CREDIT SUISSE

TRADING STRATEGY

Phil Mackintosh
+ 1 212 325 5263
Phil.mackintosh@credit-suisse.com

Market Structure

How Much is Market Structure Hurting Investors?

Market Commentary 13 March 2013

Key Points

- Over the past decade, markets have changed significantly. They are faster, more fragmented and more complex.
- We try to quantify how much this has affected real investor returns.
- Using over 7-years of real transaction data, we create the **CS Transaction Cost Index.** This index is an apples-for-apples measure of shortfall throughout the past 7 years.
- It shows that trading costs have consistently improved throughout the period.
- Based on this index, and our estimates of real investor trading, we calculate that real investors are saving around $10bn per year, versus equivalent 2005 trading costs.

Using ExPRT for the Index

ExPRT is our proprietary TCA tool, which we use to analyze and consult with clients on their transaction costs and execution strategies (see ExPRT for Dummies).

On an overall basis it represents a broad range of Institutional investors by style and size, trading via Cash, PT and Algorithmically.

We have also used ExPRT to calibrate our impact cost model (see: A New EDGE in Impact Cost and EDGE Update: **NEW Portfolio Tools**).

Just shortfall

ExPRT just looks at shortfall on trades. Arguably settlement and commission costs have also declined. However they are not included in these results.

Introducing our Transaction Cost Index

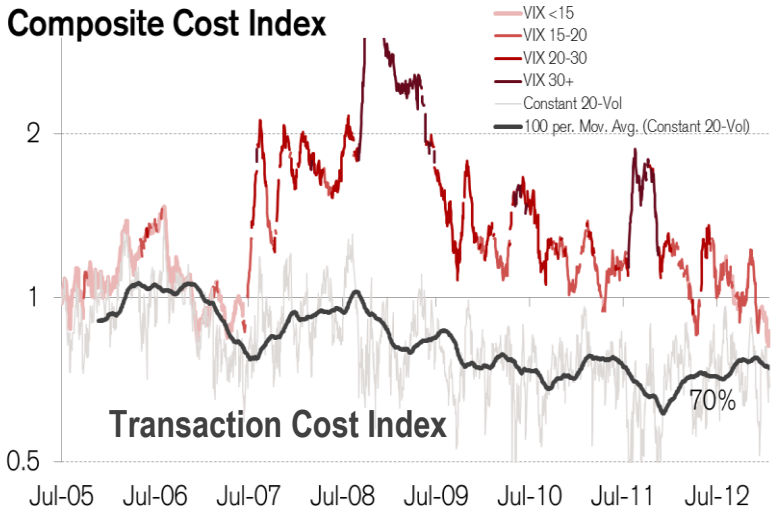
Over the past decade, markets have become more fragmented and complex. In our report Where Has All the Trading Gone? we noted that although top-line volumes have doubled, real trading liquidity has fallen to decade lows. But is it possible to quantify the economic effects of this market structure change? And are investors better or worse off?

Transaction costs are a good metric to assess the economic value of market structure changes – especially given that they represent the real investor losses due to frictions in their trading. Using ExPRT, our transaction cost data, we compare over 7 years of real trade costs.

Apples to apples shows trading is 30% cheaper

Using ExPRT data, we estimate that transaction costs, on a like-for-like basis, have fallen around 30%. Our approach seeks to remove the effects of volatility, trade size and execution style that can, on their own, lead to material shifts in a simple average cost number, but are not caused by micro-market structure itself. We detail how we do this below.

Exhibit 1: **CS Transaction Cost Index (all US trades)**



Source: Credit Suisse Trading Strategy

The **CS Composite Cost Index** (exhibit 1, red line) represents the indexed value of actual trade costs. This line is shaded according to the VIX at the time. From this it is clear that costs spike during periods of higher volatility. Despite volatility being around 50% (5 points) *above* record lows, this index recently hit *record lows*.

The **CS Transaction Cost Index** (black line) goes one step further, neutralizing the impact of volatility spikes, creating a better 'apples to apples' comparison of execution costs. This shows transaction costs have actually fallen consistently over the period, and it is now around 30% cheaper to trade than 7 years ago.

