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Trading Strategy

It's Closing Time

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Market Commentary **12 September 2017**

Key Points

- Over the past decade, an increasing proportion of stock volume has moved towards the end of the day.
- Interestingly, the end of day increase in volume has been solely due to the auction in recent years and not to other trading in the last half hour, which has remained relatively steady since 2011. This trend has continued into 2017, where the auction volume has set a new high of 8%.
- The concentration of volume on the close reflects several prominent themes in the market including the growth of index-linked products (e.g. ETFs) and generally low levels of volatility.
- As a result, finding ways to intelligently access liquidity during the close (e.g. D-quotes) has become increasingly important.

Volume Curves Shift More into the Close

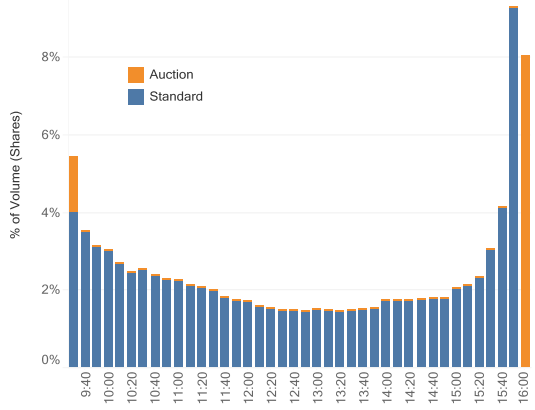
Over the past several years, an increasing proportion of volume has moved towards the end of the day and specifically, into the closing auction. Between 2004 and 2016, the estimated percentage of large cap (S&P 500) volume in the close increased from about 2% to nearly 7%. Trading has skewed even more into the close in 2017 (through August) with 8% of trading executed in the closing auction (this would be equivalent to an average of $16bn if the 8% extends across all U.S. equities).

Overall, the last 30 minutes of the trading day (including the auction) currently accounts for about 25% of volumes. Interestingly, volumes at the end of the day excluding the auction increased from 2007 to 2011, but have remained consistent since 2011; thus, recent attention has been focused directly towards the auction as opposed to the broader end-of-day period. The increased activity in the auction has come mainly at the expense of mid-day trading (10AM to 3:30PM) and to a lesser extent, the opening 30 minutes of the trading day.

The concentration of volume on the close reflects several prominent themes in the market:

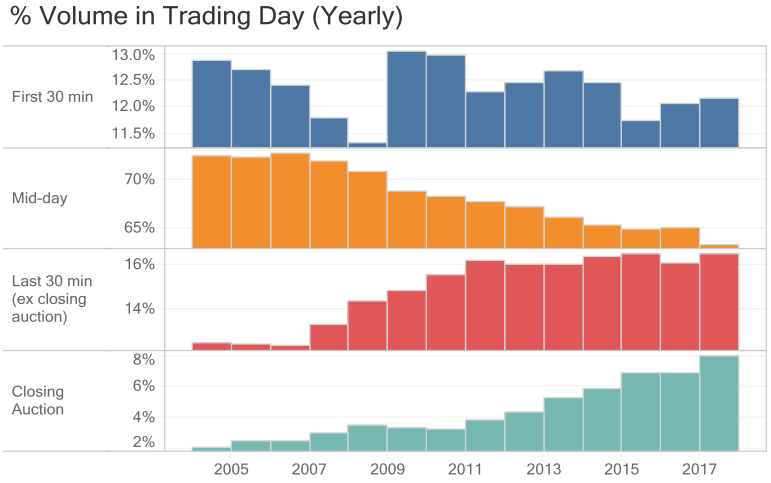
- The growth of index-linked products, which are benchmarked to the close and have share creation/redemption tied to Net Asset Value (NAV).
- Low absolute levels of volatility.
- Aversion to carrying risk overnight.

