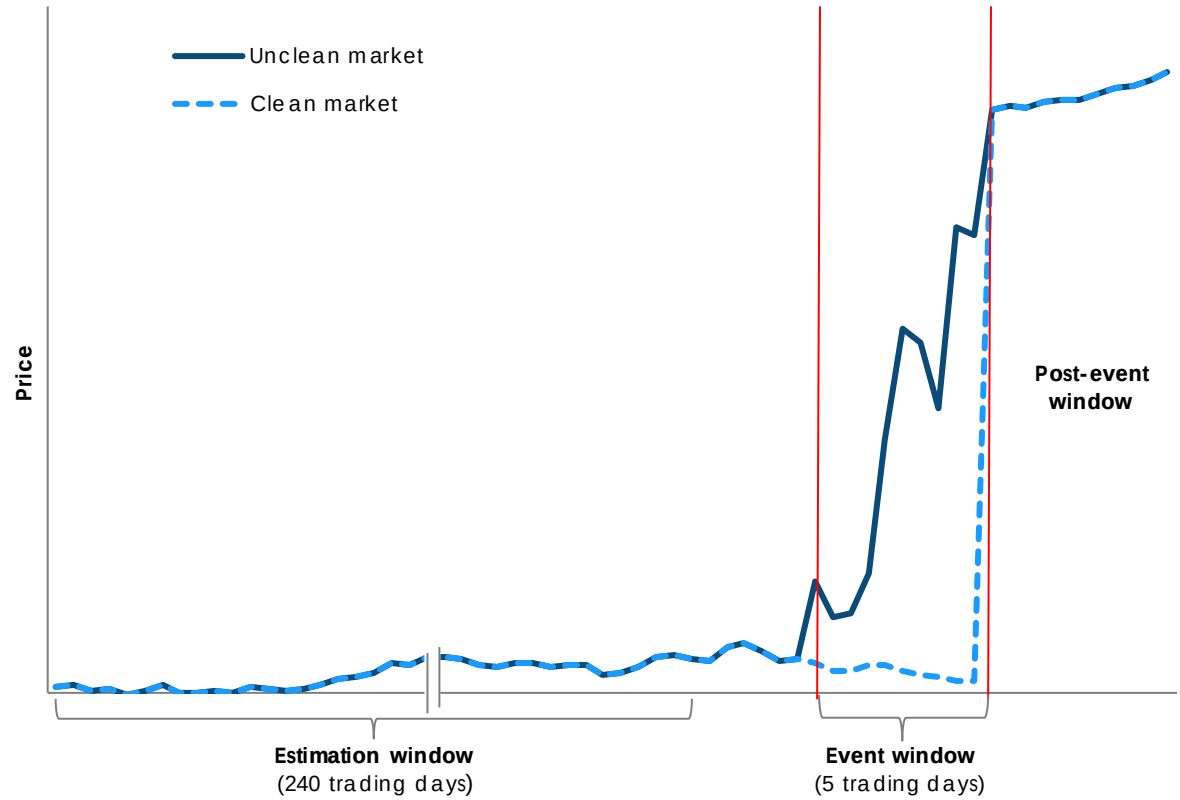
Established market cleanliness measure and results

Established market cleanliness methodology

The established market cleanliness methodology measures APPMs ahead of MPSAs. Price moves before an MPSA—in the same direction and significantly different from normal volatility—can raise concerns about market integrity and efficiency. In a clean market, security prices should react instantaneously to new information released through the proper channels and should be preceded by minimal anomalous trading or anticipatory price moves. Significant and abnormal price reactions and anomalous trading patterns ahead of announcements may signal information leaks and indicate an unclean market.

This is illustrated in Figure 1. In an unclean market, the share price rises in anticipation of the announcement. By contrast, in a clean market, the share price reacts instantaneously to the announcement.

Figure 1: Illustration of established market cleanliness methodology



Note: This graph is explained in the paragraphs above (accessible version).

The established measure of market cleanliness is calculated as the percentage of MPSAs preceded by APPMs.

$$Percentage\ of\ APPMs = \frac{No.of\ APPMs}{Total\ number\ of\ MPSAs}$$

This methodology has been widely applied by international financial market regulators, exchange market operators, industry think tanks and academics. The results will form the basis for further analysis through time and across equity market segments (i.e. industry sectors, market capitalisation quintiles and announcement types).

The established market cleanliness measure calculated using this methodology should be interpreted in the context of the methodology's limitations: see REP 487 at paragraphs 33–41. Despite its limitations, however, the established methodology is intuitively attractive and practical

to apply. It can give regulators and industry stakeholders a broad indication of changes in the level of market integrity when applied consistently over time.

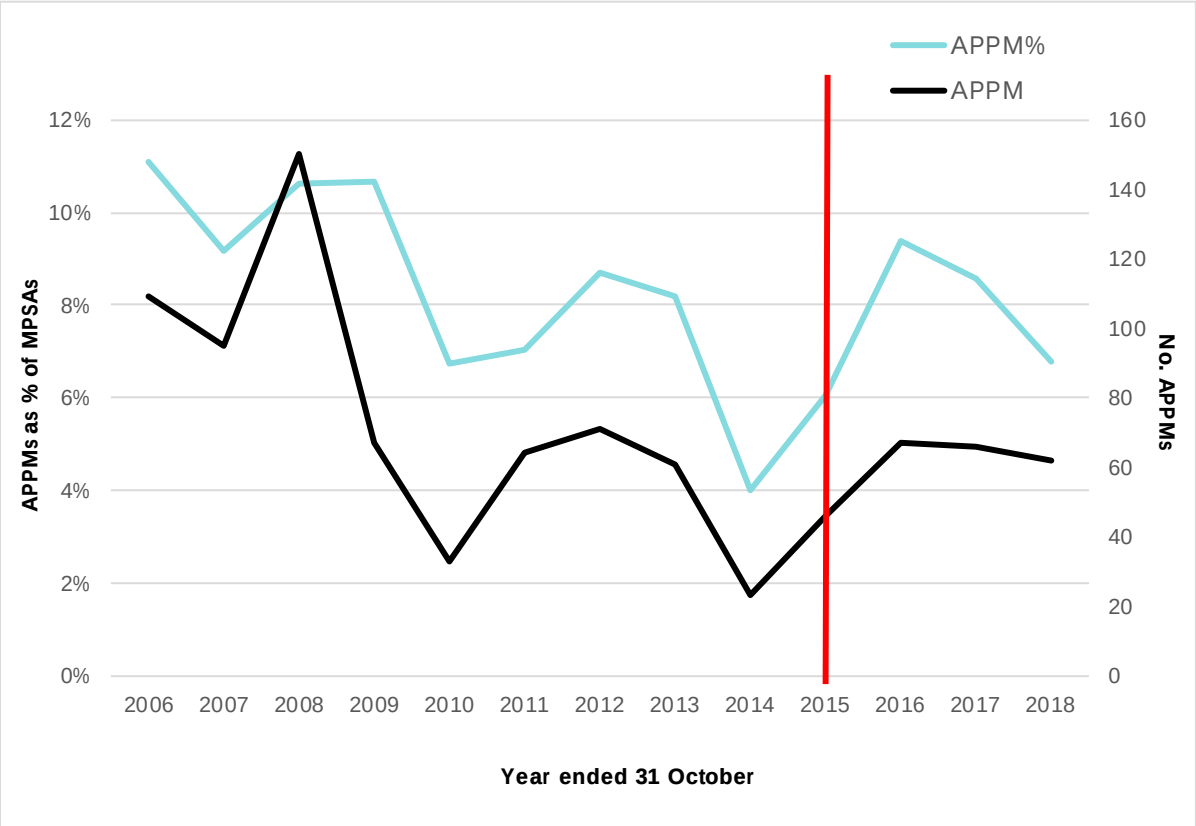
Established market cleanliness results

The established market cleanliness methodology uses abnormal price reactions ahead of MPSAs to measure market cleanliness through time and across different market segments. A low percentage of APPMs indicates that markets are relatively clean. Conversely, a high percentage of APPMs indicates that markets are relatively unclean.

