

Equity Alpha Signals from High Frequency Option Data

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Characteristics of High Frequency Option Data



- Trade and quote data (TAQ) disseminated by Option Price Reporting Authority (OPRA)
- High dimensionality:
 - 1,169 option classes observed on AAPL between Jan and Aug 2015 (Andersen et al., 2019)
 - Calls/puts, maturities, strikes, etc.
 - Greeks: delta, gamma, etc.
- High quote-to-trade ratio:
 - Ratio of 2,914:1 on AAPL option chain
 - Ratio of 12:1 on AAPL shares
- Nonstationary option chain



■ Literature review

- **Proprietary data:** Volatility Information Trading in the Option Market, by Pan and Poteshman, 2008
- **Dark trades and subpenny prices:** Tracking Retail Investor Activity, by Boehmer, Jones, Zhang and Zhang, 2021
- **Exchange classification:** Losing is Optional: Retail Option Trading and Earnings Announcement Volatility, by Silva, Smith and So, 2022
- **OPRA condition code:** Retail Trading in Options and the Rise of the Big Three Wholesalers, by Bryzgalova, Pavlova and Sikorskaya, 2022

Retail order flow in US equity options



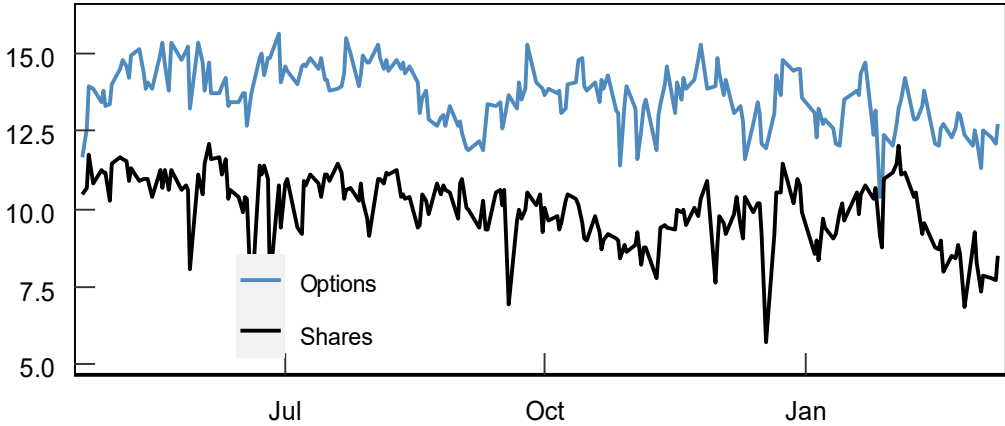
■ Why retail option order flow matters

- Retail activity in options market is substantially higher than cash equity market
- Option imbalance contains additional information not found in cash equity imbalance due to the low correlation

■ Coverage

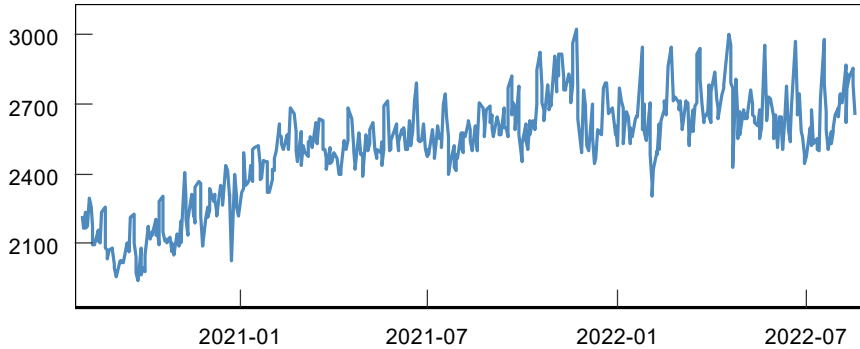
- ~3,000 daily (single stocks, ETF, equity indices) between Aug 2020 and Aug 2022

