



Epsilon Theory

Figaro

October 24, 2018



The dancers on stage are flopping around, dancing awkwardly in the absence of any music. They look uncomfortable as the Emperor Joseph II enters the rehearsal for the first performance of Mozart's The Marriage of Figaro.

Emperor Joseph II: What is this? I don't understand. Is it modern?

Kappelmeister Bonno: Majesty, the Herr Director, he has removed a ballet that would have occurred at this place.

Joseph: Why?

Count Orsini-Rosenberg: It is your regulation, Sire. No ballet in your opera.

Joseph: Do you like this, Salieri?

Antonio Salieri: It is not a question of liking, Your Majesty. Your own law decrees it, I'm afraid.

Joseph: Well, LOOK at them! No, no, no! This is nonsense. Let me hear the scene with the music.

- *Amadeus* (1984)

Of all the investment strategies that force investors to hold their noses and take their medicine, we are most uncomfortable with those based on historical price movements. We know that they work, up to a point. And so we balance in our heads the ideas of participating in trends with some vague notion that we will make enough money doing so to compensate us for it all blowing up in our face one day. Alternatively we hope that we will be able to buck the trend before it reverses, whether through a contrarian analysis of price movements or some statistical model of investor behavior. Even when the models *work*, it can feel unsettling, like dancing a ballet without music.

Music's exclusive function is to structure the flow of time and keep order in it.

- Igor Stravinsky, as quoted by Geza Szamosi in *The Twin Dimensions: Inventing Time and Space*

In a Three-Body Market, narratives are the music. Understanding how they influence the structure and flow of price-trending behaviors is not a cure-all. But it can be a useful tool.

If you would dance, my pretty Count,
I'll play the tune on my little guitar.
If you will come to my dancing school
I'll gladly teach you the capriole.
I'll know how; but soft,
every dark secret
I'll discover better by pretending.
Sharpening my skill, and using it,
pricking with this one, playing with that one,
all of your schemes I'll turn inside out.

Se vuol ballare, signor contino,
il chitarrino le suonerò, sì,
se vuol venire nella mia scuola,
la capriola le insegnerò, sì.
Saprò, saprò, ma piano,
meglio ogni arcano
dissimulando scoprir potrò.
L'arte schermendo, l'arte adoprando,
di qua pungendo, di là scherzando,
tutte le macchine rovescerò.

- *The Marriage of Figaro*, by Wolfgang Amadeus Mozart from a libretto by Lorenzo da Ponte (1796)

If narratives are the music, we must be conscious of the musicians.

This is Part 4 of the multi-part Three-Body Alpha series, introduced in the [Investing with Icarus](#) note. The Series seeks to explore how the increasing transformation of fundamental and economic data into abstractions may influence strategies for investing – and how it should influence investors accessing them.

	Economic Models	Behavioral Models	Idiosyncratic Models
Systematic	Security Screening Econometric GTAA	Trend-Following Momentum Value Factor Investing Mean-Reversion Statistical Arbitrage	High Frequency
Discretionary	DCF / DDM / Price Target Quality-Based Credit Work Growth Equity Relative Value Asset Value	Sentiment Value + Catalyst Discretionary Macro Other Trading Strategies	Activism Distress

Trend-following is an odd little corner of the market.

Well, not *little*, I suppose. When taken in the aggregate, trend-following strategies - by which I include all strategies which use historical price behavior as a primary component in determining current positioning - account for at least \$400 billion, and some multiple of that in exposure. If we included all the momentum-inclusive quant equity strategies and related factor portfolios, too, we're easily wandering into the trillions.

And yet it still has an uneven reputation.

It wasn't long ago that the most reputationally aware institutional money (i.e. endowments and foundations) wouldn't *touch* anything that looked like it was trading based on price movements. Some still don't. It was considered this sort of uncouth thing, a place for daytraders and charlatans. The real adults were investors! Value investors, business buyers, participants in the process of setting the proper price of capital! It didn't help, of course, that many of the go-go momentum shops of the late 90's *were* pretty sloppy, or that many so-called trend-following strategies were just some guy drawing dumb lines on a Bloomberg chart. And then later getting a computer to draw dumb lines for him.

Now, the empirical premises of the most basic trend-following strategies are not really all that much in question. They work. The data are pretty clear that they work. Of course, don't tell that to the professor at Wharton who taught me 18 years ago that technical analysis was only so much superstitious hogwash. And yes, as much as we might protest that the reversal pattern of long-term underperformers that DeBondt and Thaler identified in 1985 or the short-term trend continuation pegged by Jegadeesh and Titman in 1996 are *different*, it is still technical analysis, y'all.

