Market Scan Primer

DISCLAIMER

Deep Dive Stocks is not an investment advisor. The information contained in this primer is intended only for educational purposes to highlight the applicability of VoEx in a variety of hypothetical portfolio styles. No information here is intended to be offered or construed as individual investment advice, targeted investment advice, or any investment advice aimed at any one person or persons, portfolio or portfolios, objective or objectives. It is important to remember that past performance does not beget future performance and there is always risk in investing in the market.

Introduction

The market scan is designed to identify stocks that have a high probability of predictable outcomes. To achieve this goal, every day the entire market is filtered through several layers to identify stocks that are in fortuitous conditions with known probabilities of price-action as per the following research.

There are three scans currently: the first identifies stocks that are in a gamma squeeze, the second identifies stocks that have experienced significant changes in VoEx, and the third identifies stocks that have sustained and elevated VoEx values. Let's take a look at each of these metrics, and investigate how the stocks are captured, what it means, and what their probable outcomes are.

Gamma Squeezes

When a stock has a predominance of dealer short delta, it is said to be in a gamma squeeze. In such environments once can expect significant amounts of delta-hedging to occur ipsilateral to the price-action: if the price rises, the delta-hedging will be geared towards purchasing; if the price drops, the delta-hedging requirements will be geared towards selling.

Traditionally, it has always been worthwhile to identify stocks that are in a gamma squeeze under the assumption that they typically experience greater swings in price than the market is expecting. This typically creates very profitable environments for investors who engage in options. The increased range of price-action is not typically priced-in to the value of the option, nor is the increase in volatility that typically follows these drastic price swings. Combined, these two factors produce much larger increases in the value of options on the underlying, and represent a significant edge.

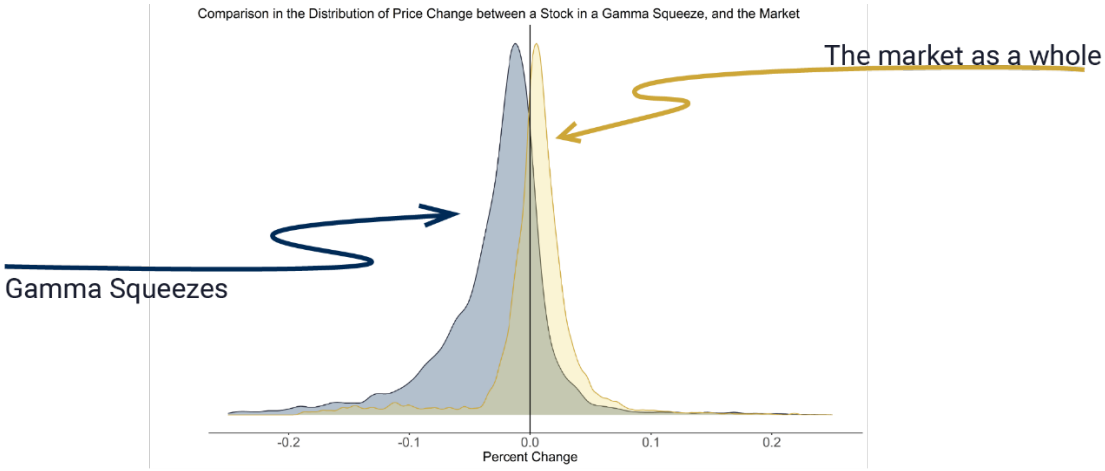
A total of 615,723 data points are included in these analysis!

This gave 14,567 distinct time-intervals!

Deep Dive Stocks investigated if its market scan could selectively find high-yield profitability in stocks experiencing a gamma squeeze beyond this common-edge. To do so, the entire market for the past three years was screened for any moments of gamma squeezes. Every time a gamma squeeze was detected, the date, price, and delta values were recorded until the gamma squeeze ended. Then, the daily change in price from the closing price of the day the gamma squeeze started was computed.

From there, for every gamma squeeze that occurred on every stock, the date interval of the gamma squeeze was extracted, and the same price calculations were performed on the S&P 500 ($SPY). This allowed side-by-side comparisons of stocks in a gamma-squeeze and the broader market on a significantly granular level.

The results of the investigation are seen below in the density plot of returns over the given periods of gamma squeezes as compared to the S&P 500, for the same time intervals. There are several interesting features to be noted.



The first finding is that the highest probability for a stock's change in price during a gamma squeeze is negative. That means, the majority of the time when a stock goes into a gamma squeeze, it will experience net negative returns.

Another interesting feature is that the probability of negative returns, even when compared to a negative market, is still significantly higher in the gamma squeeze cohort. This means that even if the market overall experienced negative returns on the same interval of time that a gamma squeeze was occurring on a randomly selected stock, it is still more likely that the randomly selected stock would still experience a greater decrease in price than the S&P 500.

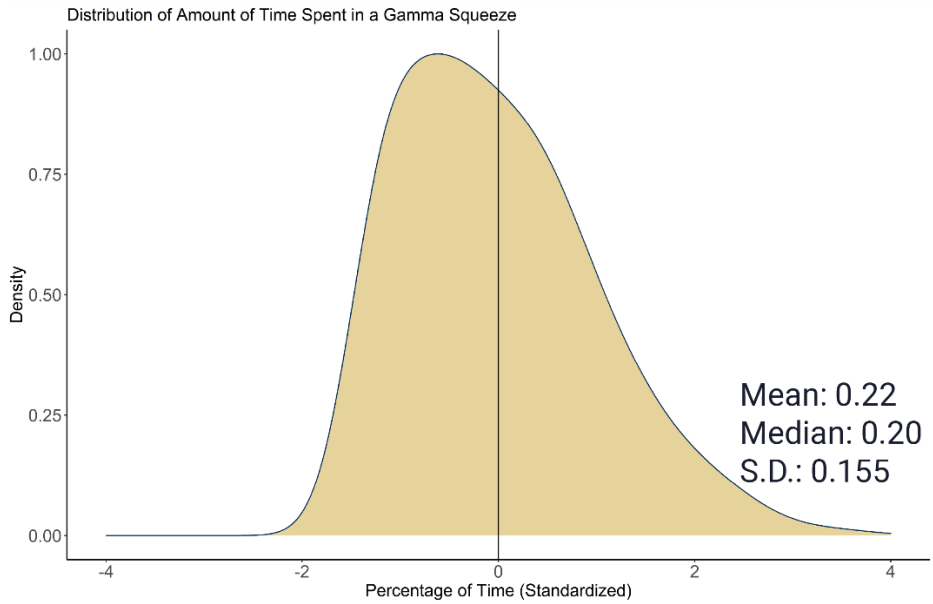
The inverse is true, however: with stocks in a gamma squeeze that experience positive gains, these gains are significantly less than the market as a whole, during the same time period, when the stock in a gamma squeeze is chosen at random.

These findings are interesting but keeping in mind the purpose of the gamma squeeze market scan is to find the stocks that have the highest probability of the highest amount of price change. The question becomes, could we narrow down these stocks even more so to give an even greater edge to our trading?

Turns out, we can! (Somewhat.)

Gamma Squeezes: Time Spent

Looking at the distribution of time spent in a gamma squeeze gives the following graph:



The graph shows us the distribution in the amount of time that the stocks in the stock market exist in a gamma squeeze. How un-ironically abnormal. Thankfully, it suggests there may be groups hidden inside of this distribution, and if there are hidden groups inside this distribution, do they have unique characteristics that are associated with price-action? Let's find out!

