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Stock Selection: Research and Results March 2019

Informativeness: Not All Charts are Created Equal

Context is Important When Interpreting Price Trends

- Quantitative models are well suited to help portfolio managers make trading decisions. That's because the behavior of other investors matters a lot when the horizon is short, although fundamentals count too. We're in the process of revising a trading model we developed a dozen years ago to take advantage of what we've learned in the interim. We'll also incorporate some Big Data into the equation. When researching what works at a trading horizon we delved into the issue of price informativeness. We're convinced that all price trends aren't created equal; some can be extrapolated while others can not.
- We know more about predicting a stock's performance when it's lagging than when it's doing well. For example, a high level of controversy, as captured in our arbitrage risk framework, suggests that a run of underperformance is likely to persist. The intensity of the controversy tells us whether the bad news is fully out. Similarly, downside risk, that measures the volatility of a stock on days in which it's underperformed, tells us something useful about the duration of a bad run. So too does a skewness of its return distribution, particularly if it's been to the downside, and high turnover of the share base is a worrisome sign. Our technical framework, that bets against traditional indicators like relative strength and MACD when they're at extremes, helps us figure out if the worst is over.
- It's considerably tougher to ascertain if stocks that have been outperforming are going to continue to do so. Our technical framework has the best track record in that regard, and greater stability in fundamentals has meant that it's safer to extrapolate a favorable trend. If a member of the market's leadership is demonstrating elevated downside risk, that's a warning sign.
- Big Data is most helpful when deployed to inform trading decisions. Sentiment extracted from traditional reporting and social media sources is valuable when deciding what to do with both winners and losers. The demand from short sellers to borrow an underperforming stock tells us whether it will remain under pressure.
- We read two interesting papers that tried to ferret out how much of a stock's movements can be explained by fundamentals, as represented by EBIT. The authors found that only a small portion of day-to-day volatility was fundamentally based, although there were meaningful differences among companies. We replicated their approach, substituting earnings per share for EBIT, and found that the sensitivity of a stock's returns to earnings helps us understand the likelihood of price moves continuing, particularly when the trend is up.

Conclusion: The Short Run is Different

- In the long run earnings and cash flow drive stock prices and eventually it all comes out in the wash. In the short run though a different dynamic is at work. While the fundamentals driving stocks show up in their day-to-day returns, the behavioral dynamics loom large, and what other decision-makers think and do contributes mightily to the results. The changing character of the players in the market and the complexity of the problem make trading decisions a natural application for sophisticated quantitative techniques. They help us figure out what game is being played before we're dealt in. We think we have the sophisticated tools required to address this problem and we're revising our trading model to take full advantage of them. The challenge is putting the factors, that are related in non-linear ways, together using a dynamic, regime-varying algorithm.
- In the meantime, Appendix 1, that begins on page 9, gives us a feel for the data by presenting a list of large-cap stocks with the best nine-month price trends, sorted by a timing score that equally weights some key timing considerations. The lower the timing score, shown at the right, the more believable the price trend. Appendix 2 beginning on page 11 does the same for stocks with bottom-quintile performance. The higher the timing score the more likely it's that the poor trend will continue.

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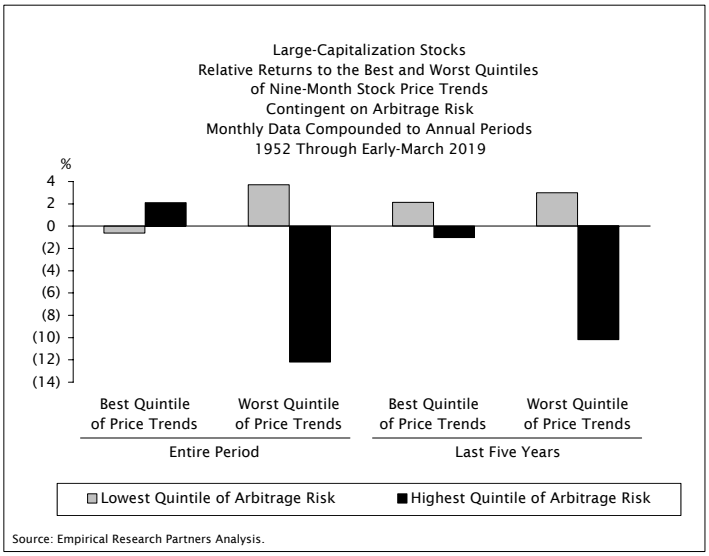
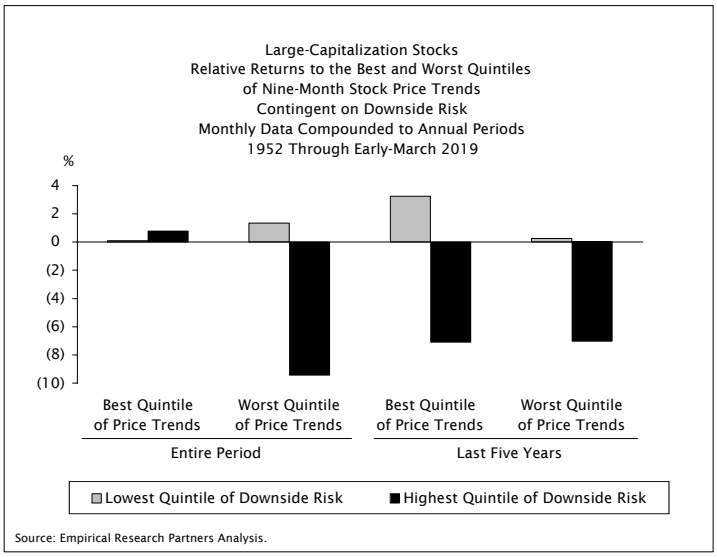
Conclusions in Brief

- Arbitrage risk impacts the way we intrepret price signals…



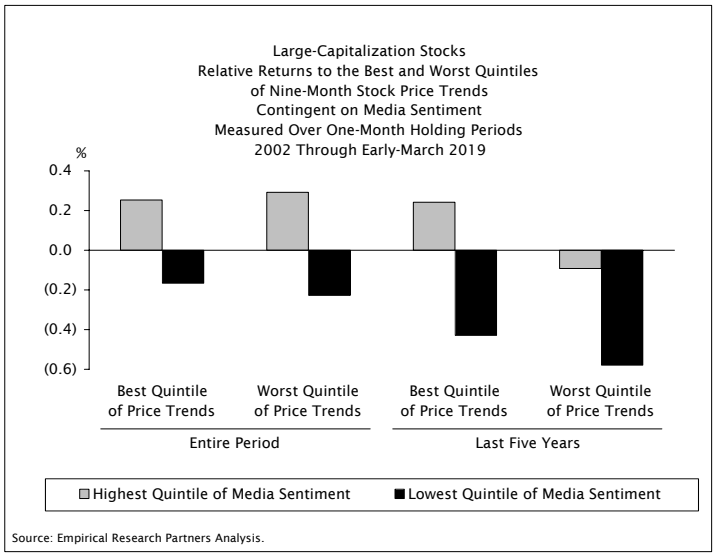
Source: Empirical Research Partners Analysis.

- …As does downside risk…



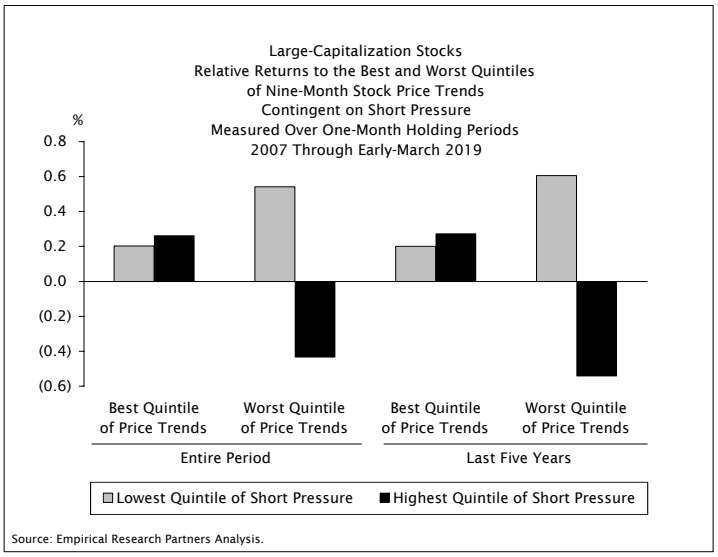
Source: Empirical Research Partners Analysis.

- …Sentiment extracted from the media…



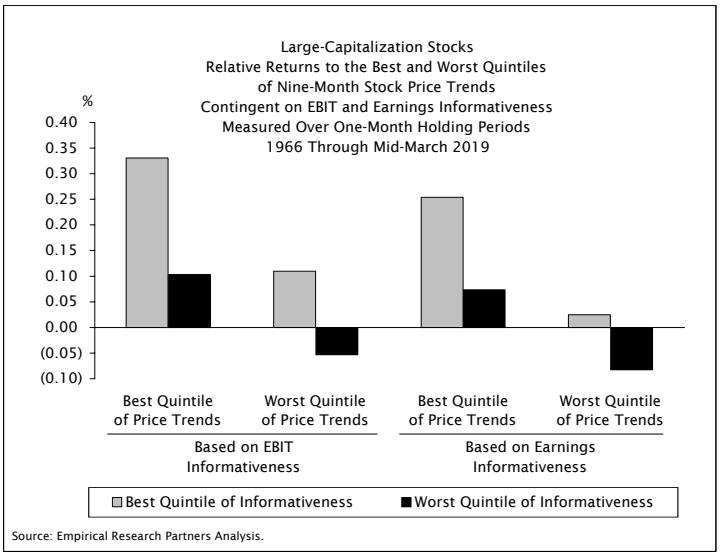
Source: Empirical Research Partners Analysis.

- …And information gleaned from the stock lending market:



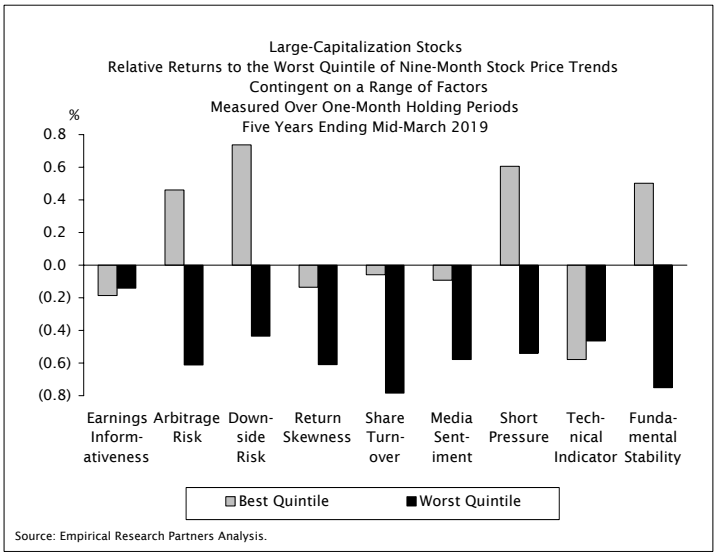
Source: Empirical Research Partners Analysis.

- Earnings informativeness is another filter worth employing:



Source: Empirical Research Partners Analysis.

- Sentiment matters most when the longer-term price trend has been poor:



Source: Empirical Research Partners Analysis.