Figure: Estimated retail market order as % of total market volume



Source: J.P. Morgan

Figure: Names covered in the dataset



Source: J.P. Morgan

Source: J.P. Morgan

Retail order flow in US equity options



- Retail traders participate most in
 - Large caps
 - Technology, industrial, communication sectors
 - Equity ETFs, including SPY, VXX and QQQ (the contrasts to index options, such as SPX, VIX, and NDX)
 - Leveraged ETFs
 - Calls outweigh puts
 - Short-dated near the money options

Figure: % Distribution of estimated retail market orders by moneyness and maturity

	> 110%	4%	6%	4%	3%
Moneyness	101% - 110%	26%	10%	3%	1%
	90% - ATM	22%	7%	3%	1%
	< 90%	3%	3%	2%	1%
		<= 1W	1W - 1M	1M - 3M	> 3M
		Maturity			

Source: J.P. Morgan

Source: J.P. Morgan

Figure: Estimated order imbalances as % of total retail orders

	> 110%	0%	0%	2%	1%
Moneyness	101% - 110%	2%	2%	3%	3%
	90% - ATM	0%	-1%	0%	1%
	< 90%	-2%	-4%	-5%	-3%
		<= 1W	1W - 1M	1M - 3M	> 3M
		Maturity			

Retail order flow in US equity options



■ Signal

- Standardized order imbalance (SOI) measure considers the direction of delta for call and put options and scales the order imbalance by the volume traded

■ Back test

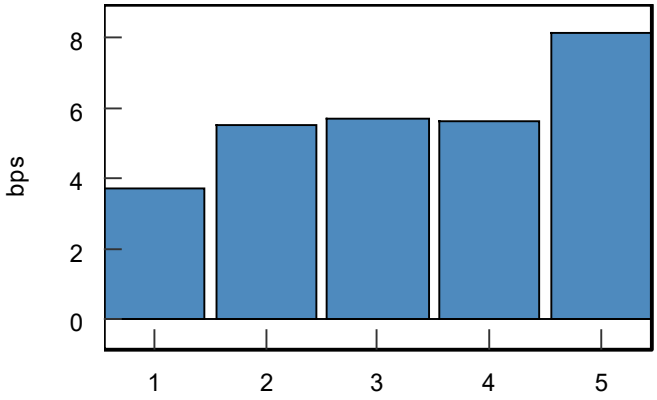
- Long stocks with the highest retail option buying pressure vs. short the lowest, equally weighted. Trades entered at T+0 market close, exit at T+1 market close.
- Information Ratio = 2.1

■ Overlay on cash equity retail order flow

- Information Ratio = 3.5

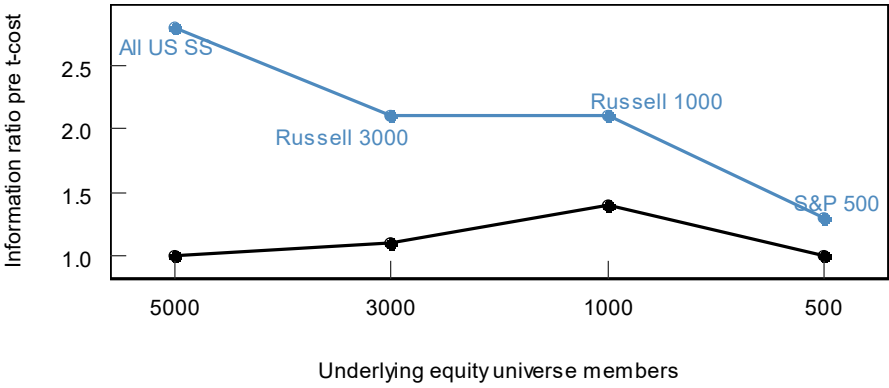
Source: J.P. Morgan

Figure: Performance of SOI by quantile (5 = high buying pressure), option only signal



