Studying the Effectiveness of Qi's Fair Value Gap as a Trading Signal for the Euro Stoxx 600

Qi Data Analytics Team January 2019

Abstract

This paper outlines the main results from testing the trading signals generated from Qi's Fair Value Gaps (FVGs). After normalising a substantial set of macro data across asset classes, Qi employs Principal Component Analysis and OLS regression to derive fair model value for any asset based on the prevailing macro regime. The deviation between spot market price and Qi model value represents the Fair Value Gap.

The purpose of this paper is to assess if these signals are useful indicators for identifying profitable trading opportunities. Historical data for the Euro Stoxx 600 was used as test data, with the SXXP Index used as a control. The results show that Qi signals generate high hit rates, especially for long only trades. Mean returns are positive but potentially even more impressive when combined with a discretionary overlay which eradicates a small number of outsized loss-making positions, often driven by idiosyncratic event risk.

Method

Qi's Fair Value Gap is the difference between the normalised z-scores of the model price and the spot price. The data from Qi's long term model is used to calculate the model price; this typically involves a factor set of 30-35 macro factors specifically chosen for each asset class. This model uses a 250 day look back period.

A position is opened once the Qi FVG hits a certain threshold, as displayed in the table of parameters below. This threshold specifies when the model price and the spot price differ by 1.5 standard deviations. An FVG $\leq$ -1.5 sigma indicates a buy signal, and an FVG $\geq$ 1.5 sigma flags a sell signal. This position is closed once the FVG reverts to a new threshold: -0.25 $\leq$ FVG $\geq$ 0.25. This is when spot and model price have converged, i.e. it is no longer under/overvalued. No transaction costs were included [1].

The final condition is the R-Squared threshold. The R-Squared indicates how much of the variance in the asset price is explained by the factor set of 30-35 macro variables over a 250d rolling look back period. It is essentially a measure of confidence in the model price. Qi defines a period where R-Squared is at least 65% as a macro driven regime. A position can only be opened if a stock is in a macro regime.

The sample period runs from 2nd January 2015, the start date of available sample data at the time of assessment, to 31st December 2018, the last business day of Q4 2018. This is a historical back-test designed to test the efficiency of Qi FVG trading signals. This analysis of simulated past performance should not be regarded as an indicator of future performance. Please see the important notes and disclaimers at the end of this paper.

Parameters:	
Stock Universe	Euro Stoxx 600
Period	2nd Jan 2015 to 31st December 2018
Qi Model	LT
Entry FVG Threshold	-1.5 / +1.5
Exit FVG Threshold	-0.25 / +0.25
Entry R-Squared Threshold	65%

Qi's assessment criteria are (i) the hit rate of profitable trades, (ii) the mean trade return and (iii) the mean profit return / mean loss return ratio. This was implemented for two different investment styles: long only and long/short. The hit rate was calculated as the percentage of profitable trades across the universe of the Euro Stoxx 600, whilst the average return was the average profit of all individual trades across all stocks. The mean profit return / mean loss return ratio is the average return of the profitable trades divided by the average return of the unprofitable trades.

The first method (strategy 1, S1) includes opening multiple positions of the same stock if the FVG remains above/below the entry threshold. This is a highly simplistic model that offers no stop-loss metrics to mitigate trades that move offside. To create a comparable control, the SXXP Index was bought daily over the duration of the test data. The holding period of these trades was set to the same average duration as Qi's long only trades.

[1] Relevant transaction costs would typically include execution costs, broker commissions and foreign exchange costs, where applicable.

Qi then refine this process (strategy 2, S2), introducing one example of a potential trading strategy involving momentum metrics for both Qi's FVG and model price. In this second strategy only one position may be opened at any one time per stock. This has the consequence of reducing the universe of trades. However, with the new constraints, it is possible to identify the signals which are created by shifts in the model price rather than the spot price. Both the conditions below need to be met to qualify for a trade:

1. Qi's model price has to be moving in the correct direction to create the signal, i.e. if there was a buy signal (FVG < -1.5), the one day change in model price must be positive for a position to be opened.

2. The FVG has to stop widening, with the expectation that it has reached its largest gap, and this may therefore create a stronger signal. An example of this for a buy signal (FVG < -1.5), would be when the FVG passes this threshold but then sees a 1 day opposite change.

