FSB FINANCIAL STABILITY BOARD

Foreign Exchange Benchmarks

Report on progress in implementing the September 2014 recommendations

1 October 2015

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1. Introduction

In 2013, concerns were raised about the integrity of foreign exchange (FX) rate benchmarks. These concerns stemmed particularly from the incentives for potential market malpractice linked to the structure of trading around the benchmark fixings. As a result, the FSB formed a working group chaired by Guy Debelle of the Reserve Bank of Australia and Paul Fisher of the Bank of England to focus on FX benchmarks.[1] The mandate of the Foreign Exchange Benchmark Group (FXBG) was to undertake analysis of the FX market structure and incentives that may promote particular types of trading activity around the benchmark fixings. The group was tasked to propose possible remedies to address these adverse incentives as well as to examine whether there was a need and scope to improve the construction of the benchmarks themselves.

After extensive consultation with many parts of the FX industry across the globe, the group prepared a report which contained fifteen recommendations to achieve these goals. These recommendations were endorsed by the FSB at its meeting in Cairns in September 2014 and the report was published later that month.[2]

Following a letter summarising progress from the chair of the FXBG, in March 2015 the FSB Chair wrote to a number of foreign exchange committees (FXCs) seeking their assistance in providing a broad assessment of market participants' progress in implementing the FX benchmark report's recommendations as at 30 June 2015. This report summarises the information gathered by the FXCs, as well as by central banks in other large FX centres.[3]

The overall assessment of this report is that there has been good progress in implementing many of the September 2014 recommendations, although on some, the progress has been mixed. In particular, it is worth re-emphasising that the recommendations are intended to apply to *all* FX benchmarks, to ensure more widespread implementation.

The recommendations in the FX benchmarks report can be divided into four categories: benchmark methodology; execution of benchmark transactions; market conduct; and guidance on central bank reference rates. Section 2 provides assessments of the progress against each set of recommendations. Section 3 presents an analysis of the behaviour of the FX market around the London 4pm fixing window following the changes to the window in February 2015, and compares it to that prevailing before the changes which was described in the earlier report. Section 4 summarises the main findings.

2. Progress Against the Recommendations

2.1 Benchmark methodology

The September 2014 FX benchmarks report made four recommendations about the calculation of benchmark rates, mostly pertaining to WM who calculates the London 4pm fix (the most widely used FX benchmark rate).

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1 Paul Fisher subsequently changed roles; hence the work for this report was chaired only by Guy Debelle.

2 FSB (2014), *Foreign Exchange Benchmarks: final report*, September; available at: http://www.financialstabilityboard.org/2014/09/r_140930/.

3 See Appendix A for the FXCs, central banks and other agencies that contributed to this report.

Recommendations 1–4 from September 2014 report

1. The group recommended the fixing window be widened from its width of one minute.
2. The group recommended that WM should incorporate price feeds and transactions data from a broader range of sources to further increase its coverage of the FX market during the fixing window, provided it is assured that the additional sources are of sufficient quality and are representative of the market. WM should regularly assess its coverage as market structure continues to evolve.
3. WM should expand its consultation activities to include a named user group to consider the proposed changes to the calculation methodology and to ensure it remains appropriate going forward.
4. The group supported the findings of the IOSCO review of WM and endorses the recommendations for improvement contained in that review.[4]

While WM has been constructive in their response to the recommendations contained in the report, there is scope for it to follow through more completely on a number of them.

On 15 February 2015, WM widened the window used to calculate benchmark rates from 1 minute for 'traded' currencies and 2 minutes for 'non-traded' currencies, to 5 minutes for all currency pairs. Section 3 provides an analysis of the effect of the widening of the window on the FX market, noting that this has only been in effect for a few months and hence only includes a small number of month-ends (which is when volume tends to be particularly large). The analysis suggests that the wider window appears to be helping to achieve the intended outcomes. This view is generally shared by both buy-side and sell-side market participants. The wider window has also served to highlight the risk transfer involved in executing fixing transactions. This has facilitated the communication, both externally and internally, of charging for fixing transactions described below. That said, some respondents question the current one-size-fits-all approach of WM for the time window and would have preferred a more granular approach depending on the liquidity of the underlying currency.

Also from February 2015, WM has begun to incorporate more data feeds.[5] In the first instance, this has involved utilising data from Thomson Reuters, Electronic Brokerage Services (EBS) and Currenex in calculating fixes for a number of currency pairs. On 15 February 2015, the incorporation of Thomson Reuters Matching (TRM) data across four additional currency pairs (EUR/USD, EUR/CHF, USD/JPY, and USD/RUB) was approved by the WM Board and Oversight Committee. There is, however, scope for WM to include more data feeds beyond these, provided they are of sufficient quality. To this end, WM is in the process of evaluating a number of platform providers, including EBS, with initial due diligence and data analysis underway.

WM has indicated their intention to form a user group with a remit to review and comment on proposed changes to the policies and methodologies which WM uses to calculate, administer

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[4] The IOSCO review was included in the FSB's September 2014 report, and also published at: http://www.iosco.org/library/pubdocs/pdf/IOSCOPD451.pdf.

[5] For more details see: http://www.wmcompany.com/pdfs/WMReuters_Spot_Rate_Service_-_Methodology_Changes.pdf.

and calculate the benchmark rates. The user group will also share feedback, commercial requirements, market intelligence and product suggestions relating to the benchmark rates. At the time of writing, a Charter has been drawn up defining the scope and responsibilities of the user group. Whilst the group does not yet exist, WM aims for the group to convene by the end of 2015. The existence of such a group would assist WM with a more complete implementation of the previous two recommendations.

As noted above, as part of the September 2014 FX benchmarks report, IOSCO conducted a review of the implementation of the IOSCO Financial Benchmarks Principles[6] by WM with respect to the 4pm London closing spot rate. The review concluded that a number of recommended actions were to be undertaken by WM in order to implement the Principles. IOSCO is planning to conduct a follow-up review to assess the progress of WM against these recommendations.

In addition to the recommendations of the FX benchmarks report, the FCA has taken a number of actions around benchmark reform that are relevant. In June 2014, the UK government announced the Fair and Effective Markets Review (FEMR). One of the first recommendations was for a further seven financial benchmarks to be brought into the scope of UK regulation, including the WM/Reuters London 4pm Closing Spot Rate. As a result, in April 2015 this FX benchmark, along with six other financial benchmarks, became subject to the FCA's standards of governance, controls, accountability, management of conflicts of interest, and record keeping.

2.2 Execution of benchmark transactions

The next set of recommendations concerned the execution of benchmark transactions:

Recommendations 6–8 from September 2014 report

6. The group supported the development of industry-led initiatives to create independent netting and execution facilities for transacting fix orders.
7. The group recommended that fixing transactions be priced in a manner that is transparent and is consistent with the risk borne in accepting such transactions. This may occur via applying a bid-offer spread, as is typical in FX transactions, or through a clearly communicated and documented fee structure such as a direct fee or contractually agreed price.
8. The group recommended that banks establish and enforce internal guidelines and procedures for collecting and executing fixing orders including separate processes for handling such orders.