Figure 2 shows the established market cleanliness measure in Australia based on our sample of MPSAs from 2006 to 2018 (full years to end October). Following a general improvement in market cleanliness from 1 November 2006 to 31 October 2015, there was an overall stabilisation in the three years from 1 November 2015 to 31 October 2018. A somewhat pronounced deterioration in market cleanliness in 2016 was followed by two consecutive years of improvement in 2017 and 2018. With the deterioration in 2016 and subsequent improvement in the following two years, the measure returned to approximately 2015 levels.

Note: All years referenced in this report start on 1 November and end on 31 October (e.g. 2018 refers to the period 1 November 2017 to 31 October 2018).

Figure 2: Established market cleanliness measure



Note: See Table 1 for the data shown in this figure (accessible version).

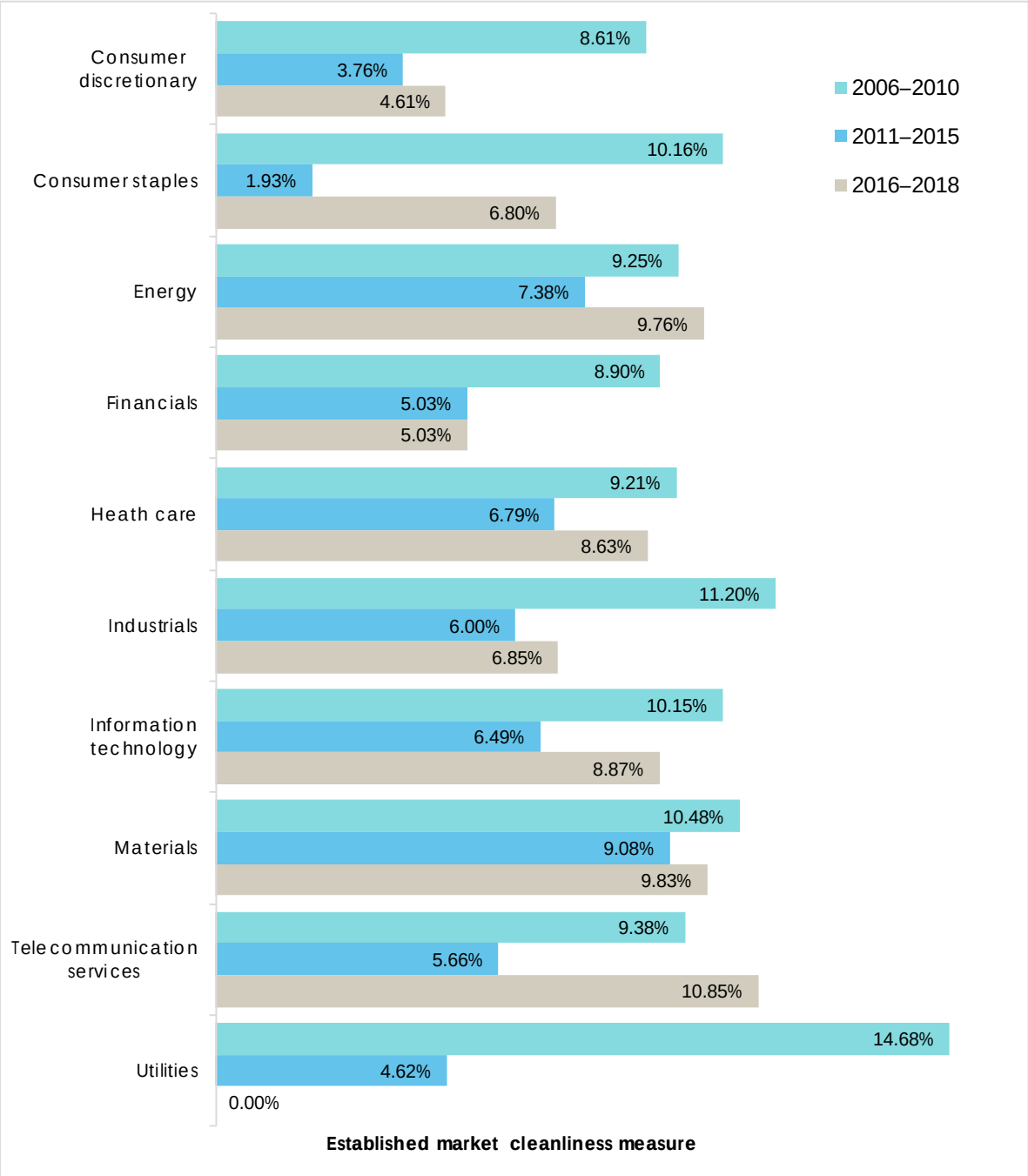
In 2015, 6.07% of MPSAs were preceded by APPMs. In 2016, anomalous MPSAs rose to 9.37% and then fell to 8.56% in 2017 and 6.76% in 2018. One reason for the increase in 2016 is that the market capitalisation of companies making MPSAs tended to be smaller than in 2015. These smaller companies generally exhibited lower liquidity and trading volume. This meant that trading ahead of the MPSAs was more likely to result in price impact. The internal market cleanliness measure echoes this finding—that is, the average percentage of anomalous accounts and volume ahead of MPSAs was slightly higher in 2016 compared to 2015. Both measures improved in 2017 and 2018, back towards 2015 levels.

This pattern was generally reflected in our analysis across sectors, market capitalisation and announcement types. Further, during the three years from 1 November 2015 to 31 October 2018, the traditional market cleanliness measure across industry sectors, market capitalisation quintiles and announcement types was generally better than in the first five years from 1 November 2006 to 31 October 2010, but worse than that of the second five years from 1 November 2010 to 31 October 2015.

Industry sector

To examine market cleanliness across industry sectors we used the 10 sectors that make up the structure of the Global Industry Classification Standard (GICS)—that is, energy, materials, industrials, consumer discretionary, consumer staples, health care, financials, information technology, telecommunication services and utilities.

Figure 3: Established market cleanliness measure by industry sector



Note: See Table 2 for the data shown in this figure (accessible version).

We grouped the announcements made by companies in each industry sector to explore whether there were any industry-specific patterns of variation in the established market cleanliness measure over the periods 2006–10, 2011–15 and 2016–18 (the last period being three rather than five years): see Figure 3.

Our analysis of the sectors using the established method indicates the highest percentage of APPMs was in the period 2006–10. There was a substantive improvement in 2010–15 which was not continued in 2016–18, as the measure stabilised. While the rate of improvement was not sustained over the most recent period (2016–18), most sectors still showed an overall improvement in cleanliness compared to the first study period (2006–10). This suggests long-term improvement in market cleanliness for most sectors.

The utilities sector improved in each study period, along with a reduction in MPSAs. Historically, however, this sector has been volatile in the market cleanliness measure. The financial sector has maintained its cleanliness (5.03%) and comes after the consumer discretionary sector (4.16%) as the third cleanest sector.

Market cleanliness scores for the telecommunication services and energy sectors deteriorated in the most recent three-year period and had the poorest and third poorest market cleanliness scores (10.95% and 9.76% respectively)—the materials sector has the second poorest market cleanliness measure (9.83%). It should be noted that the materials sector accounted for over 40% of MPSAs in the 2016–18 period.

Size—Market capitalisation

To examine market cleanliness by company size we grouped companies into quintiles according to their market capitalisation—Quintile 1 being the 20% of companies with the smallest market capitalisation and Quintile 5 being the 20% of companies with the largest market capitalisation. Market capitalisation for each company was determined using the average market capitalisation for the five days before the MPSA.

Our analysis by size (market capitalisation quintile) shows that larger companies generally exhibited better market cleanliness.

