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# Small-Cap Allocations:
## *Timing the Entry*

ERIC SORENSEN AND SEBASTIAN LANCETTI

PanAgora

P anAgora Asset Management is a quantitative investment manager whose proprietary approach is designed to capitalize on inefficiencies across market cycles and to deliver relative and absolute returns through distinct and innovative Equity, Multi Asset and Risk Premia strategies. PanAgora's approach combines the firm's fundamental investment philosophy and original research with an advanced quantitative framework. These elements come together in an open, collaborative environment that builds upon the intellectual versatility of its team and leverages their complementary strengths — essential to serving the evolving objectives of institutional investors worldwide.

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### Eric Sorensen, PhD, *President & Chief Executive Officer*

Dr. Sorensen is the President and Chief Executive Officer of PanAgora, and a member of the firm's Board of Directors, Investment, Operating, Risk, Code of Conduct & Ethics, and Directors' Committees. He is responsible for PanAgora's business and investment activities.

He took over leadership of PanAgora in 2004 and established a new research and investment direction for the firm. Prior to joining PanAgora, Dr. Sorensen was Director of Quantitative Research at Putnam Investments, overseeing the activities of several quantitative teams including equity, fixed income, asset allocation and financial engineering. He was also Chief Investment Officer of Structured Equity, which managed institutional portfolios using advanced quantitative approaches.

Between 1986 and 2000 Dr. Sorensen was the Global Head of Quantitative Research at Salomon Brothers (now Citigroup). At the end of his 14 years on Wall Street, he led a group of 55 quantitative analysts comprising teams in New York, London, Singapore, Tokyo and Australia. During that time, he published extensively, and consulted with institutional investor clients around the world. His honors include many years on the Institutional Investor All American Research Team, and several Graham and Dodd awards for excellence in financial writing.

Prior to Wall Street, he was a professor with a productive academic career from 1974 to 1986. For a decade he was Professor of Finance and Department Head at the University of Arizona. He has published over 50 journal articles and served on the editorial boards of several academic Finance journals. He is also co-author of the recent book, Quantitative Equity Portfolio Management.

Between 1969 and 1974 he served the country as a United States Air Force Officer and jet pilot. His primary mission was instructor pilot in high-performance jet aircraft.

With over 45 years of quantitative research and investment experience, Dr. Sorensen is a leading expert in the industry. He continues to maintain affiliations in both the industry and academia.

**Education:**
University of Oregon, Ph.D.
Oklahoma City University, M.B.A.
University of Oregon, A.B.



### Sebastian Lancetti, CFA, *Director, Head of Portfolio Strategy*

Mr. Lancetti is a Director at the firm and manages the Equity Portfolio Strategy team. He is responsible for conducting equity research as well as overseeing the marketing and client services product processes for PanAgora's broad suite of equity investment capabilities. Mr. Lancetti's areas of expertise include quantitative strategies, alpha extraction, equity factors and stock market event studies.

Prior to joining PanAgora, Mr. Lancetti was Head of US Equity Quantitative Research at UBS in New York where he developed and marketed global quantitative equity research products to institutional clients. Mr. Lancetti has also worked at UBS UK, Dresdner Kleinwort and Banque de Luxembourg.

Mr. Lancetti is a CFA charterholder.

**Education:**
London Business School, Masters in Finance
Università Commercial Luigi Bocconi, Economics


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## ERIC SORENSEN AND SEBASTIAN LANCETTI

**ERIC SORENSEN**
is the chief executive
officer at PanAgora Asset
Management in Boston,
MA.
esorensen@panagora.com

**SEBASTIAN LANCETTI**
is a director and head
of portfolio strategy
at PanAgora Asset
Management in Boston,
MA.
slancetti@panagora.com

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**KEY FINDINGS**
- The small-cap premium appears to have waned in the last 20 years.
- The premium is, however, still related to economic cycles.
- Economic conditions and valuations now favor a small-stock premium.

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**ABSTRACT:** *This article examines the behavior of the small-capitalization stock return cycle. The authors compare the period 1980–2020 with a study for the period 1960–1995. They find that in the earlier period small-cap stocks earned a return premium when the economy was rising, long-term rates were rising, the US dollar was rising, and market volatility was falling. During the last decade, a strong move in large-cap stocks dwarfed the small-cap premium. The authors conjecture that a change in the character of economic growth, rising long-term rates, and oversold small-cap conditions may reverse this.*

**TOPICS:** *Portfolio theory, portfolio construction, wealth management**

Four decades ago, Rolf Banz published the first influential academic work on small–company returns, now known as the *small-cap effect* (Banz 1981). Simultaneously, Marc Reinganum (1983), equally well known for this topic, produced small–cap return results as well. The primary observation is that, over time, small–cap stocks can have higher risk-adjusted returns than larger firms.

Numerous academic and practitioner studies further examined the returns to small–cap stocks. Some attributed the effect to a market inefficiency. Others focused on a potential risk misspecification by noting the correlation between small size and credit risk plus value. Perhaps, in theory, small–cap risks are blurred (and understated) by failing to account for risk factors.