First, let's find out how much time, on average, each stock spends inside of a gamma squeeze as a metric of trading days, and then normalize those values. These normalized values allow for separation based on their respective place in the distribution, as compared to the market as a whole, and can be tested for their respective significance of difference.

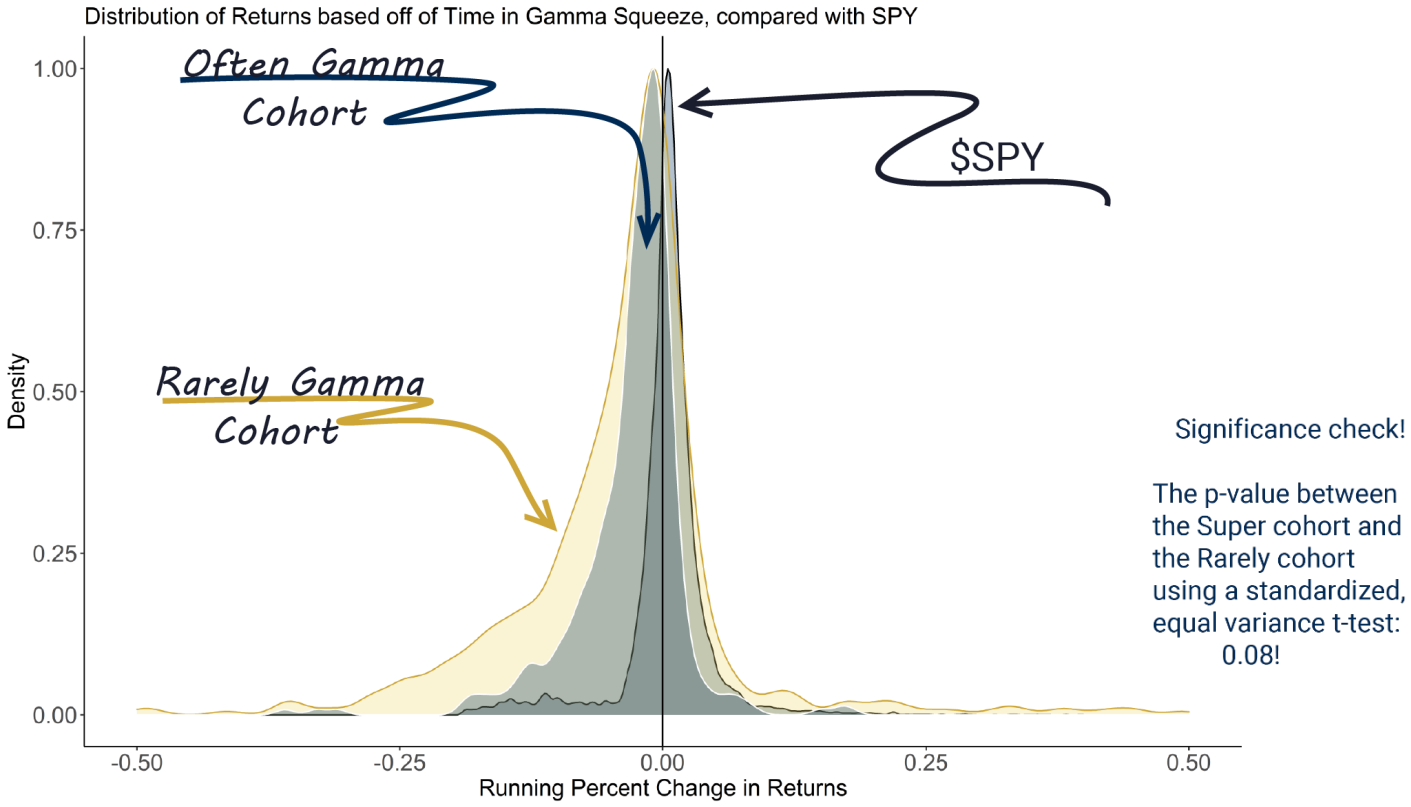
The results?

Group	Time in Gamma Squeeze	Amount of Stocks	p-value
More than Average	> 0 STD (>22 %)	2203	0.00
Fewer than Average	< 0 STD (<22%)	2667	<0.01
Often-Gamma Squeeze	>= 1.5 STD (>45%)	407	0.00
Rarely Gamma Squeeze	<= -1 STD (<6%)	848	0.00

*STD: Standard Deviation

The filtration process identified two main distinct groups: the often-gamma squeeze (OGS), and rarely-gamma squeeze (RGS) cohorts. These two groups demonstrated the greatest difference in price-action as compared intra-cohort and to the market that were statistically significantly different with an alpha value of 0.08.

The performance of these three groups is shown below:



Dividing the market into these two cohorts immediately allows for drastic improvements in the predictability and probability of known returns:

1) For both cohorts, a negative return is the greatest probability of return,
2) The stocks that belong in the OGS cohort have more narrow range of price-movement than the RGS cohort, but not $SPY,
3) The stocks that belong to the RGS cohort have significantly wider distribution of returns, and a significantly higher probability of those returns, as compared to the OGS cohort and $SPY,
4) The S&P 500 always outperforms the OGS cohort for positive gains, except for the RGS cohort, and has the highest probability of positive gains.

So, in short: the stocks that exist in the RGS have the highest probability of greater-than-expected moves in price, as compared to both the often-gamma cohort and the S&P 500. That is pretty useful to know!

If one were trying to decide which bet to take with only the knowledge of which cohort the stock belonged to, breaking the data down in this manner would immediately provide a statistically significant advantage!

There is one more group of stocks that hasn't yet been mentioned: the perpetual gamma-squeeze (PGS) cohort stocks. These stocks have greater than 2.5 standard deviations of time spent in a gamma squeeze as compared to every stock. Although not shown here, these stocks have the highest probability of returns at almost perfectly zero (-0.3% median change, -1.6% mean), and are exclusively excluded from the market scan due to their lack of statistical edge.

So now that we have identified the stocks that have the highest probability of greater-than-expected returns that are in a gamma squeeze, what can we expect their price action to be?

There are 77 stocks that are perpetually in a gamma squeeze!

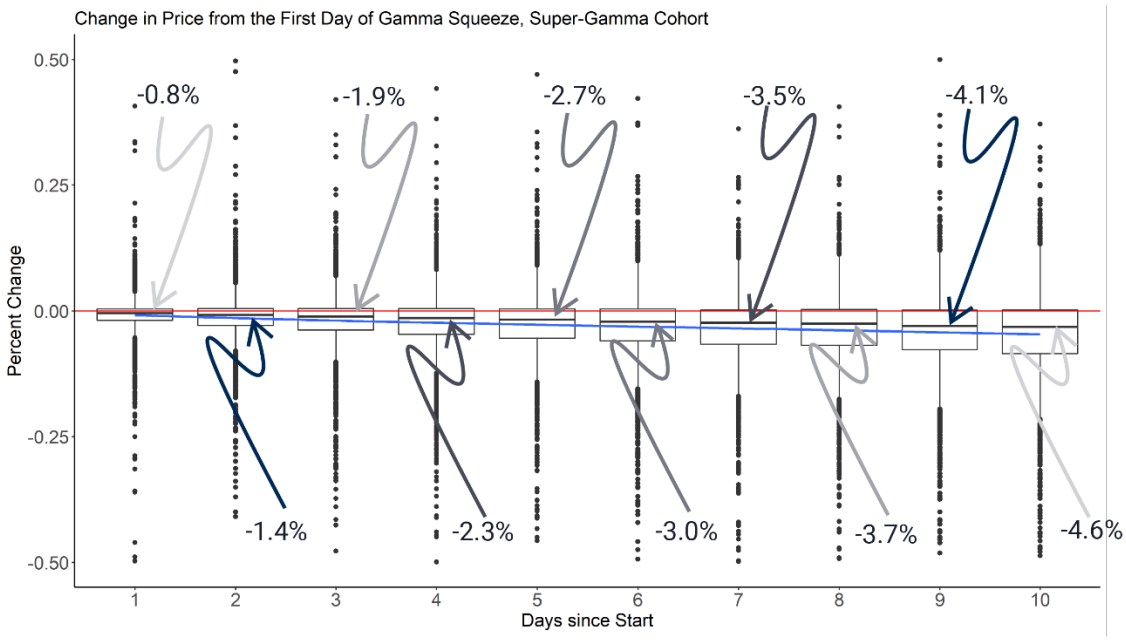
These stocks spend an average of 78% of the time in a gamma squeeze with near-zero price movement!