Exhibit 1: 2017 Composite Volume Curve for S&P 500



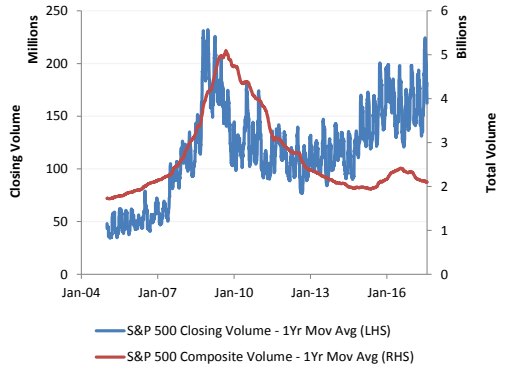
Source: Credit Suisse Trading Strategy, TAQ, 2017 through August

Exhibit 2: Volumes in the Closing Auction on the Rise



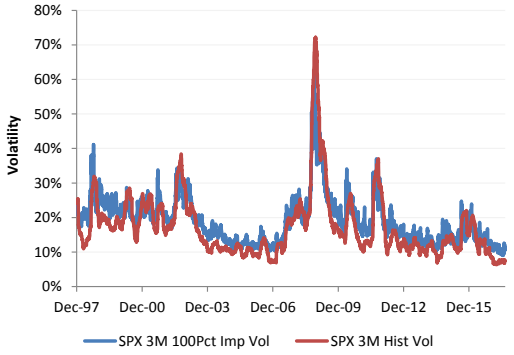
Source: Credit Suisse Trading Strategy, TAQ, Data through August 2017

Exhibit 3: MOC Volumes in the S&P 500 Rising While Overall Volumes Flat



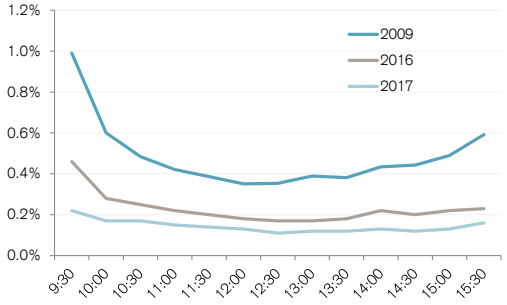
Source: Credit Suisse Trading Strategy, TAQ

Exhibit 4A: Less Intraday Trading a Potential Reflection of Historically Low Volatility



Source: Credit Suisse Trading Strategy, TAQ

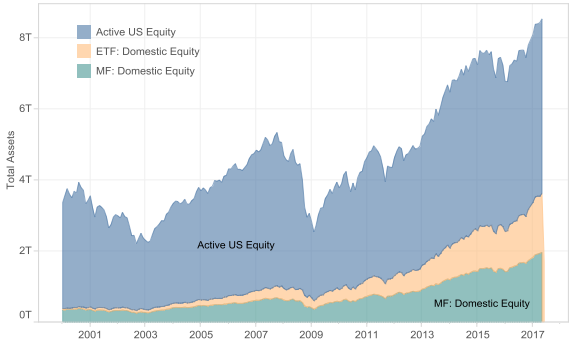
Exhibit 4B: Declining Average Intraday Moves (High/Low Difference in 30m Intervals)



Source: Credit Suisse Trading Strategy, TAQ

Exhibit 5: Rapid Growth of Passive Fund Assets

Active vs Passive Assets (US Equity MFs & ETFs)