Regardless of theory, empirically there are several episodes of small-cap stocks performing much better (or worse) than larger stocks.[1] More than 20 years ago, we

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[1] The basic capital asset pricing model (CAPM) presumes that stocks are fairly or correctly priced in equilibrium. Large-company stocks deserve higher prices (market cap). The price is right, so to speak, meaning price is moved to the equilibrium point by forces of supply and demand by myriad investors who bear no costs for implementing portfolios and who share homogeneous expectations. In aggregate, market participants are price setters. In isolation, market participants are price takers. Incremental information is of no value. Thus, to buy systematic equity risk exposure, the efficient choice is to buy price-weighted groupings (called *large-cap indexes*). Given the CAPM assumptions, small is not a choice. However, the assumptions

**EXHIBIT 1**
**Russell 2000 vs. Russell 1000**
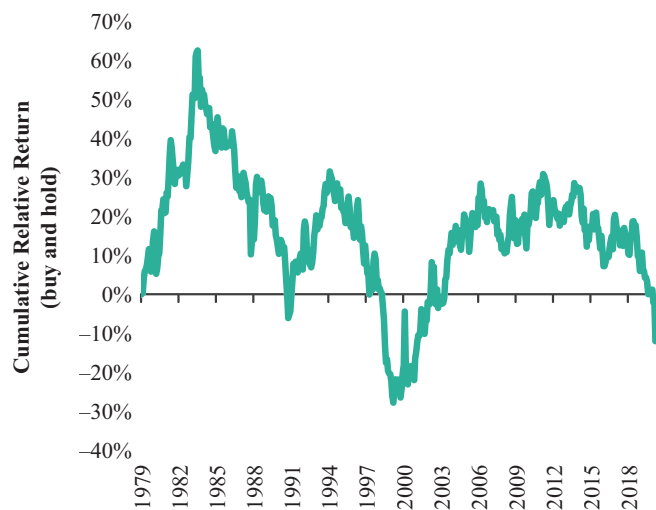


*Notes: Buy-and-hold cumulative performance. Index performance is shown net of tax withholdings on dividends, interest, and capital gains (USD). Returns assume that gross dividends are reinvested.*

*Sources: PanAgora Asset Management; Bloomberg as of April 30, 2020.*

coauthored an article that examined the cyclical drivers of small caps' outperformance between 1960 and 1995 (Sorensen, Mezrich, and Miller 1998). The research article showed that during the eight-year period from 1974 to 1982, small-cap stocks (based on the small-cap stocks within the Ibbotson index) beat the S&P 500 by a wealth accumulation of five times. Yet the relative performance of smaller stocks quickly mean reverted after 1982. What happened? When are small caps favored by investors and when do they struggle? The research article suggested that the strong outperformance of smaller stocks between 1974 and 1982 could have been driven by the cycle, with economic growth and interest rates rising sharply between 1974 and 1982. The protracted disinflation after 1982 and the corresponding fall in interest rates could explain the underperformance of smaller stocks after the 1980s peak.

In Exhibit 1, we extend the picture to 2020. The chart shows the relative return of the Russell 2000 against the Russell 1000 between 1979 and 2020.[2] As shown,

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must be invalid or flawed given the dramatic empirical relative rise and fall of small stock prices over the past 75 years.

[2]Again, the Russell 2000 versus Russell 1000 is not as dramatically volatile as the Ibbotson Small versus S&P 500. It is, however, directionally valid and highly correlated with the Ibbotson answers.

**EXHIBIT 2**
**US 30-Year Treasury Yield**



*Source: Bloomberg as of April 30, 2020.*

the premium is positive, on average, during the decade of the 1980s, with a cumulative high of 14.85% for the six months ending July 1983. After January 1990, the premium becomes negative for all six-month periods through 2020. Moreover, the annualized negative performance is approximately −3% starting when the equity market started recovering in 2009.

Exhibit 2 shows the nominal yield of the US 30-year Treasury benchmark over the same period.

As can be seen, small cap peaked in 1982 when 30-year Treasuries yielded in excess of 14%. A closer look at historical performances shows that the small-cap run started in 1974, which was the end of one amazing phenomenon and the start of another: (1) the end of the Nifty Fifty, an unprecedented spike in index concentration and (2) the start of the largest real decline in stocks ever, adjusted for inflation (Sorensen, Mezrich, and Miller 1998).

In this article, we extend the research published in 1998 and show that the cyclical drivers of the small-cap cycle identified in our earlier work continued to explain the relative performance of small caps over the last 22 years. Armed with this knowledge, we will have a closer look at what those drivers imply for the coming years. In our opinion, we may now be in the early stages of a revival of smaller stocks that could extend well into the 2020s.

## HISTORY 1960–1995: THE CYCLICAL DRIVERS OF SMALL-CAP RETURNS

The original Banz (1981) and Reinganum (1983) research studied the period 1926 through 1975. In 1998 we coauthored an article that extended the study to 1995 (Sorensen, Mezrich, and Miller 1998). The analysis showed that the annualized small-cap premium of 2% was muted after a small-cap rally ending in 1982. To understand what caused the shift between the relative performances, the article examined the impact of several cyclical variables between 1960 and 1995. The variable of interest was the rolling six-month return differential between a portfolio of the lowest size quintile of NYSE, AMEX, and over-the-counter stocks (Ibbotson data) and the S&P 500 Index.[3]

The study reported that between 1960 and 1995, the median incremental return of small caps over a six-month period was 1% with a standard deviation of 9%. In observing the overall unconditional distribution, a standard deviation of underperformance of −8% with a likelihood of 15% was identified. The standard deviation of outperformance was 10%, occurring with a likelihood of 22%.

Over the 35-year period through 1995, the study also found that conditional probabilities of small-cap performance logically adhere to changing economic scenarios. Six-month periods of top-quartile growth (measured by economic leading indicator) resulted in the likelihood of small-cap dominance 69% of the time, compared with an unconditional probability of 55%. In contrast, during periods of lower-quartile economic leading indicator readings, the probability of small-cap outperformance contracted to 41%. During these periods, the likelihood of significant small-cap underperformance was 23%.

The 1998 study further dichotomizes for movements in market volatility, US dollar, and long-term interest rates. Specifically, during periods of the lowest quartile of volatility change (falling volatility), there was a 68% likelihood of positive small-cap premiums. This fell to a 30% chance during periods of rising volatility of a top-quartile nature.