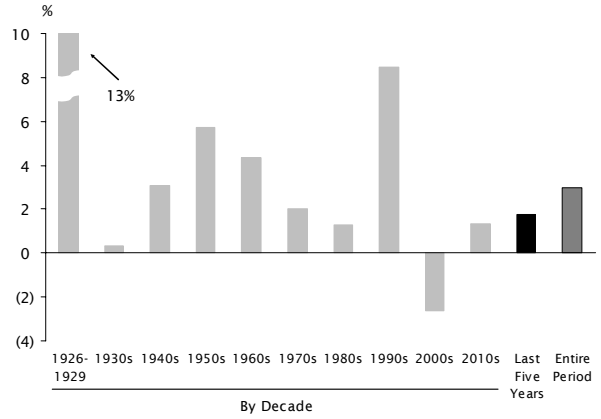
Informativeness: Not All Charts are Created Equal

Price Momentum, the 92-Year Record

We read a couple of interesting papers that try to evaluate the price trends of individual stocks based on their informativeness.[1] The authors define informativeness as the portion of the price action that can be explained by fundamentals, defined to be EBIT in the next quarter. They found that on average only a small share, around 7% of stock's returns, can be explained by EBIT alone, although there were differences across the market. We did work to see if those differences were sizeable enough to help us figure out which price trends to bet on and which were just noise.

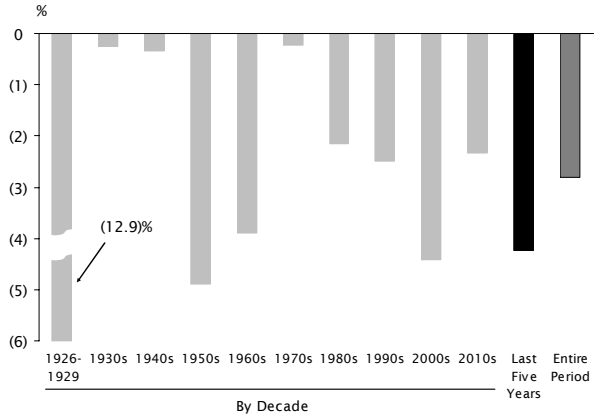
Most investors pay at least some attention to the past performance of stocks. They're not crazy in doing so because price momentum has looked like an anomaly for nine decades. Exhibit 1 presents the relative returns of large-cap stocks in the best quintile of price performance, measured over the previous nine months, presented as monthly returns compounded to annual periods. Those issues have outperformed the market by +3 percentage points per annum over more than 90 years, while in the current decade that advantage narrowed to just over a point. There hasn't been any degradation however in the performance of stocks in the worst quintile (see Exhibit 2).

Exhibit 1: Large-Capitalization Stocks
Relative Returns to the Best Quintile
of Nine-Month Stock Price Trends
Monthly Data Compounded to Annual Periods
1926 Through Mid-March 2019



Source: Empirical Research Partners Analysis.

Exhibit 2: Large-Capitalization Stocks
Relative Returns to the Worst Quintile
of Nine-Month Stock Price Trends
Monthly Data Compounded to Annual Periods
1926 Through Mid-March 2019



Source: Empirical Research Partners Analysis.

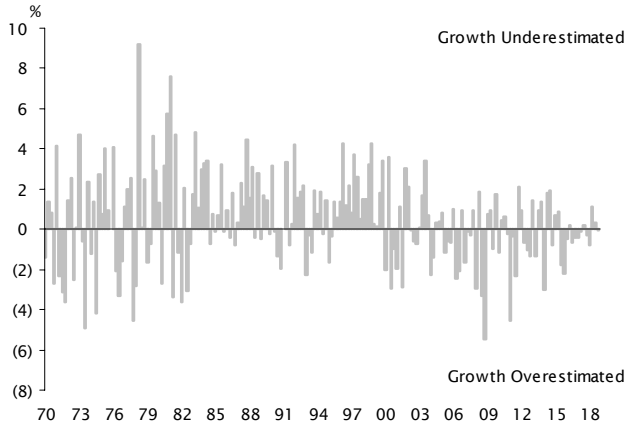
While most of the attrition in the effectiveness of price-following approaches is probably attributable to overuse and the abundance of cheap computing power, there's a fundamental explanation for it as well. Just like for value strategies we'd expect momentum ones to fare best when the economy is surprising to the upside, causing investors to underestimate the vigor and resilience of trends. Upside surprises were the norm in the 1980s and 1990s but since then the forecasting errors have been predominantly to the downside (see Exhibit 3). It's hardly surprising then that the performance of the worst quintile of price trends has held up better than that of the best one.

Looking for Tells: Our Existing Frameworks

We've long believed that the context in which price trends are formed helps us understand whether they should be extrapolated. For example, Exhibits 4 and 5 examine how a stock's arbitrage risk, that captures its unexplained volatility over the prior three months after accounting for its beta, impacts the performance of a momentum strategy. The first chart covers monthly horizons, in the second one the data is compounded out to annual periods. Both tell the same story such that high arbitrage risk, our most-reliable measure of controversy, helps us figure out whether a bad price trend is likely to continue. If there's lots of disagreement surrounding a stock, bad is indeed bad, while if there's little of it, the damaging news is probably already out and it's safer to dive in. We see the same pattern over a range of holding periods and the results for the last five years don't look much different from those for the prior sixty. On the other hand, if the price trend is constructive, controversy doesn't matter nearly as much.

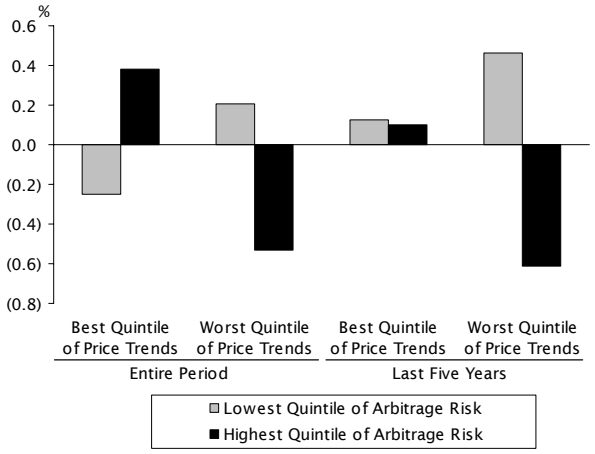
[1]Dávila, E. and Cecilia Parlatore, 2018. "Identifying Price Informativeness," NBER Working Paper 25210; Dávila, E. and Cecilia Parlatore, 2019. "Volatility and Informativeness," NBER Working Paper 25433.

Exhibit 3: The U.S.
Real-GDP Quarterly Growth Rates
Annualized Median Forecasting Errors
1970 Through 2018



Source: Federal Reserve Bank of Philadelphia, Bureau of Economic Analysis, Empirical Research Partners Analysis.

Exhibit 4: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on Arbitrage Risk
Measured Over One-Month Holding Periods
1952 Through Early-March 2019

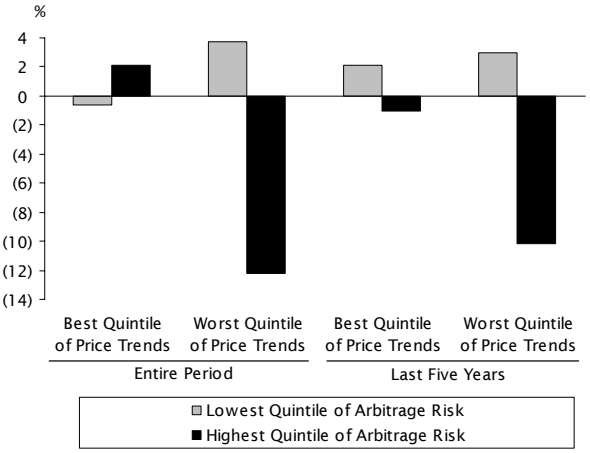


Source: Empirical Research Partners Analysis.

The odds of a stock with bottom-quintile price performance landing in the highest quintile of arbitrage risk is about 2½ times what we'd expect based on a random draw, and is nearly three times the chances of it having a low arbitrage risk score. It's worth noting that the stocks with the best price trends are also skewed toward controversy.

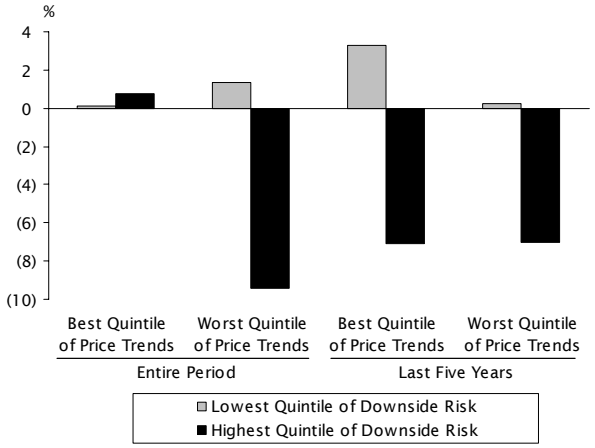
The tale told by our arbitrage risk framework is repeated in the results of some of the others we use to establish context. Exhibit 6 repeats the exercise using our downside risk calculation, that measures a stock's volatility over the prior year on days it's underperformed. Once again the factor tells us something about whether a bad trend will continue, with performance here measured over the next year. The data for one-month holding periods, not shown, reaches the same conclusion. The odds of a stock with a bottom-quintile price trend having high downside risk are 2.7 times what we'd expect from a random draw, and 3.25 times the chances of it carrying a low reading.

Exhibit 5: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on Arbitrage Risk
Monthly Data Compounded to Annual Periods
1952 Through Early-March 2019



Source: Empirical Research Partners Analysis.

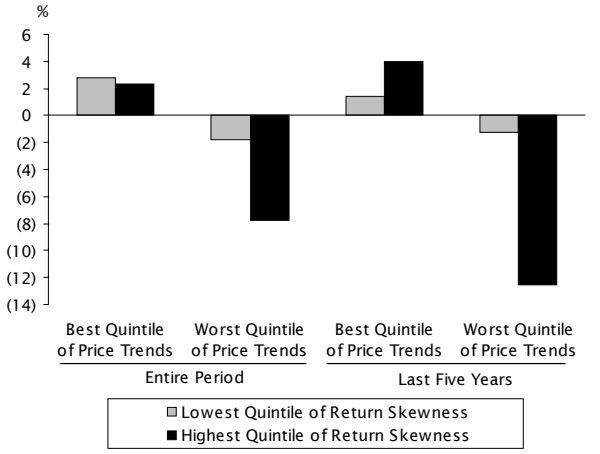
Exhibit 6: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on Downside Risk
Monthly Data Compounded to Annual Periods
1952 Through Early-March 2019



Source: Empirical Research Partners Analysis.

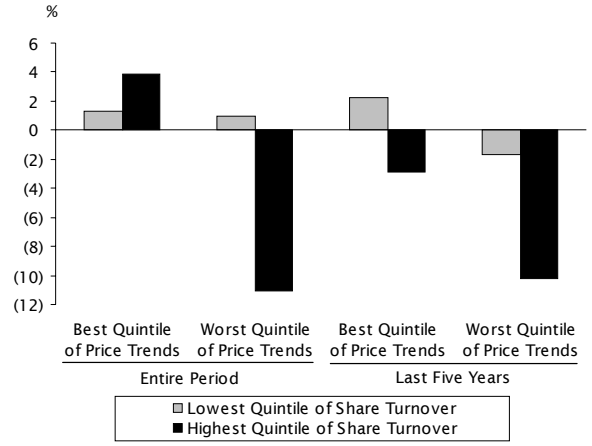
A third variable that we pay attention to is the skewness of a stock's returns, as measured daily over the prior nine months. For underperformers, high skewness means that the stock has done poorly more often than it's done well, and that pattern makes the bad news embodied in the price trend believable (see Exhibit 7). We also keep track of each stock's turnover rate, with an elevated reading an indication that the bad news is still being absorbed into the stock (see Exhibit 8). Roughly 40% of the issues with poor price trends turn over rapidly.

