SIREN: A fair benchmark for FX

Dr Jamie Walton, February 2020

Summary

We have constructed a new benchmark for FX which we call SIREN. This benchmark is designed to be a fair benchmark to use for settling large FX transactions and an alternative to the WMR Fix which has been the subject of FX controversies. SIREN is authorised and regulated by the FCA in the UK and registered under ESMA in the EU.

SIREN is published every 30 minutes throughout the trading week for 71 FX spot pairs.

SIREN uses the concept of **optimal execution** to both reflect the risk of trading larger notionals and to spread out the trading activity around the benchmark. In addition, the SIREN benchmark is calculated over a longer window allowing the market to better absorb the volume traded against the benchmark. The short window associated with existing benchmarks causes excessive market impact particularly at the 4pm London fix. We believe our approach improves results for both the buy-side and the sell-side.

We argue that FX fixing issues have arisen because the fix neglects to reflect how FX is traded in large volumes leading to collusion between market-makers and potential front-running to reduce trading risk.

The SIREN benchmark is fully transparent, hard to manipulate, has a long observation window, and can be calculated in real-time.

This whitepaper will first look at existing benchmarks and associated issues before discussing optimal execution and explaining the SIREN methodology. We graphically compare the various benchmarks before investigating real-world effects using a case study of over 3,000 fixing trades executed by a pension fund.

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A brief overview of benchmarks in Fixed Income

Benchmarks are metrics used by the buyside to measure the performance of their trades. By utilizing an independent calculation of the benchmark, a client can assess the quality of the execution achieved by the liquidity provider.

Benchmarks have two primary components:

1. Underlying market data used for calculation
2. A calculation methodology

For example, in interest rates the most famous benchmark is the LIBOR rate. The market data here is provided manually by eighteen bank LIBOR setters based on their cost of borrowing in the interbank market. The methodology is a simple average of the provided rates after the top and bottom four values have been excluded.

Since the LIBOR fixing scandal in 2012, other interest rate benchmarks have been proposed based on observable traded rates including SONIA and SOFR.

The most common benchmark used in FX is known as the WMR Fix and is used as the benchmark for larger FX transactions particularly by the buyside. WMR FIX was originally a snapshot of the quotes and traded rates for a given currency pair around 4pm London time.

The WMR FIX benchmark also suffered a trading scandal in 2013 and since then the calculation methodology changed from being a one-minute snap to taking the average of traded prices every second in a 5-minute window straddling 4pm.

The SIREN benchmark addresses some of the historical issues surrounding the existing fixing methodologies as described below:

Regulatory problems with fixings

1. Collusion
Generally, clients gave large FX benchmark orders to banks anything up to a few hours in advance. This gave banks the opportunity to trade in advance of the fix and even to take their own positions on the back of the client order. However, there is risk in this strategy as other banks and clients may have the opposite trade to execute which would cancel out the information advantage a single trader may have.

To reduce this risk, traders were found to have colluded by sharing client orders between each other so that they could net down all trades to a single order and trade the residual. This collusion resulted in $10 billion fines in 2013.

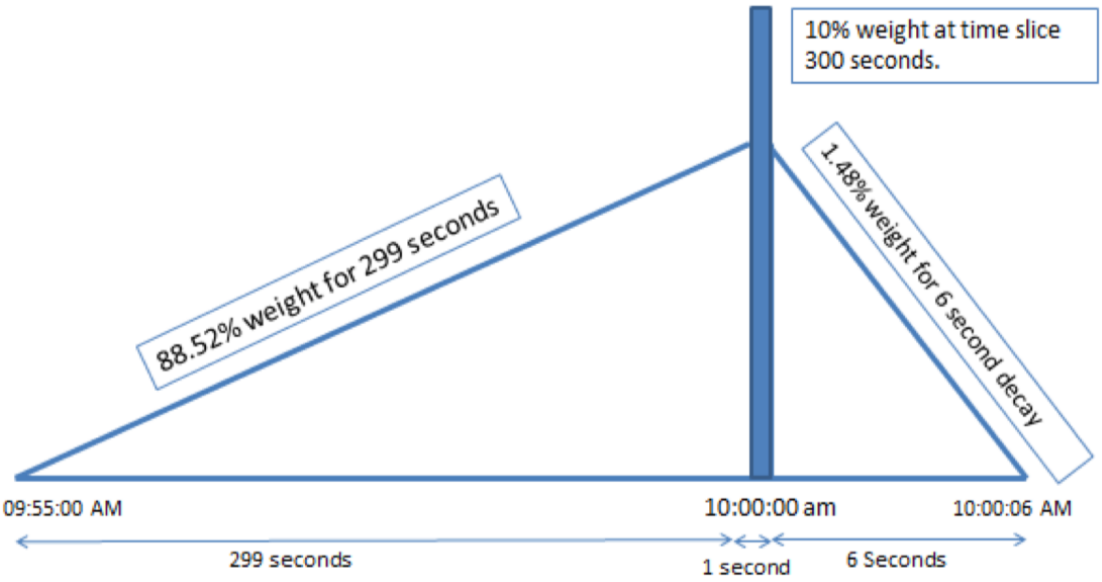
2. Pre-hedging/front-running
A potentially manipulative strategy for a trader with a large client order is to trade aggressively at the start of the fix to ramp up/ramp down the price. This will impact the average spot price over the fixing window causing the fix to be marked significantly higher or lower than if execution occurred in an equal fashion across the fix. This style of trading can look like front-running and traders have been prosecuted for this behaviour historically.