Similarly, rising long-term bond rates were shown to favor small-cap performance. Small-cap stocks appeared to have shorter duration (in a bond sense) compared with mature firms with long-term steadily growing earnings. At the extreme, a firm with highly predictable, almost certain earnings will experience price (multiple) changes primarily induced by changes in the yield curve.[4]

To summarize, the four main findings of the study were that (1) growth in the economy historically favors small firms, (2) falling market volatility favors small firms, (3) a rising US dollar supports small-company premiums, and (4) rising long-term rates do as well.

## HISTORY POST-1995: THE CYCLICAL DRIVERS OF SMALL-CAP RETURNS

In this article, we extend the statistical analyses with data beginning in 1980 through January 2020. Our aim is to understand what has happened over the past several years and test whether the cyclical drivers identified in the 1998 study are still in play.

Using the same six-month periodicity, we analyzed non-overlapping changes in factors similar to the 1998 study: 2-year Treasury rate, 20-year Treasury rate, Consumer Price Index, leading indicators, market volatility, and trade-weighted US dollar. The Appendix contains tables of these data for the periods 1980–2020 and 1995–2020, respectively.

Exhibit 3 shows the performance results for the small-cap premiums, along with the contemporaneous changes with each factor organized by quartile of change. Long-term interest rates stand out as significantly the most important factor associated with the small-cap cycle, using six-month changes over the post-1980 period.

The positive relationship between the small-cap premium and rates is not easy to spot when looking at Exhibits 1 and 2. This is largely because it is being obscured by the long-term secular fall in long rates over the entire history. However, the analyses in Exhibit 3 (1995–2020) show a strong positive relationship between rising long rates and small-cap performance. For periods of top-quartile rate changes (rising), the premium is 3.1% for six-month periods. It is −2.1% for the low-quartile

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[3] This measure of small is likely more extreme (up versus down) compared with the movements of the Russell 2000 depicted in Exhibit 1.

[4] Sorensen and Gould (1986) demonstrated this with a portfolio of actual firms that they dubbed the "ACE Portfolio," or *approximate certainty equivalents.*

E X H I B I T   3

**Cyclical Drivers and the Relative Performance of Small Caps (1995–2020)**

| Driver | Quartile | Frequency of Outperformance | Average Performance | Standard Deviation | Count |
|---|---|---|---|---|---|
| Consumer Price Index for All Urban Consumers | ALL | 46% | −0.2% | 5.4% | 50 |
| Consumer Price Index for All Urban Consumers | 4 | 54% | 1.3% | 5.0% | 13 |
| Consumer Price Index for All Urban Consumers | 3 | 67% | 1.4% | 5.1% | 12 |
| Consumer Price Index for All Urban Consumers | 2 | 25% | −1.2% | 5.9% | 12 |
| Consumer Price Index for All Urban Consumers | 1 | 38% | −2.2% | 5.5% | 13 |
| Trade-weighted US Dollar Index | ALL | 46% | −0.2% | 5.4% | 50 |
| Trade-weighted US Dollar Index | 4 | 46% | 1.3% | 6.2% | 13 |
| Trade-weighted US Dollar Index | 3 | 50% | −1.6% | 5.3% | 12 |
| Trade-weighted US Dollar Index | 2 | 33% | −1.1% | 2.8% | 12 |
| Trade-weighted US Dollar Index | 1 | 54% | 0.5% | 6.6% | 13 |
| GARCH Volatility | ALL | 46% | −0.2% | 5.4% | 50 |
| GARCH Volatility | 4 | 46% | 0.1% | 5.5% | 13 |
| GARCH Volatility | 3 | 25% | −3.3% | 5.2% | 12 |
| GARCH Volatility | 2 | 50% | −0.5% | 4.6% | 12 |
| GARCH Volatility | 1 | 62% | 2.7% | 5.4% | 13 |
| Leading Indicators OECD | ALL | 46% | −0.2% | 5.4% | 50 |
| Leading Indicators OECD | 4 | 54% | −0.6% | 6.1% | 13 |
| Leading Indicators OECD | 3 | 42% | 0.4% | 3.5% | 12 |
| Leading Indicators OECD | 2 | 42% | −0.6% | 6.4% | 12 |
| Leading Indicators OECD | 1 | 46% | 0.0% | 5.8% | 13 |
| Change in US Treasury 2-Year Rate | ALL | 46% | −0.2% | 5.4% | 50 |
| Change in US Treasury 2-Year Rate | 4 | 38% | 0.6% | 5.1% | 13 |
| Change in US Treasury 2-Year Rate | 3 | 67% | 0.6% | 3.6% | 12 |
| Change in US Treasury 2-Year Rate | 2 | 33% | −1.8% | 8.1% | 12 |
| Change in US Treasury 2-Year Rate | 1 | 46% | −0.3% | 4.4% | 13 |
| Change in US Treasury 30-Year Rate | ALL | 46% | −0.2% | 5.4% | 50 |
| Change in US Treasury 30-Year Rate | 4 | 77% | 3.1% | 3.5% | 13 |
| Change in US Treasury 30-Year Rate | 3 | 50% | 0.4% | 6.7% | 12 |
| Change in US Treasury 30-Year Rate | 2 | 42% | −2.3% | 6.0% | 12 |
| Change in US Treasury 30-Year Rate | 1 | 15% | −2.1% | 3.7% | 13 |

*Notes: Small-cap relative returns are based on the difference between the performance of the Russell 2000 (small cap) and Russell 1000 (large cap) indexes. Indexes are unmanaged and do not incur expenses. Past performance is no guarantee of future results.*

*Source: PanAgora Asset Management.*

(falling) rates. Exhibit 4 graphs the time series of small-cap return premiums and interest rate changes.