Netting facilities

Many market participants, including banks and buy side participants, are in favour of independent netting and execution facilities and indicated that they have been involved in the

[6] IOSCO (2013), *Principles for Financial Benchmarks*, 17 July; available at: https://www.iosco.org/library/pubdocs/pdf/IOSCOPD415.pdf.
See also WM Company's Statement of Compliance with the IOSCO Principles; available at: http://www.wmcompany.com/pdfs/WM_IOSCO_Principles_Statement_-_July_2014_-_final.pdf.

development of such facilities. Some banks have been reluctant to use such facilities, at least in their current form: in some cases they have expressed sensitivity about concentrating information on fixing flows; in other cases they have expressed the view that clients expect them to execute fixing orders themselves. Overall, the use of such facilities has increased as processes around fixing transactions have become more automated. Many participants noted that a key challenge is how to manage the residual balance that cannot be executed using such a facility. Some indicated that the need to execute large residual balances in the market could contribute to increased volatility and a reduction in liquidity around the fixing window, particularly if there are fewer banks participating in the execution of such orders.

The September 2014 FX benchmarks report expressed support for industry-led initiatives in this area without suggesting that market participants were required to use such facilities. In light of the progress that is occurring, it would seem appropriate for the industry-led process to run further, though there is potentially some merit in the official sector facilitating industry-wide discussion on the topic.

Charging for fixing transactions

Most sell-side respondents to the FXCs' surveys had largely implemented the recommendation to charge for fixing transactions, in particular those linked to the London 4pm fixes and especially for the most liquid currency pairs in that fix, where trading flow was automated. The widening of the fix window by WM in February 2015 was a focal point for a number of banks to begin charging. It should be noted, however, that a set of respondents which encompassed mostly smaller banks, who are less active in the fix, reported that they are still in the process of reviewing their pricing structure for benchmark orders.

A mix of pricing methodologies is being used to charge for fixing transactions, including applying a bid-offer spread and charging a fixed fee, with some respondents offering a pricing choice to their clients. These prices are generally based on an assessment of the risk transfer involved in providing the service to clients. This may evolve further as banks reassess the dynamics of the market with the wider fixing window.

Some banks use differential pricing depending on the liquidity of the relevant currency pair and/or the type of fix, generally charging more for low-liquidity currencies, while others are still in the process of analysing their pricing models by currency. Most do not adjust their pricing for orders that are fully or partially matched, internally or externally. Buy-side responses did not indicate a universally preferred pricing model.

A variety of communication methods, both verbal and written, were used to report changes to pricing structures to their clients. However, some market participants noted that they had encountered problems with the way banks had communicated the changes to them and, in particular, with the lack of transition periods to allow for systems to be adjusted for the new pricing regime. The staggered adoption of new processes and pricing arrangements across the industry was raised as an issue by some respondents, as clients were thought to have responded to the different arrangements on offer. Namely, it was argued that there was some disadvantage from being a first-mover from implementing the recommendation, as customers shifted business to those who started charging for fixing transactions at a later date.

While the recommendation has been generally implemented for the London 4pm fixes, the implementation for other benchmark fixes has been less complete (although it should be noted

that a number of these other fixes are often utilised as a valuation metric rather than a trading benchmark). The same principles of reducing the scope for benchmark manipulation described in the September 2014 FX benchmarks report generally apply to these other benchmark fixes, just as they do to the London 4pm fixes. That is, the FX benchmarks report was intended to apply to *all* FX benchmarks, not just the London 4pm benchmark rate. Hence, it is expected that this recommendation would be applied to these other benchmark fixes.

Separation of fixing business

A sizeable number of banks, especially larger ones, have implemented the recommendation to establish separate processes by shifting execution of fixing orders from the spot voice FX trading desk to electronic trading desks that utilise algorithmic execution. The share of fixing orders executed by algorithm has increased substantially, and this is evident in the data described in Section 3. In some cases, this has involved physical separation of the fixing trading desk from other desks. In other cases, the separation has primarily been through establishing or enhancing separate processes for the collection of fixing orders, giving customer orders a degree of anonymity, but with those orders still being executed by a single spot desk.

There is considerably enhanced internal scrutiny around fixing-related transactions by senior front-office management and compliance functions. In some cases this is supported by automated systems, though in other cases it relies on manual processes. In most cases, banks now have in place clearer policies, procedures and controls relating to the treatment of customer order information. These policies, such as preventing FX spot traders from having visibility into customer FX fixing orders and segregation of desks, are also meant to address potential conflicts of interest arising from managing customer flow. Many banks now have an explicit cut off for the acceptance of fixing orders, although often with some discretion to make exceptions.

A number of respondents noted that the segregation of trading functions had required significant changes in systems and processes. Some participants regarded the costs of implementing this recommendation as being too high given the size of their business, so they had not taken any action. That said, others in a similar position decided to cease offering fixing-related service directly to customers, some of them instead offering customers a portal to other fixing services.

The intention of the FX benchmarks report's recommendation was that it was to apply to all participants, with appropriate consideration to the size and structure of the market. And as noted above, the principle of the recommendation was to ensure a defensible and transparent separation of process.

Another issue raised was that the separation of business is clearly more complicated in smaller currencies than it is in the larger, more actively traded currencies. In this case, complete separation may be problematic, but participants should still be able to demonstrate to their customers that appropriate processes are being undertaken in executing their fix order, in keeping with the fundamental motivation of the recommendation to reduce the scope for benchmark manipulation.

2.3 Market conduct

The group made a number of recommendations around market conduct and information sharing.

Recommendations 9–13 from September 2014 report

9. Market-makers should not share information with each other about their trading positions beyond that necessary for a transaction. This covers both individual trades, and their aggregate positions.

10. Market-makers should not pass on private information to clients or other counterparties that might enable those counterparties to anticipate the flows of other clients or counterparties, including around the fix.

11. More broadly, the group recommended that banks establish and enforce internal systems and controls to address potential conflicts of interest arising from managing customer flow.

12. Codes of conduct that describe best practices for trading foreign exchange should detail more precisely and explicitly the extent to which information sharing between market-makers is or is not allowed. They also should, where appropriate, incorporate specific provisions on the execution of foreign exchange transactions including fixing orders.

13. The group recommended stronger demonstration by market participants of compliance with the codes of the various foreign exchange committees, as well as their internal codes of conduct.

Various initiatives are under way on these recommendations at the institutional level as well as with the market as a whole.[7] The global FXCs[8] issued a joint statement in January 2015 to encourage FX market participants to review and adopt the applicable FX benchmark report's recommendations. Following the Global FXC meeting in Tokyo in March 2015, an expanded statement of Shared Global Principles was published.[9] This statement articulated a number of principles about appropriate conduct and information sharing, including aspects of the September 2014 FX benchmark report such as policies around execution practices.

Many market participants have reviewed their internal policies, procedures and guidelines to adopt regional codes of conduct that describe best practices as well as the Shared Global Principles.[10] Many also reported raising awareness of enhanced codes of conduct through

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[7] Amongst a number of initiatives globally to improve market conduct, the UK Financial Conduct Authority has launched a remediation programme to improve standards in firms by ensuring that those fined for failings in their FX businesses address the root causes of these.

[8] These are the Australian FX Committee, the Canadian FX Committee, the ECB FX Contact Group, the Hong Kong Treasury Markets Association, the London FX Joint Standing Committee, the New York FX Committee, the Singapore FX Market Committee and the Tokyo FX Market Committee.