Source: J.P. Morgan

Figure: IR various stock universes (Blue = close to close, Black = open to close)



Source: J.P. Morgan



■ Literature review

■ Leveraged ETF Gamma:

- Understanding Ultrashort ETFs, by Deshpande, Mallick, and Bhatia, 2009
- Path-Dependence of Leveraged ETF Returns, by Avellaneda and Zhang, 2010

■ Option Gamma:

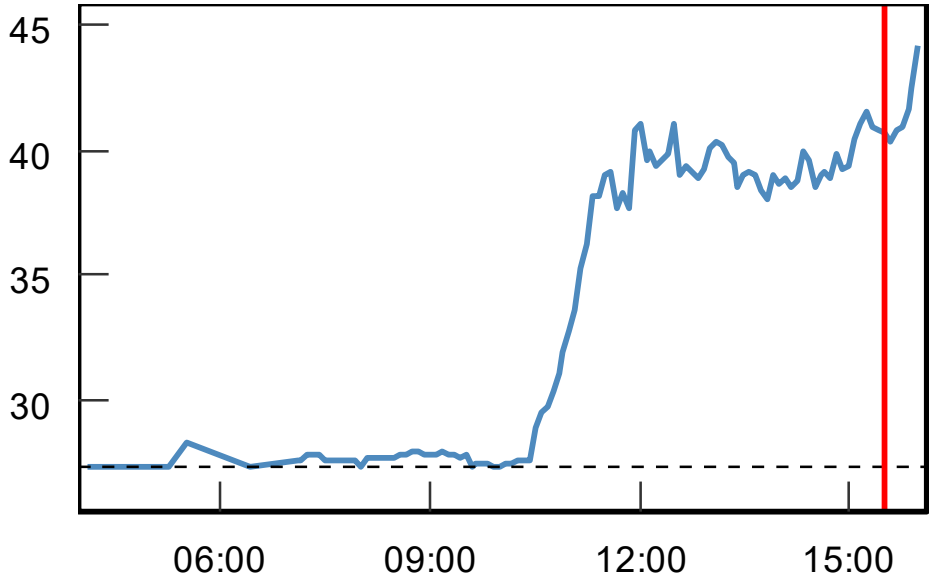
- Market Impact of Derivatives Hedging, by Kolanovic and Bharwani, 2008
- Gamma Fragility, by Barton and Buraschi, 2020
- Hedging Demand and Market Intraday Momentum, by Baltussen, Da, Lammers and Martens, 2021

End of Day Price Patterns



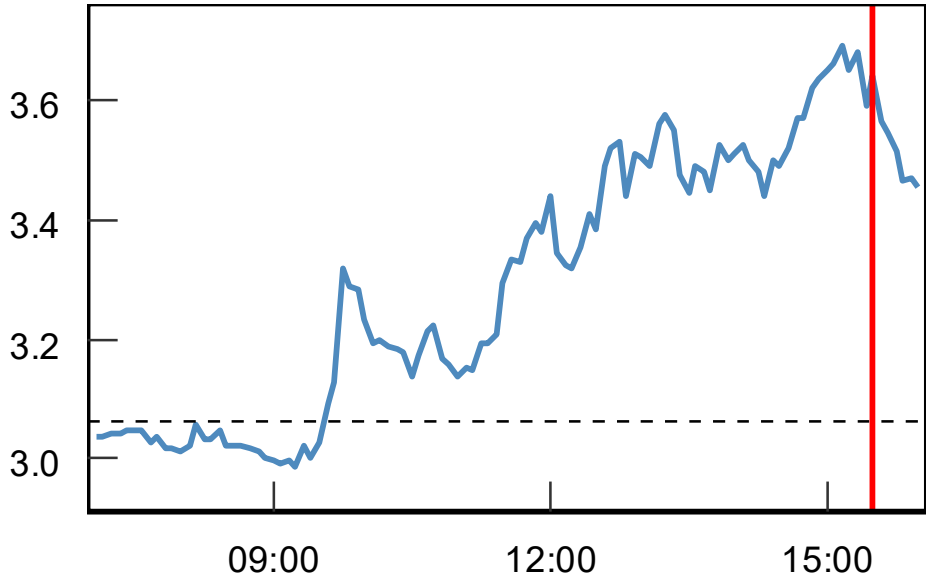
- End of day momentum: dealers short gamma, investors long gamma
- End of day reversal: dealers long gamma, investors short gamma