Exhibit 5 depicts the historical distribution of six-month return premiums for both the top and bottom quartiles of rate movements. Clearly, the rising rate scenario (quartile 4) supports the large stock duration characteristic presented in the 1998 article.

The correlations between the relative performance of small caps and the other cyclical factors after 1995 are mixed. Some of these relationships may have been distorted by market and secular forces. For example, major relative flows into price-weighted exchange-traded funds, index funds, and the like (away from stock selection strategies) may have distorted these relationships. Moreover, there are only two major recessions during the period (early 2000s and 2008–2009). The past 11-year growth period is also characterized by low and nonvolatile inflation and subdued market volatility. Because recessions are infrequent and extremely non-linear, we aggregated the returns for large cap and small cap around all recession events.

**Small Caps and Long-Term Interest Rates**
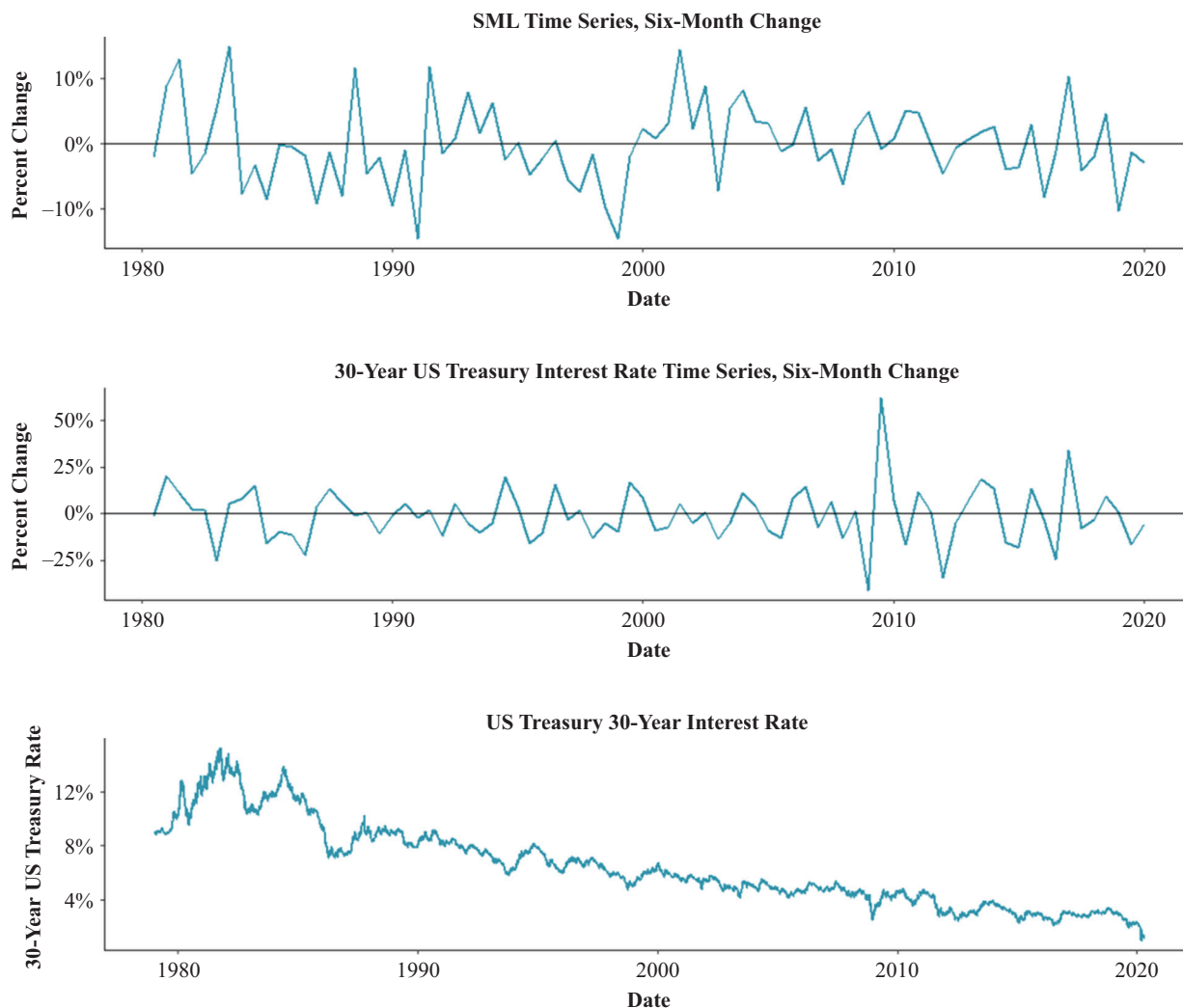


Notes: *SML is based on the relative returns of the Russell 2000 Index versus the Russell 1000 Index. Indexes are unmanaged and do not incur expenses. Past performance is no guarantee of future results.*

Sources: *PanAgora Asset Management; Bloomberg; Federal Reserve Bank of St. Louis.*

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Exhibit 6 displays the returns for the Russell 2000 and Russell 1000 associated with recession periods. For example, for the three-year period going into the 2008–2009 global financial crisis (GFC), the Russell 2000 had a cumulative return of 25.5%. The Russell 1000 was much better at 35.4%. In contrast, the three-year post-GFC Russell 2000 cumulative returns were 63.5% and higher than the Russell 1000 result of 58.7%. This exhibit, on average, corroborates the earlier study (Sorensen, Mezrich, and Miller 1998). Small-cap stocks lag going into downturns and lead coming out.

