Mind the Gap Size: Look For Two Sigma or More

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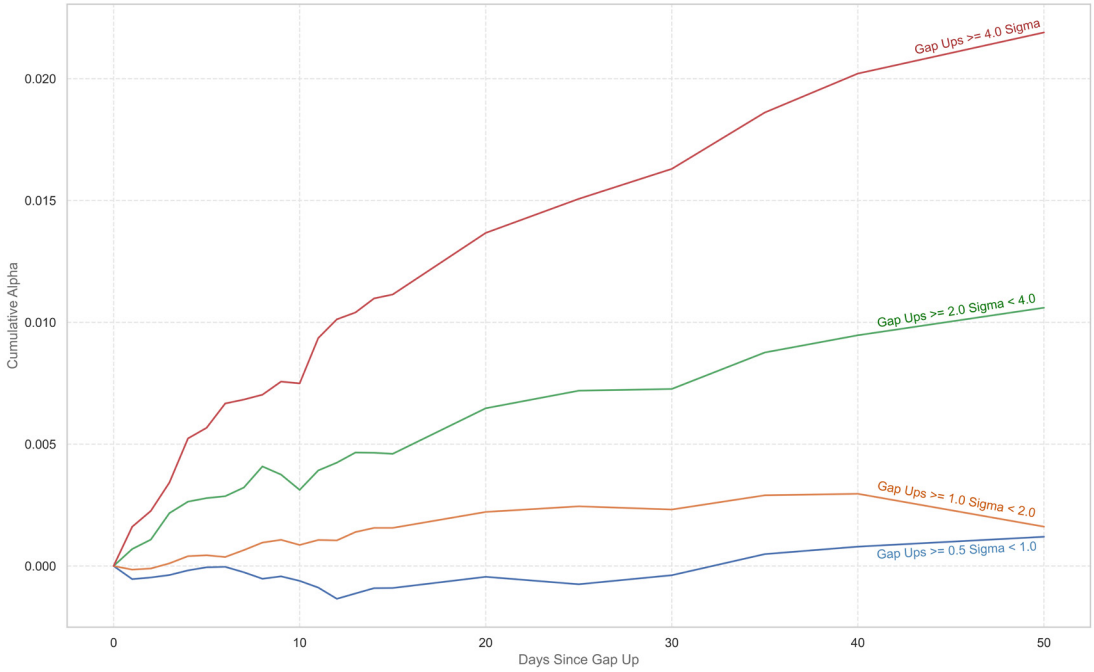

Figure 1: Cumulative excess U.S. stock returns by number of days since a gap-up event by standardized gap size for 1995 to 2020. Excess returns are standardized by the average volatility of the companies with the event. Results for gap events occurring on the same day are aggregated and liquidity weighted then averaged over time.

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KEY FINDINGS:

- Gap size was significantly related to post-event cumulative alpha for up to 10 weeks.
- Gap-ups of less than two standard deviations were indistinguishable from zero.
- Gap-ups of two to four standard deviations had average alpha of 1.06%.
- Gap-ups greater than four standard deviations had average alpha of 2.19%.

EXECUTIVE SUMMARY

We studied patterns of stocks returns following price gap events across our U.S. universe from 1995–2020. We found generally that the size of the gap was significantly related to post-event excess returns for up to 10 weeks afterward. Gap-ups of less than two standard deviations (2σ) were generally indistinguishable from zero in terms of cumulative alpha expectations, however, gaps of 2σ to 4σ in magnitude had cumulative alpha of 1.06% on average, which rose to 2.19% for gap-ups greater than 4σ. These results suggest not only that incorporation of the arrival of new information into prices occurs with a tradable delay but that such effects are stronger as a function of the magnitude of information implied by the size of the gap.