Exhibit 7: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on Nine-Month Return Skewness
Monthly Data Compounded to Annual Periods
1952 Through Early-March 2019



Source: Empirical Research Partners Analysis.

Exhibit 8: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on Share Turnover
Monthly Data Compounded to Annual Periods
1952 Through Early-March 2019

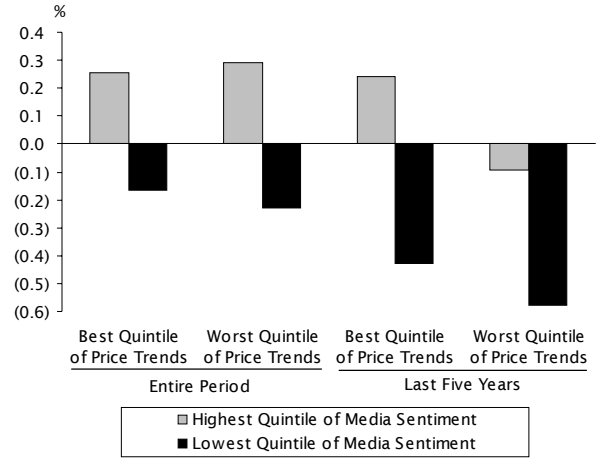


Source: Empirical Research Partners Analysis.

We've also found that Big Data is useful when gauging the veracity of price signals. A hostile tone in reporting by the media, whether it be from traditional sources or tweets, tells us something relevant, at least over shorter holding periods (see Exhibit 9). The majority of stocks with weak price trends also rank in the bottom quintile of our sentiment indicator as the media reports what's already been evident to investors.

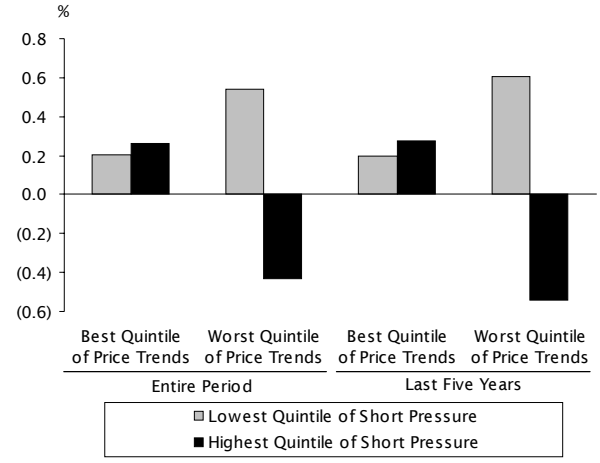
Short pressure, that employs data from stock lending agents to quantify the supply/demand dynamic for stock borrows, also provides useful short-term information (see Exhibit 10). If the price action has been poor and there's lots of short pressure the best bet is that the stock's woes will continue. Short sellers gravitate toward bad news and only about a quarter of the stocks in the bottom-quintile of price trends have low short pressure, while 43% of them have a high reading. By comparison the numbers for issues in the best quintile of price trends are 28% and 30% respectively, not too different from what we'd expect from a random draw.

Exhibit 9: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on Media Sentiment
Measured Over One-Month Holding Periods
2002 Through Early-March 2019



Source: Empirical Research Partners Analysis.

Exhibit 10: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on Short Pressure
Measured Over One-Month Holding Periods
2007 Through Early-March 2019



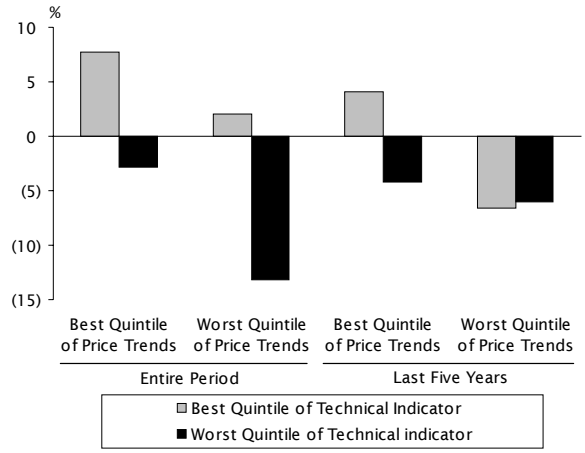
Source: Empirical Research Partners Analysis.

In 2007 we developed a technical framework that bets against well-know timing indicators like MACD and Bollinger Bands when their readings are so extreme as to set the stage for a reversal in sentiment.[2] We found that it too is

[2] *Stock Selection: Research and Results* May 2017. "Do the Opposite: Technical Indicator."

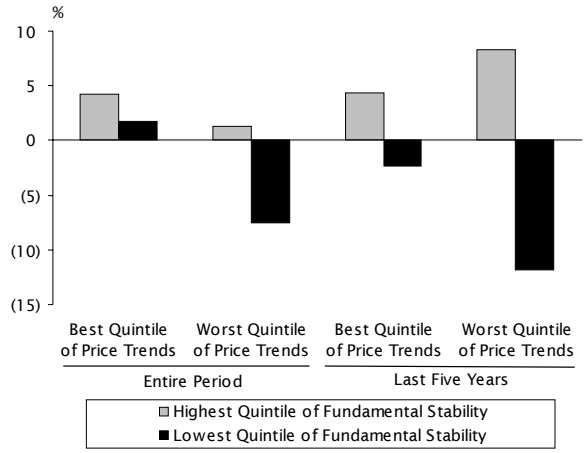
helpful when distinguishing among stocks with similar price behavior (see Exhibit 11). Our fundamental stability framework also adds value because in volatile businesses more can go wrong (see Exhibit 12).

Exhibit 11: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on the Technical Indicator
Monthly Data Compounded to Annual Periods
1952 Through Early-March 2019



Source: Empirical Research Partners Analysis.

Exhibit 12: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on Fundamental Stability
Monthly Data Compounded to Annual Periods
1952 Through Early-March 2019



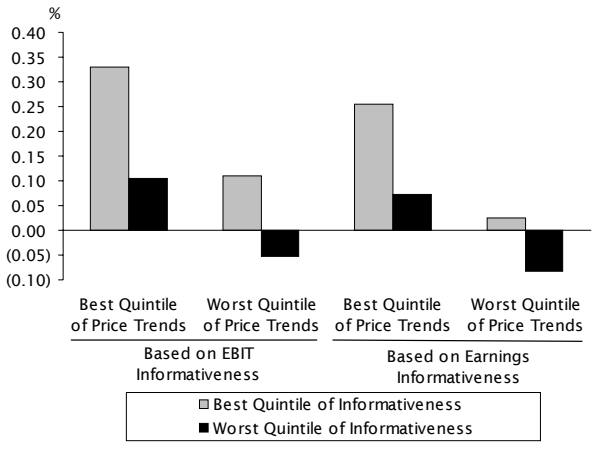
Source: Empirical Research Partners Analysis.

We conclude that the evidence supports the idea that the context in which price trends are formed tells us a good deal about the reliability of the signals they're thought to represent. That's most true when the moves are to the downside, where the intensity of the furor speaks to its duration.

Price Informativeness: More Useful on the Long Side

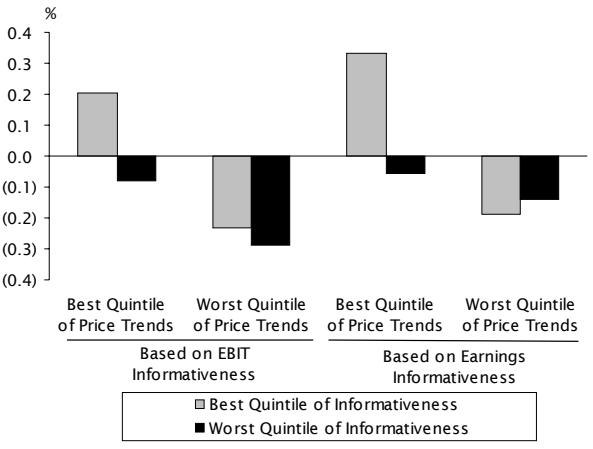
We now turn to the topic of price informativeness. We replicated the methodology in the academic papers to see if their construct could also help us distinguish among stocks with similar momentum profiles. We tested an EBIT-based approach like that employed by the authors, along with one based on earnings that uses a per share number. We found that the EBIT construct produced better performance over the long run, while the earnings-based one was superior in the last five years (see Exhibits 13 and 14). The two ratios produce results that are quite different in practice, and at present only about a third of large-cap stocks would have the same rank on both. Eyeballing the data the one based on earnings per share looks like the better of the two.

Exhibit 13: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on EBIT and Earnings Informativeness
Measured Over One-Month Holding Periods
1966 Through Mid-March 2019



Source: Empirical Research Partners Analysis.

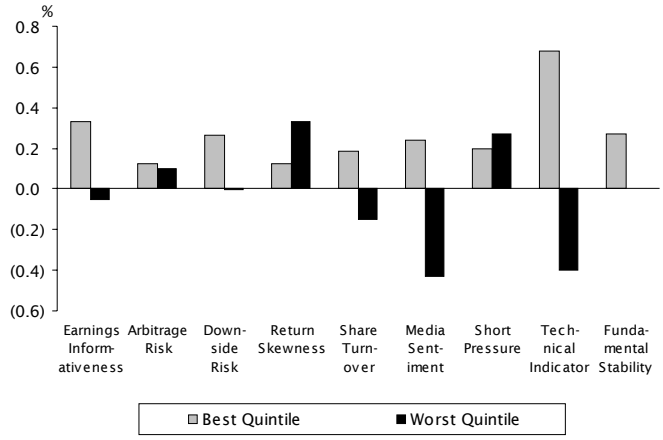
Exhibit 14: Large-Capitalization Stocks
Relative Returns to the Best and Worst Quintiles
of Nine-Month Stock Price Trends
Contingent on EBIT and Earnings Informativeness
Measured Over One-Month Holding Periods
Five Years Ending Mid-March 2019



Source: Empirical Research Partners Analysis.

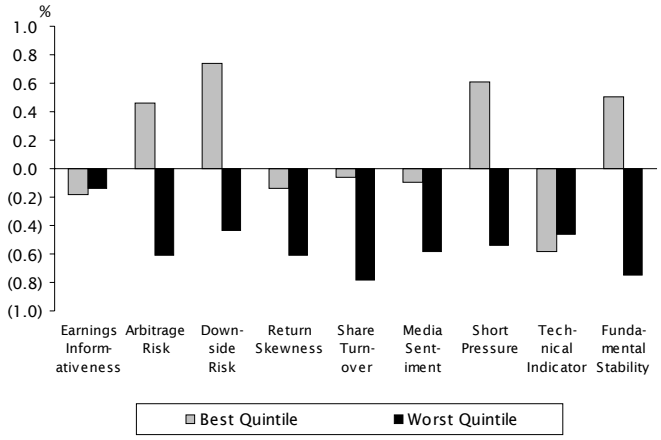
Next, we looked into how the relative returns produced by the earnings informativeness construct compare to those generated by the others in our arsenal. The first chart below examines how stocks with top-quintile price trends have performed lately depending on the timing considerations we've described, while the second draws from the universe of issues with bottom-quintile price momentum (see Exhibits 15 and 16). Here we display the results for one-month holding periods. The earnings informativeness was competitive with our other frameworks when choosing among the winners, while the more-technical approaches (i.e., arbitrage risk, downside risk and short pressure) were better at figuring out whether bad behavior would persist. We found something similar when we repeated the test using more than five decades of data (see Exhibits 17 and 18). The picture remained the same when we examined the data compounded to annual periods (see Exhibits 19 and 20).