[9] Available at: http://www.fxcomtky.com/announce/pdf_file/global_preamble.pdf.

[10] In addition to the Shared Global Principles, the Tokyo FX Market Committee has recently issued "Guidelines of Foreign Exchange Transaction, 2015 Edition" (the Guidelines), which include concrete examples of best practice to complement "Code of Conduct, 2013 Edition" (the Code) on foreign exchange transactions. Hong Kong and Singapore have commenced work to make substantive revisions to their codes to incorporate the September 2014 FX benchmark report's recommendations and the principles set out in the Shared Global Principles.

training of managers, sales and trading desk personnel. Some banks also indicated that they now require their employees to attest to their internal guidelines, policies or code of conduct on a regular basis.

More recently, the BIS Governors have commissioned a Working Group of the Markets Committee of the BIS to facilitate the establishment of a single global code of conduct, standards and principles for the FX market and to promote greater adherence to these standards and principles.[11] The intention is to have this work of developing a single global code for the FX market completed by May 2017. Market participants have welcomed the initiative of establishing a single global code for the FX market.

2.4 Index providers and asset managers

The FX benchmark report also recommended that asset managers and index providers should conduct more due diligence around FX benchmark use.

Recommendations 14–15 from September 2014 report

14. The group recommended that index providers should review whether the foreign exchange fixes used in their calculation of indexes are fit for purpose.

15. The group recommended that asset managers, including those passively tracking an index, should conduct appropriate due diligence around their foreign exchange execution and be able to demonstrate that to their own clients if requested. Asset managers should also reflect the importance of selecting a reference rate that is consistent with the relevant use of that rate as they conduct such due diligence.

There has been greater focus on this by these participants, in part because of the high public profile of benchmark manipulation over the past year or so. However, there is scope for greater follow-through in this area on the part of some market participants.

2.5 Central bank reference rates

The group recommended that central banks which publish reference rates should at least take note of the IOSCO principles, especially where central bank reference rates are intended for transaction purposes.

Recommendation 5 from September 2014 report

5. The group considered that, where central banks publish reference rates, it is the responsibility of each to set internal procedures and they should at least take note of guidance from the IOSCO Principles for Financial Benchmarks, especially where central bank reference rates are intended for transaction purposes.

A number of central banks, including the ECB (which sets for reference and not for transactions purposes, the widely used ECB euro foreign exchange reference rates), have assessed their methodology against the IOSCO principles or are in the process of doing so

[11] Further information available at: http://www.bis.org/about/factmktc/fxwg.htm.

and, where necessary, are making appropriate changes to their respective governance frameworks and calculation methodologies.

3. Data Analysis[12]

The FXBG analysed the recent trading activity around the WM 4pm London fix, to evaluate the impact of the widening of the calculation window from one- to five-minutes, as well as to observe any changes to the trading behaviour of market participants around the fixing window that may have taken place since the 2014 FSB report.[13] The group obtained, from EBS and TRM, the same type of transactional and quote data[14] that was used for the data analysis shown in the September 2014 report.[15] The analysis revealed reasonably similar trading patterns over the recent sample period across most currencies. While only the euro (EUR) charts are used in the body of the report, Appendix B shows similar charts for the Australian dollar (AUD), British pound sterling (GBP), Canadian dollar (CAD), Japanese yen (JPY) and Mexican peso (MXN). Generally, the same patterns are evident for these currency pairs too. The analysis focussed on the median daily outcome over the period, but the patterns at the 90th percentile were also analysed.

EBS data[16] show an increasing trend towards dealer driven algorithmic execution during the fixing window and away from manual trading, starting around the third quarter of 2014 (Chart 1). A noticeable jump in the share of algorithmic trading also occurred when the window was expanded to five-minutes. Dealer driven algorithmic trading now accounts for the largest share of trading volume in the fixing window for the two currencies for which we have data from EBS, while prime-brokered customers trading algorithmically are the most active participants during the rest of the day. These data observations support the findings reported above indicating an increased use of algorithmic execution by the banks for their net fixing orders.

Daily trading volume through the two platforms continues to peak during the fixing window (Chart 2).[17] However, when calculated over a constant five-minute window, the share of trading volumes are down substantially over the 4pm fixing period, except for MXN which has shown a rise and EUR which is close to flat. This longer time-frame includes the period in which large pre- and post-hedging flows took place around the one-minute window. The percentage of daily trading volume going through the fixing window is also down for most

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[12] This analysis was done jointly by the Bank of Canada and the Federal Reserve Board.

[13] Others have undertaken similar analysis to this and have documented similar findings. See, for example, http://blog.pragmatrading.com/blog/bid/406363/New-Trading-Patterns-Around-the-WM-R-Fix.

[14] Six currencies were analysed: euro and Japanese yen using data from EBS; and Australian dollar, British pound sterling, Canadian dollar and Mexican peso using data from Thomson Reuters Matching.

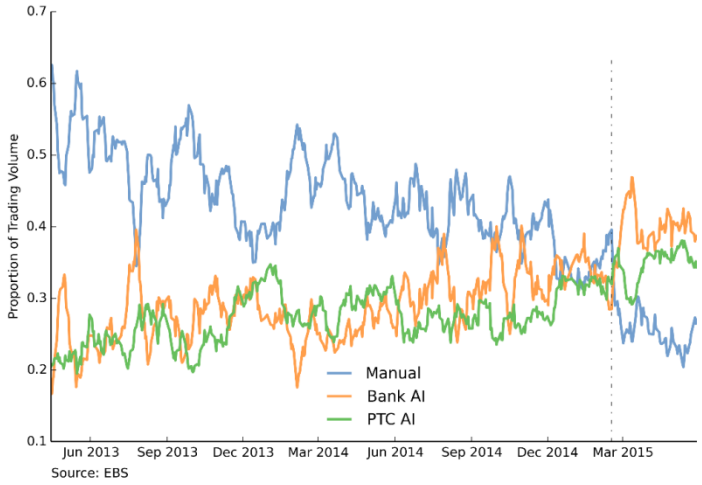
[15] The analysis in the September 2014 report covered the sample period April 2013 to September 2013, while the analysis here covers the November 2014 to May 2015 period.

[16] EBS data breaks down trading volume into activity by three broad groups of traders: dealers trading manually ('Manual'), dealers trading algorithmically ('Bank AI'), and prime-brokered customers trading algorithmically ('PTC AI'). High-frequency trading (HFT) activity accounts for a majority of the third group's trading volume.

[17] For all charts in this report (including Appendix B), trading volume is normalised by the average 5-minute (or 5-second) volume over the period from 1 November 2014 to 31 May 2015.