BBBY on 2021-06-02 (red = 15:30)



Source: J.P. Morgan

GME on 2020-10-15 (red = 15:30)



Source: J.P. Morgan

Source: J.P. Morgan

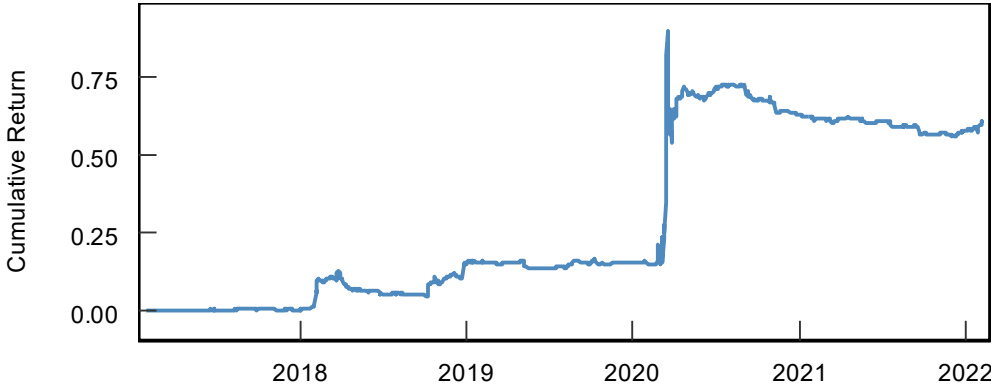
Intraday Pattern from Option Gamma Imbalance



- S&P option gamma exposure now more balanced than pre-pandemic

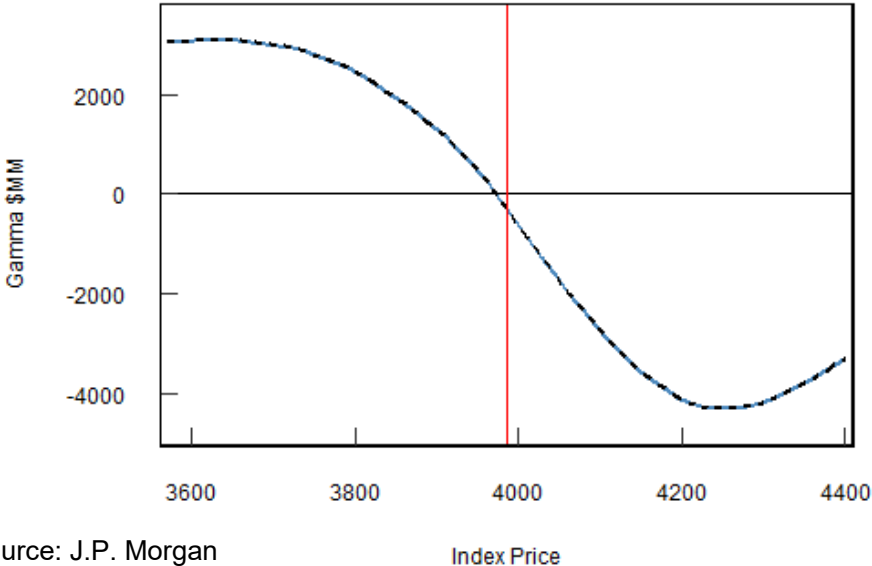
- Dealing desks less inclined to be short left tail gamma
- Clients now prefer put spreads to outright puts for hedging
- Observable implications on intraday price pattern