These stocks, and the stocks belonging to the rarely-gamma, and often-gamma are listed in the back.

Gamma Squeeze's Expected Price Action

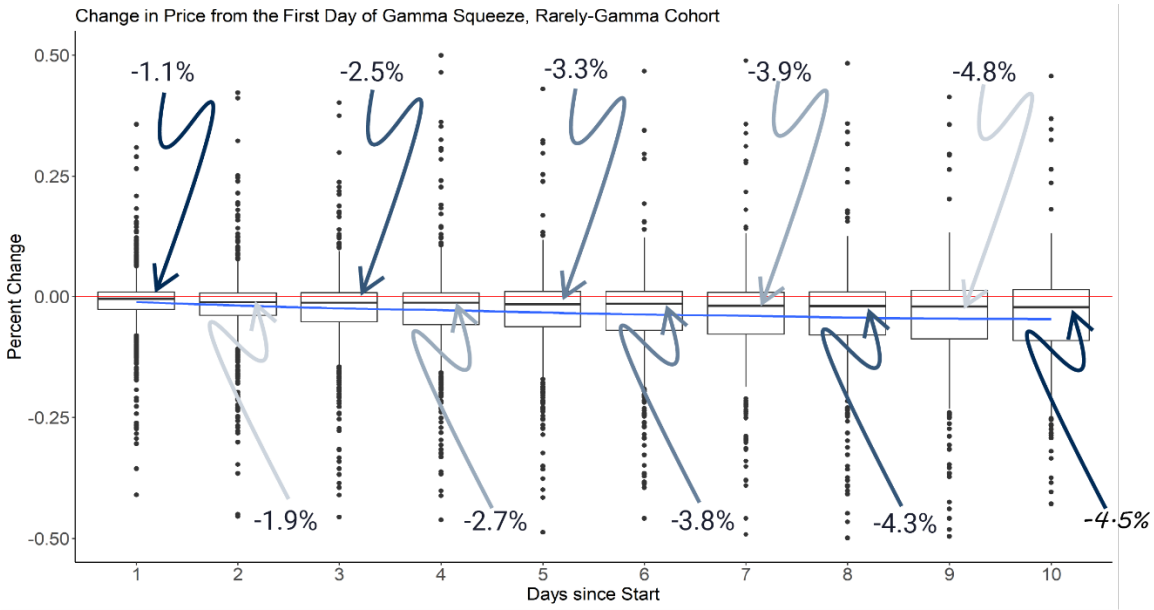
Let's take the data from before, but this time transform it so that we have the amount of change on a daily basis for gamma squeeze interval for every stock. Now, we can then graph the change in price as a function of the starting price of the gamma squeeze for each cohort.

The greater cohort:



The blue line indicates the running average for individual boxplot, the values indicated by the arrows show mean change in price.

Looking towards the stocks that are rarely in a gamma squeeze: the lesser cohort:



A similar trend of increased negative returns the longer a stock is in a gamma squeeze emerges. On average, approximately 20% of stocks end their gamma squeeze each day, and those that persist see continued decline in price. Additionally, it appears that stocks in the RGS cohort typically experience a much greater decline in price in the first few days than do those apart of the OGS cohort.

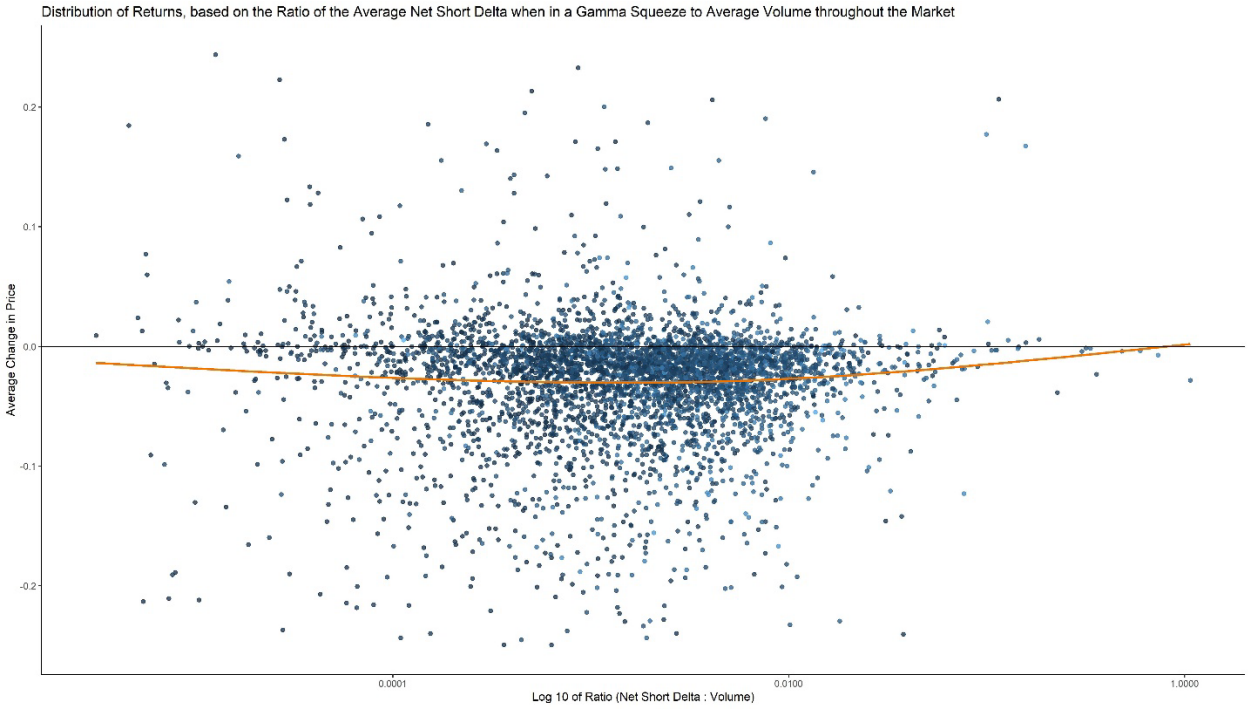
Yet this affect seems to level off the longer the rarely-gamma squeeze cohort stock is in a gamma squeeze.