Exhibit 15: Large-Capitalization Stocks
Relative Returns to the Best Quintile
of Nine-Month Stock Price Trends
Contingent on a Range of Factors
Measured Over One-Month Holding Periods
Five Years Ending Mid-March 2019



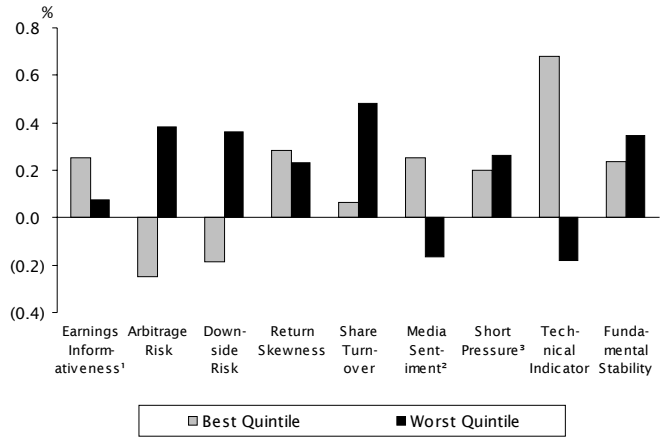
Source: Empirical Research Partners Analysis.

Exhibit 16: Large-Capitalization Stocks
Relative Returns to the Worst Quintile
of Nine-Month Stock Price Trends
Contingent on a Range of Factors
Measured Over One-Month Holding Periods
Five Years Ending Mid-March 2019



Source: Empirical Research Partners Analysis.

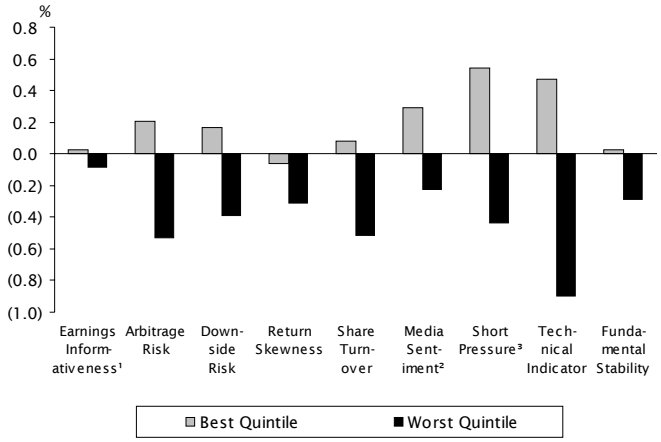
Exhibit 17: Large-Capitalization Stocks
Relative Returns to the Best Quintile
of Nine-Month Stock Price Trends
Contingent on a Range of Factors
Measured Over One-Month Holding Periods
1952 Through Early-March 2019



Source: Empirical Research Partners Analysis.

[1]Since 1966.
[2]Since 2002.
[3]Since 2007.

Exhibit 18: Large-Capitalization Stocks
Relative Returns to the Worst Quintile
of Nine-Month Stock Price Trends
Contingent on a Range of Factors
Measured Over One-Month Holding Periods
1952 Through Early-March 2019

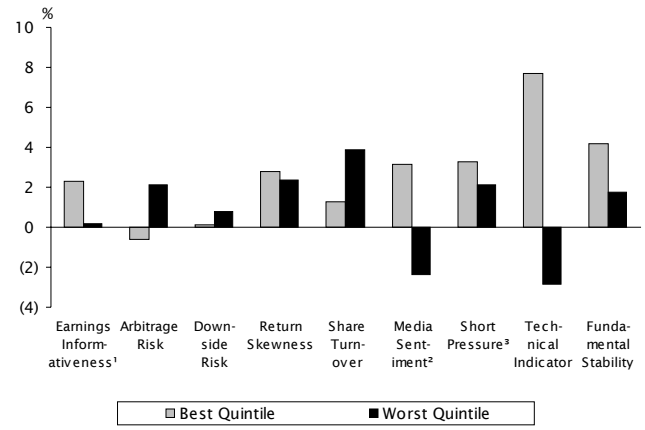


Source: Empirical Research Partners Analysis.

[1]Since 1966.
[2]Since 2002.
[3]Since 2007.

Finally, we considered whether the earnings informativeness construct could help us better understand the messages of the variables that we use to establish context. We found that if informativeness was low, arbitrage risk had a bigger effect on performance, presumably because the fundamentals played a smaller part in the stocks' behavior. That was the case over both a monthly holding period and at a one-year horizon (see Exhibits 21 and 22).

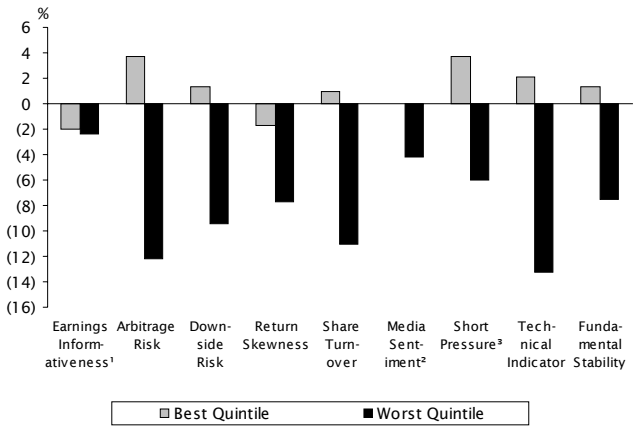
Exhibit 19: Large-Capitalization Stocks
Relative Returns to the Best Quintile
of Nine-Month Stock Price Trends
Contingent on a Range of Factors
Monthly Data Compounded to Annual Periods
1952 Through Early-March 2019



Source: Empirical Research Partners Analysis.

[1]Since 1966.
[2]Since 2002.
[3]Since 2007.

Exhibit 20: Large-Capitalization Stocks
Relative Returns to the Worst Quintile
of Nine-Month Stock Price Trends
Contingent on a Range of Factors
Monthly Data Compounded to Annual Periods
1952 Through Early-March 2019



Source: Empirical Research Partners Analysis.

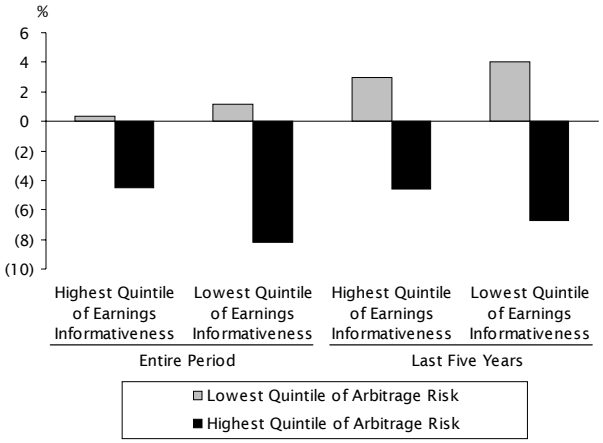
[1]Since 1966.
[2]Since 2002.
[3]Since 2007.

Conclusion: The Short Run is Different

In the long run earnings and cash flow drive stock prices and eventually it all comes out in the wash. In the short run though a different dynamic is at work. While the fundamentals that drive the stocks show up in day-to-day returns, the behavioral dynamics loom large, and what other decision-makers do contributes mightily to the result. The changing nature of the players in the market and the complexity of the problem make trading decisions a natural application for sophisticated quantitative techniques. They help us figure out what game is being played before we're dealt in. We think we have the tools required to address this problem and we're revising our trading model to take full advantage of them. The challenge is putting the factors, that are related in non-linear ways, together using a dynamic, regime-varying algorithm.

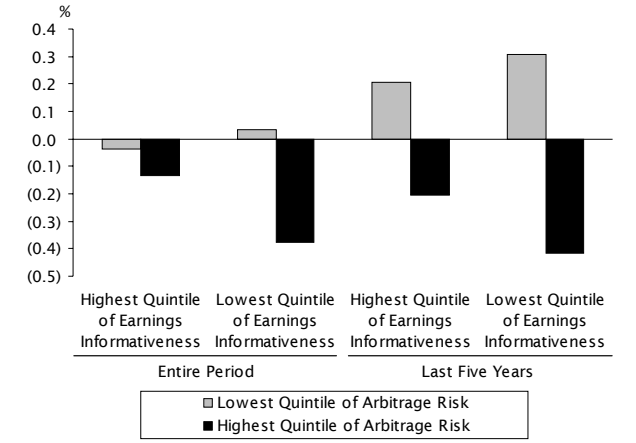
In the meantime, Appendix 1, that begins on page 9, gives us a feel for the data by presenting a list of large-cap stocks with the best nine-month price trends, sorted by a timing score that equally weights some key timing considerations. The lower the timing score shown at the right the more believable the price trend. Appendix 2 beginning on page 11 does the same for stocks with bottom-quintile performance. The higher the timing score the more likely it's that the poor trend will continue.

Exhibit 21: Large-Capitalization Stocks
Relative Returns to the Highest and Lowest
Quintiles of Earnings Informativeness
Contingent on Arbitrage Risk
Monthly Data Compounded to Annual Periods
1966 Through Early-March 2019



Source: Empirical Research Partners Analysis.

Exhibit 22: Large-Capitalization Stocks
Relative Returns to the Highest and Lowest
Quintiles of Earnings Informativeness
Contingent on Arbitrage Risk
Measured Over One-Month Holding Periods
1966 Through Early-March 2019



Source: Empirical Research Partners Analysis.