Figure: Intraday momentum strategy deteriorated recently in SPX



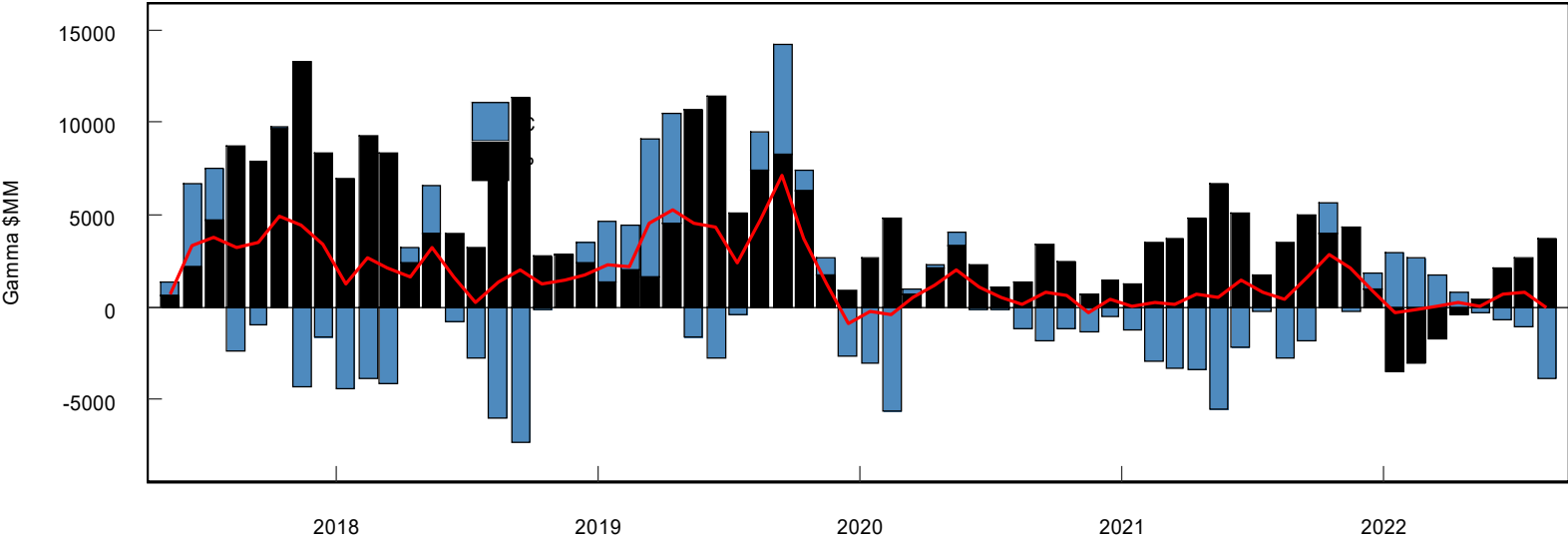
Source: J.P. Morgan

SPXSPY Gamma per % change
Current Gamma = -490.98 SPX Spot = 3986.16



Source: J.P. Morgan

SPXSPY Gamma history

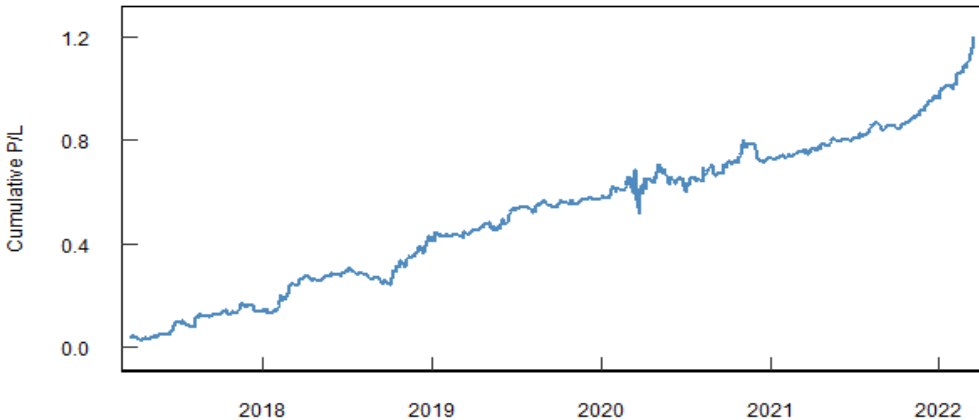


Intraday Pattern from Option Gamma Imbalance