Results

Long only

Table 1: Table of Results

	Hit Rate	Average Trade Duration (days*)	Average # Trades/day	Average Return/trade	Average Profit Return	Average Loss Return	Win/Loss Ratio
Long only - S1	66.30%	27.52	6.37	1.54%	6.08%	-7.39%	0.82
Long only - S2	62.93%	28.30	0.33	1.17%	6.23%	-7.40%	0.84
SXXP Index**	51.64%	28.00	1.00	0.03%	3.28%	-3.34%	0.98

* Trading days.
** A control defined as buying and holding SXXP for the same average duration as a Qi-driven long-only trade (≈ 28 days).

For long only trades in strategy 1, the signals produce profitable trades 66.30% of the time. This compares to 51.64% for a simple buy and hold index strategy; note the 2015 - 2018 period saw the SXXP essentially flatline (0.03% average return). The Qi average return per trade was 1.54%.

This includes all unprofitable trades, which make on average a loss of 7.39%, compared to 3.34% for the SXXP Index. When a Qi signal is incorrect, the losses tend to be large. Equities normally have mild negative skew; however Qi's returns are more skewed than when trading the SXXP Index. Note though this is based on a highly simplistic buy/sell & hold scenario with no risk management. A critical observation is that a small number of large losing trades skew the data; see Appendix.

For long only trades including Qi's momentum constraints (strategy 2, S2), Qi's signals produced average returns of 1.17%, again a significant improvement on the index, where the returns were negligible. This new rule has the effect of reducing the number of trades dramatically, which would in turn reduce transaction costs.

Figures 1 and 2 are histograms for the percentage return of every long trade in strategy 1 and strategy 2, and Figures 3 and 4 compare these results to the trades in the SXXP control. The red dotted lines in Figures 1 and 2 represent Gaussian distributions which have been fitted to the percentage return data. The black dotted lines are the means of each data set.

Figures 3 and 4 show the probability density functions for the returns of Qi's trades and the trades in the SXXP control. Figure 3 shows that Qi's trades can generate much higher returns than the SXXP Index, but equally, the unprofitable trades can be much worse. The main comparison is that there is a greater likelihood of a highly profitable trade when using Qi's signals. Once the new momentum constraints are applied in Figures 2 and 4, the negative tails of the return distributions still exist, meaning some other trading rule or a discretionary overlay is required to minimise these losses.

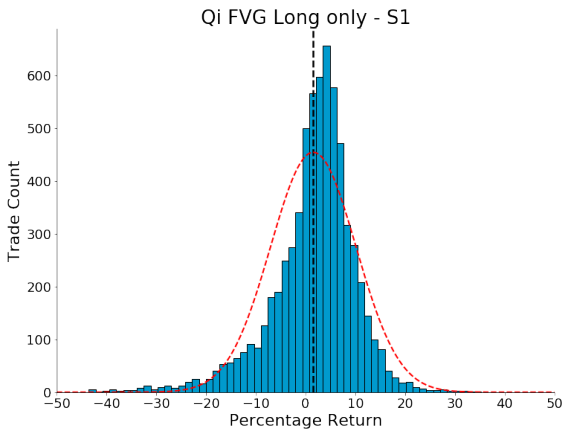

Figure 1: Distribution of the percentage returns of each long only trade in strategy 1.

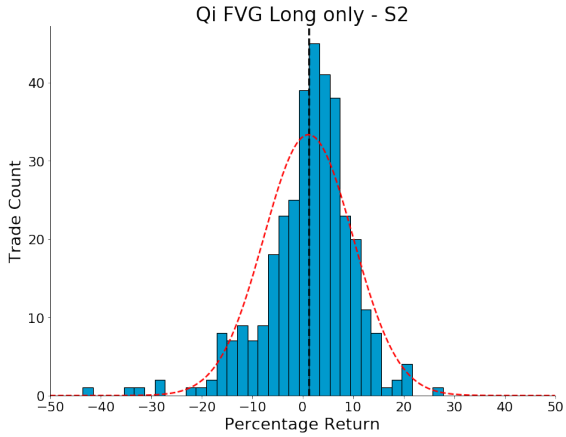

Figure 2: Distribution of the percentage returns of each long only trade in strategy 2.

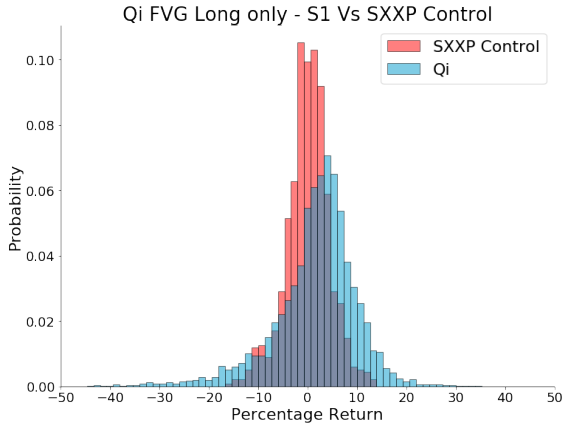

Figure 3: Probability density functions for long only trades in strategy 1 compared to trades in the SXXP control.