**HISTORIAL VALUATION FOR SMALL CAP**

In addition to cyclical indicators, it is telling to consider small-cap premiums as having some mean-reverting properties. Exhibit 7 addresses the long-term valuation spreads between the Russell 2000 and the Russell 1000 (1996–April 2020). Please note that these spreads are standardized over the entire period and therefore use stochastic data that would not have been known ahead of

EXHIBIT 5
**Probability Distribution of Six-Month Small-Cap Premiums Conditioned on Long-Term Rates**
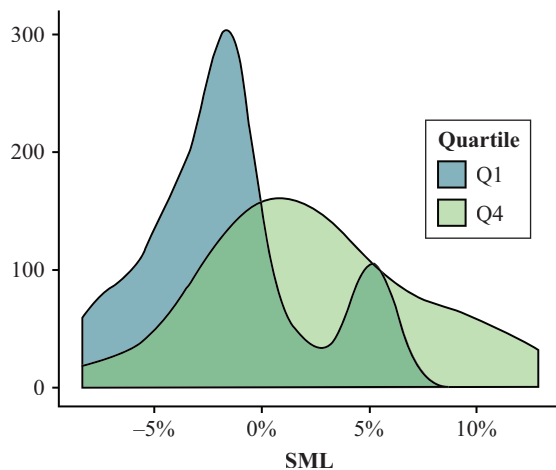


*Notes: Small-cap premium is based on the relative performance of the Russell 2000 Index versus the Russell 1000 Index. Indexes are unmanaged and do not incur expenses. Past performance is no guarantee of future results.*

*Source: PanAgora Asset Management, 1979–March 2020.*

EXHIBIT 6
**Small Caps and Recessions**

| Periods | Russell 1000 Index | Russell 2000 Index |
|---|---|---|
| Average Annualized Return 3 Years Prior to Market Peak | 8.89% | 4.38% |
| Average Monthly Returns During Recessionary Period | –0.08% | 0.15% |
| Average Annualized Return 3 Years After the Market Trough | 13.04% | 17.97% |

*Note: Recession as defined by the NBER (www.nber.org).*
*Source: PanAgora Asset Management (1979–March 2020).*

time. Being all in sample gives us a picture of relativity but is not a signal for out-of-sample asset-class timing.

We form a composite value metric for each stock in the Russell 2000 by combining Z-scores over time, based on book-to-price, earnings-to-price, and sales-to-price. We then create a series of the Z-score for the median stock in the index. We do the same for the Russell 1000.

EXHIBIT 7
**Composite Valuation Spread: Russell 2000 vs. Russell 1000**



*Source: PanAgora Asset Management. For illustrative purposes only.*
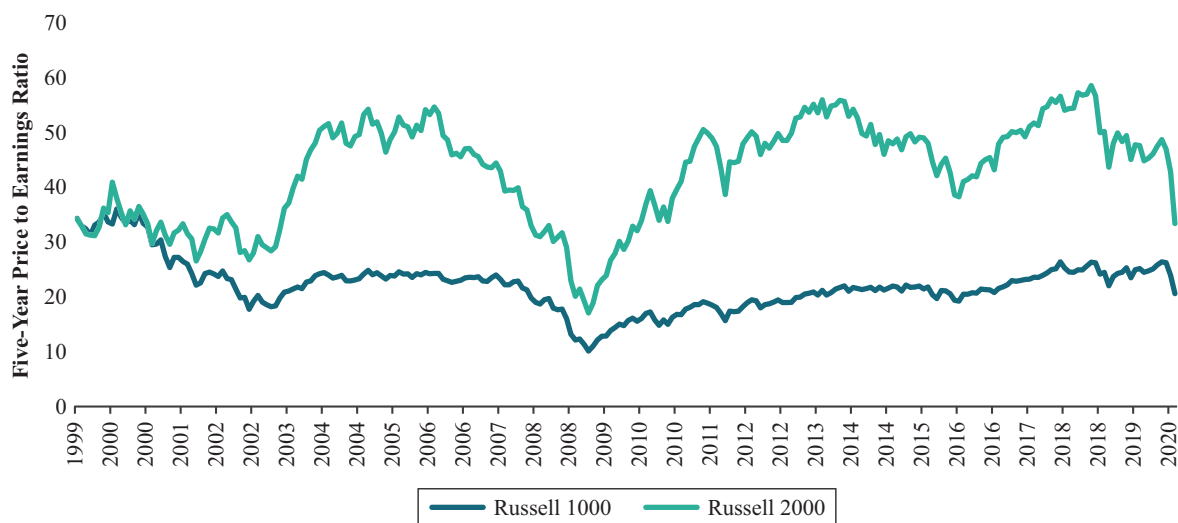
**Composite Valuation Spread and Future Returns**



*Source: PanAgora Asset Management. For illustrative purposes only.*

**Five-Year Trailing Price-to-Earnings Ratio**



*Notes: Trailing PEs are based on the previous five-year earnings. For illustrative purposes only.*
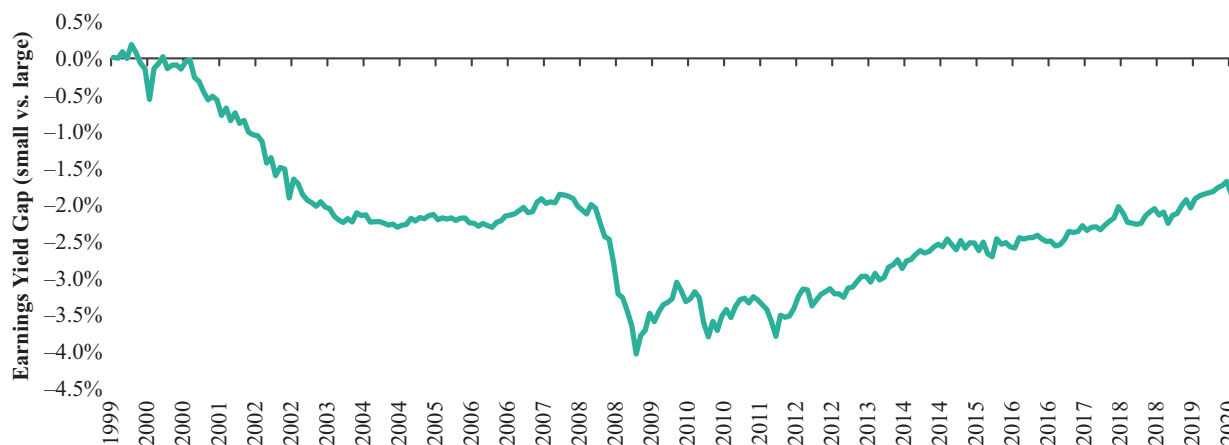*Sources: PanAgora Asset Management, Bloomberg.*