So yes, it works. But investing because of how the price has moved doesn't FEEL like investing, and this feeling is a hump that a lot of investors still can't get over. It's too simple. As it happens, a lot of professional investors are really uncomfortable telling their clients and boards that they buy things *just* because they're going up and sell them *just* because they're going down. This is a predictable outcome, given that many of those professional investors have sold themselves to their clients and boards on the basis of, y'know, not being the kind of poor sap who just does what everyone else has been doing.

And so it is that there are all sorts of stories about why trend-following and momentum strategies work that are meant to lend them credibility. *Maybe it's because dispersion of fundamental information takes time. Maybe it's because we overextrapolate earnings growth. Maybe it's because price trends are really just a proxy for intangible business momentum.* I'm sure there are many very bright people who earnestly believe these stories. Hell, they may even be right. But for my money, the simpler explanation - and to be fair, it's one that is usually recognized by those proposing the other explanations - is the easier one. Things that go up feel better and safer, a natural emotion that we have institutionalized through Morningstar ratings, consultant buy lists, 'approved lists' and hyper-frequent portfolio reviews designed under the auspices of weeding out 'bad investments', by which we mean 'investments that have done poorly over the last 12-24 months.'

The problem is that while most of us can get our heads around why price and performance trends ought to continue, we also know that they can't and don't continue indefinitely. We also know that, if value investing works, too - and it does - there's a point at which our view probably ought to shift to an expectation of a contrary relationship between future returns and stocks with strong historical performance. As you might imagine, there are a lot of implementation choices here. In fact, I'm not sure there is a space that provides the potential for as much diversity in signal design as trend-following.

Lest you get too frightened (or excited), no. This isn't going to be a survey piece. There are great primers available on trend-following, and I'm not going to write a better one. If you're in the market for a survey course in investment strategies, AQR's Antti Ilmanen wrote the [Bible](#). I'd also add that if you aren't following the work by Corey Hoffstein at Newfound Research, you may find it even more useful. He researches implementation questions in the open, and since doing is invariably the best way to learn, I suspect you will gain immeasurably from following along. I have.

If you do want to understand the smorgasbord of strategies which incorporate price as an input, I do have a small number of suggestions, none of which is groundbreaking, and all of which would be a standard part of the arsenal of questions to ask any trend, CTA, managed futures or systematic macro fund manager:

1. Understand the difference between time-series momentum and cross-sectional momentum, and know which your managers are relying on. They perform more differently than you would expect.
2. Understand time horizon diversity among the signals being used, and how you might expect those signals to work differently.
3. Understand how non-price data is being used in models, as primary signals or conditioners.
4. Understand how positions are sized, and how gross and net exposures are managed.

I'm not making recommendations here, but at their very likely great distress, I'll also share the names of a few people who, in my experience, are preternaturally good at discussing the hows and whys of these strategies. And this is me suggesting, not them offering, y'all:

- Ewan Kirk at Cantab Capital, to explain anything trend-following or managed futures.
- Rob Croce at BNY Mellon (and in full disclosure, a former colleague), to sell you on the religion of pure trend.
- Jason Beverage at Two Sigma, to explain shockingly complicated quant portfolio construction concepts in ways you will understand.
- On anything on the shorter end of the time-horizon spectrum (where a lot of mean reversion strategies live), you will never go very wrong by asking your AQR rep for a chat with Michael Mendelson.

But again, the intent behind this piece – as with the rest of the series – isn't to tell you how and why these strategies work. It is to discuss whether we think a more abstracted market with greater always-on awareness of what other investors are thinking and doing ought to change the way these strategies work. The short answer? Yes. It should also change the way some of the strategies are designed and incorporated into portfolios.

What we are NOT talking about is parsing the news for sentiment. Sure, tone and sentiment are a component of any narrative. But a lot of money has been spent by hedge funds and others over the last decade and a half to mine news for sentiment, first by building huge manual research teams in India, and later by assigning those tasks to computers. *Most of those efforts have been huge flops.* The relationship between narrative and price trends is different, and I want to show you why.