3. Excessive market impact
There is a fundamental problem with trading large volumes over a 5-minute fixing window: there is more demand for liquidity than the market can absorb in this short time-frame. To trade a large buy order, you need to find corresponding sellers and if there is not enough supply then the exchange will tend to move excessively in the search for liquidity. This leads to an excessive amount of market impact on the trade costing the client more than if they traded over a longer window.

Note that this form of market impact is not caused by market manipulation but instead arises from the limited amount of liquidity available executing over a short time window. A longer execution window will naturally reduce this effect. See the case study for an explicit calculation of the costs associated with this market impact.

Bloomberg FIX: BFIX

In 2007 Bloomberg created a new methodology for calculating FX fixes where the calculation methodology was more complex than a simple average of spot prices over the window. The weights applied to each spot price each second are shown below:



Note that the one second interval at 4pm is assigned an outsize 10% weighting of the fix. This may cause the BFIX to be sensitive to market behavior at this time slice. When trading to replicate this benchmark it would be necessary to trade 10% of the total volume within this one second.

The Bloomberg FIX observes market prices over this window of 306 seconds which is very similar to the 300 second (5 minute) window used for calculating the WMR FIX.

Optimal Execution

The concept of optimal execution in economics determines the optimal trading trajectory when considering the opposing concepts of market risk and market impact. These are related as follows:

Low market risk ↔ Faster execution ↔ High Market Impact

Low Market Impact ↔ Slower execution ↔ Higher market risk

The classic optimal execution model for market orders was first described by **Almgren and Chriss** in their seminal 2000 paper. In their model they constructed an exact solution for the trade trajectory given a fixed time horizon T:

$$\frac{Q(t)}{Q(0)} = \frac{\sinh(\Omega(1-\tau))}{\sinh\Omega}, \qquad \Omega = T\sqrt{\frac{\lambda\sigma^2}{a+b}}, \quad \tau = \frac{t}{T}$$

