J.P.Morgan

Global Quantitative & Derivatives Strategy

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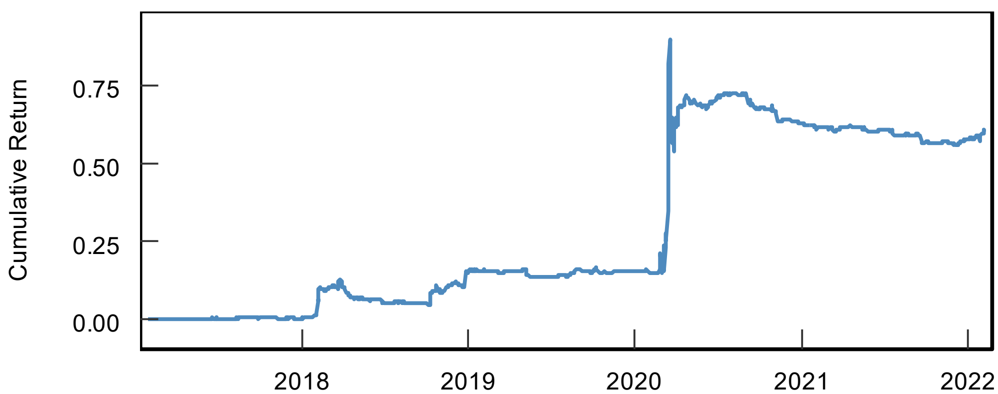
Impact of Crowding on Intraday Momentum

A Market Structure Analysis

- Intraday momentum is a systematic trading strategy which uses a security's intraday return as signal, then takes long/short positions in the security if the signal is positive/negative. The positions are generally exited at the market close. In previous report, we conducted extensive intraday data analysis on S&P 500 index and EuroStoxx50 index and their end-of-day derivatives hedging, examined the market impact in different time intervals around market close, and designed as well as applied the strategy to predict intraday market direction.

- Despite the supportive empirical evidence, intraday momentum has delivered relatively poor returns recently. Consider a prototypical strategy shown in Figure 1: we take the S&P 500 prior close to 15:30 return as signal, and hold a position in E-mini futures, sized proportionally to the signal strength, between 15:30 and 16:00. As we can see, the strategy provide steady returns before a jump in 2020. However, since then, the return of the strategy has been lackluster.

Figure 1: Performance of the prototypical intraday momentum strategy

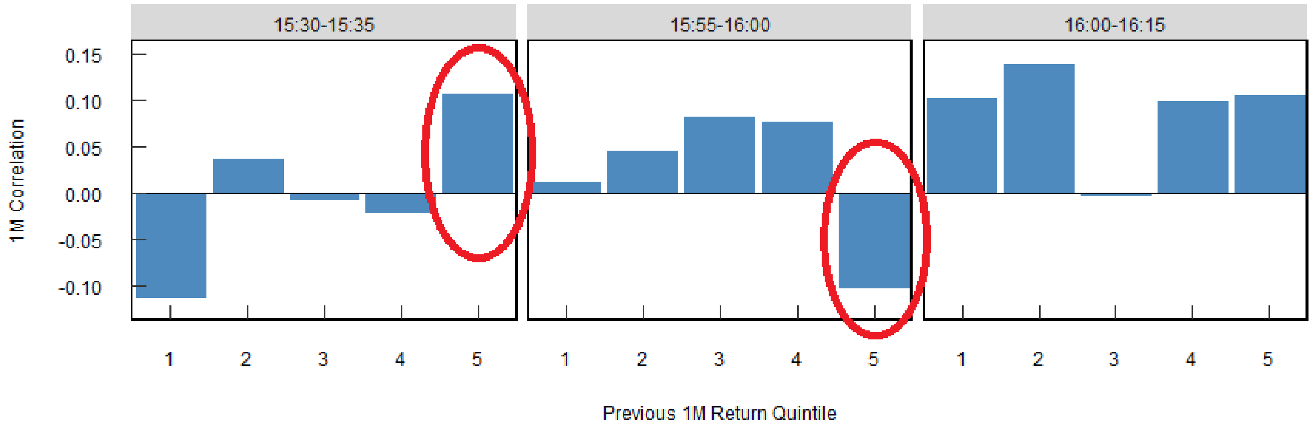


Source: J.P. Morgan

- In this report, we look to address whether the recent underperformance is due to crowding and propose a novel crowding measure based on market structure analysis. To do so, we focus on the order flow imbalance of ES futures in the last 45 minutes of the trading day. Order imbalance is defined as the difference in notional between buyer initiated and seller initiated trades in the front month futures, as a percent of the total notional of those trades. **A positive/negative correlation between the intraday return signal (from prior close to 15:30) and the imbalance around trade inception (15:30)/unwind (16:00) could indicate a large amount of intraday momentum flow.** Therefore, the correlation may be seen as a measure of crowding in such strategies.