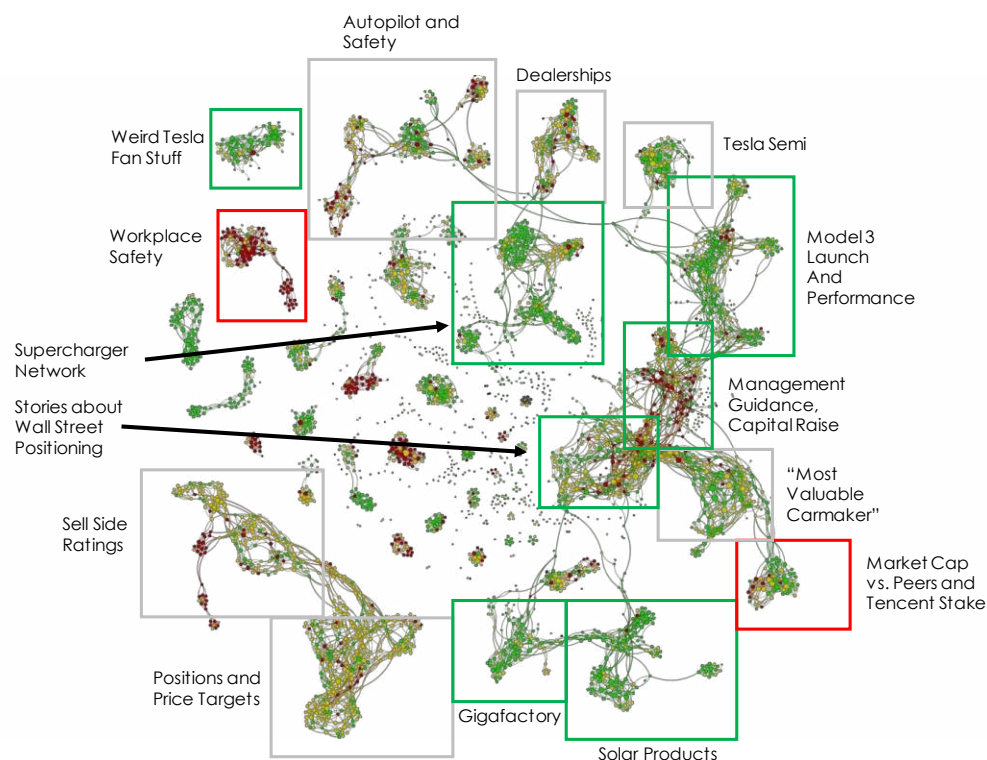
This foray will necessarily cover the relationship between narrative and trend-following more generally, and not with individual strategies. After all, if we're going to tell stories about how prices dance to the music of the stories that Wall Street tells, we must hold some things constant. So let me tell you a story about just three companies. They existed over the last 3 years. Conveniently, all of them are called Tesla Motors.

A Ballet in Three Acts, Act I: Resilient Tesla

Since calling them all the same thing will be confusing, let's call the first of our companies "Resilient Tesla." Resilient Tesla existed between for six months, from November 2016 to May 2017. In what will be familiar to regular readers, we rely on natural language processing technology from Quid to relate and graph news articles from a very broad universe of sources based on content, context, phrasing and sentiment. We provide some of our own characterizations of the clustered content to aid interpretation.

What did media reports have to say about Resilient Tesla? Well, they didn't ignore bad things that were going on. Media reported on issues with autopilot, and on reported safety issues. It reported on issues with dealership access in states. But those stories were curiously isolated. With few exceptions, they shared no language or other similarities with the core of the conversations taking place about Tesla.

The center of gravity around which the Resilient Tesla narrative orbited was management guidance, in particular around Tesla's desire to raise capital to grow. The stories about management guidance and capital raising were usually *also* stories about the Model 3 launch. They were *also* about Tesla taking over as the most valuable carmaker in the US. Importantly, they were *also* stories about Wall Street positioning, and what big investors and sell side analysts thought about the company. And – for the most part – the tone and sentiment of all of these categories were good and positive. What is more, all of these linked positive topics were things where Tesla was the only game in town. That lent stability to the overall narrative, and that narrative was **growth**. *We need capital, but we need it to launch our exciting new product, to grow our factory production, to expand into exciting Semi and Solar brands.* Sure, there were threats, but always on the periphery.