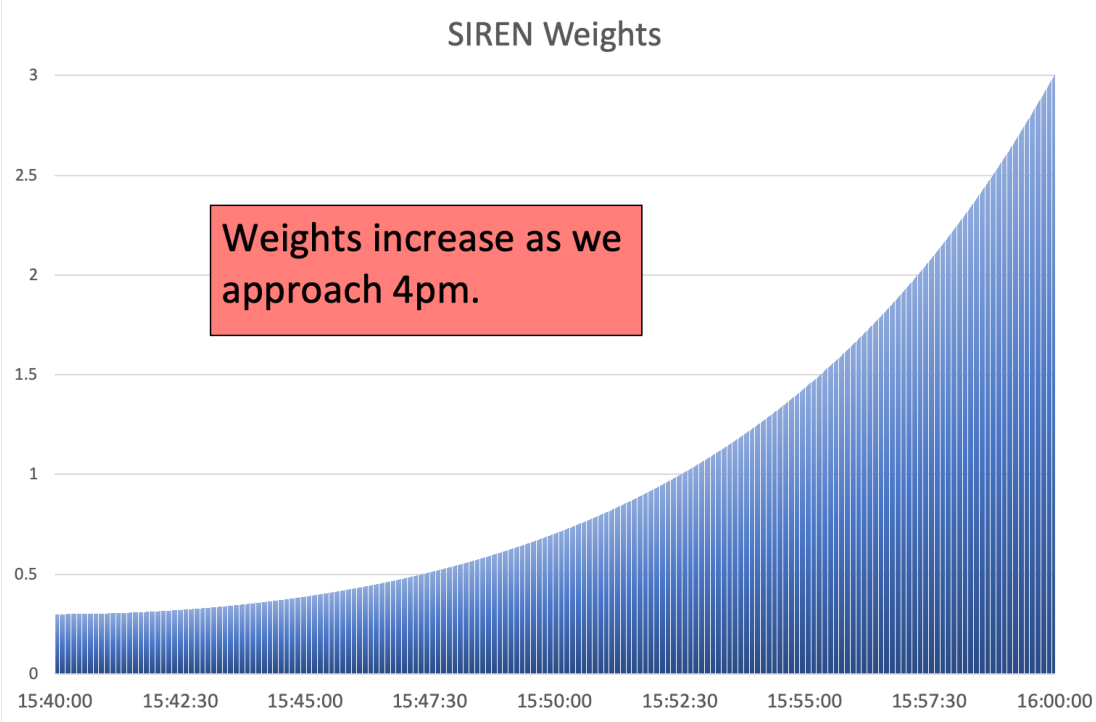
Here, “sigma” is the volatility of the underlying and “a” and “b” are the temporary and permanent price impact caused by trading. “Q(t)” represents the quantity of the trade held at any time “t” over the trading horizon “T”.

The trajectory is driven by **Omega** which is a ratio of the market risk over the market impact. This can be determined for a given asset using market data. Generally, the more liquid a currency is, the higher the omega, implying more execution can happen closer to the fix.

For our benchmark we are considering the opposite problem of executing a given notional by time T. This is analogous to the related problem in equities of executing an algorithm to hit the close and is known as **a Market-On-Close (MOC) algorithm**. Using the Almgren-Chriss framework we can simply reverse time to generate this trajectory.

SIREN calculation methodology

The optimal trajectory is used to determine the weights for our SIREN calculation. The liquidity measure omega is chosen optimally from observed market impact across a large number of trades. We apply the SIREN weight to the observed mid-price every second over the benchmark window. The weights increase as we approach the benchmark as shown in the example below:



An important element of this methodology is that market impact is a function of the volume to be traded at the benchmark. To reduce the market impact for larger notionals, we have chosen a **20-minute window** for the benchmark calculation. In the case study we show the potential savings from trading this longer window for a set of fixing trades.

The SIREN fix can be calculated in **real-time** using live mid-market spot data as the weights are known in advance.

New Change FX benchmark mid-market spot rates are snapped every second in the price construction. New Change is the only ESMA registered and FCA authorised administrator of live spot FX benchmarks. New Change FX is the benchmark administrator for the SIREN benchmark.