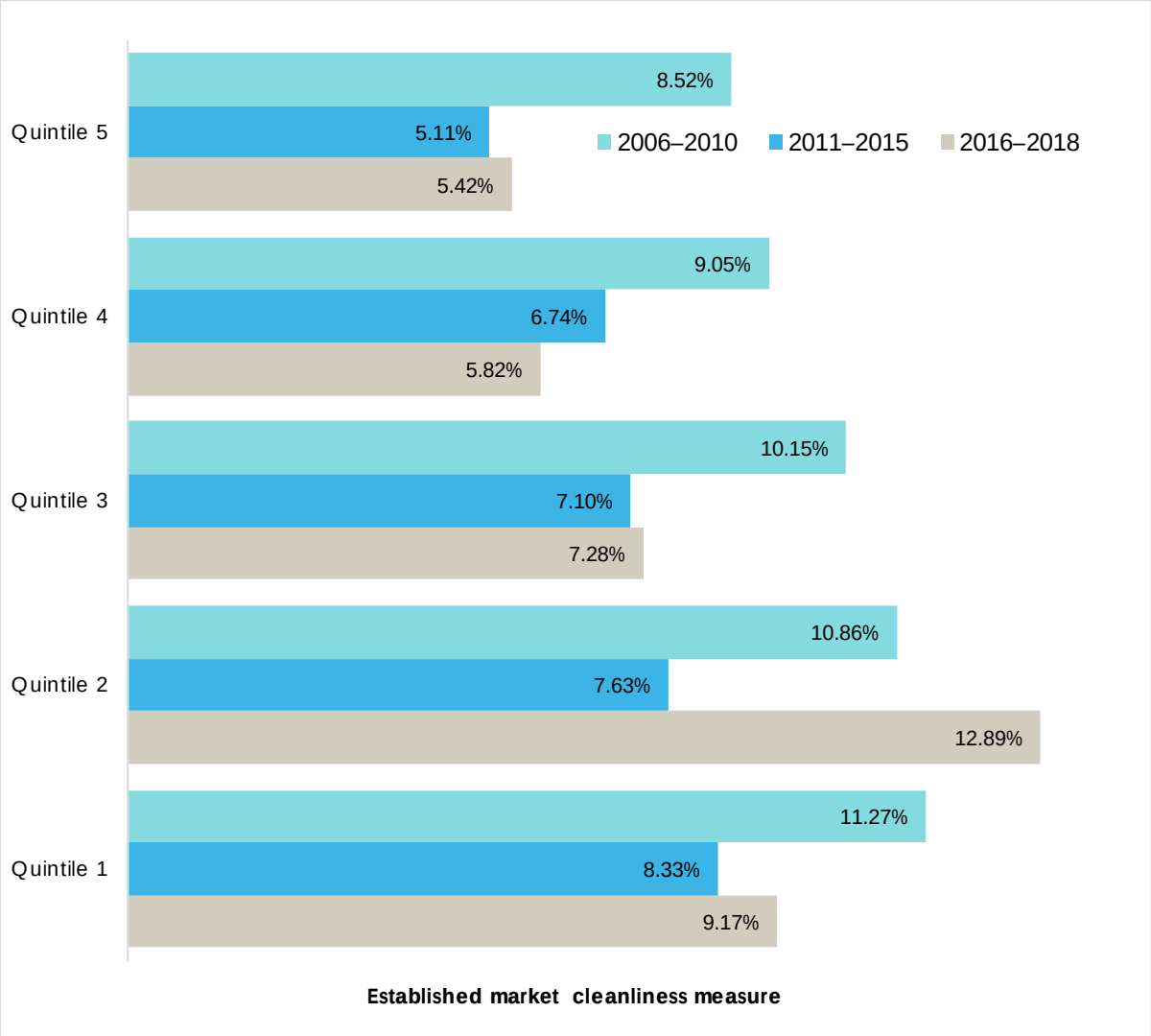
During the 2016–18 period, four out of five quintiles had poorer market cleanliness compared to the 2011–15 period. However, only Quintile 2 (the second smallest group of stocks) had their market cleanliness deteriorate further than 2006–10 levels. See Figure 4.

The probable reason for this is that nearly half of the MPSAs were by smaller companies in the materials sector with relatively limited liquidity. A significant proportion were in exploration where inside information (such as drilling results) can be known by multiple parties and is short lived due to continuous disclosure obligations.

Quintile 1 had the second poorest market cleanliness score in the 2016–18 period and included MPSAs made by a similar composition of companies.

In general, larger companies may have better market cleanliness scores because they have more resources devoted to compliance for continuous disclosure and management of confidential information. On the trading side, larger companies have greater liquidity, which can better absorb the price impact of anomalous trading ahead of announcements.

Figure 4: Established market cleanliness measure by market capitalisation quintile—Quintile 5 (largest) to Quintile 1 (smallest)



Note: See Table 3 for the data shown in this figure (accessible version).

Announcement type

This section examines the established market cleanliness measure by announcement type: see Figure 5.

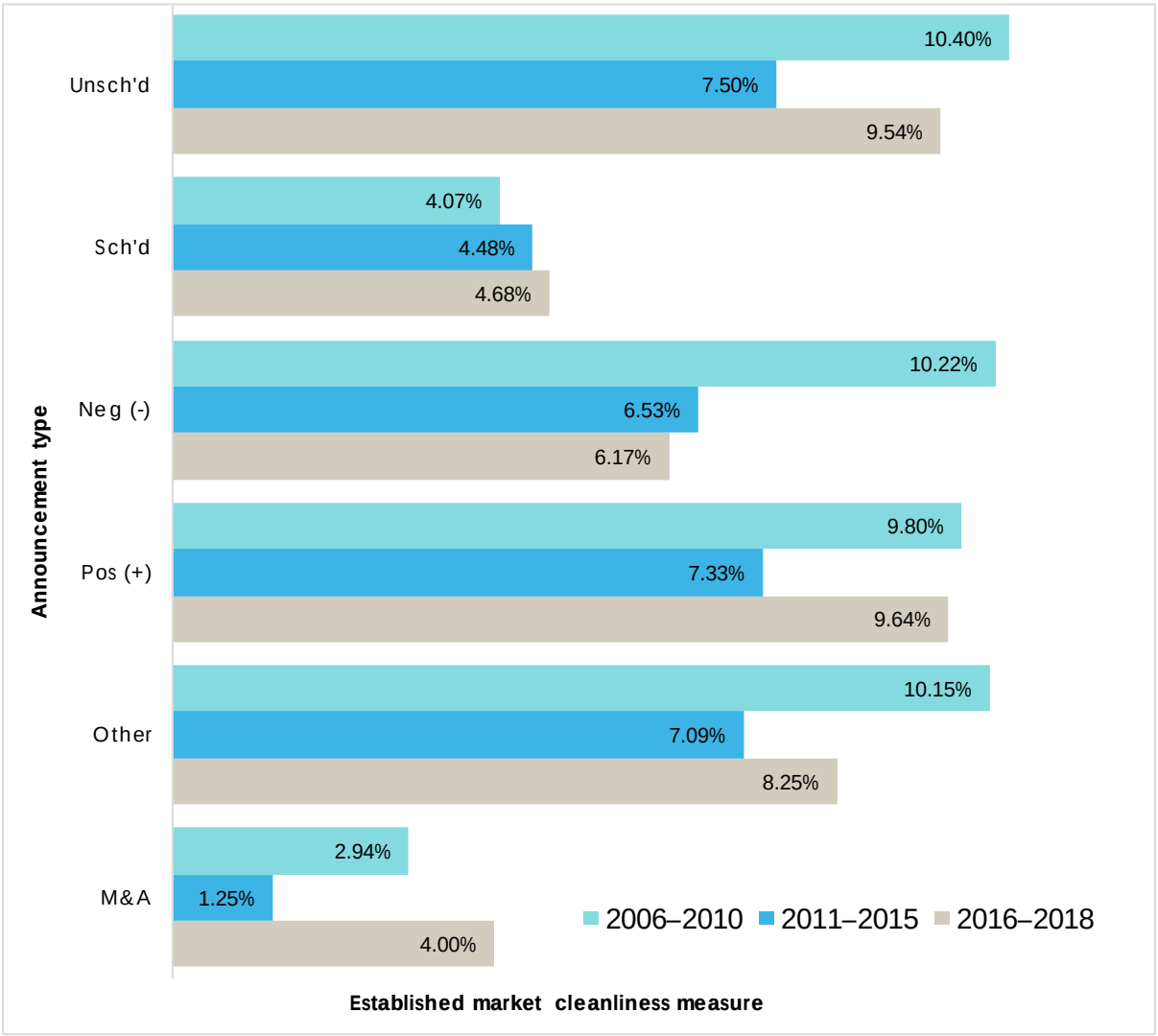
Consistent with REP 487, M&A announcements had the best market cleanliness score of the six types. Given that the number of people working on M&A deals would be quite large, this result is somewhat surprising. Indeed, it is in direct contrast with the internal market cleanliness measure, which exhibited worse cleanliness for M&As. The reasons for the contrasting results is explained in the following section on the internal market cleanliness measure.