Expanding off of the time spent in a gamma squeeze, Deep Dive Stocks investigated as to whether there was as "strength" associated with the notational value of the net short delta and the amount of price movement. Let's have a look at that.

Detailed investigation into the daily price change for gamma squeezes are laid out in the Gamma Gainers Handbook (and Market Scan – Gamma Squeezes for Premium Members). Digging deeper into this phenomenon demonstrated more nuanced price behavior and how it relates to the gamma values and liquidity. Be sure to check it out!

Strength of Gamma Squeezes

Using the same data, if we look at the average amount of net short delta on a stock when it is in a gamma squeeze, as compared to the average volume of the stock over the duration of the squeeze, we get an interesting graph:

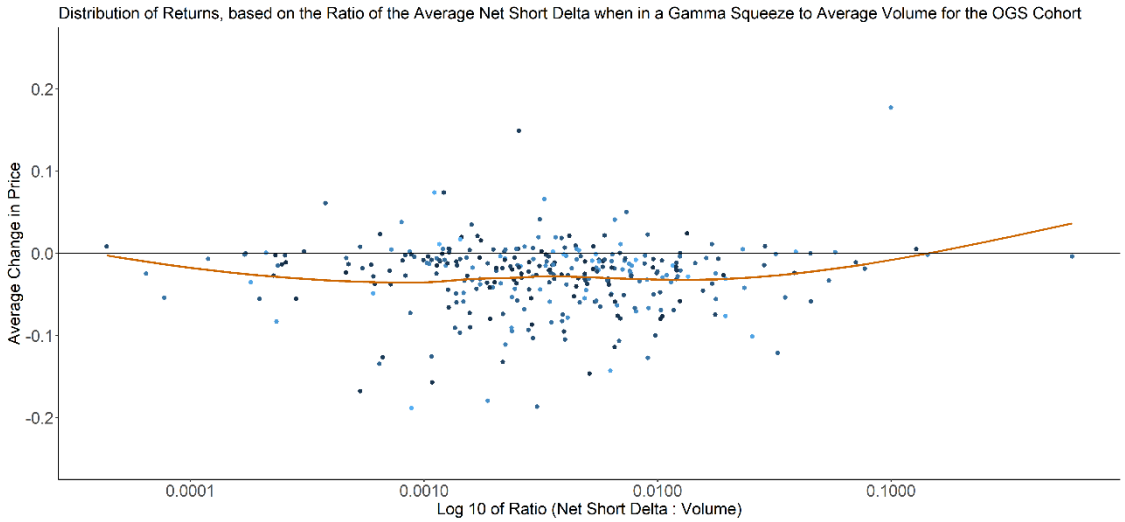


The graph shows the association between the ratio of the net short delta to the volume on a stock when in a gamma squeeze, and the average change in price over the entire interval in which it is in a gamma squeeze.

Surprisingly, there seems to be an association whereby the closer the amount of short delta to the average volume on a stock, the less the negative returns are! This is slightly counter-intuitive as one might expect that the greater the (negative) value of the short delta, the more influence it would have on a stock's price.

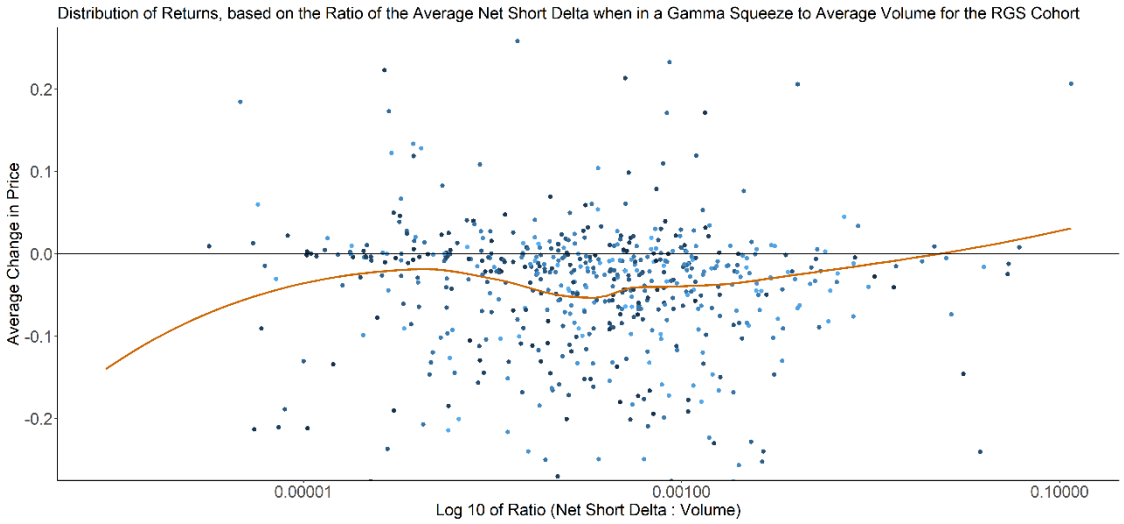
If we separate out the cohorts again into the greater-gamma squeeze and the rarely-gamma squeeze, we get the following graphs:

The OGS cohort below suggests there is an interval of optimal price movement expectations where values less than 0.1 and greater than 0.001, you can expect the most negative returns.



$$Ratio = \frac{Net\ Short\ Delta}{Average\ Volume} = y = \sum_{i=0}^{k} \frac{\delta_{i,l} + \delta_{i,s}}{Volume}$$

For the RGS cohort below, a similar pattern emerges except for the lower ratio counts, where the data suggest the lower the ratio, the greater the negative returns.



What is particularly interesting about this is that there has always been a long-standing beilef that the greater the "hedging requirements" of a stock, the greater the influence it would have on the price-action – yet if this were the case, one would expect almost opposite trends: where a ratio closer to 1 (where the amount of short delta-share-equivalence is equal or near equal to the volume) would see more negative returns due to an increase in hedging reqiurements that would occur in the negative price-action direction.

Although outside the scope of this pirmer to investigate the reasoning behind this phenomena, it adds an interesting bit of information to ponder.

Conclusion and What it Means for the Market Scan

There was a lot to go over with just gamma squeezes! First, we discussed how there were statistical differences throughout the market in terms of how often a stock is in a gamma squeeze.

From there based on the time spend in a gamma squeeze, the stocks were separated out: the Often-gamma squeeze (OGS) cohort are those that experience greater-than-average (>=1.5 standard deviations), and the Rarely-gamma squeeze (RGS) cohort are those that are rarely in a gamma squeeze (RGS; <= -1.0 standard deviation).

Analyzing the data from the perspective of those cohorts, the distribution of returns over the entire period of the gamma squeeze could be compared with the same-interval distribution of time for the whole market. It was noted that although the OGS cohort still had higher probabilities of greater-than-market negative returns over the same period, the RGS cohort outperformed both the market and the OGS extensively.

The market was further investigated to see if the amount of short delta on the stock was a significant factor in determining the trend in price-action. This ratio demonstrated that the stocks in a gamma squeeze that will experience the most negative move in price are those that have a ratio less than 0.01 for both cohorts, as greater ratios may predict more-positive returns.

So, in identifying the stocks and placing them either in the rarely-gamma squeeze, greater-gamma squeeze, or market-as-a-whole (neither), we can now map out their price-trajectory using the data above and have the tools to select for those stocks.