Appendix 1: Large-Capitalization Stocks
The Best Quintile of Nine-Month Stock Price Trends
Ranking Based on Timing Considerations
Sorted by Timing Score Within Sector
As of Early-March 2019

			Quintiles (1=Best, 5=Worst)													
				Timing Considerations												
Symbol	Company	Price	Nine-Month Price Trend	Earnings Informativeness	Technical Indicator	Arbitrage Risk (1=Lowest,	Downside Risk 5=Highest)	Return Skewness	Share Turnover	Media Sentiment	Short Pressure	Fundamental Stability	Average: Timing Score	Forward-P/E Ratio		Market Capitalization ($ Billion)
Consumer Cyclicals:																
Consumer Durables																
GRMN	GARMIN LTD	$84.53	1	5	5	5	1	5	1	1	3	1	3.0	22.7	x	$16.0
ROKU	ROKU INC	70.72	1	na	1	5	5	5	5	1	5	5	4.0	NM		7.8
Retail and Other Consumer Cyclicals																
ORLY	O'REILLY AUTOMOTIVE INC	$365.51	1	5	1	3	2	2	2	4	2	1	2.4	20.6	x	$28.9
SBUX	STARBUCKS CORP	70.05	1	5	2	2	3	4	2	2	2	1	2.6	25.6		87.1
DG	DOLLAR GENERAL CORP	119.61	1	2	3	1	4	3	4	3	2	1	2.6	18.0		31.4
AZO	AUTOZONE INC	934.61	1	4	1	3	4	3	5	1	1	1	2.6	15.1		23.3
GIL	GILDAN ACTIVEWEAR INC	35.31	1	5	3	1	2	5	1	3	2	2	2.7	17.0		7.3
DRI	DARDEN RESTAURANTS INC	109.44	1	2	3	2	3	5	5	2	2	1	2.8	18.2		13.5
DLTR	DOLLAR TREE INC	102.45	1	1	1	4	5	1	3	5	3	3	2.9	19.5		24.4
LULU	LULULEMON ATHLETICA INC	145.79	1	1	4	4	5	4	4	3	1	1	3.0	33.0		19.3
ULTA	ULTA BEAUTY INC	311.41	1	5	4	2	4	1	4	3	3	1	3.0	24.5		18.5
CMG	CHIPOTLE MEXICAN GRILL INC	630.99	1	1	5	5	4	5	5	2	3	3	3.7	51.9		17.5
MELI	MERCADOLIBRE INC	483.48	1	2	5	5	5	5	4	2	4	5	4.1	NM		21.9
ETSY	ETSY INC	71.15	1	3	5	5	5	5	5	1	4	5	4.2	111.2		8.6
CVNA	CARVANA CO	53.10	1	na	1	5	5	4	5	5	5	5	4.4	NM		7.7
W	WAYFAIR INC	171.57	1	3	5	5	5	5	5	4	5	5	4.7	NM		15.6
Media and Entertainment																
FOXA	TWENTY-FIRST CENTURY FOX INC	$50.88	1	1	2	1	1	5	3	2	3	2	2.2	24.1	x	$94.5
IAC	IAC/INTERACTIVECORP	209.49	1	1	4	4	5	4	2	1	1	4	2.9	26.5		17.6
CMCSA	COMCAST CORP	39.49	1	5	4	3	2	4	1	2	2	4	3.0	14.6		178.7
ATUS	ALTICE USA INC	20.89	1	1	1	4	4	3	5	1	5	5	3.2	35.3		14.8
DISCA	DISCOVERY INC	28.37	1	2	1	4	4	3	5	4	5	4	3.6	7.9		14.4
MTCH	MATCH GROUP INC	53.90	1	2	5	4	5	3	5	4	5	2	3.9	32.6		15.0
WWE	WORLD WRESTLING ENTMT INC	88.12	1	2	5	4	4	4	5	2	5	4	3.9	71.6		6.9
LYV	LIVE NATION ENTERTAINMENT	63.13	1	4	5	3	4	4	3	3	5	5	4.0	149.0		13.3
CHTR	CHARTER COMMUNICATIONS INC	342.51	1	4	5	5	4	5	1	5	5	5	4.3	43.1		77.2
LBRDK	LIBERTY BROADBAND CORP	89.97	1	5	5	5	4	5	1	5	4	5	4.3	52.3		16.3
Capital Equipment																
HEI	HEICO CORP	$91.66	1	3	1	2	3	5	3	1	5	1	2.7	42.6	x	$12.2
FAST	FASTENAL CO	62.17	1	3	1	2	3	5	2	3	5	1	2.8	21.8		17.8
TDG	TRANSDIGM GROUP INC	436.80	1	1	4	3	3	4	4	4	4	1	3.1	25.4		23.1
MIDD	MIDDLEBY CORP	127.68	1	2	4	4	5	5	2	1	5	4	3.6	18.2		7.1
Commercial Services and Supplies																
TRI	THOMSON-REUTERS CORP	$55.01	1	4	3	1	1	5	1	4	5	2	2.9	50.0	x	$27.7
Industrial Commodities																
CCK	CROWN HOLDINGS INC	$54.65	1	3	2	3	3	2	5	2	5	4	3.2	10.3	x	$7.4
BLL	BALL CORP	56.63	1	4	2	2	1	4	4	4	4	3	3.1	21.3		19.0
Technology:																
Technology Software and Services																
INTU	INTUIT INC	$250.30	1	2	3	2	3	3	1	1	2	1	2.0	37.2	x	$64.9
CHKP	CHECK POINT SOFTWARE TECHNOLOGIES	121.20	1	3	1	1	2	4	1	2	4	1	2.1	19.8		19.3
VRSN	VERISIGN INC	180.50	1	2	3	1	3	5	1	3	1	1	2.2	34.9		21.7
CDNS	CADENCE DESIGN SYSTEMS INC	60.62	1	3	5	1	3	5	1	1	1	1	2.3	29.9		17.0
FICO	FAIR ISAAC CORP	256.75	1	2	2	1	3	3	4	1	2	3	2.3	46.1		7.5
BAH	BOOZ ALLEN HAMILTON HLDG CP	55.69	1	2	2	2	1	4	4	3	2	2	2.4	18.8		7.9
EPAM	EPAM SYSTEMS INC	165.55	1	2	4	2	3	4	4	1	3	2	2.8	32.6		9.0
SSNC	SS&C TECHNOLOGIES HLDGS INC	62.11	1	5	3	2	4	3	1	1	3	5	3.0	16.3		15.6
CRM	SALESFORCE.COM INC	158.28	1	1	4	2	4	4	4	2	2	5	3.1	57.4		122.0
FTNT	FORTINET INC	82.40	1	2	5	4	5	2	3	2	3	2	3.1	39.6		14.1
ULTI	ULTIMATE SOFTWARE GROUP INC	331.98	1	3	1	5	4	5	3	3	1	3	3.1	54.2		10.5
EEFT	EURONET WORLDWIDE INC	138.31	1	1	4	4	4	5	2	2	4	2	3.1	19.9		7.2
VMW	VMWARE INC -CL A	175.13	1	1	4	4	2	5	5	1	5	3	3.3	27.0		71.9
WP	WORLDPAY INC	98.11	1	1	4	4	3	5	4	3	3	3	3.3	21.4		30.5
RNG	RINGCENTRAL INC	105.02	1	1	5	4	5	3	5	1	3	4	3.4	147.9		8.5
TEAM	ATLASSIAN CORP PLC	110.94	1	1	5	5	5	2	3	2	4	5	3.6	122.0		26.6
PANW	PALO ALTO NETWORKS INC	240.22	1	2	5	4	3	4	5	1	4	4	3.6	42.1		22.5
ZEN	ZENDESK INC	81.40	1	1	5	4	5	4	5	1	2	5	3.6	NM		8.8
ZS	ZSCALER INC	63.65	1	na	1	5	5	5	3	1	5	4	3.6	NM		7.9
CDAY	CERIDIAN HCM HOLDING	49.65	1	na	5	4	5	2	2	1	5	5	3.6	109.5		7.0
NOW	SERVICENOW INC	238.71	1	2	5	5	4	5	5	1	4	4	3.9	77.0		43.1
HUBS	HUBSPOT INC	166.88	1	4	5	4	5	2	5	1	5	5	4.0	145.8		6.9
WDAY	WORKDAY INC	187.34	1	5	5	4	5	4	3	1	5	5	4.1	113.5		40.8
SHOP	SHOPIFY INC	202.47	1	3	5	5	5	2	5	3	5	5	4.2	NM		22.4
PAYC	PAYCOM SOFTWARE INC	182.29	1	5	5	4	5	5	5	2	5	2	4.2	57.0		10.4
FDC	FIRST DATA CORP	25.56	1	4	3	5	5	5	5	4	3	5	4.3	16.2		24.0
DATA	TABLEAU SOFTWARE INC	128.50	1	2	5	5	5	4	5	3	5	5	4.3	74.3		11.1
TTD	TRADE DESK INC	207.80	1	na	5	5	5	5	5	1	5	4	4.4	81.4		9.3
SQ	SQUARE INC	76.77	1	4	5	5	5	2	5	5	5	5	4.6	102.4		32.2
OKTA	OKTA INC	80.63	1	na	5	5	5	4	5	4	4	5	4.6	NM		8.9
TWLO	TWILIO INC	125.70	1	na	5	5	5	5	5	4	5	5	4.9	NM		15.5
Technology Hardware																
CSCO	CISCO SYSTEMS INC	$52.15	1	4	3	1	3	3	1	2	2	2	2.3	16.6	x	$230.7
KEYS	KEYSIGHT TECHNOLOGIES INC	84.89	1	3	3	2	3	4	4	1	1	3	2.7	21.5		16.0
ERIC	TELEFONAKTIEBOLAGET LM ERICS	9.31	1	na	2	4	3	4	1	2	4	4	3.0	22.7		31.1
MSI	MOTOROLA SOLUTIONS INC	140.20	1	3	4	5	2	5	3	1	3	1	3.0	18.3		23.0
ARRS	ARRIS INTERNATIONAL PLC	31.67	1	3	3	1	2	5	4	1	3	5	3.0	11.2		5.5
ZBRA	ZEBRA TECHNOLOGIES CP -CL A	210.72	1	1	5	4	4	5	2	1	3	5	3.3	17.0		11.4
GLW	CORNING INC	34.20	1	4	4	4	3	5	3	3	2	3	3.4	16.7		26.9
UBNT	UBIQUITI NETWORKS INC	142.47	1	1	5	5	4	5	1	2	5	3	3.4	27.7		10.1
CIEN	CIENA CORP	39.79	1	4	5	5	4	5	5	1	3	5	4.1	21.9		6.2
Semiconductors																
IDTI	INTEGRATED DEVICE TECH INC	$48.43	1	5	2	1	3	5	4	2	3	2	3.0	23.2	x	$6.3
XLNX	XILINX INC	122.39	1	2	5	5	4	5	3	1	1	2	3.1	32.6		31.0
OLED	UNIVERSAL DISPLAY CORP	154.82	1	3	5	5	5	4	5	2	5	4	4.2	74.8		7.3
AMD	ADVANCED MICRO DEVICES	23.49	1	2	5	5	5	4	5	4	5	5	4.4	36.1		23.6
Health Care:																
Pharmaceuticals																
MRK	MERCK & CO	$81.23	1	3	2	2	1	3	2	1	2	1	1.9	17.3	x	$210.6
NVS	NOVARTIS AG	90.07	1	4	2	1	1	3	1	4	2	1	2.1	16.7		230.2
TECH	BIO-TECHNE CORP	193.36	1	4	3	3	4	3	1	2	2	3	2.8	40.4		7.3

Source: Empirical Research Partners Analysis.