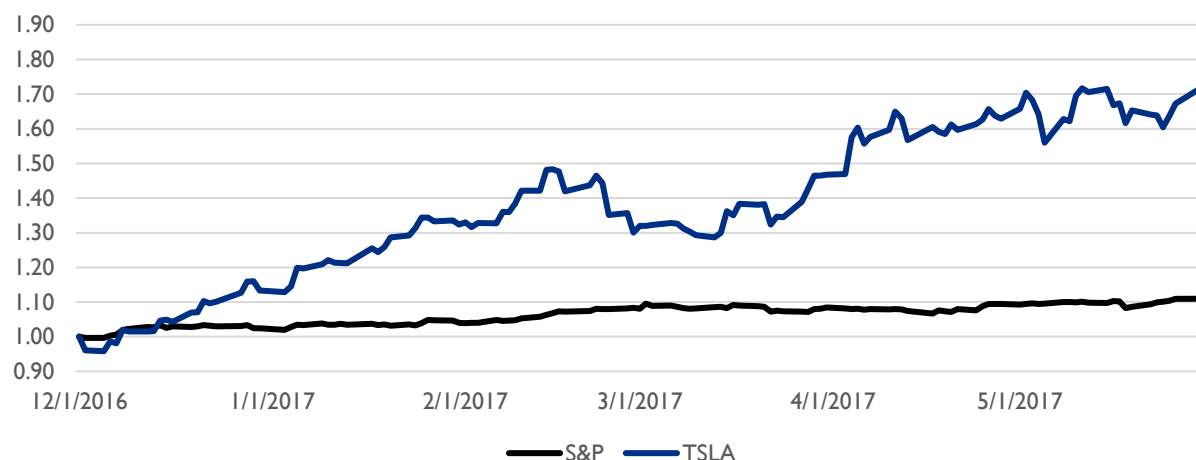


Source: Quid Epsilon Theory.

Resilient Tesla was a positive trending stock. Over all but short bursts over this period, it would have been a long position for most long-, medium- and short-term models. Sure, models and strategies incorporating

liquidity, volume, daily price action, large block trade activity or other esoteric anomalies may have had different exposure, but Resilient Tesla was a classic long for most.

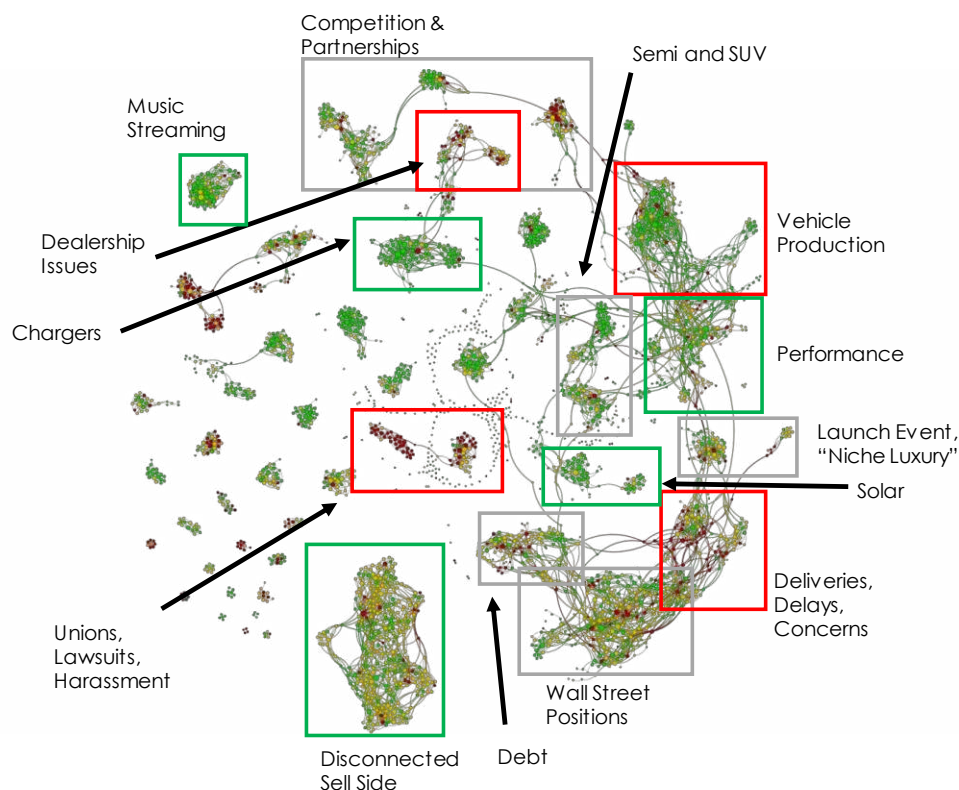
TSLA vs. S&P 500 TR Total Growth of \$1
12/1/2016 - 5/31/2017



Source: Bloomberg, Epsilon Theory. Note: This is not a recommendation to buy or sell any security, or to take any portfolio action. Past performance is not indicative of future results. You cannot invest directly in an index, and we do not invest directly in any individual securities.