Chart 1

EUR: Participation share by trader type during the fixing window[(a)]



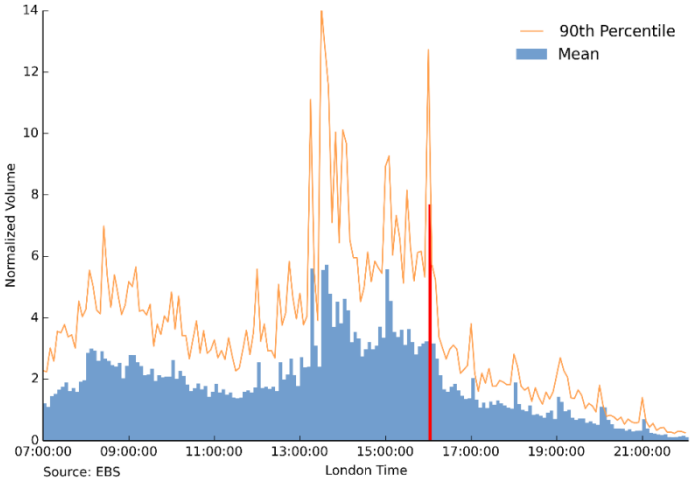
(a) 'Manual' = dealers trading manually; 'Bank AI' = dealers trading algorithmically; 'PTC AI' = prime-brokered customers trading algorithmically.

currencies. The observed reduction in relative trading volume over the fixing period could be the result of lower fixing flows at the 4pm WM fixing as some market participants shift execution to other fixings or change their methodology for executing orders. It could also be the result of improved netting of fixing flows resulting from the introduction of several new independent netting and execution facilities, such as EBS' eFix and State Street's TruCross, as well as greater internal netting of fixing flows by banks.

Chart 2

EUR: Mean five-minute trading volume post the change to a longer fixing window

16 February 2015 – 31 May 2015

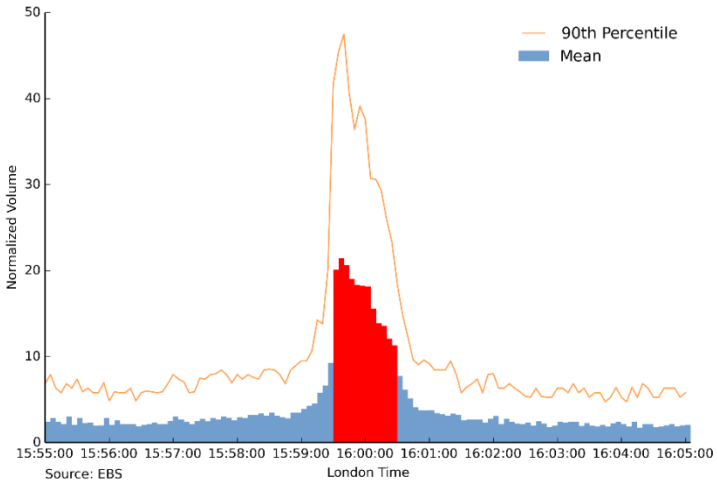


Trading volume around the fix is now more concentrated in the actual fixing window, with much less activity either side of the window, potentially as a result of both increased scrutiny around trading at the fix and the move towards algorithmic execution (Chart 3). A rise in trading volume is evident once the fixing window is open, with little or no pre-hedging taking place through either the EBS or TRM platforms. Consistent with the move towards algorithmic execution, potentially to replicate the calculation methodology of the fix and to deliver systematic and agnostic execution, trading volume is distributed much more evenly through the calculation window. In contrast, when the fixing window was one-minute wide, volume was front-loaded and spiked at the beginning of the fixing window. Again consistent with increased algorithmic execution, the size of individual trades is also smaller and more in line with the average trade size over the rest of the day.

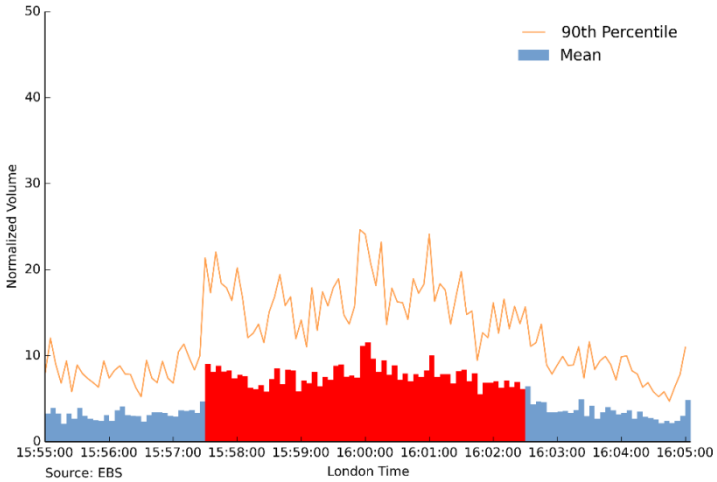
Chart 3

EUR: Mean five-second trading volume around the fixing window

A. 1 November 2014 – 15 February 2015



B. 16 February 2015 – 31 May 2015



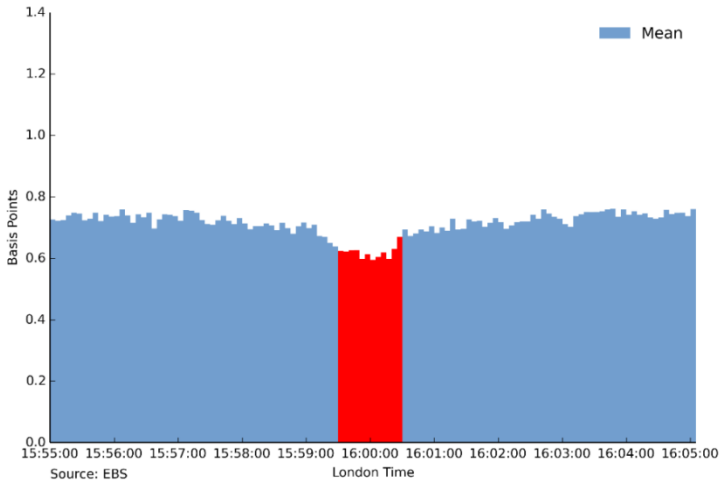
With the move to five-minutes, there continues to be a small spike in trading volume at exactly 4pm for most currencies. This small spike seems to be associated with a short-lived increase in the share of fixing flows executed manually.

Similar to the observations from the 2013 data analysis, bid-offer spreads continue to contract noticeably in the calculation window and are at their lowest level of the day in the fixing window (Chart 4). Market depth, while lower than in 2013, rises substantially during the fixing window relative to the rest of the day for the two currencies for which we have the data, indicating that 4pm continues to be one of the most liquid periods in the trading day.

