

# Interval Time Average Price (ITAP)

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## Abstract

This paper details a solution to the absence of reliable volume weighted average price (VWAP) data in over-the-counter (OTC) foreign exchange markets: The Interval Time Average Price (ITAP). The methodology can be used to evaluate trading costs in OTC foreign exchange, even in cases where time stamps may not be available in the trade history. The ITAP method produces an unbiased measure of currency trading costs.

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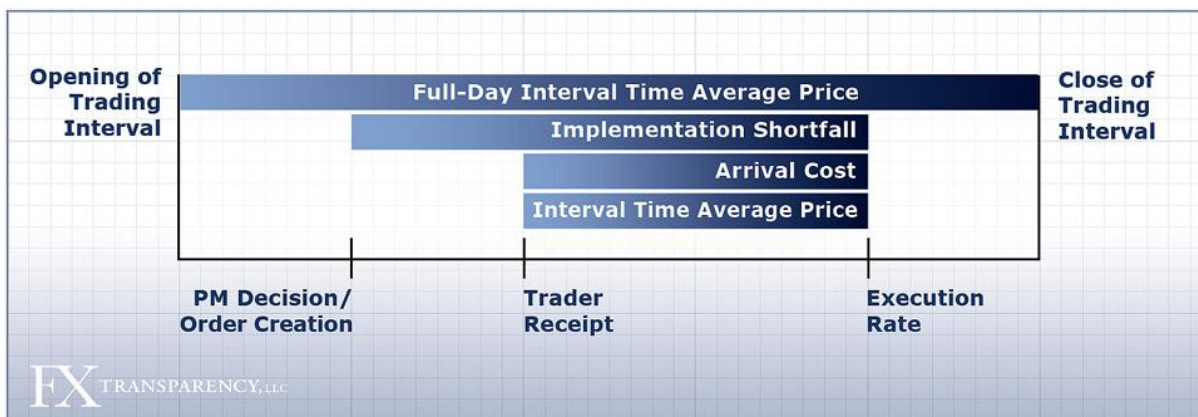
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## Introduction

Some established transaction cost analysis (TCA) methods in equities today provide a good starting point for benchmarking foreign exchange trades. Well known price-to-price comparisons such as arrival cost<sup>2</sup> and implementation shortfall<sup>3</sup> can be readily adapted in currencies, provided one has a robust database of mid-market spot and forward rates, accurate international holiday calendars and a fundamental understanding of FX forward pricing.

Where FX TCA must deviate from equity methods is in the determination of costs that rely on Volume Weighted Average Price (VWAP) as a benchmark. Attempting to use VWAP or TWAP (Time Weighted Average Price) in foreign exchange opens the door to several pitfalls, and fails to provide a reliable benchmark for peer-to-peer cost comparisons and quantification of market impact costs.

FX Transparency proposes an alternative benchmark that is more representative of the FX trading process: **The Interval Time Average Price (ITAP).**



## Pitfalls in Benchmarking FX with VWAP

- **Credit Constraints:** Every participant's tradable volume in the OTC FX market is a function of credit - who has extended you credit, and to whom you have extended credit. Each market participant (both buy-side and sell-side) has different liquidity available to them. Therefore, even if each electronic platform were to publish volume data for trades ex-post (which most currently do not), those volumes would not be representative of both Firm A's and Firm B's liquidity. This is different from the exchange-traded equity world where credit inconsistencies do not exist. In equities, all participants face the exchange from a credit perspective, and all have equal access to liquidity.
- **Decentralized Market Liquidity:** Accurate volume data is not available in the OTC foreign exchange market. Volume data from any one of the long list of electronic platforms, or from any

<sup>2</sup> Arrival Cost is the difference in price from the time the trader receives an order to the actual execution price.