Building Better Cost Indexes:

Accounting for a decade of significant change

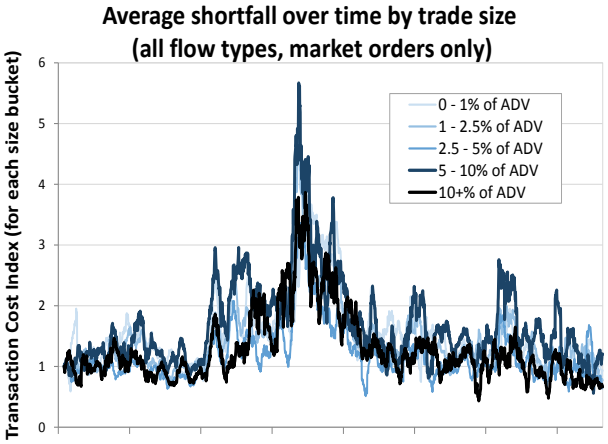
We know from A New EDGE in Impact Cost how changes in **trade size** and **volatility** significantly affect costs, however they have little to do with market structure. Not surprisingly, these are also key components in our pre-trade impact model:

Exhibit 2: **Our Impact cost model shows trade size and volatility also affect costs**

$$I = c_m \partial_{bid-ask} \frac{P^{n_m}}{1+\exp(h_m - \lambda_m P)} + c_i \sigma \frac{P^{q_i} D^{n_i}}{(1+\exp(h_p - \lambda_p P))(1+\exp(h_i - \lambda_i D))}$$

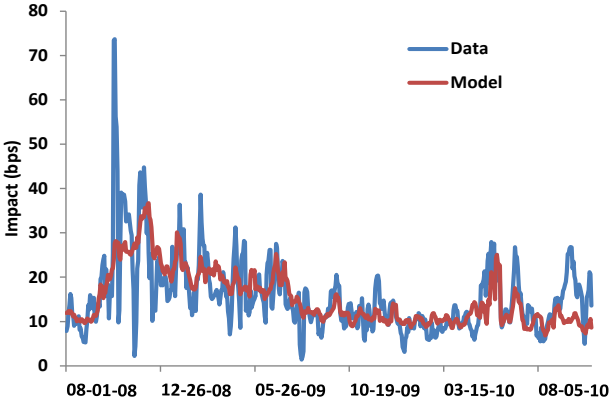
Estimated Shortfall = Spread Cost + Impact Cost

Exhibit 3: **Indexes of different trade sizes were consistent. Averaging these averages avoids structural shifts in trade size affecting the index.**



Source: Credit Suisse Trading Strategy.

Exhibit 4: **Our model's volatility factor was a good predictor for the effects of volatility changing**



Source: Credit Suisse Trading Strategy, Impact Model Stands Up to the Credit Crisis.

Accounting for changes in transaction size

As desks become more and more electronic, we know that average trade size has fallen significantly, and quant funds with diversified portfolio trades have increased. Cheaper explicit transaction costs have also allowed smaller trades and higher turnover strategies to become more economic. Consequently a simple average of trade cost might be distorted by changes in the size & composition of orders received.

We account for size in our index by:

1. Bucketing orders by size, measured as % of ADV. This ensures that large and small orders are segregated. We highlight that these results are also conservative, as increased volumes mean there are typically *more shares* in a 1% ADV order *now* than 7 years ago.
2. Indexing each bucket so that the cost of trading each bucket is set to 1 at the start of the period. Interestingly exhibit 3 shows that, despite differences in notional shortfall between the smallest and largest buckets, each index is mostly consistent. Very large orders may have improved *marginally* more than other orders in the past 2 years.
3. We then create our **Composite Cost Index** (exhibit 1, red line) from the average of each bucket. This means that shifts in the size of each bucket, as trading patterns evolve, don't affect the index like a simple average of all orders would.

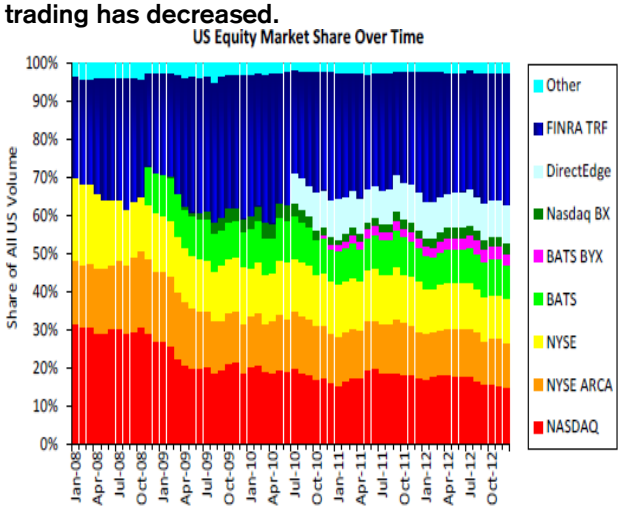
Accounting for an 8x increase in volatility

The red shading of the Composite Cost Index shows that, just as uncertainty makes options cost more, it also makes trading cost more, all other things equal. This makes it tough to compare actual costs during the past seven years, where the VIX has ranged from 10 to 80+. .