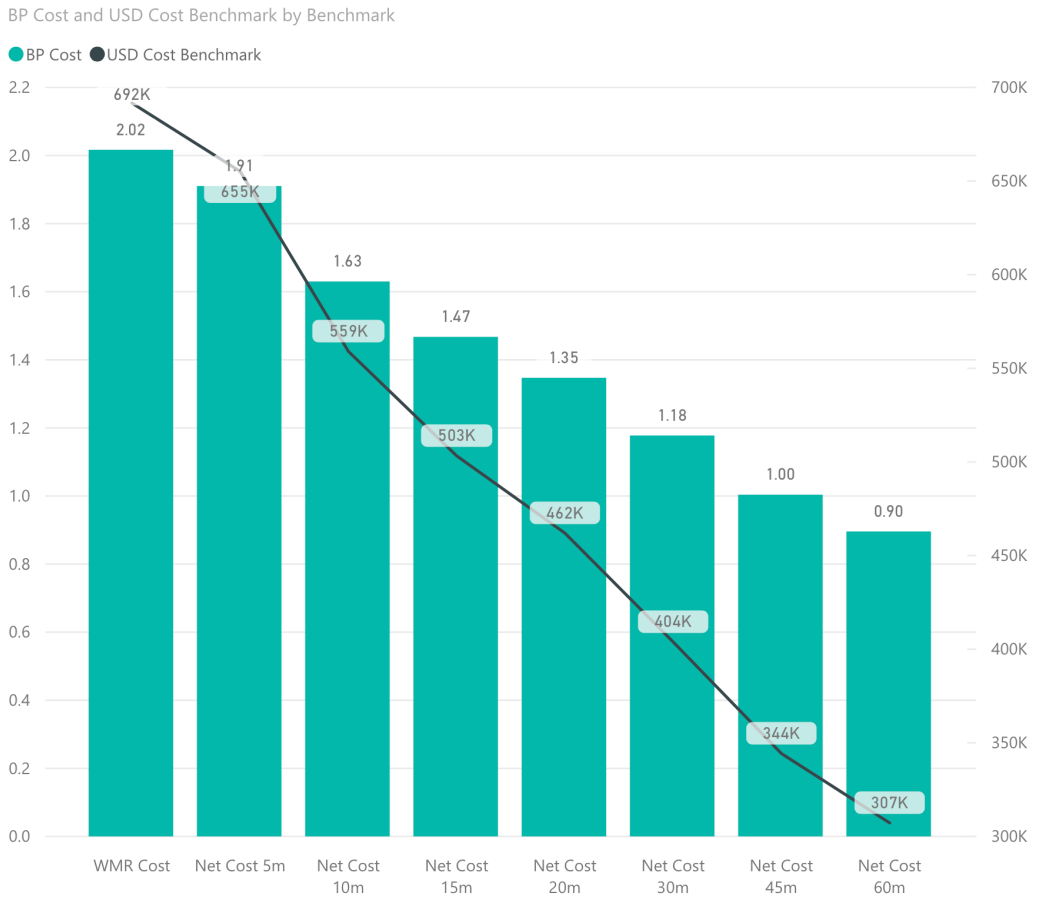
The SIREN benchmark is published **twice an hour** for all standard FX trading hours and is available for 71 currency pairs as listed in the appendix.

Case study

We have performed a real-world analysis where we compare using the Siren benchmark to trade versus using the 4pm fix. This example is based on 3 years benchmark trades as executed for a pension fund from 2015-2018, over 3,000 trades.

The first chart shows the trading activity versus the client for an hour over the benchmark window at 4pm London.

This chart shows that the costs associated with trading jump up markedly as we hit the 5-minute window around 4pm before falling again once the window has completed. It is likely that these costs are associated with the excessive market impact associated with trading in correlation to the market.



The chart shows the spread paid by the client versus the 4pm fix to be 2.02 basis points. However, there is a consistent improvement in their price if they had used SIREN as an execution benchmark whether they are a buyer or a seller.

It is worth observing that the longer the observed window, the greater the benefit to this client.

This ultimately leads to cost saving of 0.6 basis points on average by trading the 20-minute SIREN benchmark.

Conclusion

This whitepaper proposes a new benchmark for FX spot trade executions. We show that this benchmark is less vulnerable to the excess market impact at 4pm London. The case study demonstrates that using SIREN leads to costs savings to the client of at least a basis point for longer windows.

The length of the window used for benchmark execution is **20-minutes**. This window has been chosen after consultation with industry members and allows for most of the benefits associated with optimal execution and reduced market impact while also allowing sufficient time for orders to be placed by clients in advance of the start of the window. Other windows are also available for execution ranging from 5-minutes to 1-hour.

Please contact Raidne and New Change FX for more information about using the fixing.

References

Scandals:

- Timeline https://www.reuters.com/article/forex-fixing-idUSL6N0M71KO20140311
- https://www.bloomberg.com/view/articles/2014-11-12/banks-manipulated-foreign-exchange-in-ways-you-can-t-teach

WMR methodology:
https://financial.thomsonreuters.com/content/dam/openweb/documents/pdf/financial/wm-reuters-methodology.pdf
Guy Debelle on WMRbenchmark: https://www.rba.gov.au/speeches/2015/sp-ag-2015-02-12.html

BFIX rates: https://www.bloomberg.com/markets/currencies/fx-fixings
BFIX methodology: https://data.bloomberglp.com/notices/sites/3/2016/04/bfix_methodology.pdf

FSB FX benchmarks recommendations: http://www.fsb.org/wp-content/uploads/r_140930.pdf
IOSCO report on benchmarks: http://www.iosco.org/library/pubdocs/pdf/IOSCOPD415.pdf
Almgren-Chriss paper: https://www.courant.nyu.edu/~almgren/papers/optliq.pdf

Appendix: Graphical examples

In the following charts we compare the SIREN fix against WMR and BFIX for a historical 4pm fix. The WMR rate is approximated by using a 5-minute TWAP around 4pm. All calculations are measured using New Change FX mid spot data as the underlying data.