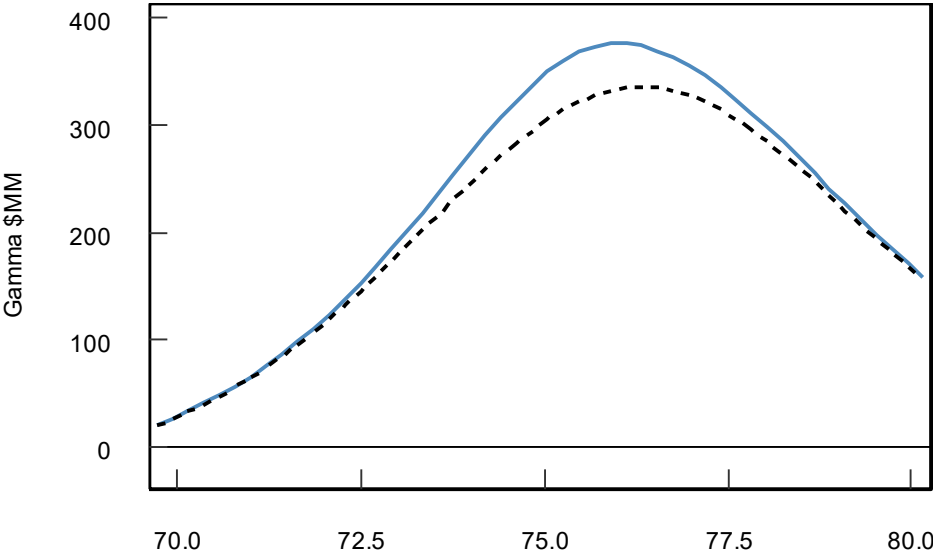


- HYG option gamma has been consistently positive
 - Investors have an increasing demand of long gamma particularly after 2020
 - The demand for put gamma persists and supply of call gamma diminishes
 - A favorable market condition for momentum strategy