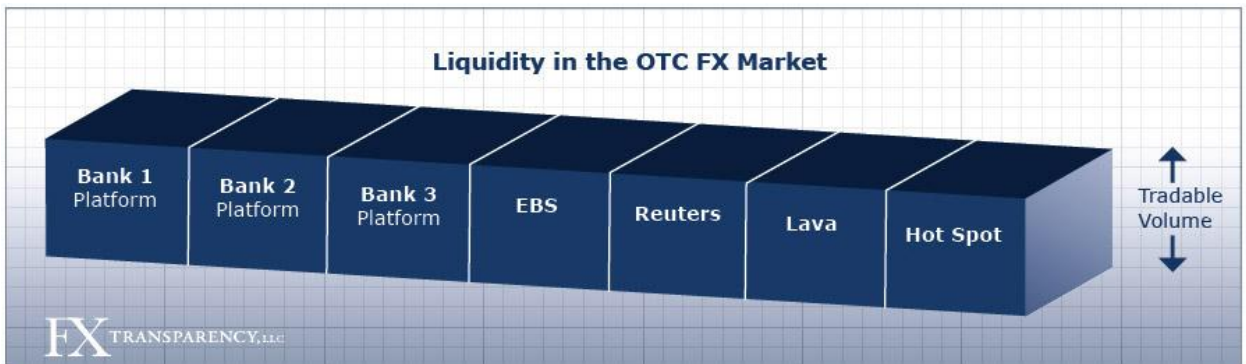
<sup>3</sup> Implementation Shortfall is the difference in price from order creation to the actual execution price.

single bank represents only a fraction of the available liquidity. Visually, the liquidity in the FX market is a shallow, horizontal box (see **Figure 1**). Notice that each individual liquidity provider is only a small portion of the total tradable volume. In order to access the maximum tradable volume, OTC FX traders must access several different liquidity pools simultaneously.

In the exchange-traded equity market, where liquidity is aggregated in one place, the picture resembles a vertical box (see **Figure 2**).

Because liquidity is aggregated in one place in equities, Firm A's and Firm B's tradable volume is the same, and you have a true peer-to-peer comparison. This is not the case in currencies, because Firm A's and Firm B's tradable volume are a function of credit and their ability to access multiple liquidity pools simultaneously.

**Figure 1:**



**Figure 2:**



- **Best Execution?:** There is another substantial flaw with VWAP as a basis for judging best execution. Let's look at an example in equities: Your firm sells 800,000 shares on a day when the total volume is two million. Your trades will determine 40% of the day's VWAP. Let's assume your trader just hits bids (sells) no matter how low or how far they were from mid-market prior to starting the execution process, and offering blocks too large for the market to handle "walking the price lower". Here it is clear that the trader is paying a very high price for immediacy<sup>4</sup> effectively costing his clients performance to have the order filled quickly. Despite acting completely irrationally and impatiently with regards to best execution, this subpar effort will not be uncovered in VWAP analysis. In fact, if the price was lower earlier in the day before the trader started to sell and then rose before beginning execution, in the VWAP framework one might give the trader praise for timing the order well.
- **Incomplete Picture:** Historical volume data only tells us what *did* happen in the market, not what *could* have happened. This is a key sticking point in the limitation of VWAP data, even in the equity market where it is thought of as the flagship of transaction cost analysis. Only the empirical volume from the trade being measured should be considered.
  - Think about observing a Ferrari going 65 mph on the highway. You typically see it moving at 65 mph, but does that mean it cannot go 165 mph? The driver of the Ferrari, of course, operates at the speed limit in order to not draw attention from police in the same way a trader icebergs<sup>5</sup> orders by not showing the market his full-volume interest. In the VWAP framework, the assumption is that 65 mph is the top speed of the Ferrari.
  - In the context of the FX market, just because 20 million EUR/USD traded at a rate of 1.4402 at a time of 13:52:02 GMT on Platform A does not mean that 40 million could not have gone through at that point in time on Platform B. Quite possibly another 12 million as well on Platform C and 15 million on Platform D could have moved through -- all at that same point in time.

### **Pitfalls in Benchmarking FX with Time Weighted Average Price (TWAP)**

- **Volatility Benchmark Bias:** Although it may be tempting to calculate TWAP using tick data, this approach will bias the analysis by assigning more weight to volatile times of the day when price changes are most frequent. This approach penalizes the trader for not transacting at volatile times of the day, when liquidity is typically poorer, such as in the seconds following important economic data releases.