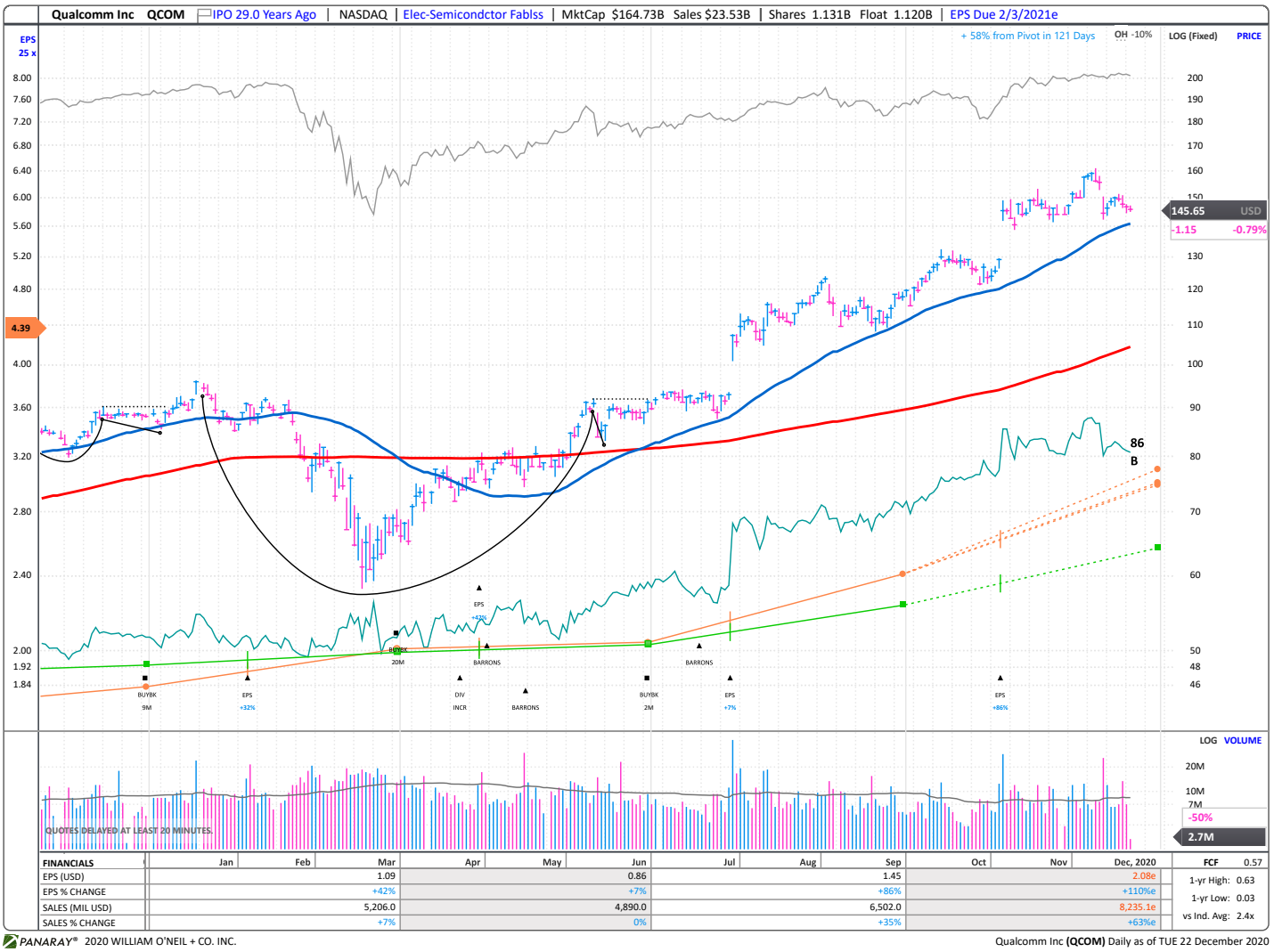

Figure 2: Price chart of Qualcomm (QCOM). Two gap-ups in price are observed in July and November 2020 in conjunction with favorable EPS reports.