The chart plots the ratio of the median valuation Z-score of the Russell 2000 stock to the median valuation of the Russell 1000 stock. A rising ratio means the median small stocks are becoming high priced relative to earnings, sales, and book value compared with the same calculation for the median large-cap stock. We have to go back to the 1990s tech bubble to see readings for small companies comparable to those we have today. Small appears on sale.

Exhibit 8 breaks the levels of rich/cheapness into deciles. The bars are average 12-month small-cap premiums (over large cap) following the valuation associated with each decile. For example, the far-left bar is the typical return for the 36-month period once the valuation is extremely cheap relatively (bottom decile). This return premium is 7% per year, on average.

Exhibit 9 is an alternative view of long-term relative value. The graph shows the price–earnings ratio of
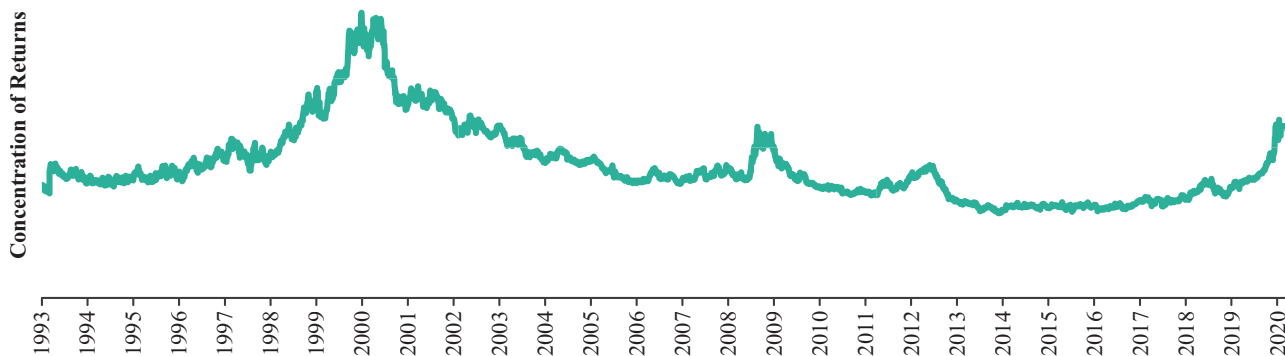
EXHIBIT 10
**Difference between the Five-Year Earnings Yield**



*Sources: PanAgora Asset Management. Bloomberg. For illustrative purposes only.*

EXHIBIT 11
**Concentration of Returns in the Russell 1000 Index (three-month rolling)**



*Source: PanAgora Asset Management. For illustrative purposes only.*

the two indexes based on the trailing five-year earnings. Exhibit 10 is the yield gap of small versus large, based on Exhibit 9 data. On an earnings-to-price differential (yield gap) basis, small stocks are reaching relative yield levels not seen since the last recession in 2008 (the GFC).

Large-cap rallies are one aspect of relative small–cap premiums. Not all large-cap rallies, however, are created equal. The situation becomes particularly interesting when a large-cap price-weighted rally persists and eventually morphs into leadership by fewer and fewer stocks.

We observe the history of concentration (narrow rallies) in Exhibit 11, which plots a Herfindahl metric

for the few names moving the large-cap index. Using the trailing three-month returns of Russell 1000 stocks, the current market has not been this narrow since the late 1990s tech bubble.

The latest reading of the concentration index, depicted in Exhibit 12, implies that holding the Russell 1000 Index is the same as owning around 100 stocks that contribute equally to performance. In comparison, Exhibit 13 shows that an investment in the Russell 2000 Index is the same as owning approximately 800 stocks after adjusting for the return concentration, an eightfold increase. This is relatively steady at 800 over the past many years.

**Concentration-Adjusted Number of Stocks in the Russell 1000**



*Source: PanAgora Asset Management. For illustrative purposes only.*

**Concentration-Adjusted Number of Stocks in the Russell 2000**



*Notes: For illustrative purposes only. The seasonality in the chart is caused by index reconstitutions occurring in June of each year.*
*Source: PanAgora Asset Management.*

## CONCLUSION

Over the past 50 years, the persistence of a small-cap premiums has waned. This may be due to cyclical or secular influences. For example, we have not controlled for the major flow into price-weighted strategies.

We have, however, reviewed the historical economic drivers of positive premiums and believe that a reversion might well be on the near-term horizon. The likelihoods are that (1) long-term rates cannot go much lower and will eventually rise; (2) the economy will recover from the current virus-induced recession; and (3) the relative valuations of small-cap stocks are quite stretched toward the cheap side, setting up a protracted reversal.

Not one of these scenarios can stand alone as a reliable predictor of better days ahead for small-cap stocks. Together, they may.