- Evidence based on last 5 years of data suggest **there is crowding in intraday momentum strategies** conditional on past returns. Specifically, we find crowdedness tends to decrease following a period of poor strategy returns, and increase following a period of good returns. The empirical relationship is shown in **Error! Reference source not found.**, where we partition our prototypical strategy into 5 quintiles by previous monthly returns. As the Figure shows, when the strategy performance is strong (5^{th} quintile), signs of increased crowdedness are observed at both inception (15:30) and unwind (16:00). We observe the opposite, although to a less extent, when the strategy performance is weak (1^{st} quintile). The pattern does not persist into post market session (16:00 – 16:15). This further indicates that the 16:00 flow is technical, rather than information driven. Given the strong performance in 2020, it is likely that the strategy experienced strong inflow and subsequent crowding. Moreover, some variations of the strategy may unwind slightly earlier (say 15:55), causing performance decay on those which rebalance closer to 16:00.

Figure 2: Strategy prior 1M return quintile and subsequent order flow/return 1M correlation – evidence of crowding following strong returns



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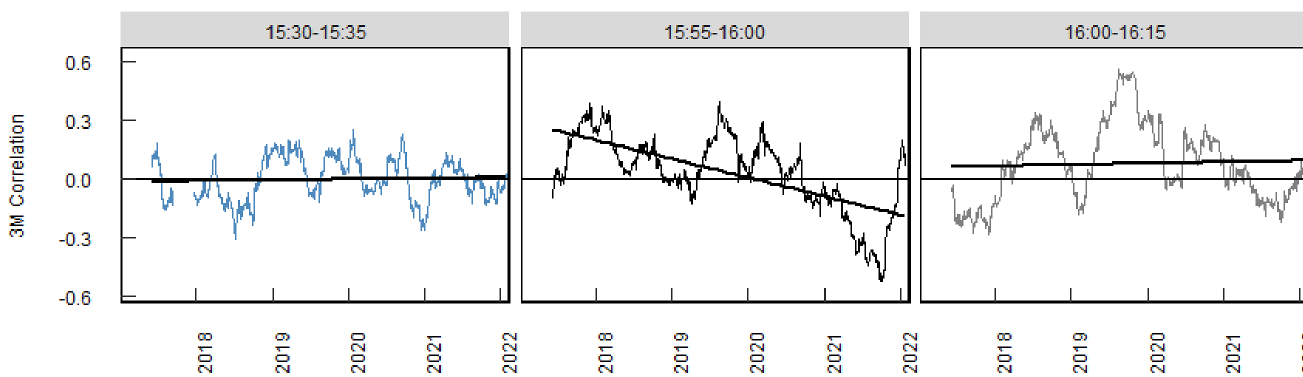
- Looking at the correlation over time in Figure 3, the correlation has, indeed, become more negative around market close (15:55 – 16:00) since 2020. However, the correlation at 15:30 remained largely constant over the years. Why is it we have not seen a corresponding increase in correlation around the time of trade inception? One reason is that the entry timing of intraday momentum strategy is much more varied than the exit timing. While the majority of the strategies exit around market close, they do not necessarily all enter at around 15:30. Therefore, crowding is likely less pronounced at our assumed trade inception time. We hypothesize another potential reason to be the change in the dealers' option gamma positioning, which may have applied a downward pressure on this correlation.

Figure 3: Correlation between prior close to 3:30PM return, and post 3:30PM ES futures order flows



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- In order to get a more dynamic understanding of gamma imbalance, we assign directions to SPX option trades based on their distance to the best bid/offer at the tick level, rather than the constant assumption of investors being outright long puts and short calls. Admittedly, an analysis of gamma exposure also depends highly on many other factors, including further assumptions on open interest, OTC options, and leveraged ETFs etc. For the purpose of this study, our analysis is only limited to the S&P 500 index options, a market segment which has direct impacts on the ES futures order flow.

- We find that the investor positioning in option gamma has tilted more and more towards negative imbalance, i.e. dealers becoming longer gamma (Figure 4). As previously introduced[1], dealers/hedgers who are long gamma tend to transact near the market close, and dampen the market moves. In recent years, the hedging activity has evolved to intraday trading. However there is still likely a bias towards trading near the end of the day given the higher market liquidity. The systematic long gamma hedging strategy therefore tends to favour mean reversion and supply liquidity to intraday momentum. This may be another factor that alleviates the crowding at the time of trade inception.