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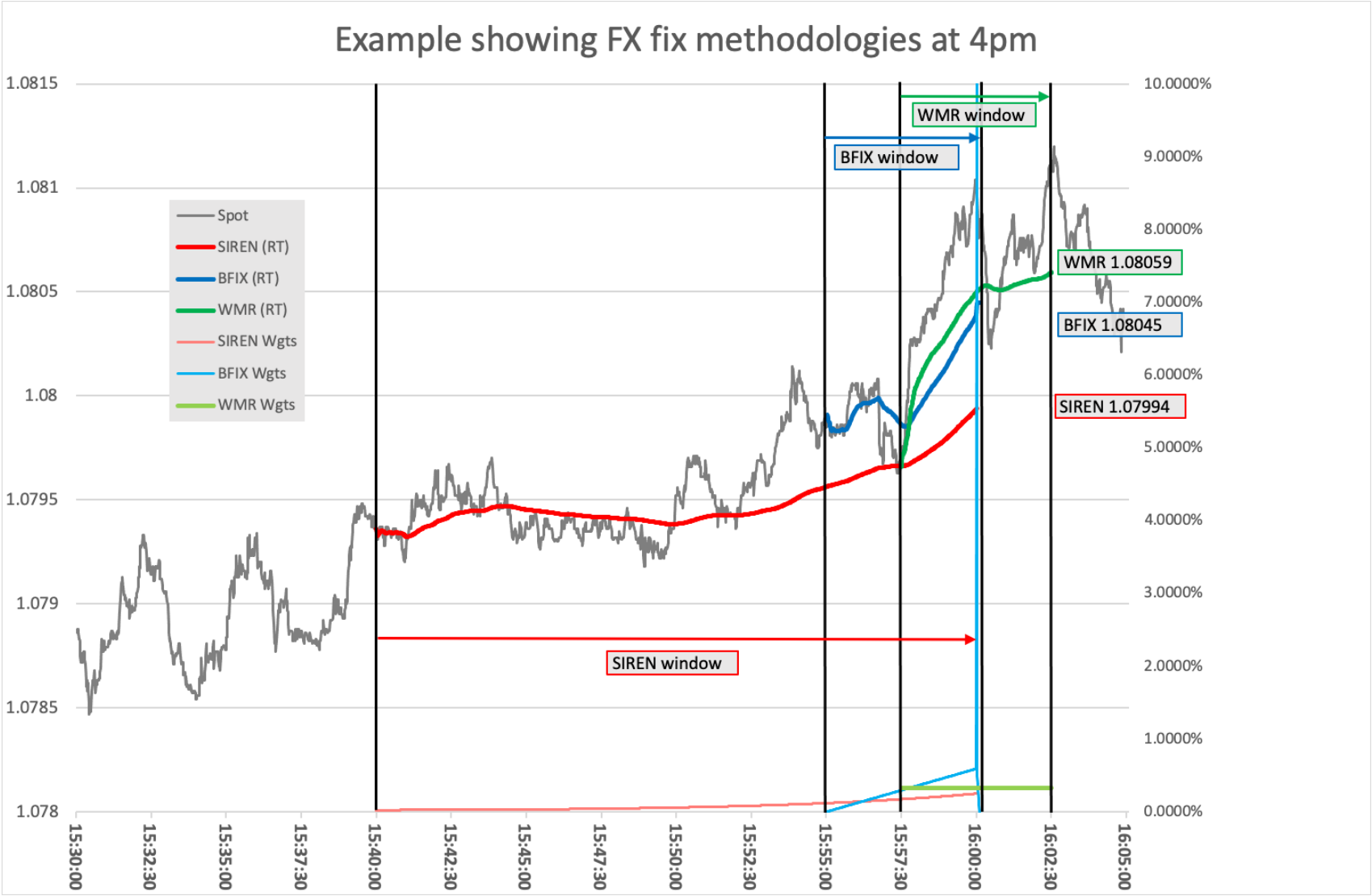