However, we know from Impact Model Stands Up to the Credit Crisis that the volatility factor in our cost model was able to accurately forecast the increase in transaction costs, even during the extreme volatility changes of the credit crisis (exhibit 4). Consequently, it seems reasonable to use this factor to now normalize our composite cost index for the impact of VIX changes.

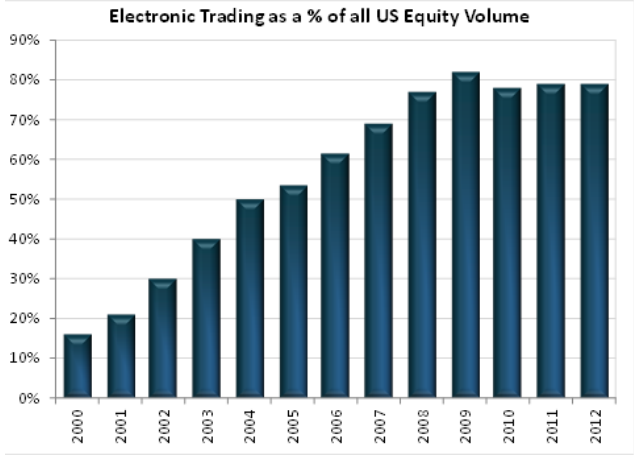
Doing this, we create the **CS Transaction Cost Index** (exhibit 1, black line). This represents what the Composite Cost Index should have done had volatility, measured by the VIX, remained at a constant 20 level.

Exhibit 5: over the same period, fragmentation and order types have increased, and primary trading has decreased.



Source: Credit Suisse Trading Strategy

Exhibit 6: Electronic trading has grown throughout the period of our index.



Sources: Tabb Group; Rosenblatt Securities, NY Times

Is Increased Market Complexity Hurting?

Coincidentally or not, our Transaction Cost Index has ground lower at the very same time as fragmentation and complexity have ground higher.

It's tough to know what specific changes in the market have helped the most – or even if some have hurt – because so much has changed. We have had regNMS, sophisticated buy-side EMS's, growth in HFT, competition for exchanges from ATS's and improvement in computer power generally.

All changes have ripple effects

The market is also a complex web of corporates, retail, broker dealers, market makers, hedge funds, liquidity providers, quants, fundamental investors and even index funds. Structural changes affect them in different ways - often indirectly. For example:

- Computerization gave investors direct and cheaper access to the markets, but also left an electronic footprint in the market.
- Technology enabled more sophisticated market making, which tightened spreads but also increased latency.
- Both of these aided signal detection strategies. Which dark pools and smaller trade sizes evolved to counter.
- Smaller trade sizes increased trade data. This grew exchange revenue as well as routing costs. Pushing liquidity into ATS's.

As the market evolved, has it gotten better or worse?

If the primary role of the market is the efficient transfer of capital in the economy – the 'cost' of trading, for real investors, is a potentially important measure of progress (or lack there-of).

$10bn cheaper to trade

The US market trades around $200bn/day, which equates to $50tr a year. According to Where Has All the Trading Gone?, around one-third of this is real-investor trading. As all trades are 2-sided, this would equate to $33tr in buying + selling per year.

A conservative estimate shows that the 30% improvement in our Transaction Cost Index, at current levels of trading, would translate to savings for real investors of over $10bn per year.

On balance, the changes to the market over the past decade seem to have made trading cheaper for all investors.

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USA

Phil Mackintosh	+1 212 325 5263	phil.mackintosh@credit-suisse.com
Victor Lin	+1 212 325 5281	victor.lin@credit-suisse.com
Ana Avramovic	+1 212 325 2438	ana.avramovic@credit-suisse.com
Stephen Casciano	+1 212 325 0776	stephen.casciano@credit-suisse.com

Europe

Colin Goldin	+44 20 7888 9637	colin.goldin@credit-suisse.com
Mark Buchanan	+44 20 7888 0908	mark.k.buchanan@credit-suisse.com
Marwan Abboud	+44 20 7888 0082	marwan.abboud@credit-suisse.com

Asia

Karan Karia	+852 2101 6322	karan.karia@credit-suisse.com

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