Overall, positive MPSAs appeared less clean than negative MPSAs, which can be affected by naked short selling restrictions.

It is interesting to see that the market cleanliness measure for unscheduled MPSAs appeared significantly worse than for scheduled MPSAs. Scheduled announcements are expected and they may be managed with analyst briefings, company announcements and market research before the announcement. Also, leaks can occur over a more prolonged period of time. Additionally, one would expect scheduled MPSAs to be preceded by increased liquidity and speculation in

both directions, which may mask the anomalous trading and make it more difficult to create any APPMs. On the other hand, unscheduled MPSAs tend to be less clean than scheduled MPSAs by both measures, which is indicative of possible market misconduct rather than traders betting ahead of scheduled MPSAs.

Figure 5: Established market cleanliness measure by announcement type



Note: See Table 4 for the data shown in this figure (accessible version).

Internal market cleanliness measure and results

Internal market cleanliness methodology

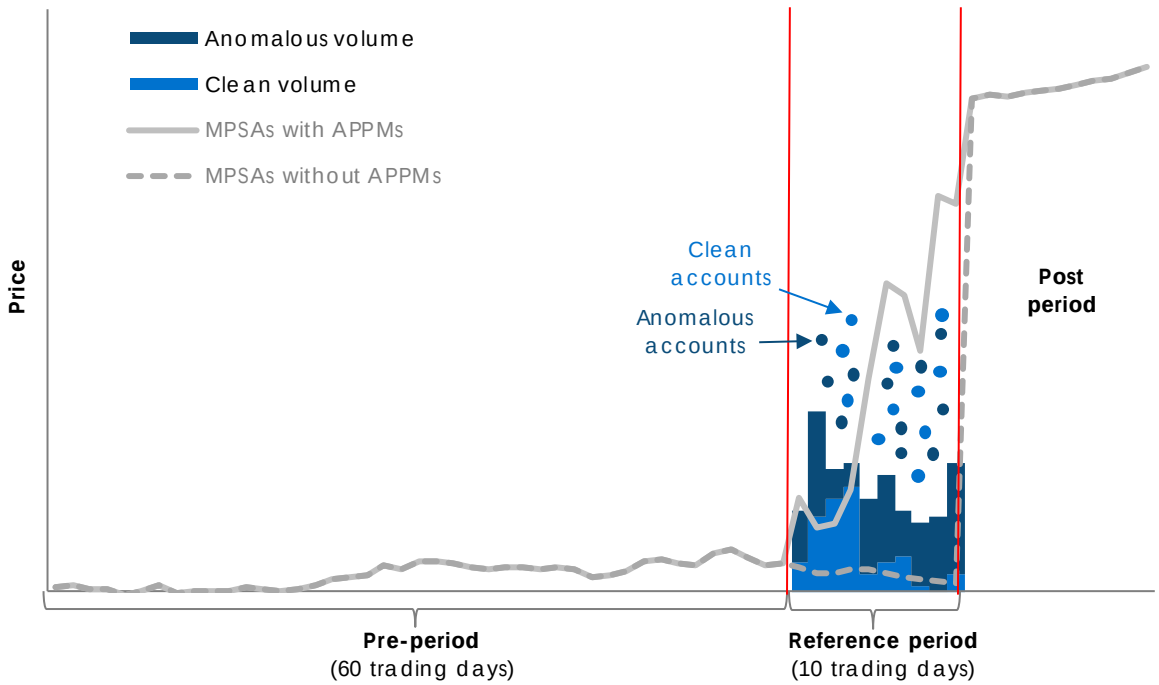
We developed an innovative market cleanliness methodology that is independent of the established methodology. It removes the reliance on price reactions to indicate an 'unclean market'. Instead of relying on the price impact of possibly suspicious trading, we look at the anomalous trading itself.

The internal methodology was inspired by our market surveillance activity and made possible by our access to enhanced surveillance data through our Market Analysis Intelligence (MAI) system, which allows the identification of individual origin of order IDs (accounts). Market participants were required to provide origin of order IDs in the regulatory data feed from 28 July 2014. The internal measure started on 1 November 2014 to allow for a clean period following 28 July 2014.

This report updates our review of Australian equity market cleanliness to the end of October 2018. Given that in the original study (see REP 487) our internal market cleanliness methodology only made use of one year of origin of order ID data (i.e. 1 November 2014 to 31 October 2015), this extension allows us to conduct a time series analysis on the internal methodology (i.e. 1 November 2014 to 31 October 2018).

We examined timely and profitable trading before MPSAs and identified accounts that demonstrated anomalous behavioural patterns compared to their historical trading behaviour and the rest of the market's trading behaviour. We isolated accounts that not only traded in a timely and profitable manner during the reference period (i.e. 10 trading days before an MPSA) but had notably diverged from how they had behaved historically during the pre-period (i.e. 60 trading days before the MPSA) and/or how the rest of the market behaved: see Figure 6.

Figure 6: Illustration of internal market cleanliness methodology



Note: This graph is explained in the paragraph above (accessible version).

In doing so, we measured the extent and intensity of anomalous trading (rather than price reaction) ahead of MPSAs. It is similar to how a surveillance analyst would screen for suspected insider trading. For example, the methodology attempts to identify traders who exhibit various combinations of certain characteristics, including (but not limited to) traders who:

- have not traded the security of interest for an extended period of time, but have suddenly started aggressively trading in the security of interest just ahead of the MPSA
- changed from historical trading and portfolio diversification behaviours to increased trading and position concentration in the security of interest just ahead of the MPSA
- significantly increased the size of trading in the security of interest just ahead of the MPSA, and/or
- made a material profit as a result of the timely trading.

This was done by systematically filtering timely buying or selling, profitability, the ratio of trading in the relevant security to the entire portfolio during the pre-period compared to the reference period, and abnormal trading volume. For example:

- a large average stock-to-portfolio ratio in the reference period indicated that the account bought a concentrated stake in the relevant security or liquidated existing holdings in the portfolio to buy the relevant security ahead of a positive MPSA
- a much lower average stock-to-portfolio ratio in the pre-period showed that the account historically traded a diversified range of securities
- the account accumulated a much larger stake in the relevant security during the reference period compared to what it bought during the pre-period
- the accumulated relevant security during the reference period was substantial, relative to its historical trading in other securities
- the total profit from trading ahead of the MPSA was significant.

Market cleanliness measures can be constructed by looking at the percentage of accounts trading before MPSAs that demonstrate anomalous behavioural patterns (internal market cleanliness measure 1), and the percentage of volume they traded (internal market cleanliness measure 2).