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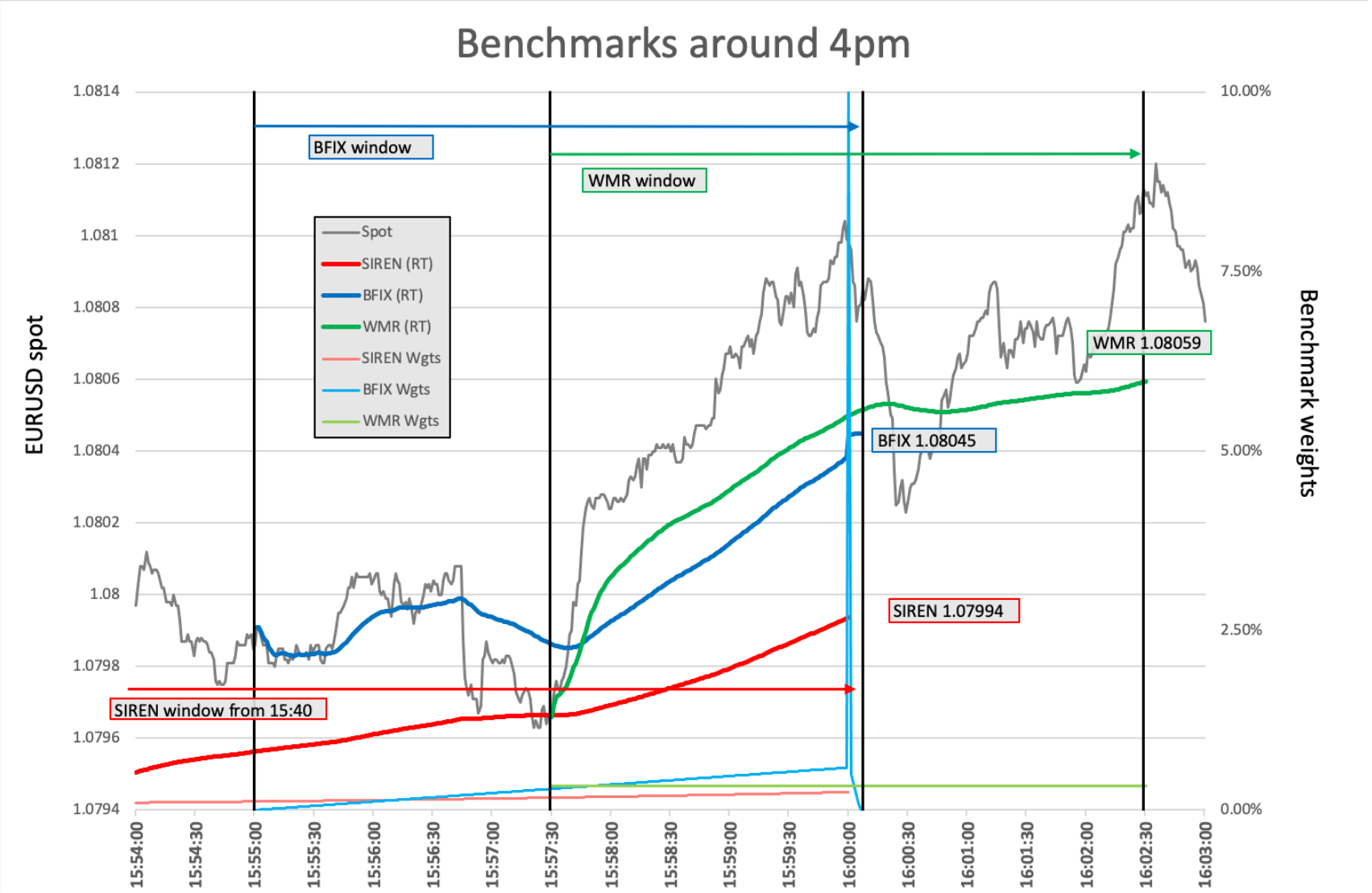