Appendix 1 (cont.): Large-Capitalization Stocks
The Best Quintile of Nine-Month Stock Price Trends
Ranking Based on Timing Considerations
Sorted by Timing Score Within Sector
As of Early-March 2019

			Quintiles (1=Best, 5=Worst)												
			Timing Considerations												
Symbol	Company	Price	Nine-Month Price Trend	Earnings Informativeness	Technical Indicator	Arbitrage Risk (1=Lowest,	Downside Risk 5=Highest)	Return Skewness	Share Turnover	Media Sentiment	Short Pressure	Fundamental Stability	Average: Timing Score	Forward-P/E Ratio	Market Capitalization ($ Billion)
Pharmaceuticals (cont.)															
CRL	CHARLES RIVER LABORATORIES	$140.49	1	2	3	4	3	4	4	1	1	3	2.8	21.8 x	$6.8
LLY	LILLY (ELI) & CO	123.50	1	4	1	3	2	3	3	4	5	1	2.9	22.0	127.9
PKI	PERKINELMER INC	93.47	1	5	1	1	3	4	3	2	4	3	2.9	23.2	10.4
IQV	IQVIA HOLDINGS INC	139.85	1	5	3	3	2	5	3	2	1	4	3.1	22.1	27.7
ACB	AURORA CANNABIS INC	7.96	1	na	1	5	5	5	5	5	5	5	4.5	NM	8.0
CGC	CANOPY GROWTH CORP	46.76	1	na	5	5	5	5	5	5	5	5	5.0	NM	16.0
Biotechnology															
REGN	REGENERON PHARMACEUTICALS	$417.62	1	3	4	3	3	4	1	3	3	2	2.9	17.9 x	$45.6
VRTX	VERTEX PHARMACEUTICALS INC	182.57	1	5	4	3	3	5	1	1	1	5	3.1	44.2	46.7
INCY	INCYTE CORP	84.90	1	2	5	5	5	4	2	3	1	5	3.6	65.8	18.2
IONS	IONIS PHARMACEUTICALS INC	74.88	1	2	5	5	5	2	2	1	5	5	3.6	NM	10.4
EXEL	EXELIXIS INC	23.59	1	5	5	5	5	5	3	1	3	5	4.1	21.5	7.1
SAGE	SAGE THERAPEUTICS INC	155.52	1	4	5	5	5	5	2	5	5	4	4.4	NM	7.9
EXAS	EXACT SCIENCES CORP	93.64	1	4	5	5	5	5	4	4	5	5	4.7	NM	11.8
SRPT	SAREPTA THERAPEUTICS INC	134.02	1	5	5	5	5	5	4	5	5	5	4.9	NM	9.9
Equipment and Services															
BSX	BOSTON SCIENTIFIC CORP	$40.26	1	2	1	2	3	3	2	2	1	3	2.1	25.8 x	$55.8
HCA	HCA HEALTHCARE INC	128.88	1	1	4	4	2	5	2	2	1	1	2.4	12.9	44.2
A	AGILENT TECHNOLOGIES INC	79.93	1	4	2	1	3	4	4	1	1	2	2.4	26.0	25.4
MASI	MASIMO CORP	131.84	1	4	3	3	2	5	2	1	1	1	2.4	42.8	7.0
ABT	ABBOTT LABORATORIES	78.24	1	5	3	2	2	3	1	3	2	3	2.7	24.4	137.4
COO	COOPER COMPANIES INC	292.99	1	3	5	2	4	1	4	2	2	2	2.8	24.4	14.5
DHR	DANAHER CORP	127.44	1	4	5	4	1	5	2	2	1	2	2.9	26.5	91.0
HOLX	HOLOGIC INC	47.21	1	4	3	3	3	2	2	1	4	4	2.9	19.5	13.8
ANTM	ANTHEM INC	296.98	1	2	5	4	2	5	2	4	1	2	3.0	15.5	76.4
EW	EDWARDS LIFESCIENCES CORP	175.44	1	5	5	4	4	3	3	2	3	1	3.3	33.6	36.5
VEEV	VEEVA SYSTEMS INC	119.04	1	1	5	3	5	4	5	1	3	3	3.3	62.0	17.3
DXCM	DEXCOM INC	143.79	1	3	1	5	5	5	3	2	4	5	3.7	NM	12.9
MOH	MOLINA HEALTHCARE INC	138.94	1	1	5	5	5	5	5	1	4	5	4.0	14.2	8.7
Consumer Staples															
PG	PROCTER & GAMBLE CO	$100.05	1	2	2	2	1	5	2	2	1	1	2.0	21.9 x	$250.3
CCEP	COCA-COLA EUROPEAN PARTNERS	48.88	1	1	4	2	1	5	1	2	2	2	2.2	17.1	23.8
HSY	HERSHEY CO	110.36	1	4	1	2	1	4	4	2	3	1	2.4	19.6	23.1
CLX	CLOROX CO/DE	159.19	1	5	3	4	3	3	4	2	4	1	3.2	24.6	20.4
MKC	MCCORMICK & CO INC	138.40	1	3	3	5	3	1	4	4	5	1	3.2	26.5	18.3
CHD	CHURCH & DWIGHT INC	66.40	1	4	4	4	3	3	4	4	4	1	3.4	27.0	16.4
POST	POST HOLDINGS INC	101.15	1	1	2	4	3	4	5	4	3	5	3.4	19.7	6.7
KDP	KEURIG DR PEPPER INC	27.23	1	5	5	4	2	5	3	3	5	1	3.7	22.2	38.3
Financials:															
Banks, Consumer Finance and Other															
CACC	CREDIT ACCEPTANCE CORP	$446.86	1	2	3	4	3	5	1	1	5	1	2.8	13.8 x	$8.5
Insurance															
PGR	PROGRESSIVE CORP-OHIO	$73.58	1	1	2	1	3	1	3	3	1	2	1.9	14.7 x	$43.0
CINF	CINCINNATI FINANCIAL CORP	85.69	1	3	1	1	2	4	1	2	4	2	2.2	24.5	14.0
ERIE	ERIE INDEMNITY CO -CL A	175.22	1	3	1	4	1	4	1	1	3	2	2.2	28.8	9.2
Real Estate															
ELS	EQUITY LIFESTYLE PROPERTIES	$113.66	1	2	4	2	1	1	2	4	1	2	2.1	43.7 x	$10.2
ESS	ESSEX PROPERTY TRUST	286.99	1	3	4	2	1	2	3	2	2	2	2.3	57.6	18.9
SUI	SUN COMMUNITIES INC	117.84	1	5	4	2	1	1	2	1	1	4	2.3	92.8	10.2
STOR	STORE CAPITAL CORP	32.70	1	4	3	3	1	2	4	2	1	1	2.3	35.0	7.2
AMT	AMERICAN TOWER CORP	185.75	1	1	4	1	1	3	2	4	3	3	2.4	53.0	81.9
CCI	CROWN CASTLE INTL CORP	123.85	1	5	4	1	2	2	2	2	2	3	2.6	72.9	51.5
O	REALTY INCOME CORP	71.36	1	5	4	2	1	2	3	1	5	1	2.7	51.3	21.7
AIV	APARTMENT INVESTMENT & MGMT CO	50.29	1	4	3	2	1	1	4	3	na	5	2.9	98.5	7.3
WELL	WELLTOWER INC	76.86	1	4	3	3	2	2	3	2	3	4	2.9	42.9	29.7
UDR	UDR INC	44.98	1	5	3	2	1	1	3	4	3	4	2.9	132.3	20.7
MPW	MEDICAL PROPERTIES TRUST	18.25	1	3	2	4	2	3	4	1	4	3	2.9	18.2	7.0
NNN	NATIONAL RETAIL PROPERTIES	53.18	1	4	4	3	1	2	3	5	4	1	3.0	33.2	8.6
OHI	OMEGA HEALTHCARE INVS INC	36.45	1	3	4	4	2	2	4	5	4	2	3.3	22.2	7.4
HCP	HCP INC	31.10	1	5	3	3	2	2	3	4	4	5	3.4	57.6	14.9
Energy:															
Integrateds, Oil Service, Refiners and Other															
KMI	KINDER MORGAN INC	$19.86	1	3	4	3	2	3	3	3	4	4	3.2	19.7 x	$45.0
ENB	ENBRIDGE INC	36.77	1	4	4	3	3	4	1	3	4	4	3.3	19.6	74.3
Telecommunication Services															
TMUS	T-MOBILE US INC	$71.70	1	4	1	2	2	5	1	3	1	3	2.4	18.4 x	$61.0
S	SPRINT CORP	6.22	1	5	3	4	4	5	1	5	4	5	4.0	93.3	25.4
Utilities															
NEE	NEXTERA ENERGY INC	$190.89	1	2	4	2	1	1	2	2	2	1	1.9	22.8 x	$91.3
DTE	DTE ENERGY CO	124.06	1	2	3	1	1	2	3	2	2	1	1.9	19.9	22.6
AEP	AMERICAN ELECTRIC POWER CO	83.11	1	5	4	1	1	1	2	1	2	1	2.0	20.2	41.0
D	DOMINION ENERGY INC	76.33	1	3	3	2	1	1	3	3	2	1	2.1	18.1	61.7
AWK	AMERICAN WATER WORKS CO INC	104.92	1	2	5	2	1	1	2	1	4	1	2.1	29.3	19.0
EXC	EXELON CORP	49.46	1	4	4	1	1	1	3	3	1	2	2.2	15.7	48.0
ES	EVERSOURCE ENERGY	70.51	1	5	2	1	1	1	2	5	2	1	2.2	20.4	22.4
AEE	AMEREN CORP	72.37	1	3	3	2	1	1	3	5	1	1	2.2	22.2	17.7
LNT	ALLIANT ENERGY CORP	47.15	1	3	4	2	1	1	1	4	3	1	2.2	20.9	11.1
PNW	PINNACLE WEST CAPITAL CORP	94.94	1	2	4	3	1	1	4	1	3	1	2.2	19.6	10.6
DUK	DUKE ENERGY CORP	90.51	1	5	3	1	1	1	2	5	2	1	2.3	18.3	65.8
SO	SOUTHERN CO	51.68	1	3	4	1	1	1	3	4	3	2	2.4	17.0	53.5
XEL	XCEL ENERGY INC	56.46	1	3	4	2	1	2	2	4	3	1	2.4	21.6	29.0
FE	FIRSTENERGY CORP	41.58	1	2	4	1	1	1	4	1	5	3	2.4	16.2	22.0
WEC	WEC ENERGY GROUP INC	77.58	1	3	4	2	1	1	3	3	5	1	2.6	22.1	24.5
CMS	CMS ENERGY CORP	55.32	1	4	4	2	1	1	4	3	3	2	2.7	22.1	15.7
OGE	OGE ENERGY CORP	42.91	1	4	4	2	1	1	4	2	4	2	2.7	20.1	8.6
AES	AES CORP	18.12	1	1	4	3	2	2	4	2	2	5	2.8	13.5	12.0
CNP	CENTERPOINT ENERGY INC	30.68	1	1	3	2	1	2	5	5	3	4	2.9	18.4	15.4
ETR	ENTERGY CORP	94.89	1	2	4	2	1	2	4	5	3	4	3.0	17.9	18.0
NRG	NRG ENERGY INC	42.94	1	2	4	3	1	3	5	3	2	4	3.0	11.5	12.2
NI	NISOURCE INC	28.00	1	3	5	2	4	1	4	2	4	2	3.0	21.4	10.4
SRE	SEMPRA ENERGY	124.00	1	4	5	2	1	5	3	1	5	2	3.1	20.6	34.0
PPL	PPL CORP	32.47	1	4	4	3	3	1	4	3	4	2	3.1	13.3	23.4

Source: Empirical Research Partners Analysis.