Internal market cleanliness measure 1 is calculated as the percentage of accounts demonstrating timely and anomalous trading ahead of MPSAs.

$$Suspicious\ accounts\ \% = \frac{No.of\ accounts\ with\ anomalous\ trading\ ahead\ of\ MPSA_i}{Trading\ no.of\ accounts\ ahead\ of\ MPSA_i}$$

Internal market cleanliness measure 2 is calculated as the percentage of volume traded using the accounts ahead of MPSAs.

$$Suspicious\ volume\ \% = \frac{Volume\ traded\ by\ anomalous\ accounts\ ahead\ of\ MPSA_i}{Total\ volume\ ahead\ of\ MPSA_i}$$

Where securities are volatile, it is difficult to distinguish APPMs. Even where there is no pre-announcement price move we are still concerned with illegal and unfair activity. Therefore, in

addition to APPMs, market cleanliness should examine the nature and pattern of trading by each account prior to MSPAs.

This measure is subject to the strictness of our quantitative filters that deem trading patterns as timely, profitable and anomalous, based on our usual surveillance activities. The exact quantitative thresholds and parameters used to generate the internal market cleanliness measure are designed to profile and stylise general sets of trading patterns informed by our internal surveillance activity. We have conducted various sensitivity and robustness checks by altering some of the parameters and applying different model specifications in our day-to-day surveillance. Like APPMs in the traditional market cleanliness methodology, the internal measure provides an indication of possible undesirable activity (e.g. insider trading and information leaks), while not asserting that the entire measure is attributable to such conduct.

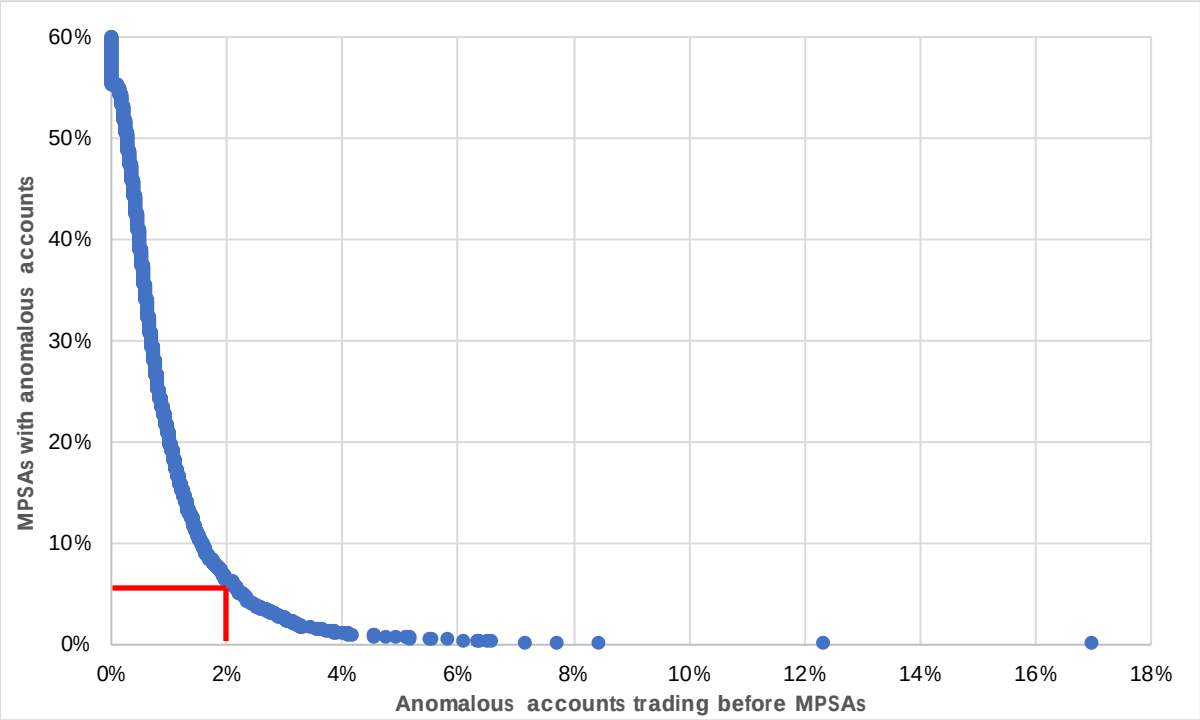
Internal market cleanliness results

This section extends our analysis of the internal market cleanliness measure results previously published in REP 487. Our analysis in REP 487—for the year 1 November 2014 to 31 October 2015—indicated that approximately 62% of MPSAs exhibited no anomalous trading behaviour leading up to the announcement. Of the 38% of MPSAs that had some level of anomalous trading, around 5% were preceded by more than 2% of accounts demonstrating anomalous trading patterns, and around 5% contained more than 12% of volume traded by anomalous accounts.

Cumulative market cleanliness measures

The internal market cleanliness measures for the years 1 November 2014 to 31 October 2018 indicate that approximately 45% of MPSAs exhibited no anomalous trading behaviours at the account level. Of the 55% of MPSAs that had some level of anomalous trading, around 5% contained more than 2% of accounts (roughly the same as in REP 487) demonstrating anomalous trading patterns ahead of the announcement: see Figure 7.

Figure 7: Internal market cleanliness measure—Cumulative MPSA % by account

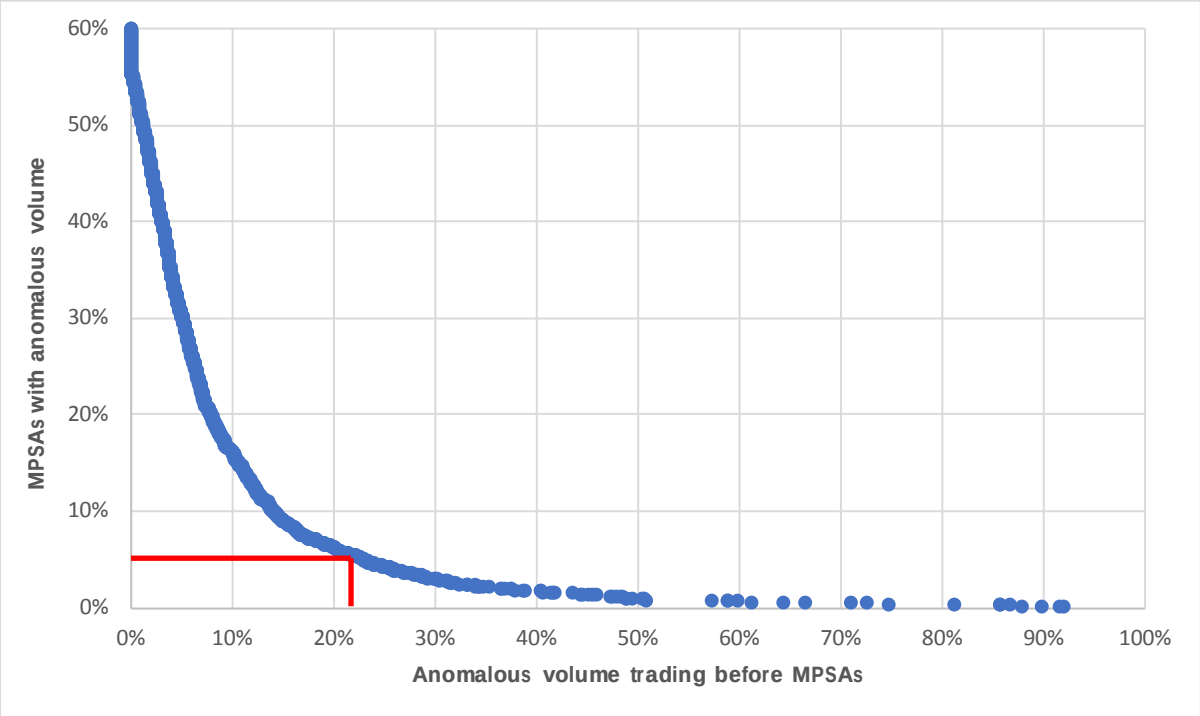


Note: This graph is explained in the paragraph above (accessible version).

Further, of the 55% of MPSAs that had some level of anomalous trading, around 5% contained more than 23% of volume traded by anomalous accounts. This is higher than in our previous review (see REP 487), where around 5% of MPSAs contained more than 12% of volume traded by anomalous accounts. This is a much larger proportion than by accounts: see Figure 8.