# Appendix

## Exhibit A1
**Cyclical Drivers and the Relative Performance of Small Caps (1980–2019)**

| Driver | Quartile | Frequency of Outperformance | Average Performance | Standard Deviation | Count |
|---|---|---|---|---|---|
| Consumer Price Index for All Urban Consumers | ALL | 43% | −0.1% | 6.1% | 80 |
| Consumer Price Index for All Urban Consumers | 4 | 25% | −0.7% | 6.3% | 20 |
| Consumer Price Index for All Urban Consumers | 3 | 55% | 0.9% | 6.7% | 20 |
| Consumer Price Index for All Urban Consumers | 2 | 50% | 1.0% | 5.8% | 20 |
| Consumer Price Index for All Urban Consumers | 1 | 40% | −1.8% | 5.8% | 20 |
| Trade-weighted US Dollar Index | ALL | 43% | −0.1% | 6.1% | 80 |
| Trade-weighted US Dollar Index | 4 | 50% | 2.4% | 7.1% | 20 |
| Trade-weighted US Dollar Index | 3 | 55% | −0.1% | 6.3% | 20 |
| Trade-weighted US Dollar Index | 2 | 30% | −1.3% | 3.5% | 20 |
| Trade-weighted US Dollar Index | 1 | 35% | −1.6% | 6.7% | 20 |
| GARCH Volatility | ALL | 43% | −0.1% | 6.2% | 79 |
| GARCH Volatility | 4 | 35% | −0.8% | 5.0% | 20 |
| GARCH Volatility | 3 | 32% | −1.1% | 5.9% | 19 |
| GARCH Volatility | 2 | 40% | −1.7% | 6.7% | 20 |
| GARCH Volatility | 1 | 65% | 3.1% | 6.2% | 20 |
| Leading Indicators OECD | ALL | 43% | −0.1% | 6.1% | 80 |
| Leading Indicators OECD | 4 | 50% | 0.2% | 6.9% | 20 |
| Leading Indicators OECD | 3 | 45% | 1.2% | 5.3% | 20 |
| Leading Indicators OECD | 2 | 30% | −1.4% | 5.5% | 20 |
| Leading Indicators OECD | 1 | 45% | −0.5% | 6.8% | 20 |
| Change in US Treasury 2-Year Rate | ALL | 43% | −0.1% | 6.1% | 80 |
| Change in US Treasury 2-Year Rate | 4 | 40% | 0.4% | 4.6% | 20 |
| Change in US Treasury 2-Year Rate | 3 | 60% | 1.6% | 6.5% | 20 |
| Change in US Treasury 2-Year Rate | 2 | 30% | −2.0% | 6.8% | 20 |
| Change in US Treasury 2-Year Rate | 1 | 40% | −0.6% | 6.3% | 20 |
| Change in US Treasury 30-Year Rate | ALL | 43% | −0.1% | 6.1% | 80 |
| Change in US Treasury 30-Year Rate | 4 | 65% | 2.4% | 5.0% | 20 |
| Change in US Treasury 30-Year Rate | 3 | 50% | 1.1% | 7.7% | 20 |
| Change in US Treasury 30-Year Rate | 2 | 35% | −2.4% | 6.4% | 20 |
| Change in US Treasury 30-Year Rate | 1 | 20% | −1.7% | 3.8% | 20 |

*Source: PanAgora Asset Management.*
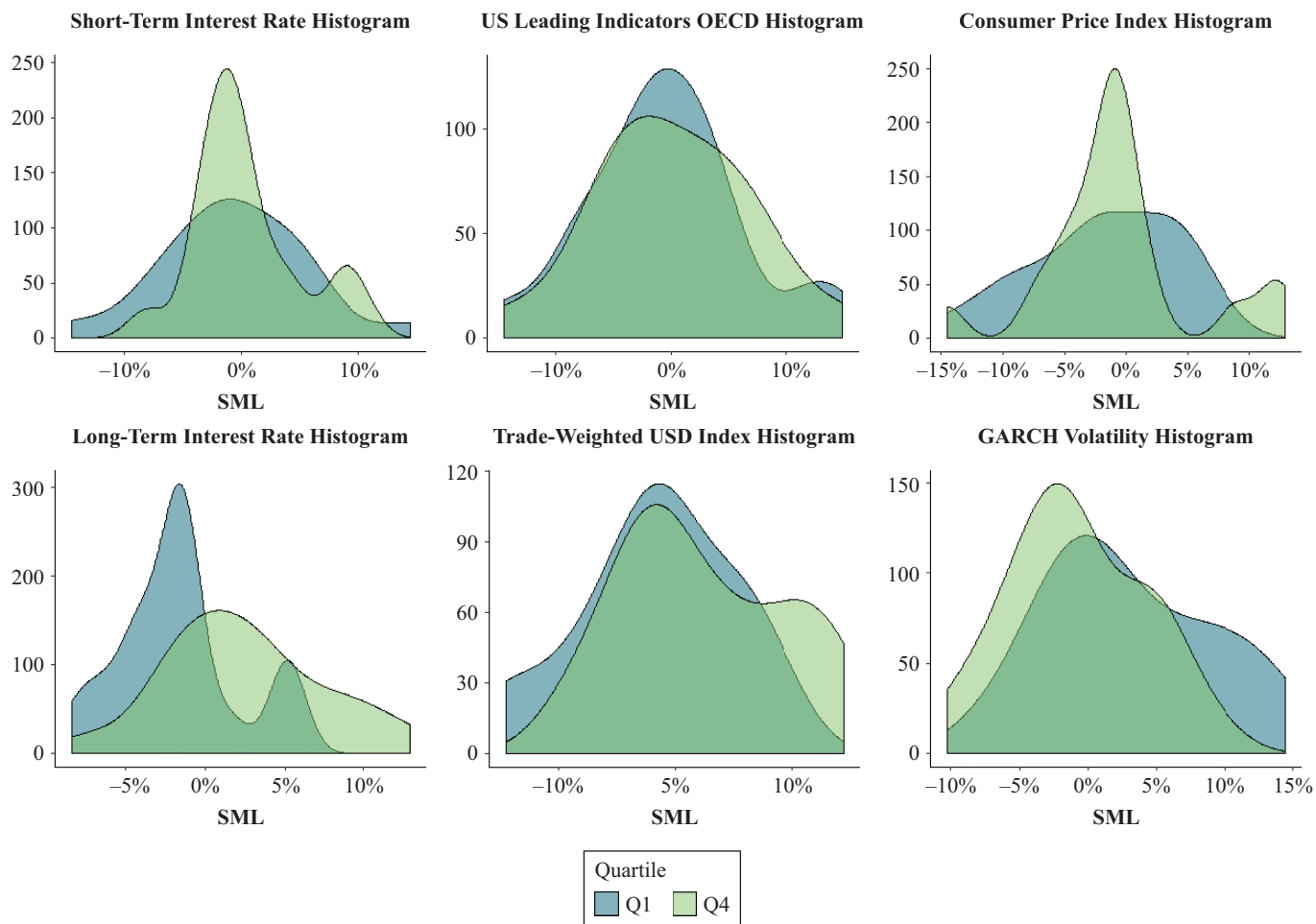
## Exhibit A2