For information on how the stocks are chosen and how the data is present on the Market Scan (or Gamma Gainers Newsletter), be sure to check out the Gamma Gainers Handbook or the Market Scan – Gamma Squeezes.

Drastic Changes in VoEx

The idea is that when a stock experiences a drastic change in VoEx, there are several deterministic changes in price that are most probable. Since VoEx is a measure of underlying stability on a stock, when this stability shifts drastically in one direction or another, there may be price-action consequences worth keeping an eye out for.

Quick Reminder!

VoEx > 0.5:
inhibitory pressure

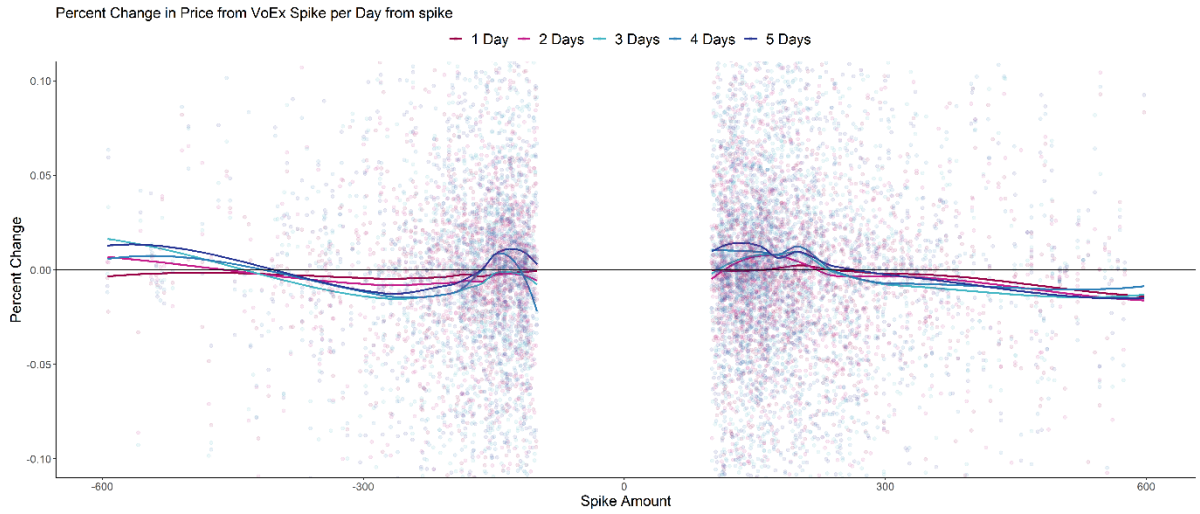
VoEx < -0.5:
propagation pressure

To investigate, let's scan the market for stocks that meet the following criteria in the past year:

1- Has a volume of at least 5,000,000,
2- Has been trading for at least 1 trading year (282 days),
3- Has a |VoEx| >= 0.5,
4- A change in VoEx of at least 100% from the day prior.

The volume and trading times are to protect against low liquidity stocks and stocks that may still be undergoing price-discovery, respectively. Additionally, filtering out the stocks that have VoEx's residing within the stability zone helps select for stocks that are already unstable to some degree. Using these metrics, a total of 12,445 instances of significant VoEx changes were identified.

From there, we can map out the occurrences of drastic changes in VoEx against the change in price over the subsequent five days. Here's what was found:



Incredible! The x-axis here represents the spike amount of VoEx from the day prior, and the percent change represents the percent

change in price. It seems that with positive VoEx spikes, there is a direct relationship between the strength of the spike and the price response.

For positive spike strengths, the greater the strength, the more negative the price action. For negative VoEx spike strengths, prior to -400 the price-action is negative whereas after -400 the price action becomes increasingly positive.

This graph is particularly useful in that it shows the *evolution* of the price: if you pick a spike amount, you can map out the percent change in price from the day of the spike up to 5-days.

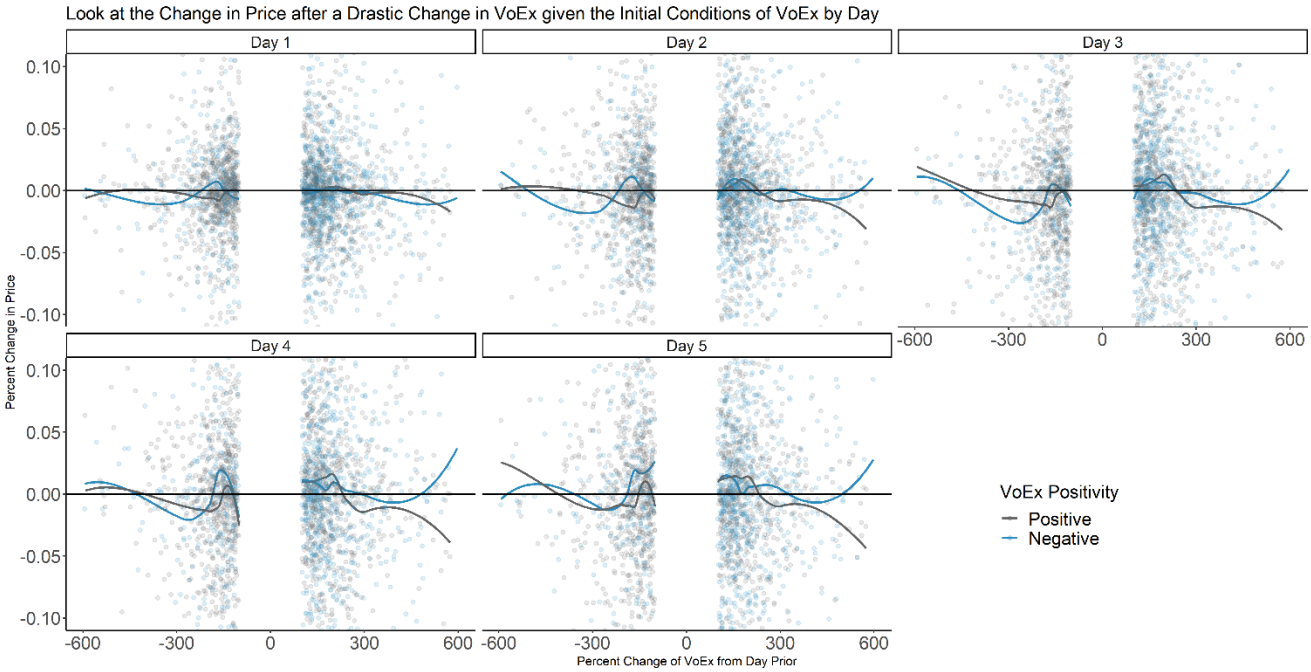
For instance, we see if VoEx experienced a -300 spike amount, then we could expect the following changes:

Date	Change in Price from Spike	Change in Price from Day Prior
1	Negative	-
2	Negative	Negative
3	Negative	Positive
4	Negative	Positive
5	Negative	

The data is showing us that on days 4 and 5, a slight rebound in price is the most likely outcome, but that the price will still be overall negative from the instance of the VoEx Spike.

Yet – what if VoEx was initially negative or positive? Wouldn't that make a difference? Suppose that VoEx was -5 and jumped to -1 versus if VoEx was 1 and jumped to 5?

To investigate this, let's divide the data set into two distinct groups: those that had negative VoEx values and those that had positive VoEx. In doing so, of the 9,870 catches, 4,935 had negative initial VoEx, and 7,510 had positive initial VoEx. Here are the results:



There is quite a difference in the behavior the price-action of a stock when the initial VoEx values are tweezed out! There are a lot of interesting trends to find here.