INTRODUCTION

A gap-up occurs when a stock's low price for the current day is higher than the high price for the prior trading day, giving the appearance of a discontinuity or 'gap' in its price chart. Price gaps are often associated with the arrival of new fundamental information that is not fully and immediately incorporated by all market participants. This may be due to the use of prior prices rather than the new information as a reference in assessing future returns, creating temporary excess supply that leads to the temporary positive serial correlation of returns. Serial correlation can also be associated with slower-moving institutional reallocation decisions reflected in above-normal trading volume.

Anecdotal research dates back to at least 1935 with the publication of *H.M. Gartley's Profits in the Stock Market*. Gartley introduced the notion of different types of gaps: Breakaway Gap, Measuring Gap (also referred to as the Midway, Runaway, or Continuation Gaps), and the Exhaustion Gap, which correspondingly occur at the early, mid, and late stages of a major move, implying differing long-term expectations for future returns. Breakaway Gaps are anecdotally expected to be followed by larger positive longer-term moves. Runaway Gaps occur in the middle of a major move, while Exhaustion Gaps are expected to occur toward the end of a major move.

While Exhaustion Gaps imply expectations of flat or negative future price movement, Breakaway and Runaway Gaps imply positive movement in the direction of the gap. In these cases, it is implied that, conditioned on the arrival of new information associated with the price gap, strong positive returns are positively correlated with future returns.

Unfortunately, gap definitions that require knowledge of subsequent price movements, such as the existence of a subsequent trend, are of little use to traders when identification of such trends in an ex-ante fashion is precisely what is at issue. We can, however, consider the relevant information that would have been knowable at the time in light of the above definitions, such as the trend direction prior to the gap event, and then employ empirical methods to all observed price gaps meeting reasonable thresholds of relevance.

In this study, we start with a generalized study of gaps to test for the presence of such a momentum effect and to see if the size of the gap in fact matters. If gaps reflect the arrival of new information that is of sufficient magnitude to cause a price gap that is not fully and immediately reflected in market prices, it begs the question as to the relationship between the magnitude of the new information and that of the following delayed adjustment in market prices. If the two tend to be proportional to one another, it stands to reason that bullish gaps that are larger in magnitude would tend to experience proportionately greater performance following the gap. We would hypothesize therefore that, on average, price gaps would be followed by continued positive or negative performance consistent with the direction of the gap and that, on average, gaps of greater magnitude would be followed by future returns that are monotonically greater in magnitude as well.

METHODOLOGY

We empirically tested, over a range of gap-size buckets, the conditional expectations of cumulative excess returns[1] following price gaps over the period January 1995 to June 2020. Each day, for all stocks experiencing a gap-up in price, we measure the size of the gap by dividing the log-differential of the low price on the day of the gap by the high price on the prior day then dividing by the stock-specific one-year trailing standard deviation of returns to measure the volatility-normalized size of the gap in standard deviations (σ).

We then aggregated all stocks in our U.S. universe[2] that experienced a price gap into gap-size buckets of 0.5–1.0, 1–2, 2–4, and greater than 4 daily standard deviations. This resulted in a total of approximately 104,000 price-gap events during our study period. We measured cumulative excess returns each day over a subsequent 50-day window and standardized by each stock's individual volatility. We then aggregated the normalized excess returns according to days since the gap event and weighted them by liquidity so that our results are driven by the most well-known companies. We then further normalize by longer-term shifts in broader market volatility so that undue weight is not given to more volatile time periods.

RESULTS

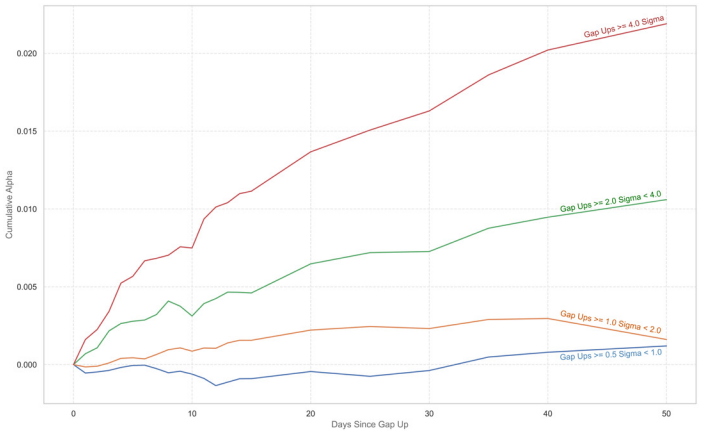

Figure 3: Average cumulative excess returns by gap size in standard deviations (σ) of daily log returns by days since the event.