**Probability Distribution of Six-Month Small-Cap Premiums Conditioned on the Highest and Lowest Quartiles (1995–2019)**
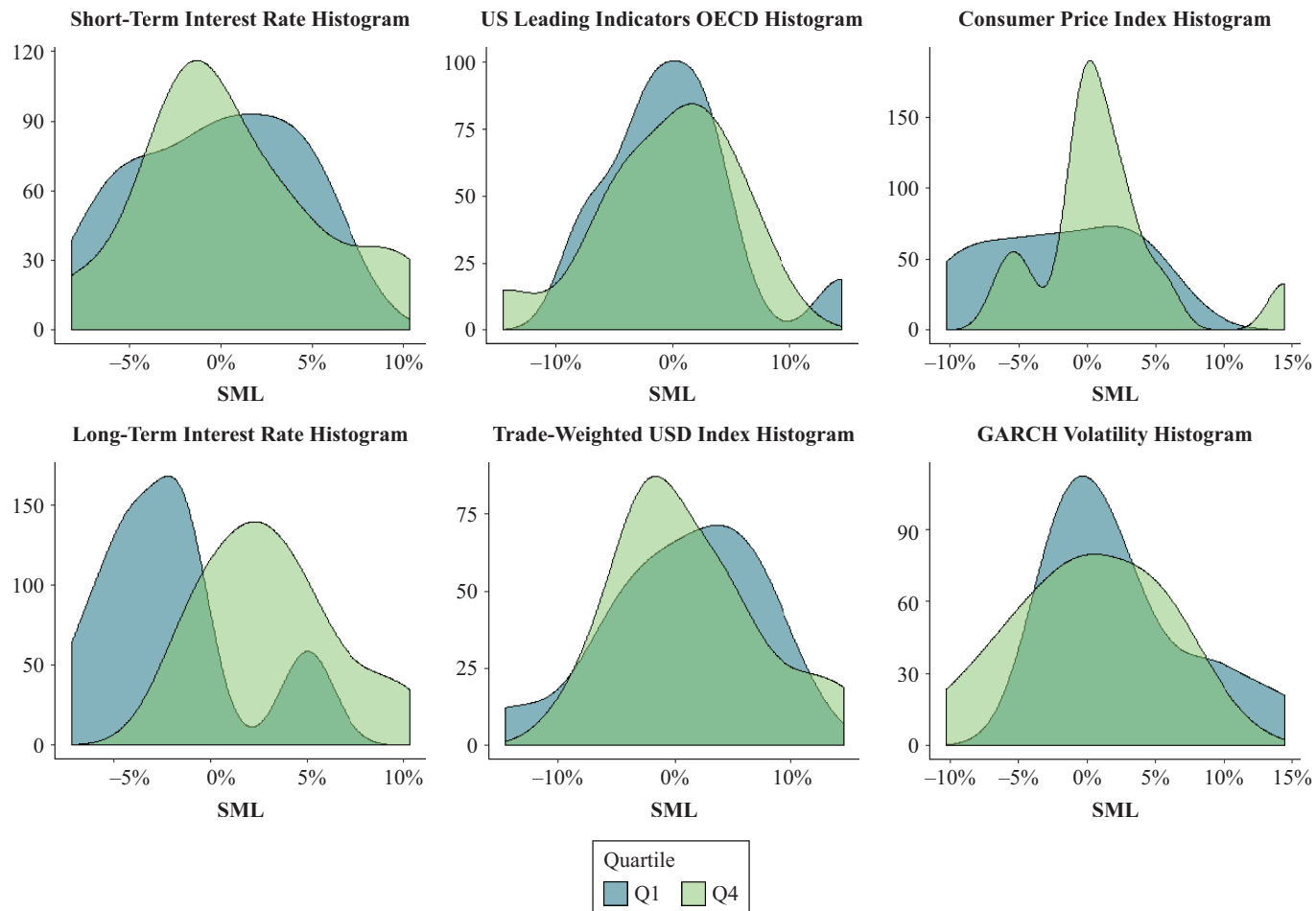


*Source: PanAgora Asset Management.*

## Exhibit A3
**Probability Distribution of Six-Month Small-Cap Premiums Conditioned on the Highest and Lowest Quartiles (1980–2019)**



*Source: PanAgora Asset Management.*

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