Initial VoEx	Positive Spike	Negative Spike
Positive	Generally negative price action if spike > 200.	If the VoEx spike is greater than -400: negative, else: positive
Negative	Day 1: Generally Negative Day 2+: If spike value is >= 500, positive, else: Negative	Overall negative price action, unless extreme VoEx spike

Again, it is important to remember that these prices are calculated as a change in the price on the day that the VoEx spike occurred: so, day 1 is 1 day after the VoEx spike. The trends seen in the graph are statistically significant to an alpha of 0.32[1],[2].

What is most interesting here is that it indirectly verifies VoEx: if large changes in VoEx have statistically significant changes in price-action, then one might say this adds evidence that VoEx indeed works as intended!

Thus, scanning through the market to identify large changes in VoEx, classify them in terms of positive or negative initial VoEx, we can make some predictive market-moves.

Are these statistics good?

Well obviously I would tell you yes - as I am going to, but let's look at comparative market statistics:

Of the 12 most common technical analysis chart patterns utilized, only 2 have been shown to have any statistically significant predictive powers.

In investigating all of the technical indicators, they're average success rate ranges from 25% to 76% with an mean success rate of 56% and median of 40%.

Interestingly, the one statistically significantly technical analysis was for one that was so wrong you could use it in reverse!

Drastic VoEx Changes Conclusion

Drastic changes in VoEx may indicate severe shifting in the price-directing forces on a stock and are useful to identify and quantify. Here, it was shown that by looking at the initial starting conditions, and the directionality of VoEx spike, confident predictions in future price-action could be made.

These predictions were statistically validated using over 12,000 data points obtained by Deep Dive Stocks market scan for drastic change in VoEx. An alpha value of 0.32 to give a 68% confidence interval (1 standard deviation) was used to minimize the spread of the trend across-positivity lines (positive or negative returns) while maintaining meaningful trends that can be actionable.

In the market scan, the results shown will be ordered by spike amount for any stock that has experienced a spike greater than 200 in magnitude.

What does an alpha of 0.32 mean?

It means if we repeated the whole process of creating these data and graphs 100 times on different samples 68% of the time we would we would come up with values that match those shown here.

In other words, we can be 68% confident that the true trend and values are shown here.

[1] Although lower alpha levels were achievable while maintaining significance with regards to the trends, there was loss in the granularity in terms of positive/negative gains. As such, a higher alpha was selected to ensure positivity of position remained bounded inside of the confidence interval.
[2] Some of the positivity-maintenance obtained with the alpha of 0.32 is lost at the extreme values.

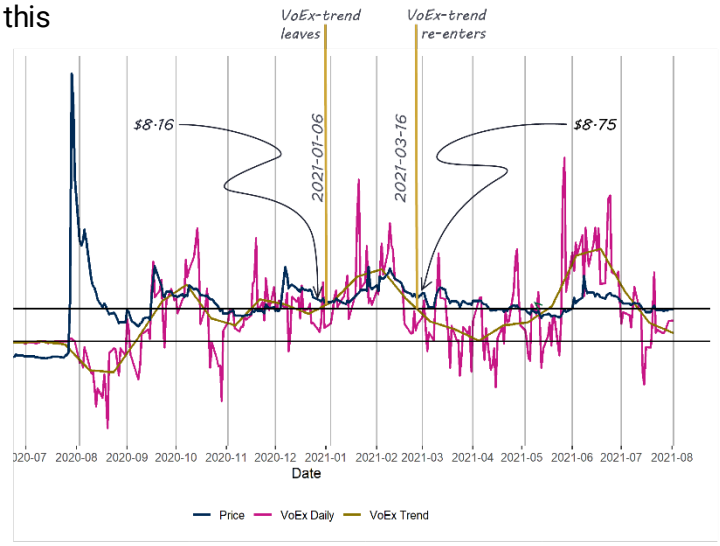
Persistently Unstable Stocks

Stocks that are experiencing persistently off-sides VoEx are those that are unstable in their current price action. From the Tier II material, it was noted that when VoEx-trend rose above the inhibition line, on its decline back into the stability zone, the price-difference between when VoEx left and when VoEx returned was minimal.

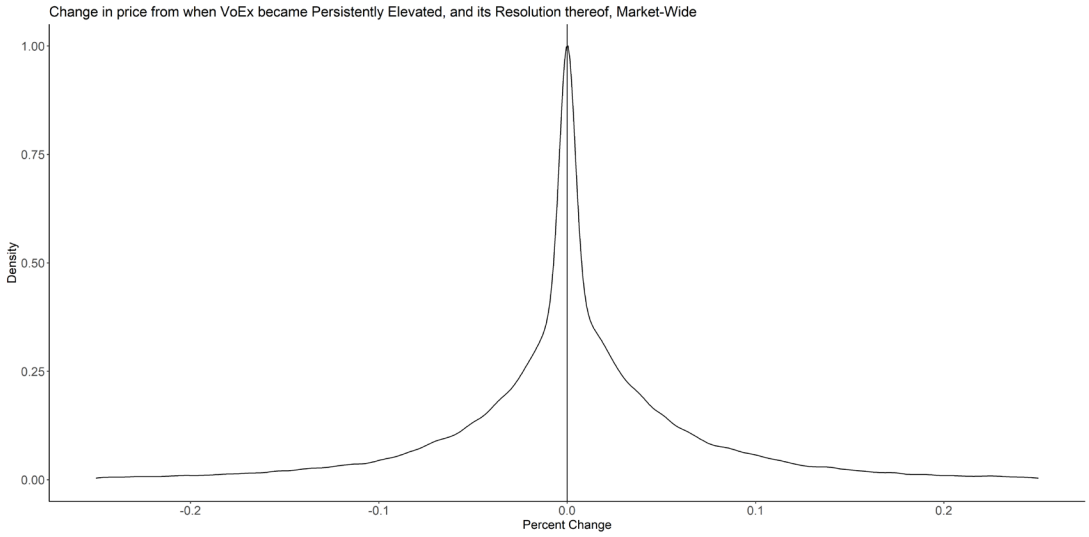
Let's investigate this phenomenon.

The running average isn't quite the same as VoEx-trend, but it is a good approximation.

By scanning the market for the past two years for any time the 1-week (5 trading days) running average for VoEx rose above 0.75 or fell below -0.75 for at least two days produced 39,908 instances recorded by the market scan comprising 4,222 individual stocks.



From there, the change in price from when VoEx achieved a value greater outside the 0.75 boundary to when it re-entered was recorded. The graph below shows the distribution of those price differences



Note!