This shows that accounts engaging in anomalous trading may have traded larger volumes than the average account at each level of the cumulative distribution. It is also driven by the longer sample period of four years. Note that the denominator of percentage volume is the single-sided total volume ahead of the MPSA, hence resulting in above 50% reading.

Figure 8: Internal market cleanliness measure—Cumulative MPSA % by volume



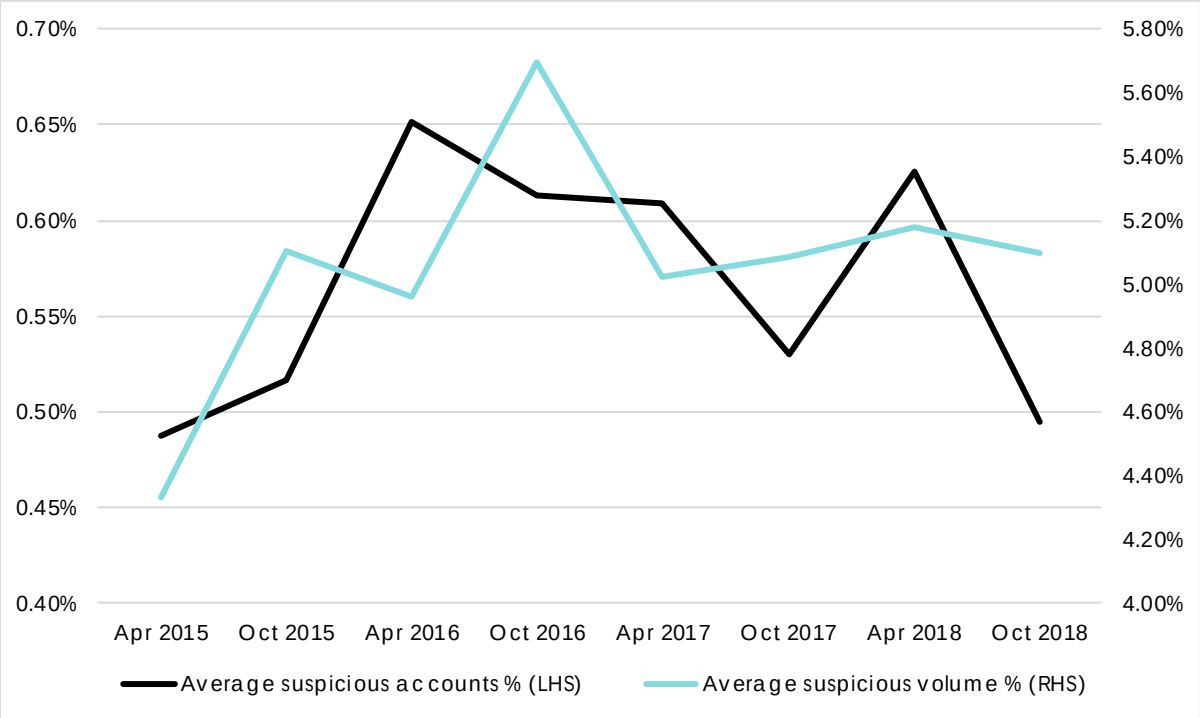
Note: This graph is explained in the paragraph above (accessible version).

Market cleanliness measures over time

Figure 9 sets out the internal market cleanliness measures from 1 November 2014 to 31 October 2018. It shows that the average proportion of suspicious accounts preceding MPSAs increased from 0.49% for the half year between 1 November 2014 and 30 April 2015 to 0.65% for the half year between 1 November 2015 and 30 April 2016, before falling back to 0.49% for the half year between 1 May 2018 and 31 October 2018. This indicates that market cleanliness fluctuated around a stable level.

The average proportion of suspicious volume preceding MPSAs increased from 4.33% for the half year between 1 November 2014 and 30 April 2015 to 5.70% for the half year between 1 May 2016 and 31 October 2016, before falling back to stabilise around 5% for the rest of the sample periods until 31 October 2018.

Figure 9: Internal market cleanliness measures



Note: See Table 5 for the data shown in this figure (accessible version).

Industry sector

The internal market cleanliness measures by industry sector over 2015–18 showed that consumer staples, materials and industrials had the highest percentage of anomalous accounts preceding MPSAs, while financials, telecommunication services and materials had the highest percentage of anomalous volume preceding MPSAs.

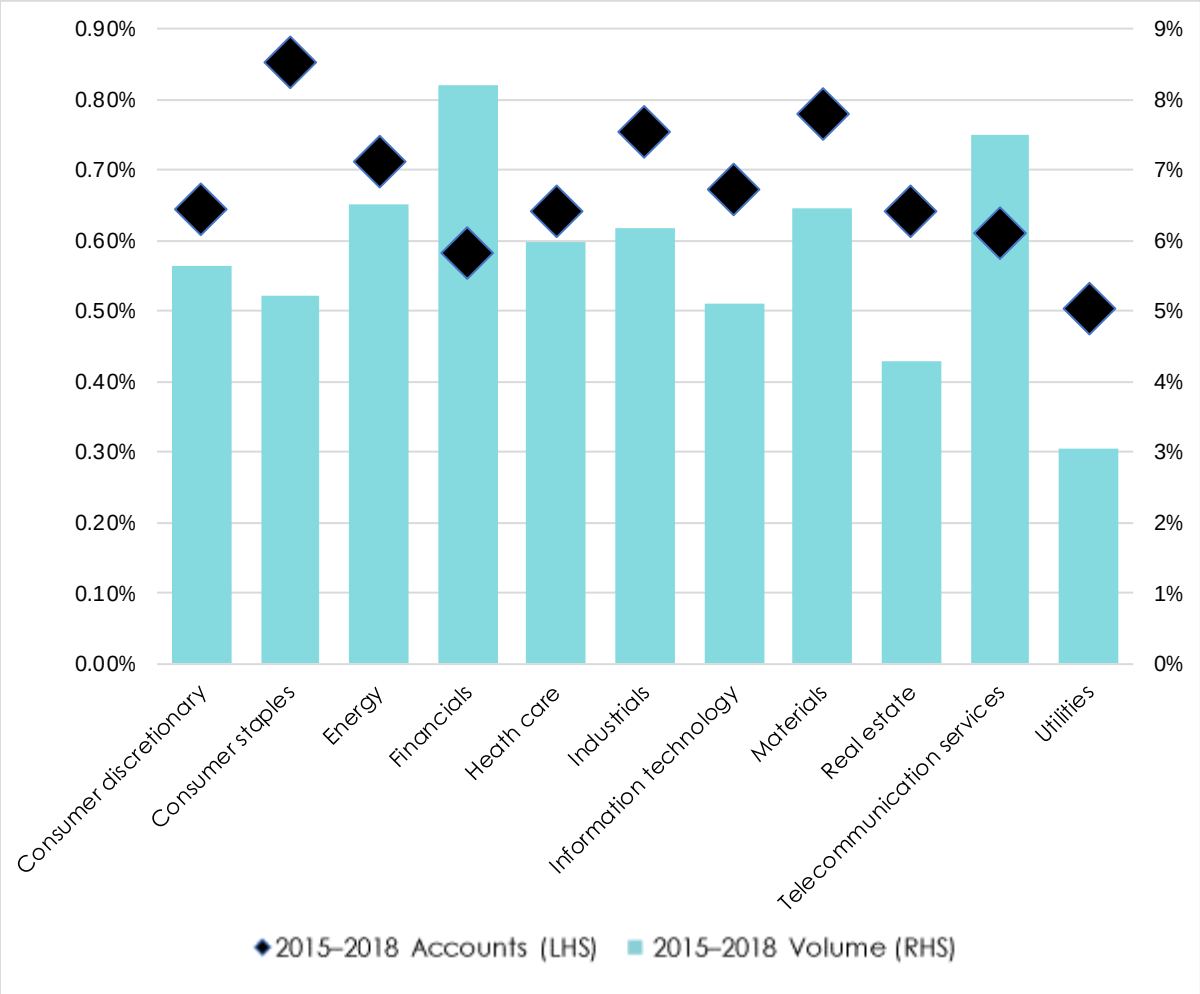
Utilities was the cleanest sector with measures of only 3% by volume and 0.50% by accounts. Real estate, followed by information technology, were the next cleanest sectors by percentage of volume.