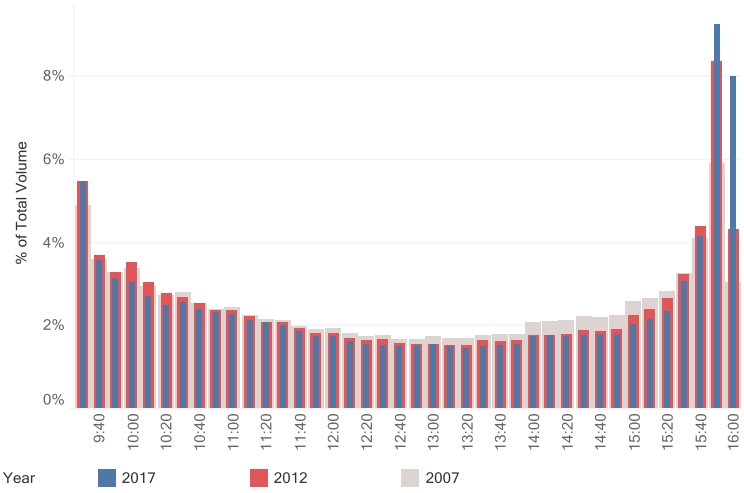


Source: Credit Suisse Trading Strategy, ICI, Factset

The Persistence of Low Volatility

The strong relationship between volumes and volatility potentially explains part of the shift in volume curves. From an absolute volume perspective, trading both prior to the closing auction and in the closing auction peaked in 2008/2009 during the market lows of the credit crisis. Afterwards, volumes outside the closing auction dropped back down to pre-crisis levels, but have remained relatively flat for the past several years (see Exhibit 3). The lack of intraday volume, exclusive of the closing auction, is likely a reflection of the historically low volatility the market has experienced since the credit crisis. In contrast, closing volumes have mostly increased over the same period – causing stock volume curves to become increasingly skewed towards the close.

Exhibit 3: Volume Curves Reflect Shift towards the Close



Source: Credit Suisse Trading Strategy, TAQ

However, why have closing volumes been rising in recent years while volatility has continued to fall? Most tend to agree that the growth of ETFs and changes in the mutual fund industry have played a significant role in the increased end-of-day volumes. Moreover, given that this is where the increased (and larger-sized) liquidity can be found, trading strategies and behaviors have adapted, further reinforcing the level of activity at the close. With less intraday price movement in a drifting market to spur more natural liquidity earlier in the day (see Exhibits 4A and 4B), traders who may normally have preferred to work orders more slowly may not have enough volume to interact with prior to the close. At the same time, most traders are still reluctant to carry risk overnight, leading to a convergence on the close.

Impact of ETFs and Mutual Funds

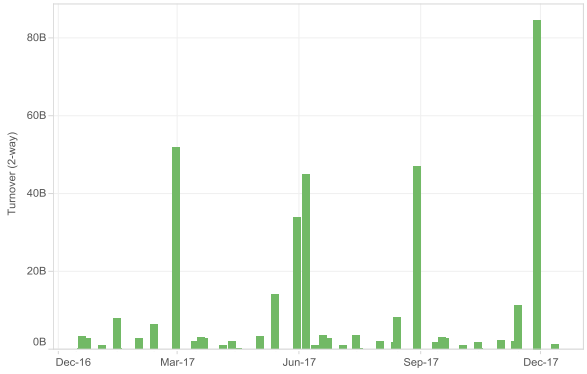
Fund dynamics over the past decade have had a material impact on the convergence of trading towards the market close.

- Index-linked funds need to rebalance according to the schedules defined by their methodologies. As passively managed assets have grown, these rebalances have become larger in magnitude.
- The growth in popularity of U.S. equity index funds (both ETFs and mutual funds) has resulted in consistently large inflows, meaning

new assets often need to be invested near/at the close to match the fund's Net Asset Value (NAV) more closely.

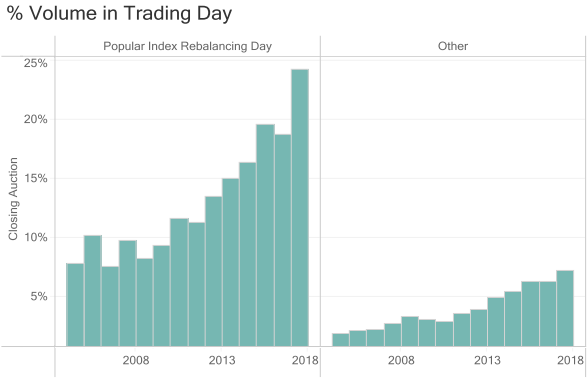
- Redemptions in actively managed U.S. equity mutual funds have been consistent over the same period as well, resulting in necessary selling near/at the close.