In fact, one could argue anecdotally that the times of the day with the most ticks are actually the most illiquid. Intuition from most people who have spent time on a trading desk would suggest that liquidity in the seconds following critical data releases and key headlines often represent the worst time of day to transact. This is the time when the price of immediacy is dramatically higher.

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<sup>4</sup> George Chacko, Jakub Jurek, and Erik Stafford, The Price of Immediacy, Journal of Finance 63(3), June 2008, p. 1253-1290.

<sup>5</sup> Intentionally hiding, or partially hiding the full size of an order from other market participants.

Because those time slices have the highest frequency of ticks, they will play a greater role in determining the TWAP benchmark.

### **Solution: The Interval Time Average Price (ITAP)**

The ITAP is a flexible benchmark designed to represent a firm's FX trading day and fill the void left by the flaws and inadequacies of using VWAP or TWAP in foreign exchange. It is an arithmetic average of each one-minute price (or one-second price, if more granularity is desired) throughout the defined trading day.

For firms lacking time stamps, ITAP can be used to determine total trading costs, provided an adequate number of observations are available.

For firms with time stamps, it can describe how well traders are timing their execution and provide a standard benchmark for measuring market impact costs similar to VWAP in the context of arrival cost and implementation shortfall.

#### **The Interval Time**

The interval time is a *firm-specific* parameter. It is defined as the trading window in a typical day when the bulk of currency trades are executed. For example, if a U.S. desk does most of its trades prior to the London close to take advantage of the greater number of market participants, and thus potential liquidity, it might define this interval time as 7 a.m. to 11:30 a.m. In this proper context, firms are not evaluated against trades that occur outside of their normal trading hours.

#### **The Average Price**

In foreign exchange, we cannot reach consensus on market depth. However, for most currencies, most of the time, we can reach consensus around where the mid-market spot and forward rates (out to one year) are throughout the trading day.

The mid-market spot rate snapshot can be taken at one-minute or one-second intervals and averaged to determine the day's benchmark spot rate. The spot rate can then be moved along the forward curve using interpolation, provided one has an international business day calendar and a fundamental understanding of FX forward pricing, including day-count conventions.

#### **An Example of the Interval Time Average Price**

A firm executes most of its FX trades between 8 a.m. and 5 p.m. EST, therefore:

$$ITAP = \frac{\sum_{i=1}^n P_i}{n}$$

where  $n$  = number of minutes in the trading interval and  $P_i$  = price at minute  $i$ . In this case ITAP would be the arithmetic average of 540 mid-market spot prices snapped at one-minute intervals starting at 8 a.m. and ending at 5 p.m.

If more granularity is desired, the same approach can be used with one-second intervals.

### **The Advantages of ITAP**

- *Assumption Free*: Mid-market rates can be readily determined, as opposed to assumption-laden proprietary volume data for the aforementioned reasons of credit and decentralized liquidity.
- *Transparency & Cost Clarity*: The analysis can be performed with publically available pricing data, avoiding conflict of interest issues surrounding proprietary volume information. Analysis results provide a high degree of cost clarity for OTC Foreign Exchange participants.
- *Tailored Solution*: Interval Time is customizable to accurately reflect each firm's trading process. Only data relevant to the defined trading window is used, providing a more accurate reflection of costs. This eliminates the possibility that a trader is penalized for price action outside normal business hours.
- *Time Stamps Not Required*: To obtain an objective critique of FX trading costs, time stamps are not needed. This perceived obstacle has stopped many investors from performing currency TCA in the past.

### **Conclusion**

The interval time average price framework provides a robust solution to benchmark costs in OTC currency markets for participants that have, and do not have, time-stamped trade histories. Peer-to-peer comparisons are valid because the historical data is price-only, market-consensus mid-rates and not assumption-laden volume estimates.

Until historical-volume data, currently clouded by decentralized liquidity and credit constraints, can be normalized, it should not be part of FX transaction cost analysis.