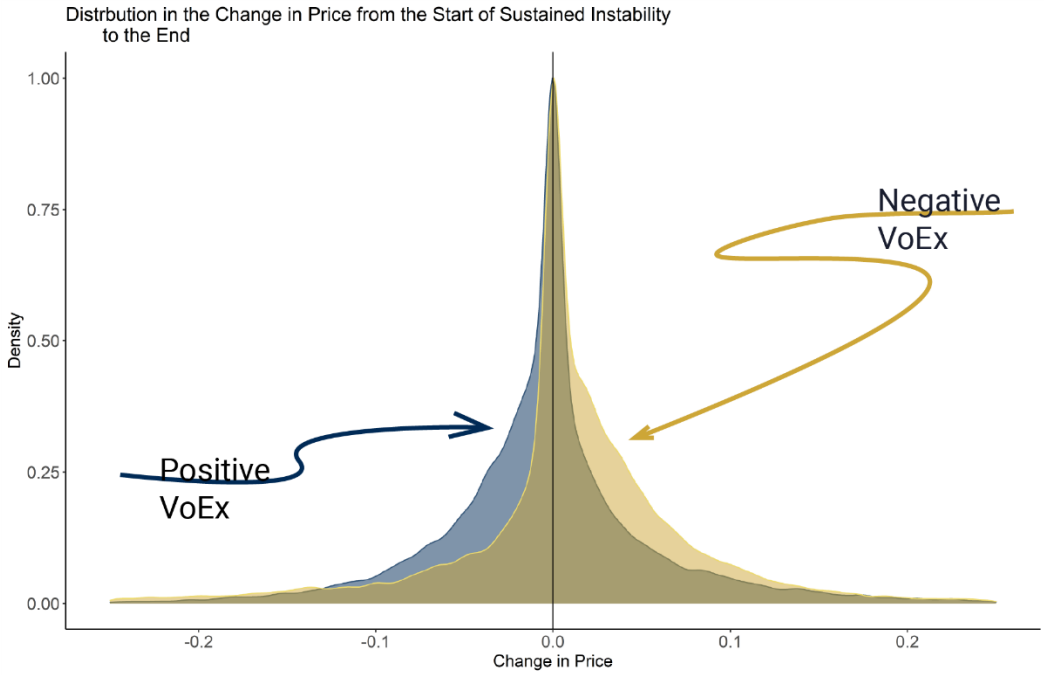
This is a different change in price calculation than DDS usually uses!

It is just a pure start to finish percent change with no regards to the price between those two dates!

Pleasantly boring but remarkably on-point! The greatest probability of returns between the start date, and end date is 0%, just as expected. Yet, there seems to be a bit of flaring at the bases: can the data be separated out more for a more refined picture?

It turns out, it can!

By dividing the data based on the positivity of VoEx, the following graphic is produced:



Rule of Thumb:

- If VoEx is in inhibtory zone: 0 to negative

- If VoEx is in propagation zone: 0 to positive

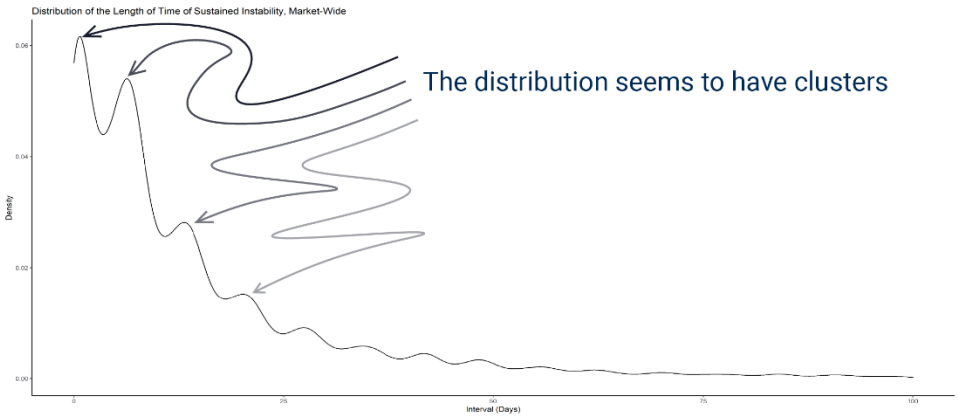
It shows that when VoEx was within the inhibition zone, the there was a significantly greater probability that the price would be *lower* than when it entered the inhibition zone. Conversely, if the stock was in the propagation zone, there was significantly increased chance of a *positive* change in price!

This is a slightly surprising finding at first, especially given the negative VoEx's increase in probability of producing positive price changes – yet considering the majority of stocks that enter into the propagation zone are on a significant price decline, it suggests that a stock's price *needs to be* at least the same value as when it entered the propagation zone to exit it.

Notwithstanding these trends associated with VoEx, the over-whelming probability rests in the stock returning into the stability-zone with a near-zero change in price.

Yet, knowing the price that a stock will re-enter the stability zone is less helpful if you don't know *when* a stock will do so. In other words, what are the lengths of these sustained instabilities?

Let's take a look at the distribution of the time spent in the persistently unstable state:



The distribution in the amount of time that a stock spends in a persistently unstable state seems to have clusters – indicating that there may be some way to sub-divide the stocks and gain better granularity in predicting how long the stock might have remaining until it returns to stability.

By normalizing the values, filtering, and then grouping the distinct occurrences into their respective stocks, the values were much easier to investigate. It was found an extreme cohort of stocks existed that were in perpetually unstable states or when they were in unstable states, lasted significantly longer therein than their peers. Once these stocks were separated out, the following image of the market formed:

Important!

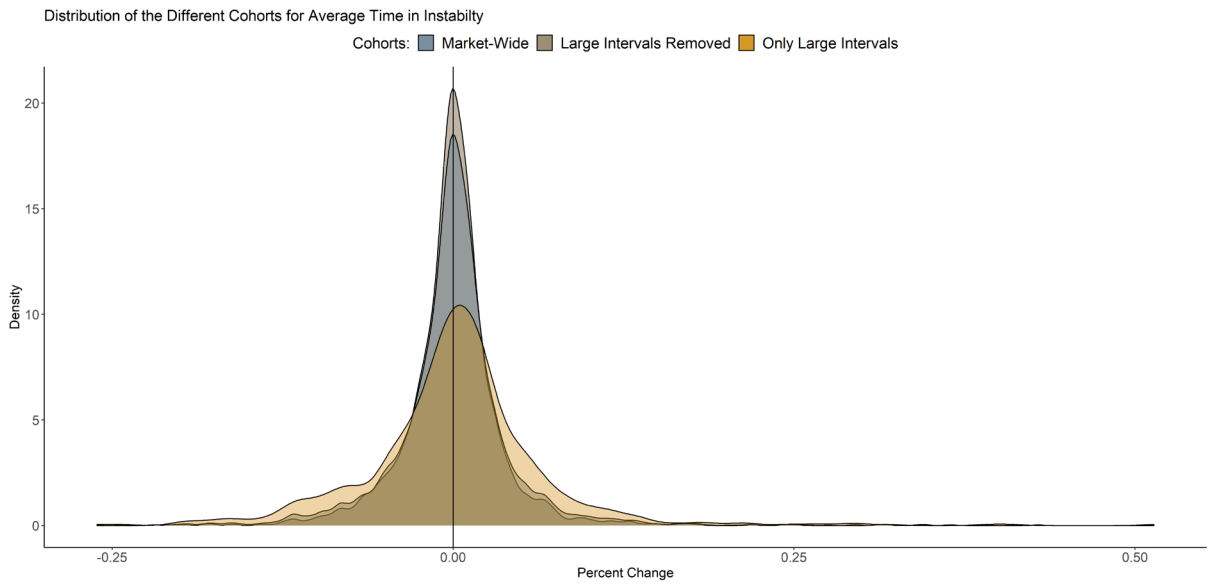
All days are trading days!

That means 10 days is really 14 days!

10 / 5 = 2 weeks of trading.

The idea has always been that when a stock's price is being overly dominated by price directing forces - VoEx would indicate instability by breeching the boundries of the inhibition or probagation lines.
Thus, in order for the stock to return to stabilty it would have to return back to its last known point of stability: the price the stock was last in the stable zone.