Following utilities, financials and telecommunication services were relatively clean by percentage of accounts. However, these sectors had the poorest measures by percentage of volume at 8.19% and 7.50% respectively.

Financials are primarily large cap stocks that are highly liquid and widely traded so it is easy to understand that a smaller proportion of accounts would appear anomalous—but for those accounts, the volume may be quite high. This is similar for telecommunication services where the composition of stocks is mainly large.

Telecommunication services, materials and energy were consistently poor in both the established and internal market cleanliness measures.

Figure 10: Internal market cleanliness measures by sector



Note: See Table 6 for the data shown in this figure (accessible version).

Size—Market capitalisation

The internal market cleanliness measure over 2015–18 showed a gentle improvement in cleanliness from the largest companies (Quintile 5) to the smallest companies (Quintile 1). The one exception was Quintile 2.

This differs from the established market cleanliness measure where it improved from the smallest companies (Quintile 1) to the largest companies (Quintile 5). One reason for this is the difference in the methodologies. The established measure is based on price moves, and small companies exhibit greater volatility in price compared to large companies.

Quintile 2, the second smallest companies by market capitalisation (from about $20 million to $85 million), had the poorest market cleanliness at 7.09% of volume and 0.81% of accounts: see Figure 11.

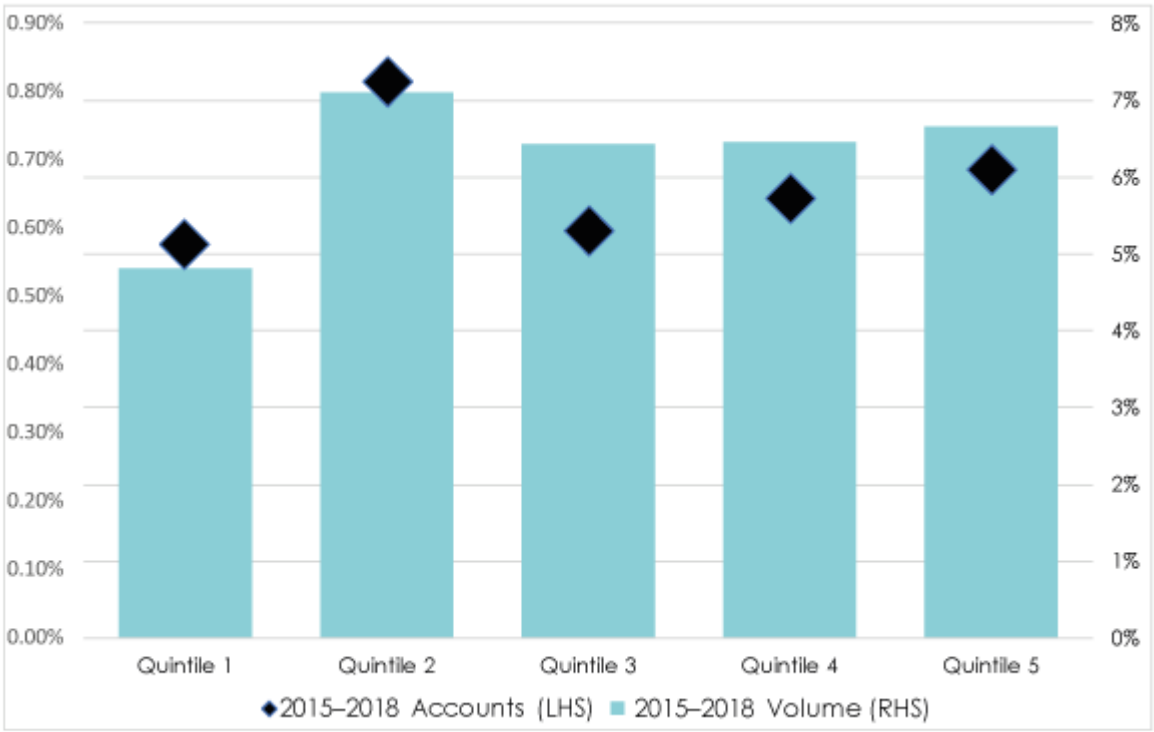
This is consistent with the established market cleanliness measure for Quintile 2. The reason for this may be that 48% of stocks in Quintile 2 were resource stocks (materials and energy). Further, a significant portion of announcements are unscheduled.

Quintile 1 was also dominated by the smallest materials stocks (which were 58% of the composition). However, the accounts and trading that were classified as anomalous for Quintile 1 were less than that of Quintile 2. One possible explanation for this is that there is a conditional filter

that the account has to have made a substantial profit—this may be difficult to achieve in very small and illiquid stocks.

Quintile 5 had a more diverse spread of sectors. The largest sectors were consumer staples, materials, financials and industrials, which ranged from 15% to 12% of composition.

Figure 11: Internal market cleanliness measures by market capitalisation quintile



Note: See Table 7 for the data shown in this figure (accessible version).

Announcement type

The one standout announcement type for the internal market cleanliness measure was M&As which had 12.47% of volume and 1.09% of accounts: see Figure 12. This result differs from the established measure where M&A announcements had the best market cleanliness score: see Figure 5.

All other announcement types had similar measures, ranging from 5.65% to 6.44% of volume and from 0.61% to 0.70% of accounts.

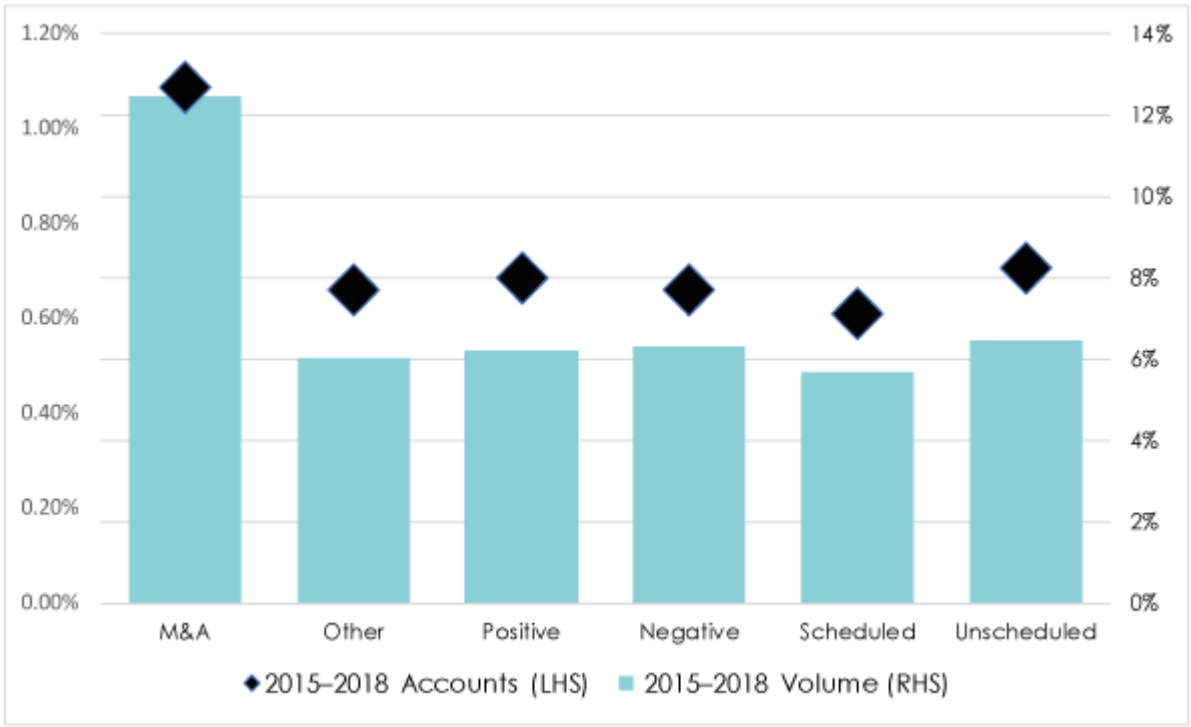
The reason for the difference between established and internal measures for M&As may be twofold. First, the established method has a low reading because M&As tend to be larger, more liquid, stocks and insiders potentially are aware of the information months in advance. Thus, they are less likely to have a price impact.