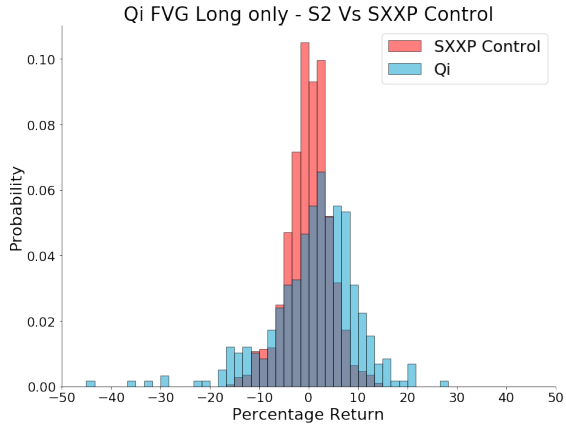

Figure 4: Probability density functions for long only trades in strategy 2 compared to trades in the SXXP control.

Results

Long/Short

Now the same methodology and parameters outlined on page 1 are replicated, using both Qi's simple (strategy 1, S1) and constrained (strategy 2, S2) strategy types. This time with the focus on long and short trades.

Table 2: Table of Results

	Hit Rate	Average Trade Duration (days)	Average # Trades/day	Average Return/trade	Average Profit Return	Average Loss Return	Win/Loss Ratio
Long/Short - S1	61.30%	25.56	10.43	0.74%	5.59%	-6.94%	0.80
Long/Short - S2	59.23%	26.51	0.52	0.62%	6.23%	-6.75%	0.84

The trades generated by Qi's FVGs in strategy 1 had a hit rate of 61.30%, with an average return per trade of 0.74%. 10,867 signals were generated over the test period, which resulted in an average of 10.43 positions being opened a day. Each position was held for an average duration of 26 trading days. The average return of solely profitable trades was 5.59%, whereas that of the unprofitable trades was -6.94%, giving a win/loss ratio of 0.80. Once again a small number of large loss-making trades have skewed the results; see Appendix.

Note that this long/short strategy is akin to a market-neutral, absolute return strategy in contrast to SXXP-long only. Indeed, it is notable that this strategy has delivered higher returns than the SXXP index over the 4 year sample period.

When including the momentum constraints (strategy 2, S2), the hit rate moves to 59.23%. 61% of trades were longs and 39% were shorts. This is notable given a simple buy and hold SXXP strategy delivers a hit rate of 51.64% during this period. Critically, Qi outperforms the average returns of the Index by 0.59% per trade.

The histograms below in Figures 5 and 6 show the distributions for the percentage returns of each trade for the two strategies. Trade returns in strategy 1 have a negative skew, which provides an opportunity to improve hit rates and profits if the negative tails can be reduced. Strategy 2 eliminates some of the trades in the negative tail, but with a lower hit rate, the average profit falls marginally.

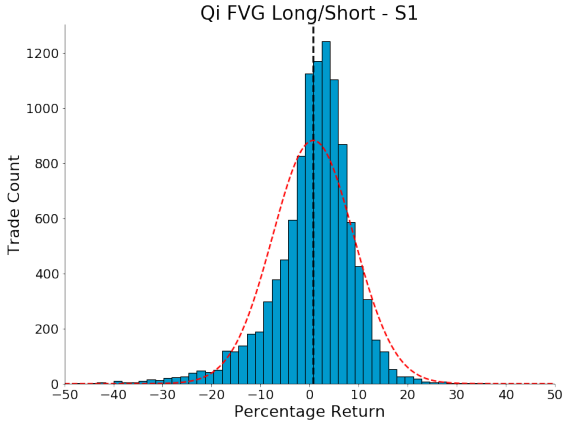

Figure 5: Distribution of the percentage returns for each trade in strategy 1.

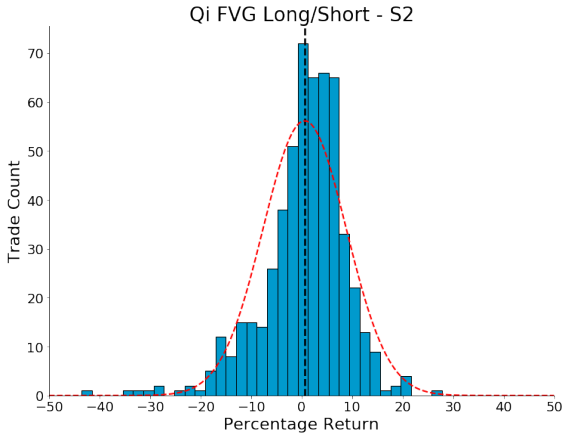

Figure 6: Distribution of the percentage returns for each trade in strategy 2.