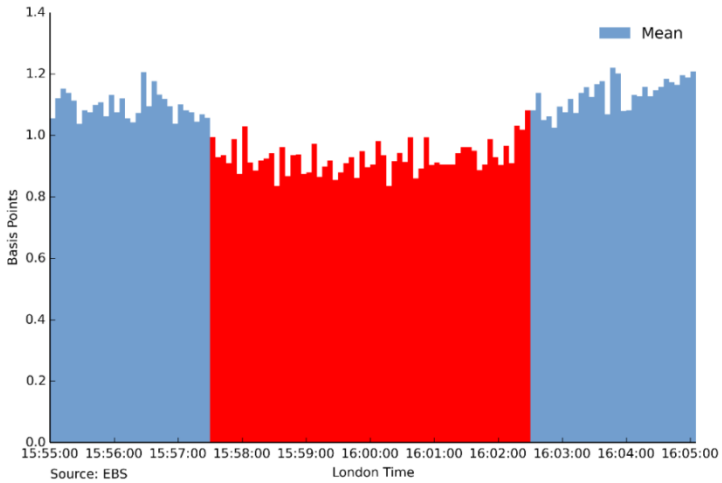
Chart 4

EUR: Mean five-second bid-offer spread around the fixing window

A. 1 November 2014 – 15 February 2015



B. 16 February 2015 – 31 May 2015

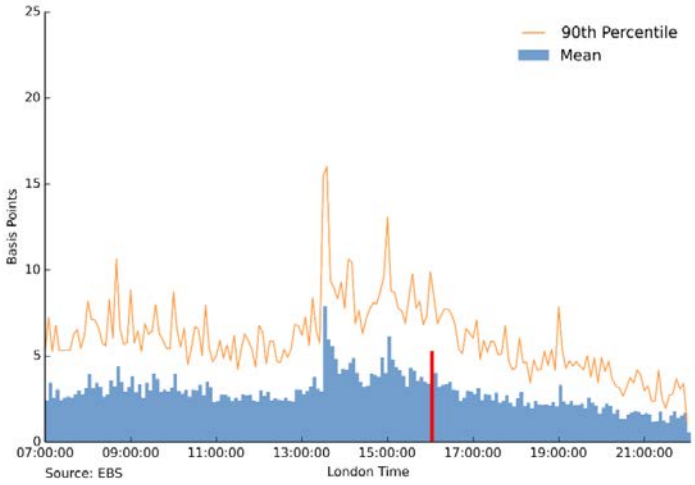


In contrast with the 2013 data, prices only start to move once the fixing window is open, but not before. The increase is most pronounced at the start of the fixing period, after which it moderates quickly, similarly to the prior data. For most currencies, except the EUR which may have been influenced more by idiosyncratic events, price volatility[18] in the fixing window, calculated at high frequency, remains close to the 2013 levels. However, the price volatility calculated over a five-minute interval has risen relative to the rest of the day despite the trading range within the fixing window remaining relatively contained for all but the EUR (Chart 5).

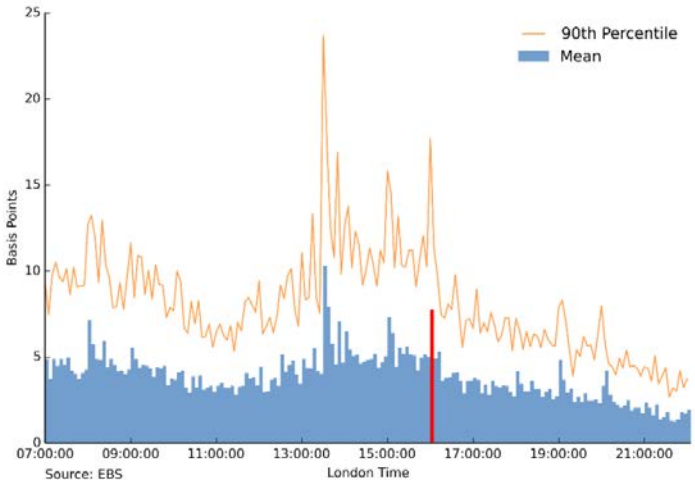
Chart 5

EUR: Mean five-minute absolute price change

A. 1 November 2014 – 15 February 2015



B. 16 February 2015 – 31 May 2015



[18] Volatility is measured as the absolute value of the difference over a given time interval in the natural log of the mid-price of the quotes. Thus it is essentially the absolute percent change in the mid-price over the interval.

Statistically, the order flow during the fixing window has a slightly higher influence on price behaviour than was the case with the 2013 data.[19] However, it is not clear whether this is more a function of the increase in algorithmic execution, rather than directly the result of the move to a five-minute window.

The limited trading volume and lack of increase in price volatility prior to the start of the fixing window may indicate that market participants are not trading ahead of the fixing window using knowledge of the size of their aggregate fixing flow. The relatively even distribution of the trading volume in the window, together with the constant low bid-offer spread may indicate that dealers are, on average, executing their fixing flow in a more uniform manner. This does not mean, however, that prices will not move, even temporarily, when there are sizeable one-way flows taking place through the window.

4. Conclusion

The fifteen recommendations of the September 2014 FX benchmarks report have been adopted to varying degrees. The recommendations to enhance WM's calculation of the London fix have been implemented to a reasonable extent with further progress expected in the coming months, particularly in terms of using more data feeds and forming a user group. There are a number of initiatives in the marketplace to provide independent execution and netting of fix orders. There is a global effort underway to develop a single code of conduct for the foreign exchange market. That effort will also address the means of promoting greater adherence to the code, which remains an important challenge.

There has been substantial follow-through on the recommendations around charging and separation of order management for the WM London 4pm fix, with a large share of fixing transactions occurring in line with the recommendations.

For foreign exchange benchmarks other than the WM London 4pm fix, the implementation of the recommendations is less advanced. As stated above, the principles articulated in the September 2014 report apply to all FX benchmarks, not just the London fix. Hence there is an expectation they will be implemented more broadly, though with appropriate consideration to the size and structure of the market.

One of the principal aims of the recommendations of the FX benchmarks report was to reduce the incentive and opportunity for improper trading behaviour by market participants around the benchmark fixes. The implementation of the recommendations described here, together with the enhanced scrutiny externally and within organisations on fixing transactions, appears to have moved the market in a favourable direction. This is also reflected in the data analysis. A more complete implementation of the recommendations would increase the likelihood of maintaining and extending this improvement. Regulators and FX market participants must remain focussed on achieving such an outcome.

[19] Several market participants have pointed to increased directionality of the fix, including Pragma cited in footnote 13 above.