Exhibit 6: **Estimate of U.S. Equity ETF Rebalancing in 2017**



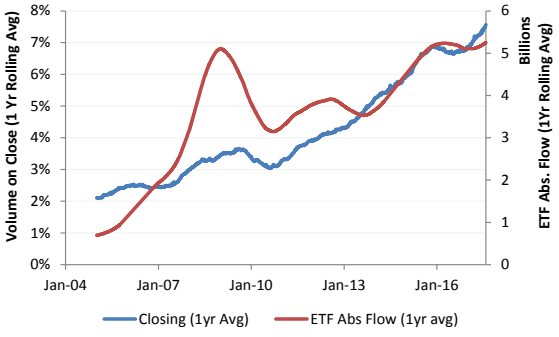
Source: Credit Suisse Trading Strategy

Exhibit 7: **MOC Volumes on Big Index Rebalancing Days Markedly Higher**



Source: Credit Suisse Trading Strategy

Exhibit 8: **2008/2009 Aside, Growing Fund Flows (ETFs in particular) Well Correlated to Increasing MOC Volumes**



Source: Credit Suisse Trading Strategy

Index Rebal Closing Volumes: Large, But Infrequent

Many people tend to associate increased end-of-day trading with larger index rebalancing activity. Indeed, based on significant asset growth in recent years and our annual turnover estimates of passively indexed U.S. equity ETFs/mutual funds, around 15-20% of U.S. yearly stock value traded on the close could be directly from index fund rebalancing (assuming 8% of volume on the closing auction). However, outside of smaller corporate actions induced activity, index rebalances do not happen every day! In fact, large-scale index rebalancing activity is limited to a handful of days due to assets being heavily concentrated in certain indexes and similarities in rebalancing schedules (see Exhibit 8, which approximates U.S. Equity ETF rebalancing in 2017 – index mutual funds likely follow a similarly shaped schedule). We estimate more than 75% of scheduled index rebalancing activity occurs on just 6 trading days (and in total, only around 15% of the trading days in a year have any sort of meaningful rebalancing activity). On those days, the proportion of volume on the close is markedly higher (see Exhibit 7), approaching nearly 25% in 2017 YTD. However, closing volumes have still been rising over time even on ordinary days when there is much less (or no) significant index rebalancing – suggesting index rebalances alone are unlikely the primary driver of increasing end-of-day trading.

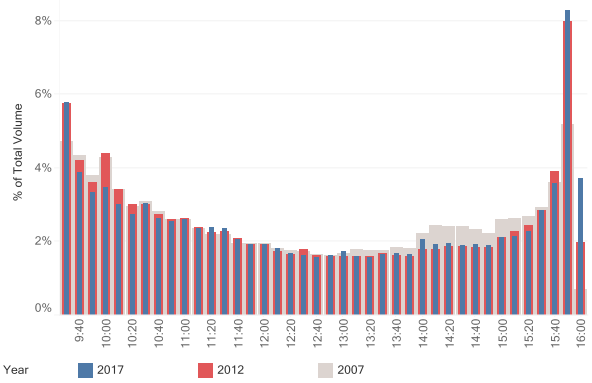
Influential Asset Inflows and Outflows

While index rebalances happen infrequently, inflows and outflows from funds occur every day, contributing to closing volumes; however, the actual size of these flows executed in the closing auction are difficult to precisely determine since the underlying trades are not necessarily executed exactly at the close. Daily creation/redemption activity (evaluated as the sum of the absolute value of flows in each ETF) in U.S. equity ETFs has averaged around $5bn in recent years – on par with the highs reached in 2009. Daily U.S. equity index mutual fund flows are harder to gauge, but based on recent monthly flows we could interpolate an estimate of $400-$500mm in average underlying trading daily (note that applying the same rationale to active U.S. equity mutual funds would reflect an estimated average of $1bn in additional daily flows).

If we assume all of these flows are executed at the close (AND on the same side, i.e. no paired off activity in the same stocks), the estimated daily asset flows from index funds would represent about 33% of current closing auction trading; realistically speaking though, the figure is likely appreciably lower due to the unlikelihood of the assumptions and the fact that some funds may choose to trade outside of the closing auction. Additionally, the sum of ETF flows was actually just as high in 2009 when the percentage of trading on close was still just 3.5% - suggesting index fund flows would have been more than 65% of closing volumes if we were to assume the flows were all executed on the close. Although it is difficult to confirm, a value that high seems unlikely.

Nevertheless, the sizeable flows that ETFs (and to a lesser extent, mutual funds) have seen on a daily basis over the past decade seem to have meaningfully increased trading volumes at the close.