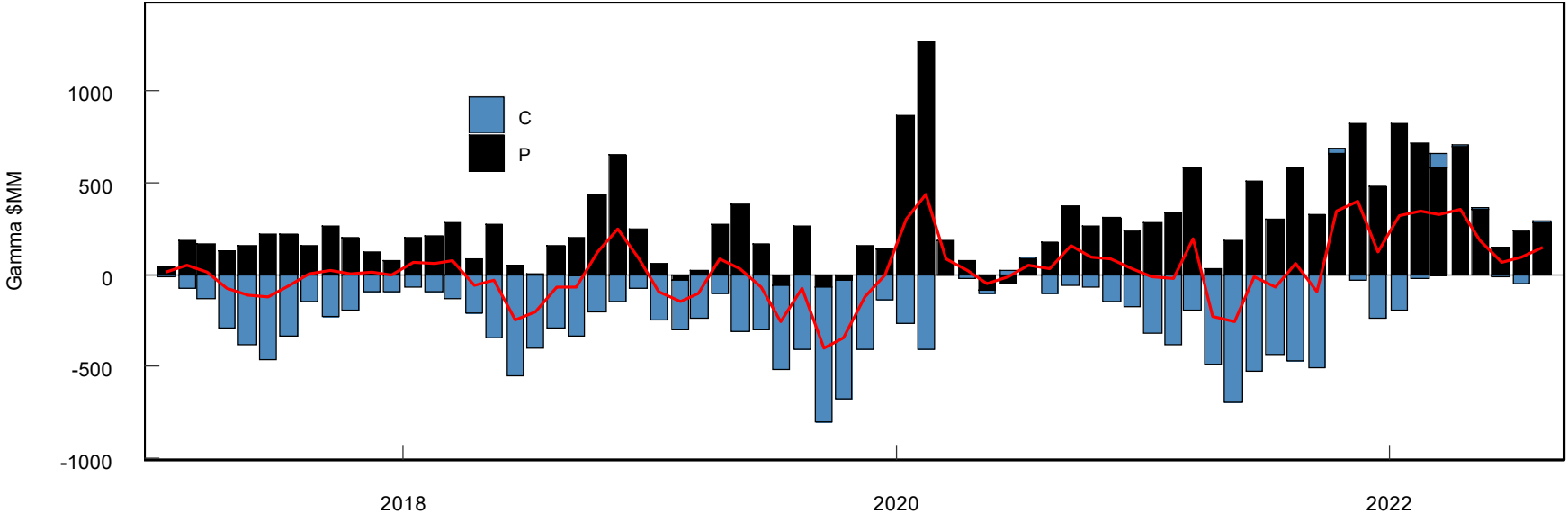
Figure: Intraday momentum strategy continued to persist in HYG



HYG Gamma per % change
Current Spot = 74.94, Current Gamma = 332.16



HYG Gamma history



Source: J.P. Morgan

Stock price

Intraday Pattern from Option Gamma Imbalance



Option gamma imbalance as stock selection signal

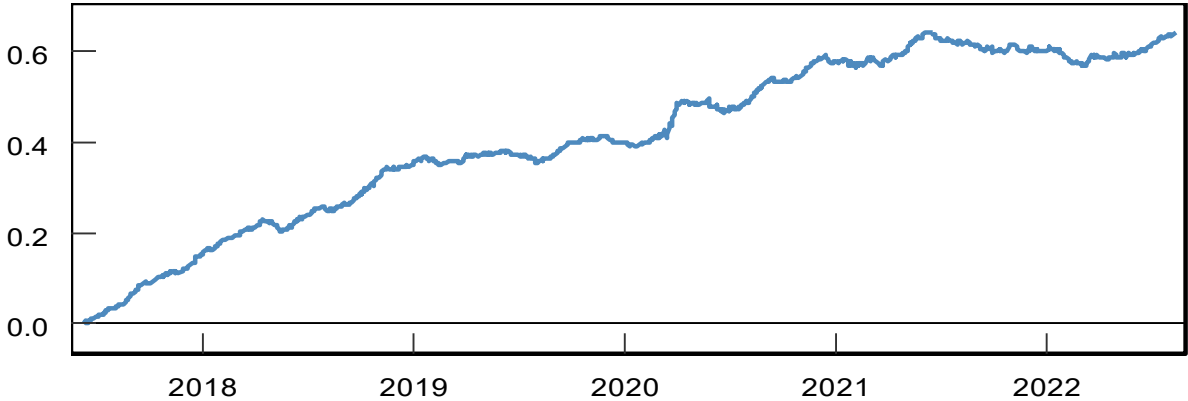
- Hedging pressure $\%_{i,t} = \frac{Gamma_{i,t-1} \cdot ret_{i,t}}{1M \$ACV_{t-1}}$
 - $Gamma_{i,t-1}$: dollar amount to trade per $\pm 1\%$ move in spot based on order imbalance on day t-1
 - $ret_{i,t}$: the % return from market close on day t-1 to 15:30 ET on day t
 - $1M \$ACV_{t-1}$: 1 month average closing volume between 15:30 and 16:00 as of day t-1