Appendix A: Foreign Exchange Committees and Authorities Consulted

Australian FX Committee

Canadian FX Committee

European Central Bank FX Contact Group

Hong Kong Treasury Markets Association

London FX Joint Standing Committee

New York FX Committee

Singapore FX Market Committee

Tokyo FX Market Committee

Australian Securities and Investments Commission

Bank of Canada

Bank of England

Bank of Japan

Bank of Mexico

Board of Governors of the Federal Reserve

Bundesanstalt für Finanzdienstleistungsaufsicht

European Central Bank

Federal Reserve Bank of New York

UK Financial Conduct Authority

Hong Kong Monetary Authority

Japan Financial Services Agency

Monetary Authority of Singapore

Reserve Bank of Australia

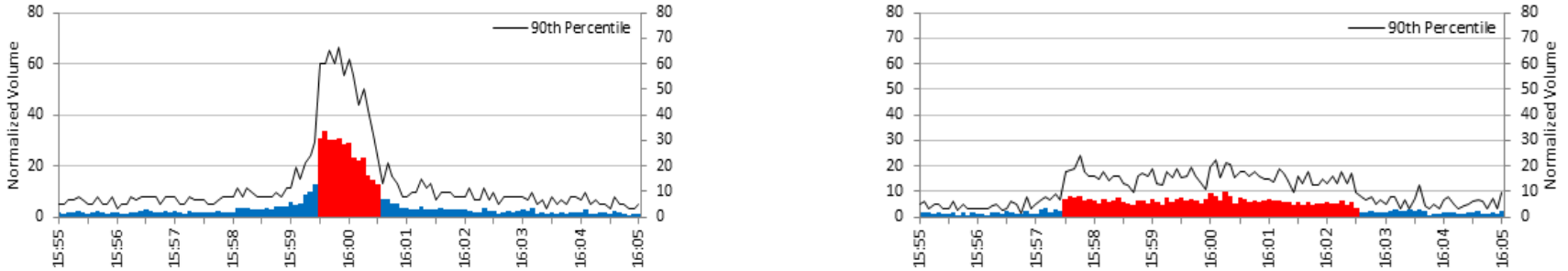
Swiss National Bank

Appendix B: Data analysis for additional currency pairs

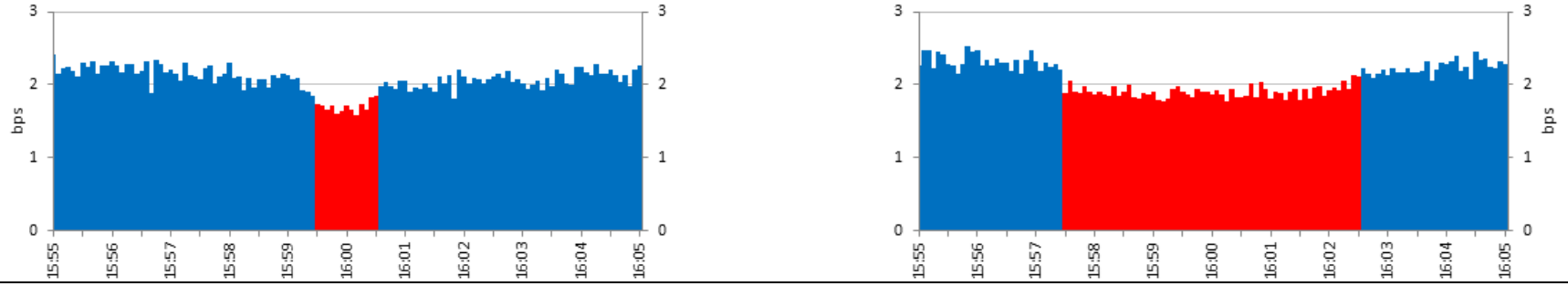
AUD/USD

1 November 2014 – 15 February 2015	16 February 2015 – 31 May 2015

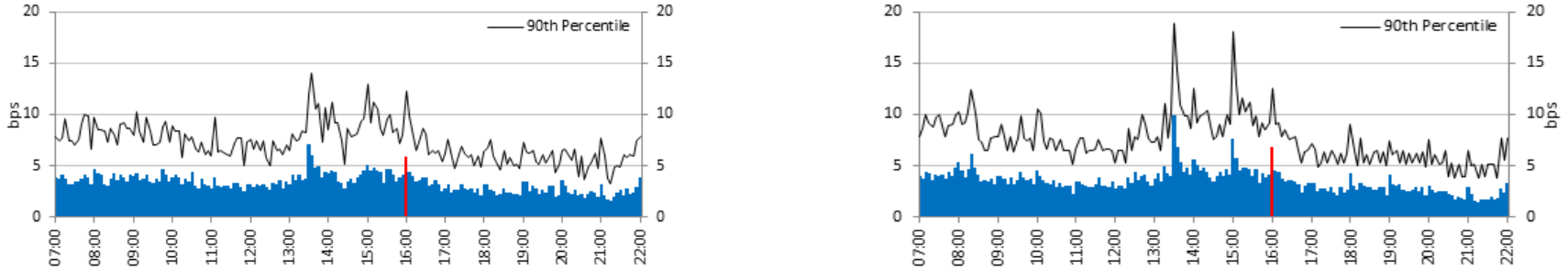
Mean five-second trading volume around the fixing window



Mean five-second bid-offer spread around the fixing window

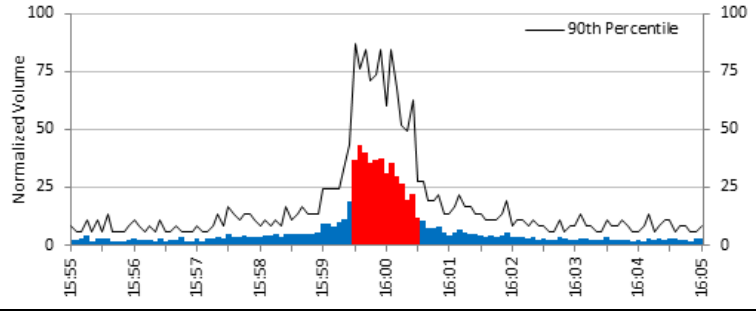
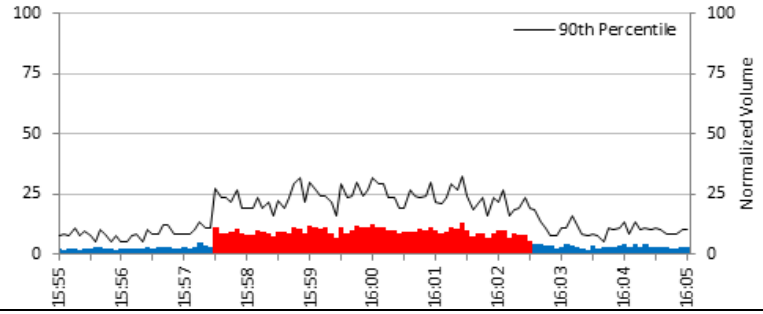
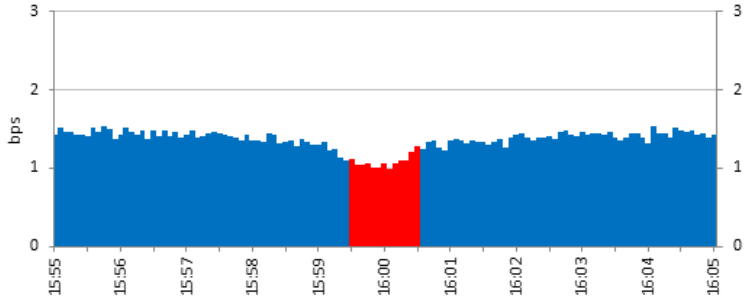
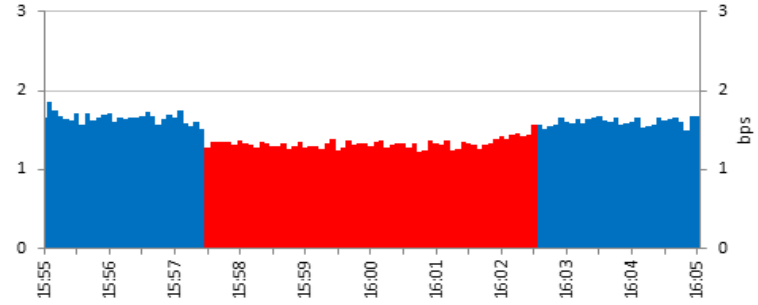
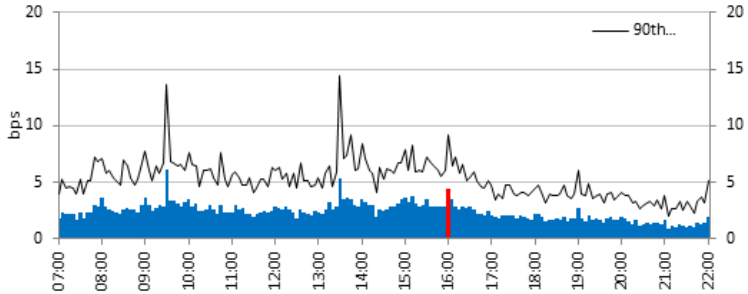
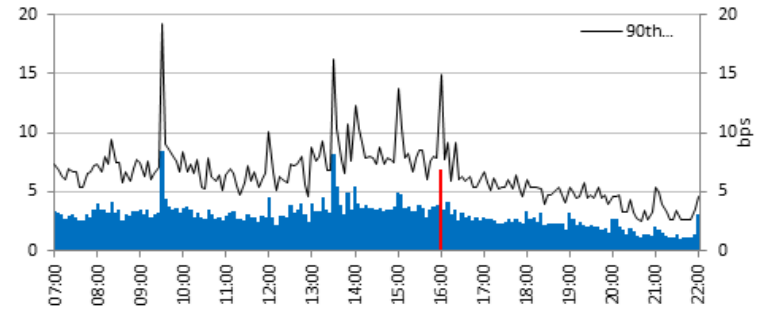


Mean five-minute absolute price change



Source: TRM. Charts show local London time.