Appendix 2: Large-Capitalization Stocks
The Worst Quintile of Nine-Month Stock Price Trends
Ranking Based on Timing Considerations
Sorted by Timing Score within Sector
As of Early-March 2019

			Quintiles (1=Best, 5=Worst)												
				Timing Considerations											
Symbol	Company	Price	Nine-Month Price Trend	Earnings Informativeness	Technical Indicator	Arbitrage Risk (1=Lowest, 5=Highest)	Downside Risk (1=Lowest, 5=Highest)	Return Skewness	Share Turnover	Media Sentiment	Short Pressure	Fundamental Stability	Average: Timing Score	Forward P/E Ratio	Market Capitalization ($ Billion)
Consumer Cyclicals:															
Consumer Durables															
MGA	MAGNA INTERNATIONAL INC	$50.02	5	1	1	2	4	2	2	1	3	2	2.0	7.3 x	$16.7
NVR	NVR INC	2,769.46	5	4	2	4	3	2	4	3	1	1	2.7	16.3	10.0
LEA	LEAR CORP	146.05	5	2	1	4	3	4	5	3	2	3	3.0	8.0	9.2
BWA	BORGWARNER INC	38.85	5	3	4	3	4	3	4	1	2	4	3.1	9.2	8.1
FCAU	FIAT CHRYSLER AUTOMOBILES NV	14.49	5	1	5	5	5	1	1	4	3	5	3.3	4.5	28.3
APTV	APTIV PLC	82.47	5	3	4	3	3	4	4	4	4	4	3.7	15.3	21.4
MHK	MOHAWK INDUSTRIES INC	133.26	5	3	4	4	5	1	5	4	4	3	3.7	11.8	9.6
ALV	AUTOLIV INC	77.58	5	4	3	4	4	3	4	5	5	4	4.0	10.8	6.8
NWL	NEWELL BRANDS INC	15.59	5	4	2	5	5	1	4	5	5	5	4.0	9.8	6.6
F	FORD MOTOR CO	8.57	5	4	5	4	3	4	5	5	3	5	4.2	7.1	34.1
Retail and Other Consumer Cyclicals															
BKNG	BOOKING HOLDINGS INC	$1,736.00	5	5	2	5	4	1	2	4	2	2	3.0	17.2 x	$79.2
PVH	PVH CORP	112.03	5	3	5	4	4	2	5	1	1	2	3.0	10.9	8.5
LKQ	LKQ CORP	26.87	5	1	1	4	5	3	2	5	3	3	3.0	11.2	8.5
LVS	LAS VEGAS SANDS CORP	59.16	5	1	1	3	4	5	3	5	2	4	3.1	18.4	46.4
ARMK	ARAMARK	30.31	5	5	1	3	4	1	5	5	2	3	3.2	12.8	7.5
TPR	TAPESTRY INC	33.78	5	3	3	5	5	1	5	5	2	1	3.3	12.5	9.8
MTN	VAIL RESORTS INC	217.82	5	4	3	5	5	1	4	2	4	2	3.3	29.8	8.8
TIF	TIFFANY & CO	95.87	5	3	5	2	5	1	5	2	5	3	3.4	19.6	11.7
CPRI	CAPRI HOLDINGS LTD	45.55	5	5	3	5	5	1	5	4	2	1	3.4	9.0	7.0
LB	L BRANDS INC	26.27	5	4	1	5	5	1	5	5	5	1	3.6	11.0	7.2
WYNN	WYNN RESORTS LTD	117.35	5	1	1	5	5	3	5	5	3	5	3.7	19.3	12.8
QRTEA	QURATE RETAIL INC	17.72	5	5	5	5	5	1	1	5	4	5	4.0	9.2	7.8
M	MACY'S INC	23.82	5	5	4	5	5	1	5	4	5	2	4.0	7.6	7.3
KMX	CARMAX INC	60.99	5	5	4	4	2	5	5	3	5	4	4.1	12.0	10.5
GRUB	GRUBHUB INC	78.07	5	5	1	5	5	5	5	5	5	4	4.4	55.4	7.1
Media and Entertainment															
WPP	WPP PLC	$55.89	5	1	na	3	5	1	1	5	2	3	2.6	8.5 x	$14.1
BIDU	BAIDU INC	166.99	5	1	na	4	4	3	3	3	2	4	3.0	19.0	58.3
SIRI	SIRIUS XM HOLDINGS INC	6.14	5	4	3	3	4	1	1	3	5	3	3.0	25.5	29.1
ATVI	ACTIVISION BLIZZARD INC	42.63	5	2	4	5	5	1	3	5	3	2	3.3	19.6	32.6
NWSA	NEWS CORP	12.87	5	2	5	1	5	1	2	5	4	5	3.3	29.9	7.6
EA	ELECTRONIC ARTS INC	98.59	5	1	5	5	5	4	4	4	2	2	3.6	23.5	29.7
TWTR	TWITTER INC	31.16	5	5	4	5	5	1	5	3	3	4	3.9	35.8	23.9
TTWO	TAKE-TWO INTERACTIVE SFTWR	89.85	5	3	3	5	5	2	5	4	3	5	3.9	18.2	10.2
Z	ZILLOW GROUP INC	39.76	5	5	3	5	5	3	5	4	5	5	4.4	NM	8.1
SNAP	SNAP INC	9.88	5	5	na	5	5	5	5	4	5	5	4.9	NM	13.5
Capital Equipment															
GD	GENERAL DYNAMICS CORP	$168.77	5	2	5	2	2	1	2	2	2	2	2.2	14.5 x	$48.7
RTN	RAYTHEON CO	179.97	5	1	4	3	3	2	3	2	2	1	2.3	15.5	50.8
NOC	NORTHROP GRUMMAN CORP	275.17	5	1	1	2	4	1	3	4	3	2	2.3	14.5	46.9
ABB	ABB LTD	18.93	5	1	na	2	1	3	1	5	5	2	2.5	14.5	41.1
TXT	TEXTRON INC	51.93	5	1	3	2	4	1	4	3	4	4	2.9	14.1	12.2
AOS	SMITH (A O) CORP	51.44	5	1	3	2	2	5	5	2	4	2	2.9	19.0	8.7
FBHS	FORTUNE BRANDS HOME & SECUR	46.33	5	3	1	3	4	2	5	4	2	4	3.1	12.7	6.5
URI	UNITED RENTALS INC	125.30	5	5	1	4	5	1	5	1	4	5	3.4	6.5	10.0
FLR	FLUOR CORP	37.28	5	5	4	3	5	1	5	3	3	4	3.7	13.5	5.2
AER	AERCAP HOLDINGS NV	43.55	5	5	3	4	3	3	4	5	3	5	3.9	6.2	6.4
GE	GENERAL ELECTRIC CO	9.76	5	5	1	5	5	4	5	4	2	5	4.0	14.0	85.0
WAB	WABTEC CORP	71.79	5	5	3	5	5	1	5	4	5	4	4.1	17.3	6.9
Industrial Commodities															
EMN	EASTMAN CHEMICAL CO	$81.20	5	1	1	2	2	3	4	5	1	3	2.4	9.3 x	$11.3
AXTA	AXALTA COATING SYSTEMS LTD	26.25	5	3	2	2	2	2	4	1	2	4	2.4	19.2	6.2
STLD	STEEL DYNAMICS INC	36.35	5	4	1	3	4	2	2	3	1	4	2.7	8.6	8.5
LYB	LYONDELLBASELL INDUSTRIES NV	89.28	5	3	1	4	2	4	3	4	2	2	2.8	8.5	33.5
PKG	PACKAGING CORP OF AMERICA	99.20	5	3	1	4	4	2	4	3	1	4	2.9	11.8	9.4
DWDP	DOWDUPONT INC	55.57	5	3	2	5	3	3	2	5	2	4	3.2	13.9	126.1
IP	INTERNATIONAL PAPER CO	46.85	5	3	2	3	3	5	4	3	3	4	3.3	8.8	18.8
WRK	WESTROCK CO	39.55	5	5	1	4	4	1	4	5	2	4	3.3	9.1	10.1
TECK	TECK RESOURCES LTD	22.20	5	5	1	5	5	3	2	5	2	5	3.7	7.9	12.7
WLK	WESTLAKE CHEMICAL CORP	68.55	5	4	1	5	4	4	3	5	3	4	3.7	10.2	8.9
SCCO	SOUTHERN COPPER CORP	37.83	5	5	4	5	4	2	1	5	5	3	3.8	16.2	29.2
CC	CHEMOURS CO	38.59	5	5	1	4	4	3	5	3	4	5	3.8	7.9	6.6
MT	ARCELORMITTAL	21.66	5	5	3	5	4	4	1	4	5	5	4.0	5.7	22.2
FCX	FREEPORT-MCMORAN INC	12.65	5	5	5	5	5	2	5	4	4	5	4.4	24.8	18.3
Transports															
JBHT	HUNT (JB) TRANSPORT SERVICES INC	$103.89	5	3	1	3	2	4	2	5	4	2	2.9	16.4 x	$11.3
FDX	FEDEX CORP	177.17	5	5	1	4	4	1	4	5	3	4	3.4	10.4	46.2
AAL	AMERICAN AIRLINES GROUP INC	30.92	5	1	5	5	5	3	4	5	4	3	3.9	5.1	14.2
XPO	XPO LOGISTICS INC	49.02	5	5	4	5	5	1	5	5	5	5	4.4	13.6	5.7
Technology:															
Technology Software and Services															
DOX	AMDOCS	$54.52	5	2	4	3	2	1	1	4	2	1	2.2	12.9 x	$7.6
BR	BROADRIDGE FINANCIAL SOLUTNS	100.44	5	1	1	2	3	4	4	4	1	1	2.3	20.8	11.6
SABR	SABRE CORP	21.46	5	3	3	3	3	2	2	4	2	4	2.9	19.9	5.9
DXC	DXC TECHNOLOGY COMPANY	65.11	5	3	1	4	5	1	4	4	1	5	3.1	7.2	17.6
DBX	DROPBOX INC	23.11	5	5	na	5	5	4	5	4	4	4	4.5	57.3	9.5
NTNX	NUTANIX INC	37.19	5	5	na	5	5	1	5	5	5	5	4.5	NM	6.9
Technology Hardware															
TEL	TE CONNECTIVITY LTD	$82.54	5	2	5	2	2	2	3	3	2	2	2.6	15.1 x	$28.0
HPQ	HP INC	19.06	5	5	1	5	5	1	3	5	2	1	3.1	8.8	29.3
IPGP	IPG PHOTONICS CORP	152.16	5	5	4	4	5	1	3	5	5	4	4.0	24.1	8.1
WDC	WESTERN DIGITAL CORP	49.15	5	5	2	5	5	1	4	5	5	5	4.1	9.2	14.3
Semiconductors															
UMC	UNITED MICROELECTRONICS CORP	$1.89	5	1	3	4	4	2	1	5	3	1	2.7	31.3 x	$4.7
STM	STMICROELECTRONICS NV	15.79	5	5	1	5	5	1	2	2	5	4	3.3	12.7	14.5
NVDA	NVIDIA CORP	162.52	5	5	1	5	5	1	5	4	3	3	3.6	35.8	98.5
SWKS	SKYWORKS SOLUTIONS INC	82.26	5	5	5	5	5	3	3	4	2	1	3.7	12.4	14.3
NXPI	NXP SEMICONDUCTORS NV	93.99	5	2	5	5	5	4	4	3	2	4	3.8	12.4	30.9
AMAT	APPLIED MATERIALS INC	38.71	5	5	4	5	5	4	3	5	1	4	4.0	13.1	36.8
MU	MICRON TECHNOLOGY INC	39.25	5	5	1	5	5	2	5	5	4	5	4.1	5.6	44.0

Source: Empirical Research Partners Analysis.