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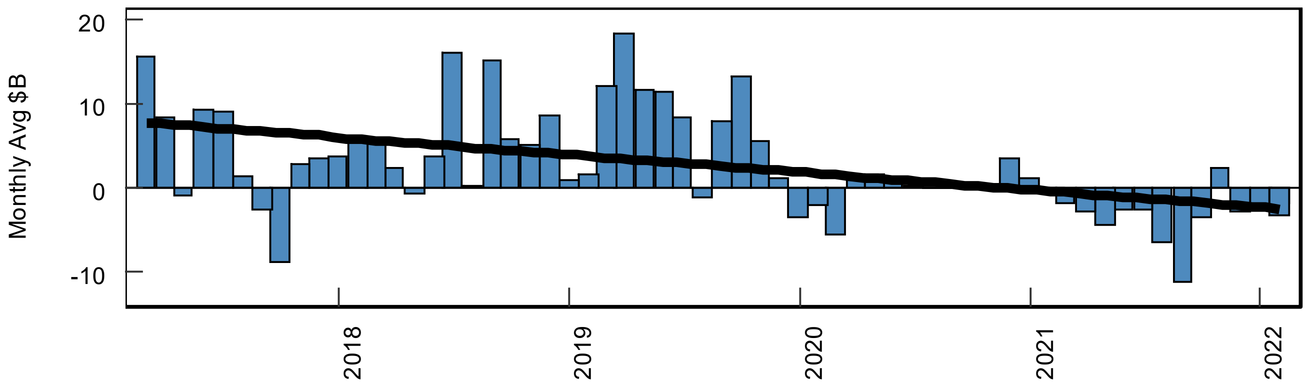
[1] Market Impact of Derivatives Hedging – How Index Options and Variance Swap Hedging Impac the Market Near the End of a Trading Day, Kolanovic and Bharwani, 22 Oct 2008

Figure 4: We estimate investor side gamma imbalance on SPX options to have declined in the past 5 years



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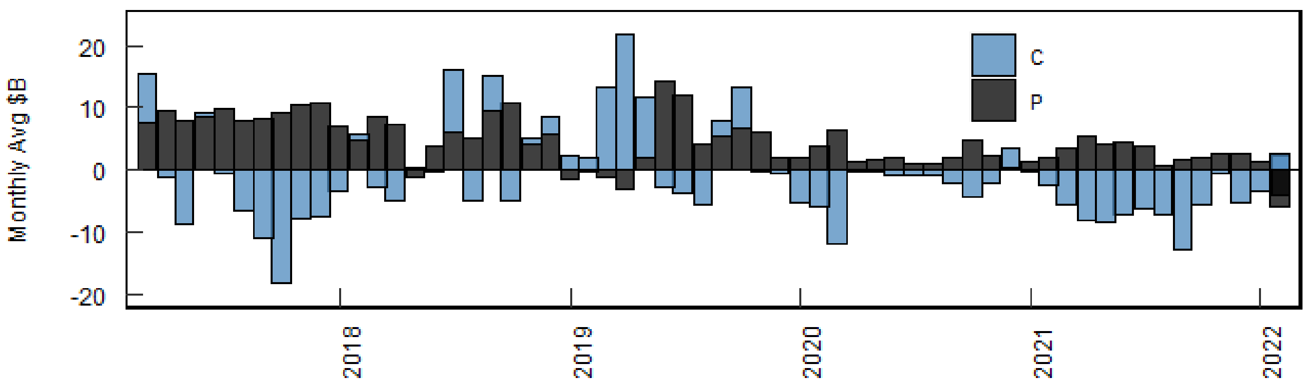
- Decomposing the gamma imbalance time series into calls and puts, it appears that dealers used to be heavily short SPX put gamma but have reduced that exposure substantially post 2018 (Figure 5). Between 2017 and 2019, the average put gamma outstanding declined around 30% yearly, and declined even further over the last two years. This could be due to a combination of decreased risk appetite of dealers to be short put gamma, and a change in the investors' hedging preference (from outright put options to put spreads).

Figure 5: The decline in gamma imbalance appears to be mainly driven by put options



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- In conclusion, using high frequency E-mini futures order flow data and a novel measure of crowding, our market structure analysis finds evidence of crowding in intraday momentum strategies following the strong performance in 2020. In addition, we find possible changes in dealer gamma positioning in recent years, which may have also favoured mean reversion into the market close.

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