GBP/USD

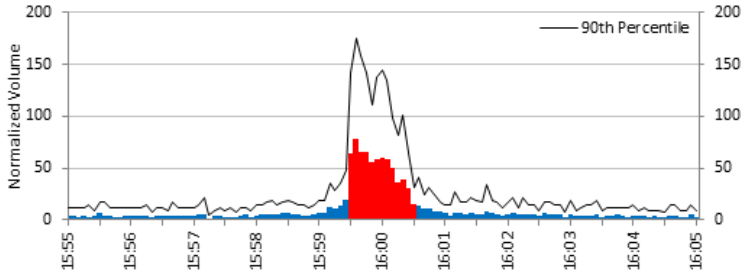
1 November 2014 – 15 February 2015	16 February 2015 – 31 May 2015
Mean five-second trading volume around the fixing window	
	
Mean five-second bid-offer spread around the fixing window	
	
Mean five-minute absolute price change	
	

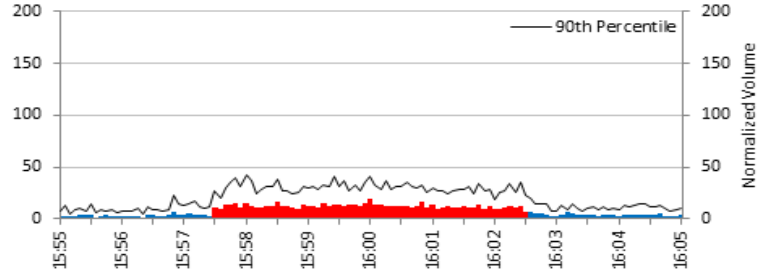
Source: TRM. Charts show local London time.

CAD/USD

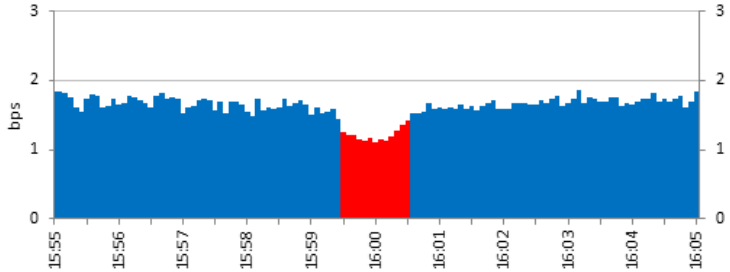
1 November 2014 – 15 February 2015	16 February 2015 – 31 May 2015

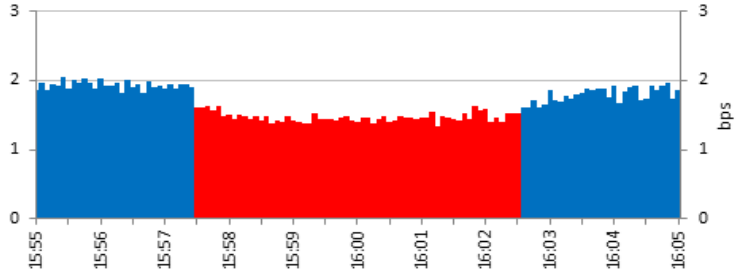
Mean five-second trading volume around the fixing window



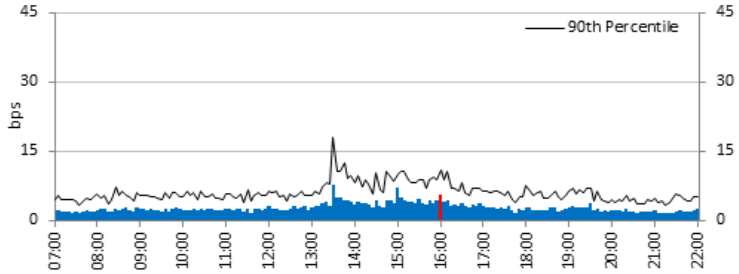


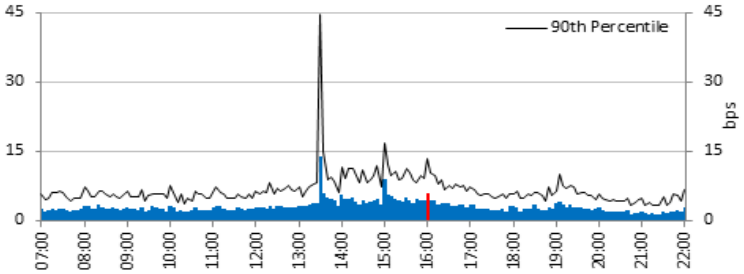
Mean five-second bid-offer spread around the fixing window





Mean five-minute absolute price change



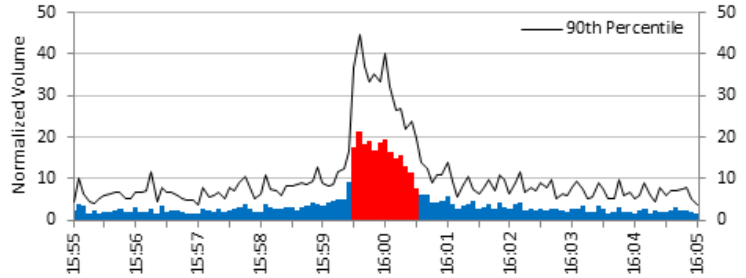


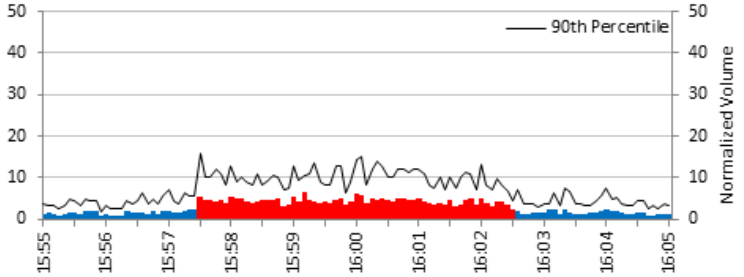
Source: TRM. Charts show local London time.