This is exactly what we are seeing here! The most probable difference in price between when a stock leaves and re-enters the stable zone is predoinantely zero!



3,168 stocks are included here!

By removing the abnormally unstable stocks from the group, a better schedule was formed with regards to how long a stock is typically in unstable states. Table 1 below shows the remaining group of stocks after the persistently unstable stocks were removed:

Metric	Duration (Days)
Median	12.7
Mean	12.7
Max	20.5
Minimum	2

Table 2 shows the same values but for the persistently unstable stocks:

Metric	Duration (Days)
Median	25.7
Mean	28.8
Max	115.5
Minimum	20.5

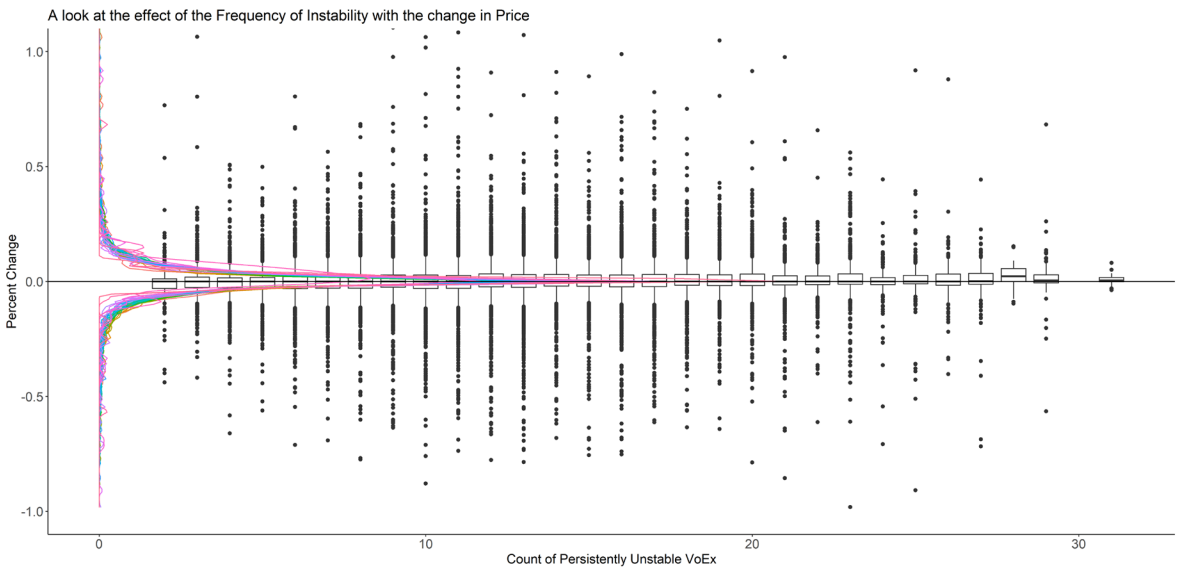
852 stocks are excluded from the search results!

These persistently unstable stocks violate the purpose of the market scan: finding the stocks that have the highest probability of the most predictable returns. These stocks followed neither the price-trend nor the overexposure patterns the rest of the market did, and are removed from being shown as results in the market scan.

So far, we have:

1) The highest probability for a stock is to have a near-zero return on price once the stock becomes persistently unstable,
2) There is a greater chance for stocks with a negative VoEx to achieve positive price changes,
3) There is a greater chance for stocks with a positive VoEx to achieve negative price changes,
4) The average time spent in a persistently unstable state is around 12 (trading) days

Lastly, by mapping the number of times a stock within the remaining cohort has unstable VoEx with that stock's respective return over the unstable period (shown below) demonstrated that within the remaining cohort, there were no significant deviations in expectations that were dependent on the number of times that a stock experienced sustained instability.



So unlike gamma-squeezes that showed a price-change that was dependent on the amount of time, or the frequency of the gamma squeezes, persistent instability as denoted by VoEx does not show the same behavior! This helps verify VoEx's accuracy in demonstrating instability – its efficacy doesn't diminish with increased occurrences.

Persistently Elevated VoEx Conclusion

In identifying stocks that have persistently elevated VoEx, the vast majority of stocks were found to enter and exit the unstable state at or around the same price that they entered.

It was found that the only change in this was found to be VoEx-dependent: when VoEx was positive (the stock was in the inhibition zone), there was a higher probability of the stock exiting the inhibitory zone at a price lower than it entered. When VoEx was negative (the stock was in the propagation zone), there was a higher probability that stock exiting the propagation zone at a higher price than it entered.

Furthermore, it was found that within a boundary of 1 standard deviation, the average time spent in an overly unstable state was 12 trading days, equivalent to approximately 3 weeks of trading.

Combined, this helps identify profitable situations by keeping tabs on how long a stock has been in a persistently elevated state, ensuring that DDS' systems do not return a stock that is inside of the persistently unstable list.

Market Scan Primer's Primer: Conclusion

That was a lot!

Let's quickly review:

Gamma Squeezes

When searching for profitable stocks in a gamma squeeze, first the stock is classified into its *cohort*: either it is rarely in a gamma squeeze (RGS) or it is often in a gamma squeeze (OGS).

The RGS had greater probabilities of larger changes in price than both the market, and the greater cohort for both positive and negative changes in price. The stocks that belong to the OGS outperformed the market in terms of negative returns, but not positive returns.

When looking at the relative strength of the gamma squeeze, it was found that by comparing the ratio of the net short delta and the average volume on the stock gave statistically significant values for expected price movements, with maximum negative change in price around 0.001. In both cohorts, if the ratio was above 0.015 there was a decrease in the probability of large returns that may not beat the market.

There were certain stocks that were identified that are excluded from the market search due to their time spent in gamma squeezes or the price-action they develop while in gamma-squeezes.

Drastic Changes in VoEx

When scanning the market for sudden shifts in VoEx, the largest determinant in the directionality of the price-action following the large change was the strength of the spike in VoEx (spike amount), as well as the positivity or negativity of the VoEx.

Generally, large positive spikes area associated with negative returns over the time-interval studied. In the more extreme spikes and later days, there was a slight difference in price behavior between the cohorts with initially positive VoEx versus those with initially negative VoEx.

The negative VoEx spikes tended to be more dynamic: with a delineation at around 400 which shifted the trajectory of the price-action. From -200 to -400, the price action is mostly negative, but -400 onwards the price action-becomes increasingly positive.

In the market scan PDF, a reference graph is given so you don't have to memorize these changes

Persistently Unstable VoEx

When VoEx indicates instability on a stock, it has been shown that the highest probability of price-action is to return to the price prior to the instability occurring. In measuring this, it was found that a stock had the highest probability of a near-zero price return, regardless of if VoEx was in the inhibition or propagation zones. Yet, when the market was divided into two cohorts based on their time spent in unstable environments, it was found that those that had instability in the form of overly strengthened propagating forces tended to have near-zero or positive returns, as compared to those that had inhibitory instability which had the highest probability of near-zero or negative returns.

In timing these phenomena, it was found that most of the market spends approximately 12 trading days (about 3 weeks) in a persistently unstable state with both the increase and resolution in price action during that period.

I hope that you have enjoyed this primer and learn to gain the most out of the market scan! If you have any questions, never hesitate to reach out.

-Justin

Deep Dive Stocks