Conclusion

The results show that the Qi FVGs are able to identify profitable trades, most notably when opening multiple long only positions. Indeed, this strategy significantly outperforms the SXXP long only strategy. Furthermore, when adhering to both the buy and sell signals and incorporating momentum constraints (i.e. long/short - S2), Qi again generates returns in excess of an SXXP-long only strategy.

Qi gives a macro insight into markets and, in a highly simplistic risk management approach, provides high hit rates solely from the signals driven from the FVGs. Turning that into higher returns depends on finding an overlay that limits the group of large unprofitable trades. Many of these trades may have been avoidable if other information was available. Therefore Qi can greatly enhance conviction in a trade if combined with additional resources, see Appendix. Moreover, adding additional constraints into the screening process, such as model momentum, shows how Qi can be used to deliver alpha in a more robust way.

Lastly, this is the fifth in a series of White Papers designed to showcase empirical examples of the Qi output. Here Qi developed a highly simplistic trading rule into just a more refined trading strategy. Topics to follow include...

- Further iterations of trading strategies with different constraints and on different asset classes.
- RSq and macro regimes. How long do regimes last? Which asset class enjoys regimes with the greatest longevity?
- Closing the FVG – model to market or market to model? An empirical look at the most efficient way to capture the 'correct' mean reversion.

Appendix

A small number of large loss-making positions skew the Qi returns data; 9% of trades in strategy 1 resulted in losses of more than 10%; similarly 10% of trades in strategy 2 also result in losses of more than 10%. A discretionary overlay can help avoid such out-sized losses. That overview can be a function of both macro and micro factors. Critically though it can have a substantial impact on P&L. The table below shows the results of implementing a hypothetical discretionary overlay that is able to mitigate half of the trades which lose more than 10%. In all the instances where a position moved 10% off-side, the assumption is the investment manager stops out of the trade half the time.

Table 3: Discretionary Overlay - Table of Results

	Average Return/trade	SPX Index	Qi Excess Return
Long only - S1	1.91%	0.03%	1.88%
Long only - S2	1.61%	0.03%	1.58%
Long/Short - S1	1.10%	0.03%	1.07%
Long/Short - S2	0.98%	0.03%	0.95%

Case studies:

The case studies below provide some real life examples of when a discretionary manager, cognisant of the prevailing environment, would overrule systematic trading signal.

Siemens-Gamesa Renewable Energy - April 2017
Having completed their merger in the April, the combined entity of Germany's Siemens and Spain's Gamesa released their first combined earnings details for q2'17 at the end of July. Earnings fell around 20% due to a fall in demand for their wind turbines, predominantly from India who announced a switch to auctioning wind power. By end September, when Qi's long signal from end April was finally unwound, the stock price was down 43.6%. A disciplined stop-loss would clearly have mitigated such a hit.

Glencore - July 2015
Weaker Chinese demand resulted in commodity markets struggling over h1'15 and that pressure forced the Glencore share price down to a point where a Qi buy signal was triggered on July 28th. A discretionary overlay would have questioned the buy signal even if only because of caution over the growing bear market in commodities. However, analysts were already starting to question Glencore's high level of debt and, by the end of Aug when Qi finally stopped out (with the share price down 35.1%), pressure was already building for a new corporate strategy to cut debt via asset sales and new share issues.

Sopra Steria - September 2018
The modest decline in Sopra Steria over September 2018 prompted a Qi buy signal on the 18th of the month. In October, SOP cut guidance aggressively after "a major commercial opportunity" for its Banking Software business failed to materialise. That left its FY18 operating forecast some 13% below consensus. Qi's long was exited on November 6th at a loss of -32.3%, whereas a prudent risk management approach would have reacted to October's earnings guidance.

There are several more outsized losses. Qi signalled a short on BTG on November 15th 2018 just a week before Boston Scientific offered a 36% premium to the prevailing price to buy BTG's profitable portfolio of live-saving drugs and licensing business. The simple, systematic approach adopted here does not include any form of risk management to mitigate such corporate actions. A discretionary overlay would go a long way to help avoid these "landmines" and reduce the average loss of 7.4% over the sample window described above.

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