Consistent with our original hypothesis, we found generally that the size of the gap was significantly related to post-event excess returns over a subsequent 10-week horizon and that outperformance tended to increase monotonically with gap size in volatility-normalized terms. Specifically, the 0.5–1.0σ and 1–2σ buckets, which had average alpha of 0.12% and 0.16%, respectively, had alpha that was indistinguishable from zero. The 2–4σ and greater than 4σ buckets, in contrast, had statistically significant average alpha of 1.06% and 2.19%, respectively. Such results reflect a monotonic relationship between the normalized size of the gap and expectations of future market outperformance over the ensuing 50 days. This also suggests that 2σ is a good threshold for expectations of significantly positive alpha.

1 Each day, for each stock in our universe, we apply a forward-looking beta estimate using our proprietary model that weights the results of multiple OLS regressions over various timeframes together with expectations of coefficient drift and mean reversion. Excess returns are equivalent to CAPM alphas under zero risk-free rate and zero dividend yield assumptions with the S&P 500 used as a proxy for market returns.

2 Our universe construction methodology is free of survivorship bias and considers each stock each day for inclusion on the basis of investability while excluding potential confounders such as penny stocks, ADRs, ETFs, and corporate events. The bottom 20% of stocks by price and the bottom 50% by liquidity are removed, with the remaining stocks weighted by liquidity.

This result provides solid evidence for the premise that the magnitude of the information, expressed by gap size, carries important information about future excess returns.

Gap Up–Gap Size	0.5σ–1.0σ	1.0σ–2.0σ	2.0σ–4.0σ	> 4.0σ
Cumulative Return	0.97%	0.87%	1.67%	2.40%
Cumulative Alpha	0.12%	0.16%	1.06%	2.19%
Hit Rate	57.15%	57.47%	59.35%	61.51%
Average Gain	11.89%	11.72%	11.59%	11.02%
Average Loss	-12.74%	-12.84%	-12.08%	-11.26%
Average Maximum Favorable Excursion	11.46%	11.40%	11.25%	11.21%
Average Maximum Adverse Excursion	-10.79%	-10.65%	-9.80%	-8.74%

Table 1: This table shows average post-event performance statistics for 50 days following a gap-up event in the U.S. from 1995 to 2020 segmented by gap size in terms of the standard deviation of daily log returns. Return and Alpha are statistically significant at the 99% confidence level. Cumulative Alpha is based on the CAPM, with the S&P 500 as a proxy for market returns. Hit Rate refers to the percentage of events on average yielding positive returns.

CONCLUSION

These results confirm our hypothesis of momentum effects relating to both the direction of a price gap and its normalized magnitude. We found generally that the size of the gap was significantly related to post-event excess returns for up to 10 weeks afterward. While we do not make distinctions between different types of gaps as per Hartley, we can draw a general conclusion that there is a reasonable baseline expectation for future outperformance in the direction of the gap and that such outperformance expectations should increase as a function of gap size normalized for stock volatility. We have come to these conclusions without reliance on classification methodologies that depend on post-gap market action, which can only be known in retrospect. Rather, we consider all valid gaps occurring in our universe in equal measure, regardless of whether a subsequent trend developed. In future studies, we hope to refine these expectations further by layering additional logical conditions and dimensions, such as market segment, coincident trading volume, turnover, prior trend strength/direction, and the flip side of gap-downs. Proceeding down these paths in a systematic way, we hope to arrive at objectively useful rules that traders can use to extract the essence of otherwise subjectively backward-looking observations.

REFERENCES

Gartley, H.M. *Profits in the Stock Market.* Lambert Gann Pub, 1935.

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