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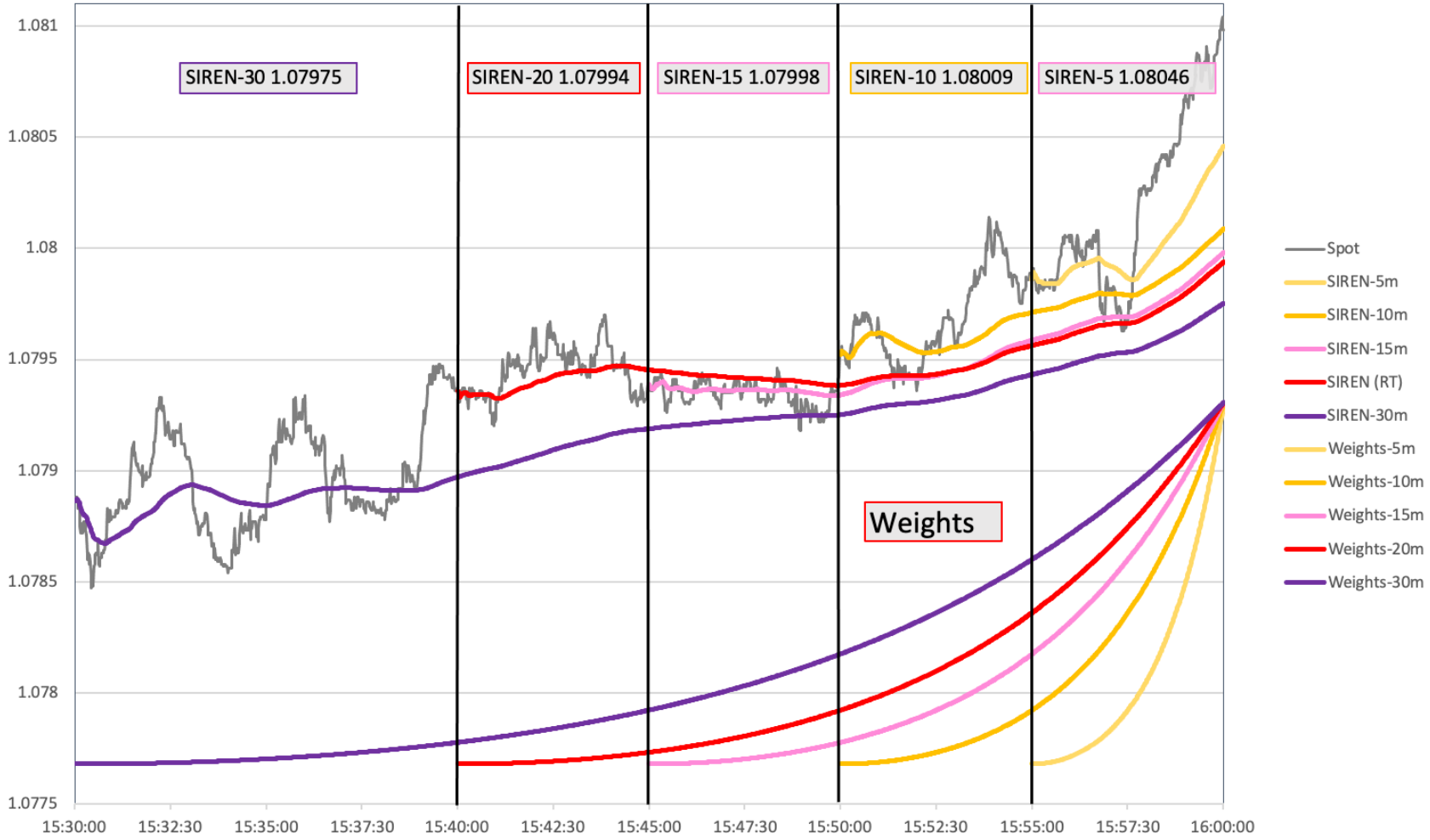
SIREN calculated for various time windows



Appendix 2: Currency pair benchmarks.

The SIREN benchmark is calculated every 30 minutes for the following 71 currency pairs:

AUDCAD	EURHKD	GBPMXN	USDCHF
AUDCHF	EURHUF	GBPNOK	USDCNH
AUDJPY	EURJPY	GBPNZD	USDCZK
AUDNOK	EURMXN	GBPPLN	USDDKK
AUDNZD	EURNOK	GBPSEK	USDHKD
AUDSEK	EURNZD	GBPSGD	USDHUF
AUDSGD	EURPLN	GBPTRY	USDILS
AUDUSD	EURRON	GBPUSD	USDJPY
CADCHF	EURRUB	GBPZAR	USDMXN
CADJPY	EURSEK	NOKSEK	USDNOK
CHFJPY	EURSGD	NZDCAD	USDPLN
CHFPLN	EURTRY	NZDCHF	USDRON
EURAUD	EURUSD	NZDJPY	USDRUB
EURCAD	EURZAR	NZDNOK	USDSEK
EURCHF	GBPAUD	NZDSEK	USDSGD
EURCZK	GBPCAD	NZDSGD	USDTRY
EURDKK	GBPCHF	NZDUSD	USDZAR
EURGBP	GBPJPY	USDCAD	

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