Exhibit 9: **Shift Towards Close Evident in ETFs as Well**



Source: Credit Suisse Trading Strategy, TAQ

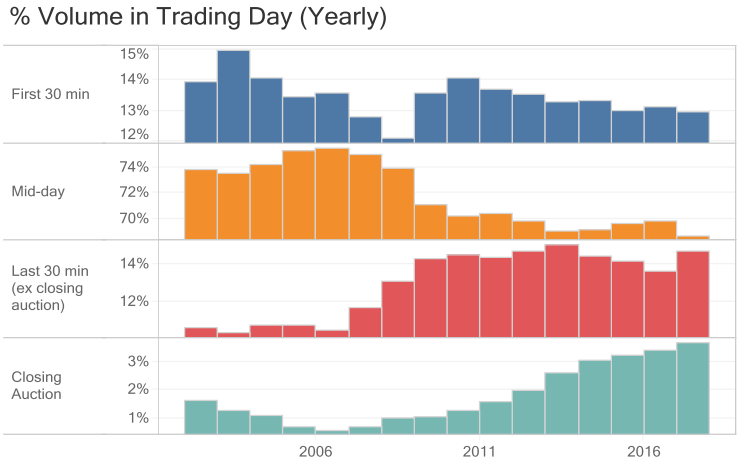
ETF Trading Less Focused on the Close

But Auction ETF Volumes Rising As Well

As has been noted in previous reports, the average ETF volume curve is shaped differently than the curve for stocks. ETFs see a larger proportion of volume at the open and significantly less on the close. Intuitively, this pattern makes sense from an ETF market-making and arbitrage standpoint – the market close represents a trading endpoint after which the underlying can no longer be used to hedge positions.

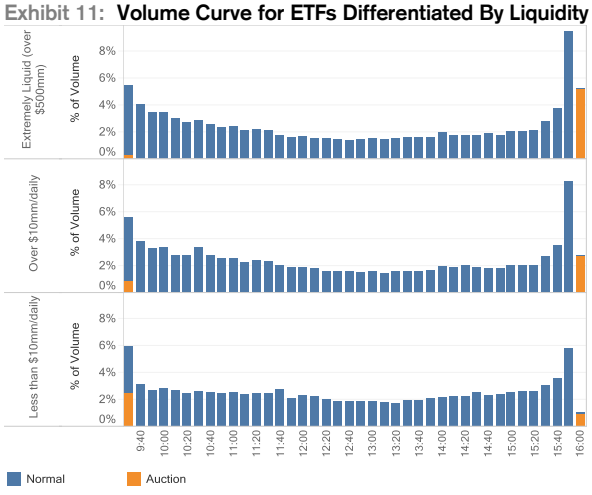
However, the trend towards trading the close is still observable in ETFs as well. The percentage of MOC volume has risen to 3.7% YTD, up from 2% five years ago and 0.7% ten years ago.

Exhibit 10: **ETF Trading in the Closing Auction Has Increased As Well, but Remains Significantly Less than Stocks**



Source: Credit Suisse Trading Strategy, TAQ

Exhibit 11: **Volume Curve for ETFs Differentiated By Liquidity**



Source: Credit Suisse Trading Strategy, TAQ

Most Liquid ETFs Trade More on the Close

Perhaps unsurprisingly, more liquid ETFs (referring to on-screen liquidity as opposed to the liquidity of the underlying) are more active at the close – trading more like a stock. For example, ETFs that trade more than $500mm on average daily see more than 5% of the volume executed on the close (see Exhibit 11). In contrast, ETFs that trade less than $10mm per day have less than 1% of their volume on the close.

Interestingly, the percentage of volume in the opening auction is just the opposite; the less liquid ETFs see *more* at the open.

Strategizing on the Close

Although the driving factors can be debated, there is no arguing that closing volumes have increased and finding ways to intelligently access liquidity during this time has become even more important. Clients can utilize existing strategies or even build custom strategies to target the liquidity at the end of the trading day. In addition, D-quotes (see the recent report The ABCs of D-Quotes) represent an alternative to traditional market-on-close and limit-on-close orders that can be entered and canceled (up until 3:59:50) regardless of whether a regulatory imbalance exists. These are just a few ways that traders have focused their attention on the close. Please contact your Credit Suisse sales coverage to learn more.

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