Back test

- Universe: 345 stocks with most liquid option trading over the last 5 years
- Tradable universe is rebalanced monthly: most liquid 200 names
- Sort securities into deciles based on hedging pressure %
- Long securities in the 10th decile (greatest buying pressure)
Short securities in the 1st decile (greatest selling pressure)
- Information ratio = 3.4

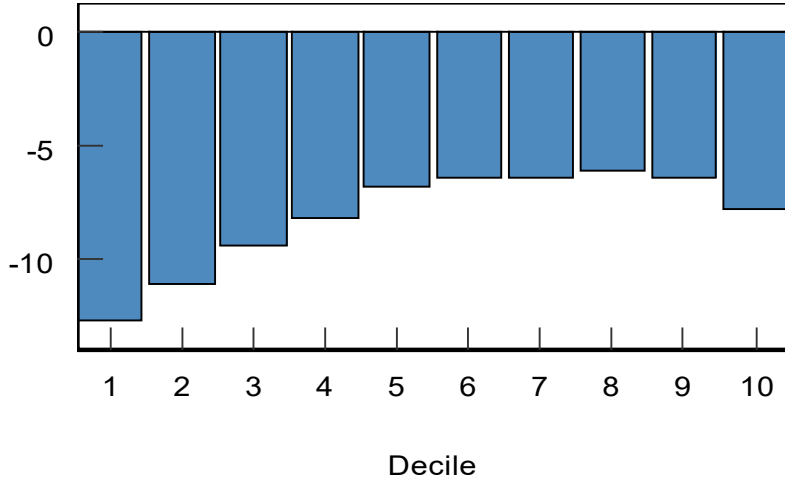
Source: J.P. Morgan

Figure: Performance of long/short equity strategy based on option hedging pressure



Source: J.P. Morgan

Figure: Signal return (bps) by decile



Source: J.P. Morgan



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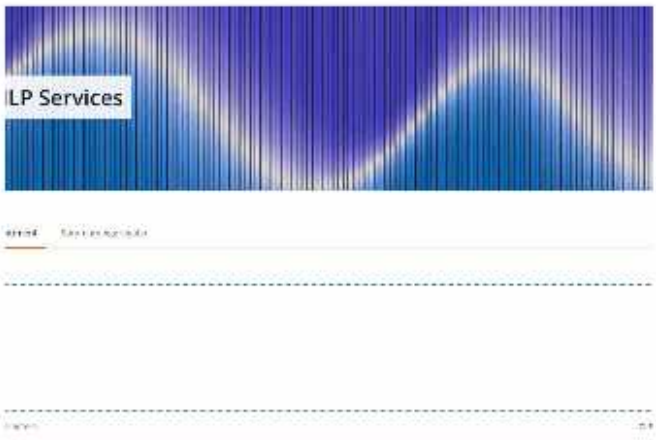
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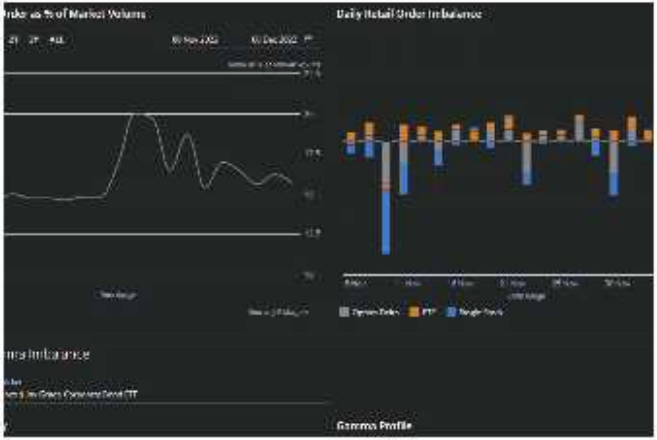
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