Second, the internal method can have a high reading on M&As because it does not rely on price run-ups as a proxy; rather, the internal method looks at suspicious trading itself. Due to the nature of M&As, relatively more people tend to know about the upcoming activity before the announcement. Hence the internal method would register an arguably more compelling measure of M&A market cleanliness than the established method.

We remind all parties involved in an M&A transaction, bidders and advisers (and then targets and their advisers) in particular, to put in place meaningful confidentiality arrangements at the start of a potential transaction and make sure these are rigorously followed.

Unscheduled announcements have the second worst score for market cleanliness. Scheduled announcements are consistent in their low market cleanliness measure for both the established and internal methods, which is indicative of possible market misconduct rather than traders betting ahead of scheduled MPSAs.

Figure 12: Internal market cleanliness measures by announcement type



Note: See Table 8 for the data shown in this figure (accessible version).

Appendix 1: Accessible versions of figures

This appendix is for people with visual or other impairments. It provides the underlying data for the figures in this report.

Table 1: Established market cleanliness measure

Year ended 31 October	APPM	APPM%
2006	109	11.11%
2007	95	9.16%
2008	150	10.62%
2009	67	10.67%
2010	33	6.75%
2011	64	7.04%
2012	71	8.70%
2013	61	8.18%
2014	23	4.01%
2015	46	6.07%
2016	67	9.37%
2017	66	8.56%
2018	62	6.76%

Note: This is the data contained in Figure 2.

Table 2: Established market cleanliness measure by industry sector

Sector	2006–2010	2011–2015	2016–2018
Consumer discretionary	8.61%	3.76%	4.61%
Consumer staples	10.16%	1.93%	6.80%
Energy	9.25%	7.38%	9.76%
Financials	8.90%	5.03%	5.03%
Heath care	9.21%	6.79%	8.63%
Industrials	11.20%	6.00%	6.85%
Information technology	10.15%	6.49%	8.87%
Materials	10.48%	9.08%	9.83%
Telecommunication services	9.38%	5.66%	10.85%
Utilities	14.68%	4.62%	0.00%

Note: This is the data contained in Figure 3.

Table 3: Established market cleanliness measure by market capitalisation quintile—Quintile 5 (largest) to Quintile 1 (smallest)

Review period	Quintile 1	Quintile 2	Quintile 3	Quintile 4	Quintile 5
2006–2010	11.27%	10.86%	10.15%	9.05%	8.52%
2011–2015	8.33%	7.63%	7.10%	6.74%	5.11%
2016–2018	9.17%	12.89%	7.28%	5.82%	5.42%

Note: This is the data contained in Figure 4.

Table 4: Established market cleanliness measure by announcement type

Review period	M&A	Other	Positive	Negative	Scheduled	Unsch'd
2006–2010	2.94%	10.15%	9.80%	10.22%	4.07%	10.40%
2011–2015	1.25%	7.09%	7.33%	6.53%	4.48%	7.50%
2016–2018	4.00%	8.25%	9.64%	6.17%	4.68%	9.54%

Note: This is the data contained in Figure 5.

Table 5: Internal market cleanliness measures

Year ended 30 October	Average suspicious accounts %	Average suspicious volume %
April 2015	0.49%	4.33%
October 2015	0.52%	5.10%
April 2016	0.65%	4.96%
October 2016	0.61%	5.70%
April 2017	0.61%	5.03%
October 2017	0.53%	5.08%
April 2018	0.63%	5.18%
October 2018	0.49%	5.10%

Note: This is the data contained in Figure 9.

Table 6: Internal market cleanliness measures by sector

Sector	2015–2018 Accounts	2015–2018 Volume
Consumer discretionary	0.65%	5.65%
Consumer staples	0.85%	5.22%
Energy	0.71%	6.51%
Financials	0.58%	8.19%
Heath care	0.64%	5.98%
Industrials	0.75%	6.17%
Information technology	0.67%	5.10%

Sector	2015–2018 Accounts	2015–2018 Volume
Materials	0.78%	6.45%
Real estate	0.64%	4.27%
Telecommunication services	0.61%	7.50%
Utilities	0.50%	3.05%

Note: This is the data contained in Figure 10.

Table 7: Internal market cleanliness measures by market capitalisation quintile

Quintile	2015–2018 Accounts	2015–2018 Volume
Quintile 1	0.58%	4.81%
Quintile 2	0.81%	7.09%
Quintile 3	0.60%	6.42%
Quintile 4	0.64%	6.45%
Quintile 5	0.69%	6.66%

Note: This is the data contained in Figure 11.

Table 8: Internal market cleanliness measures by announcement type

Announcement type	2015–2018 Accounts	2015–2018 Volume
M&A	1.09%	12.47%
Other	0.66%	6.04%
Positive	0.69%	6.24%
Negative	0.66%	6.32%
Scheduled	0.61%	5.65%
Unscheduled	0.70%	6.44%

Note: This is the data contained in Figure 12.

Appendix 2: Sample company and MPSA summary statistics

Table 9 shows a summary of company and announcement data which reveals that the composition of the sample has not changed dramatically over the relevant period.

Table 9: Company and announcement summary statistics

Year ended 31 Oct	Mean market cap.	Median market cap.	No. M&A	% of M&A	No. positive MPSAs	No. negative MPSAs	No. total MPSAs
2006	$2,347m	$131m	31	3.16%	618	363	981
2007	$4,641m	$153m	24	2.31%	591	446	1037
2008	$9,092m	$159m	18	1.27%	683	729	1412
2009	$2,161m	$122m	8	1.27%	373	255	628
2010	$2,172m	$150m	21	4.29%	286	203	489
2011	$1,705m	$144m	21	2.31%	538	371	909
2012	$1,272m	$130m	22	2.70%	453	363	816
2013	$1,608m	$147m	10	1.34%	403	343	746
2014	$1,845m	$206m	10	1.75%	298	275	573
2015	$2,671m	$127m	17	2.24%	396	362	758
2016	$1,619m	$150m	18	2.52%	426	289	715
2017	$1,422m	$105m	16	2.08%	423	348	771
2018	$2,208m	$153m	41	4.47%	500	417	917
Total	**$2,674m**	**$144m**	**257**	**2.44%**	**5,988**	**4,764**	**10,752**

Key terms

account (origin of order ID)	For each side (buy and/or sell) of the order or transaction where the participant acts as agent for a client, a unique notation, code or number used by the participant to identify the person on whose instructions the order is submitted, or transaction was executed
APPM	Abnormal pre-announcement price move
ASIC	Australian Securities and Investments Commission
established market cleanliness measure	Market cleanliness measure based on APPMs in the security ahead of MPSAs
financial market	As defined in s767A of the Corporations Act, a facility through which offers to acquire or dispose of financial products are regularly made or accepted
GICS	Global Industry Classification Standard, an industry taxonomy developed in 1999 by MSCI Inc. and Standard & Poor's Financial Services LLC
internal market cleanliness measure	Market cleanliness measure based on anomalous trading behaviour by accounts ahead of MPSAs
MAI	ASIC's Market Analytics and Intelligence surveillance system
market cleanliness	Measure of market integrity based on the perceived indicators of insider trading and information leaks ahead of MPSAs
MPSA	Material price-sensitive announcement
REP 487 (for example)	An ASIC report (in this example numbered 487)
stock-to-portfolio ratio	The time-weighted proportion of the security to the entire portfolio of securities accumulated by an entity during a period of time