Appendix 2 (cont.): Large-Capitalization Stocks
The Worst Quintile of Nine-Month Stock Price Trends
Ranking Based on Timing Considerations
Sorted by Timing Score Within Sector
As of Early-March 2019

			Quintiles (1=Best, 5=Worst)												
				Timing Considerations											
Symbol	Company	Price	Nine-Month Price Trend	Earnings Informativeness	Technical Indicator	Arbitrage Risk (1=Lowest, 5=Highest)	Downside Risk (1=Lowest, 5=Highest)	Return Skewness	Share Turnover	Media Sentiment	Short Pressure	Fundamental Stability	Average: Timing Score	Forward P/E Ratio	Market Capitalization ($ Billion)
Health Care:															
Pharmaceuticals															
JAZZ	JAZZ PHARMACEUTICALS PLC	$133.85	5	4	3	5	5	1	2	2	3	2	3.0	9.2 x	$8.1
MYL	MYLAN NV	27.37	5	5	3	5	5	4	2	5	1	4	3.8	6.3	14.1
TEVA	TEVA PHARMACEUTICAL INDUSTRIES-ADR	15.68	5	3	1	5	5	5	5	5	3	4	4.0	6.6	17.2
NKTR	NEKTAR THERAPEUTICS	36.21	5	5	2	5	5	2	3	4	5	5	4.0	NM	6.3
PRGO	PERRIGO CO PLC	47.18	5	4	5	5	5	1	5	5	5	4	4.3	10.8	6.4
Biotechnology															
ABBV	ABBVIE INC	$78.74	5	4	5	4	4	2	2	5	2	1	3.2	9.1 x	$116.4
NBIX	NEUROCRINE BIOSCIENCES INC	80.97	5	5	1	5	5	2	2	2	3	5	3.3	NM	7.4
Equipment and Services															
LH	LABORATORY CORP OF AMERICA	$151.41	5	1	1	2	4	1	4	2	2	3	2.2	13.5 x	$15.4
DGX	QUEST DIAGNOSTICS INC	86.81	5	1	3	2	4	1	4	4	3	2	2.7	13.5	11.7
ABMD	ABIOMED INC	323.76	5	5	2	5	5	2	3	2	2	1	3.0	65.8	14.6
CVS	CVS HEALTH CORP	54.65	5	5	4	4	4	1	4	5	1	3	3.4	8.1	70.9
DVA	DAVITA INC	51.33	5	4	2	3	4	4	4	5	1	4	3.4	11.8	8.5
MCK	MCKESSON CORP	115.61	5	4	5	4	4	2	4	5	1	4	3.7	8.2	22.2
ALGN	ALIGN TECHNOLOGY INC	250.84	5	5	5	5	5	1	4	4	3	3	3.9	49.1	20.1
Consumer Staples															
INGR	INGREDION INC	$92.28	5	2	1	1	4	1	4	3	4	2	2.4	13.1 x	$6.2
K	KELLOGG CO	54.16	5	1	5	3	3	1	3	5	4	2	3.0	13.5	18.6
KHC	KRAFT HEINZ CO	31.99	5	1	2	5	5	1	1	5	4	4	3.1	11.3	39.0
STZ	CONSTELLATION BRANDS	168.81	5	4	1	5	4	1	5	3	4	1	3.1	17.8	32.1
BG	BUNGE LTD	52.00	5	4	5	3	3	1	5	5	3	4	3.7	19.1	7.3
CAG	CONAGRA BRANDS INC	22.79	5	4	3	5	5	1	5	5	4	3	3.9	10.7	11.1
Financials:															
Banks, Consumer Finance and Other															
EWBC	EAST WEST BANCORP INC	$51.89	5	2	5	3	3	2	1	2	1	3	2.4	10.2 x	$7.5
RF	REGIONS FINANCIAL CORP	15.62	5	1	3	2	3	3	5	2	1	4	2.7	9.8	16.0
FITB	FIFTH THIRD BANCORP	27.86	5	4	2	3	4	2	2	3	2	3	2.8	10.2	18.1
CFG	CITIZENS FINANCIAL GROUP INC	35.06	5	2	1	3	2	4	5	3	1	4	2.8	9.1	16.3
SIVB	SVB FINANCIAL GROUP	240.94	5	3	2	4	5	1	2	1	3	4	2.8	11.6	12.7
COF	CAPITAL ONE FINANCIAL CORP	82.95	5	3	5	3	2	2	3	4	1	3	2.9	7.4	38.8
KEY	KEYCORP	17.07	5	3	2	3	3	3	5	3	1	3	2.9	9.2	17.4
CMA	COMERICA INC	82.23	5	2	2	4	2	4	5	2	1	4	2.9	10.0	13.2
ZION	ZIONS BANCORPORATION NA	48.92	5	1	3	2	2	4	3	3	5	4	3.0	11.0	9.2
JEF	JEFFERIES FINANCIAL GRP INC	19.37	5	1	2	2	3	4	3	4	4	5	3.1	15.9	6.4
ADS	ALLIANCE DATA SYSTEMS CORP	167.91	5	4	4	4	4	1	5	1	4	3	3.3	7.6	9.0
Capital Markets															
NTRS	NORTHERN TRUST CORP	$90.14	5	1	1	1	2	3	1	2	1	3	1.7	13.5 x	$19.7
SEIC	SEI INVESTMENTS CO	50.85	5	1	1	1	3	3	1	4	1	3	2.0	16.4	7.8
BLK	BLACKROCK INC	427.84	5	1	1	1	3	2	2	5	2	3	2.2	16.2	68.0
RJF	RAYMOND JAMES FINANCIAL CORP	81.16	5	1	5	1	3	3	3	2	1	4	2.6	11.4	11.4
SCHW	SCHWAB (CHARLES) CORP	43.99	5	1	5	2	3	4	2	4	2	3	2.9	15.6	58.6
ETFC	E TRADE FINANCIAL CORP	48.05	5	4	2	3	3	2	3	4	2	3	2.9	11.7	11.8
MS	MORGAN STANLEY	42.03	5	3	3	3	2	4	3	5	1	3	3.0	8.6	71.8
TROW	PRICE (T. ROWE) GROUP	100.43	5	4	5	3	3	3	1	4	3	2	3.1	14.9	23.9
STT	STATE STREET CORP	69.00	5	3	5	3	4	1	4	4	1	4	3.2	10.3	26.2
AMG	AFFILIATED MANAGERS GRP INC	106.56	5	3	2	3	3	4	5	5	2	4	3.4	7.6	5.5
GS	GOLDMAN SACHS GROUP INC	196.63	5	3	5	4	3	4	4	3	2	4	3.6	8.2	74.9
IBKR	INTERACTIVE BROKERS GROUP	54.01	5	5	2	4	4	3	4	2	5	3	3.6	22.5	22.3
IVZ	INVESCO LTD	18.97	5	3	2	3	3	3	5	5	4	4	3.6	9.0	7.5
Insurance															
MKL	MARKEL CORP	$980.55	5	3	4	2	3	1	1	5	3	5	3.0	26.3 x	$13.6
AIG	AMERICAN INTERNATIONAL GROUP	43.05	5	5	1	4	4	1	3	5	3	5	3.4	9.8	37.4
BHF	BRIGHTHOUSE FINANL INC	38.62	5	5	na	5	4	5	3	4	4	5	4.4	4.4	4.5
Real Estate															
WY	WEYERHAEUSER CO	$25.77	5	5	1	3	3	2	3	1	1	5	2.7	30.3 x	$19.2
MAC	MACERICH CO	43.24	5	3	1	4	3	2	4	4	5	5	3.4	135.1	6.6
Energy:															
Integrateds, Oil Service, Refiners and Other															
PSX	PHILLIPS 66	$97.39	5	1	1	2	3	3	3	3	2	3	2.3	11.4 x	$44.4
SU	SUNCOR ENERGY INC	33.20	5	3	1	2	2	3	1	4	5	5	2.9	18.0	52.6
OXY	OCCIDENTAL PETROLEUM CORP	64.20	5	1	5	2	3	2	3	2	3	5	2.9	19.4	48.1
IMO	IMPERIAL OIL LTD	27.25	5	2	2	3	2	3	1	4	5	4	2.9	15.4	21.3
EQNR	EQUINOR ASA	21.98	5	2	na	2	2	4	1	3	5	5	3.0	12.4	73.1
VLO	VALERO ENERGY CORP	83.85	5	4	2	4	4	2	4	2	1	4	3.0	11.2	35.0
MPC	MARATHON PETROLEUM CORP	58.86	5	3	1	3	4	4	5	5	1	4	3.3	9.4	40.0
HFC	HOLLYFRONTIER CORP	50.70	5	4	1	3	4	3	5	3	2	5	3.3	9.5	8.7
SLB	SCHLUMBERGER LTD	42.59	5	5	5	4	2	4	4	2	2	5	3.7	26.6	59.0
HAL	HALLIBURTON CO	28.09	5	5	3	4	4	2	5	3	3	5	3.8	20.3	24.5
BHGE	BAKER HUGHES A GE CO	26.82	5	4	na	4	4	2	5	3	4	5	3.9	25.3	27.8
FTI	TECHNIPFMC PLC	21.49	5	4	na	5	4	3	4	5	3	5	4.1	15.3	9.7
NOV	NATIONAL OILWELL VARCO INC	26.93	5	5	2	4	4	5	4	5	4	5	4.2	168.3	10.3
ESV	ENSCO PLC	4.23	5	5	5	5	5	3	5	5	5	5	4.8	NM	1.9
Exploration and Production															
EOG	EOG RESOURCES INC	$86.98	5	4	1	4	4	3	3	4	3	5	3.4	19.3 x	$50.5
CNQ	CANADIAN NATURAL RESOURCES	27.29	5	5	2	4	3	5	1	5	1	5	3.4	20.1	33.1
ECA	ENCANA CORP	7.11	5	5	2	5	5	3	5	1	3	5	3.8	10.0	10.6
PXD	PIONEER NATURAL RESOURCES CO	135.03	5	4	4	4	4	4	4	5	2	5	4.0	19.8	22.9
APC	ANADARKO PETROLEUM CORP	43.81	5	5	4	5	5	2	5	4	1	5	4.0	29.2	21.9
MRO	MARATHON OIL CORP	16.90	5	5	5	5	5	4	5	1	2	5	4.1	39.8	13.8
CLR	CONTINENTAL RESOURCES INC	40.92	5	5	2	5	5	4	3	5	4	5	4.2	20.3	15.4
CXO	CONCHO RESOURCES INC	102.16	5	5	3	5	5	2	5	5	4	5	4.3	24.7	20.5
XEC	CIMAREX ENERGY CO	70.03	5	5	5	4	4	4	5	2	5	5	4.3	12.9	7.1
DVN	DEVON ENERGY CORP	28.76	5	5	5	5	4	3	5	5	3	5	4.4	23.8	12.9
APA	APACHE CORP	33.68	5	5	5	5	4	3	5	4	5	5	4.6	55.2	12.6
NBL	NOBLE ENERGY INC	22.44	5	5	3	5	5	4	5	5	5	5	4.7	NM	10.9
Telecommunication Services															
VOD	VODAFONE GROUP PLC	$18.16	5	2	na	4	2	5	1	5	2	5	3.3	15.4 x	$50.1
ZAYO	ZAYO GROUP HOLDINGS INC	28.26	5	1	5	5	5	1	5	3	3	5	3.7	44.2	6.6
CTL	CENTURYLINK INC	12.22	5	5	5	5	5	2	5	5	5	4	4.6	10.3	13.2

Source: Empirical Research Partners Analysis.