JPY/USD

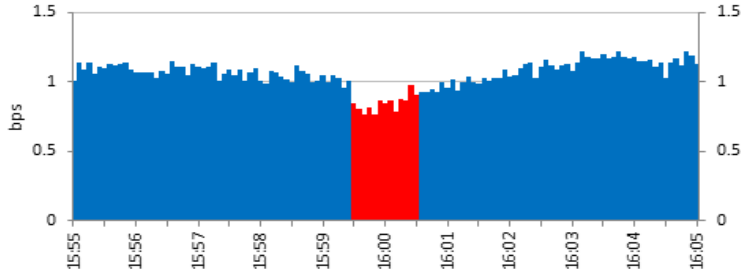
1 November 2014 – 15 February 2015	16 February 2015 – 31 May 2015

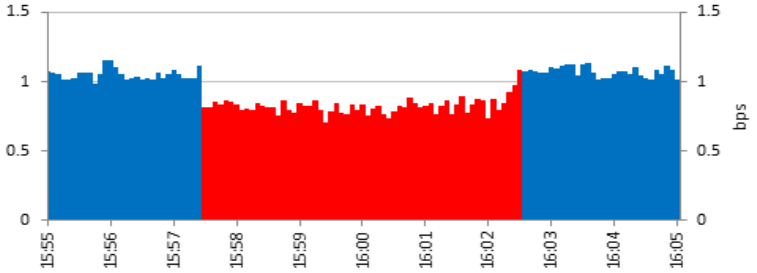
Mean five-second trading volume around the fixing window



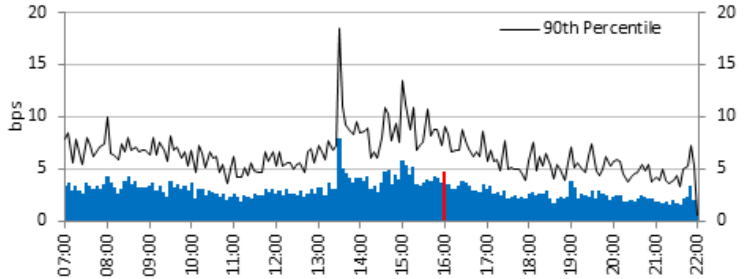


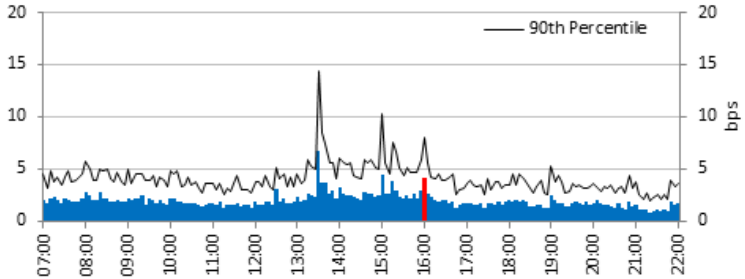
Mean five-second bid-offer spread around the fixing window





Mean five-minute absolute price change



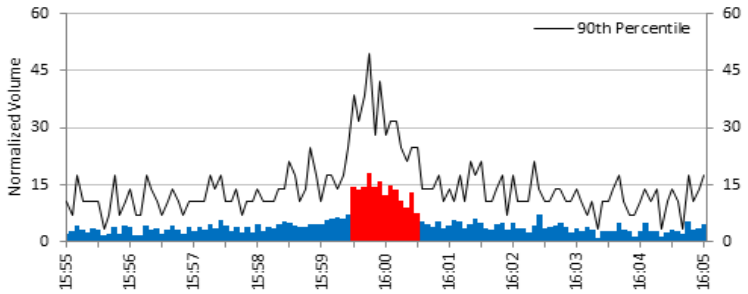


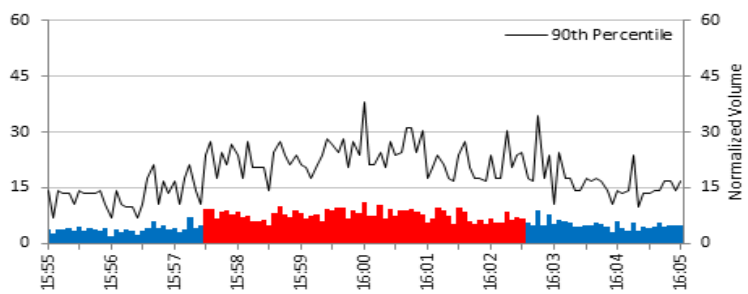
Source: EBS. Charts show local London time.

MXN/USD

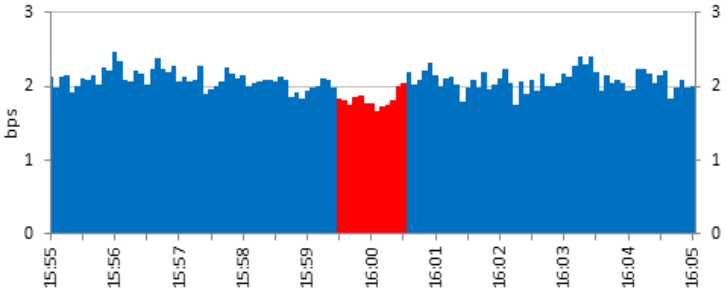
1 November 2014 – 15 February 2015	16 February 2015 – 31 May 2015

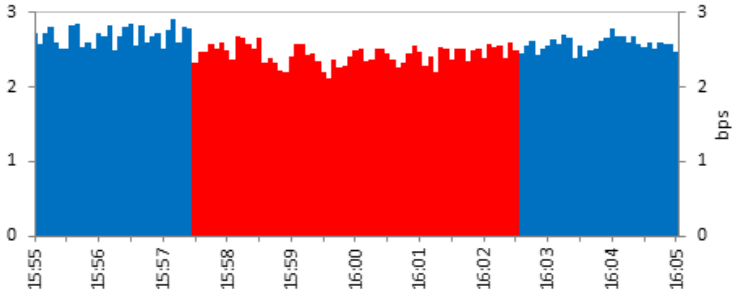
Mean five-second trading volume around the fixing window



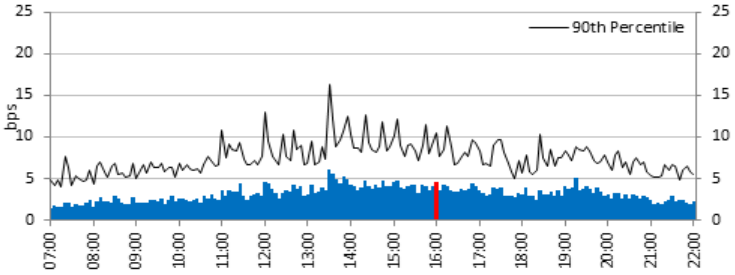


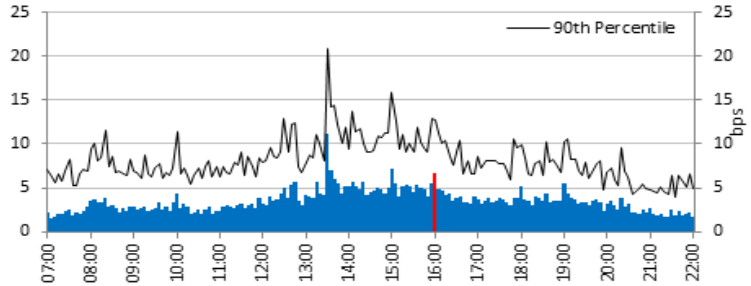
Mean five-second bid-offer spread around the fixing window





Mean five-minute absolute price change





Source: TRM. Charts show local London time.