A Ballet in Three Acts, Act II: Transitioning Tesla

The stories started changing in summer 2017. Act II tells the story of Transitioning Tesla, a company which existed for three months, from May 2017 through August 2017.



Source: Quid, Epsilon Theory

The overall sentiment and the language used in stories about Transitioning Tesla were still positive. In fact, they were actually *slightly more* positive than they were for Resilient Tesla. But gone was the center of gravity around management guidance and growth capital. In its place, the cluster of topics permeating most stories about Tesla was now about **vehicle deliveries**. Articles about Tesla used to be *Management says this AND Model 3 is coming AND did you know that Tesla is now the most valuable US carmaker AND here's Wall Street's updated buy/sell recommendation stories*. For Transitioning Tesla they were *The Model 3 launch is exciting AND the performance of these cars is amazing, BUT Tesla is having delivery problems AND can they actually make them AND what does Wall Street think about all this?* **The narrative was still positive, but it was no longer stable.**

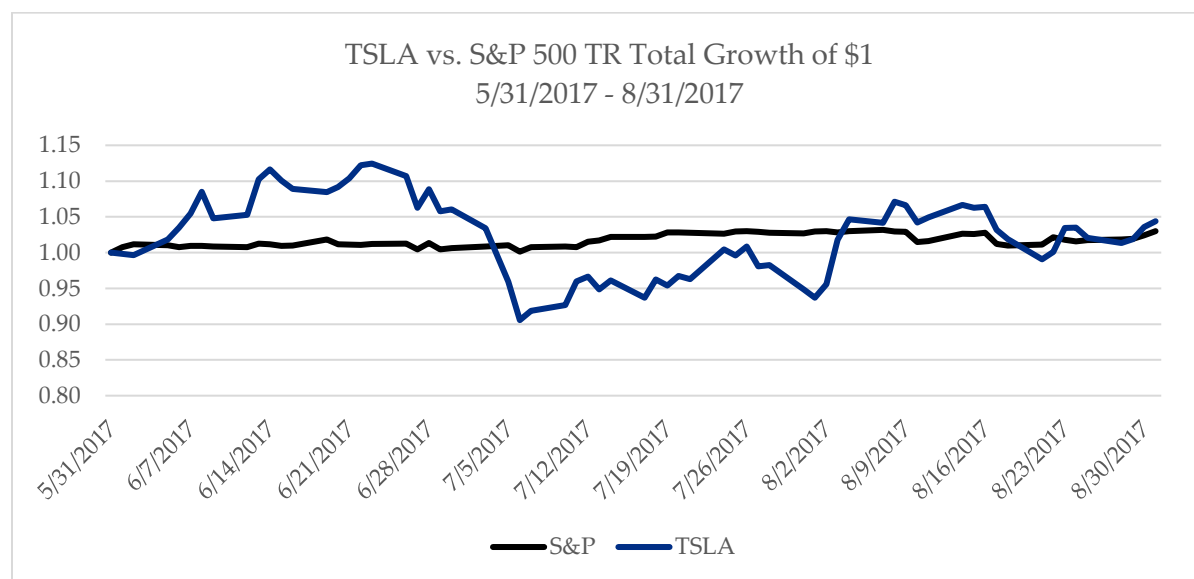
In other words, two things happened here:

- Transitioning Tesla lost control over the narrative. It failed to **control its cartoon**.
- The main connectivity among the stories people tell about Tesla became concern about deliveries and production.

We've previously described narrative as providing meta-stability to an overall market: the ability to shrug off contrary new facts that are inconsistent with the narrative, and to incorporate new facts that were previously considered tangential. Instead, the excitement about non-Model 3 opportunities like Solar, Gigafactory and Semi moved further to the periphery, less linked to most content about the company. Debt concerns, competition and partnership issues, previously easily shrugged off, were now being mentioned in articles that were ostensibly *about* something else. This is what it looks like when meta-stability fails. This is what it looks like when the narrative breaks.

You wouldn't necessarily have sensed a difference in how the Tesla story was being told. It was still positive in tone, still almost universally optimistic. Investors and the public alike were still excited about the vehicles' uniqueness. They still saw value in the periphery businesses. You probably wouldn't have thought much of the price performance over these four months, either. Long-term cross-sectional momentum models would have shrugged off the addition of four choppy months of ultimately in-line performance. Time-series models would have scored a still-rising stock.

But it was already broken.



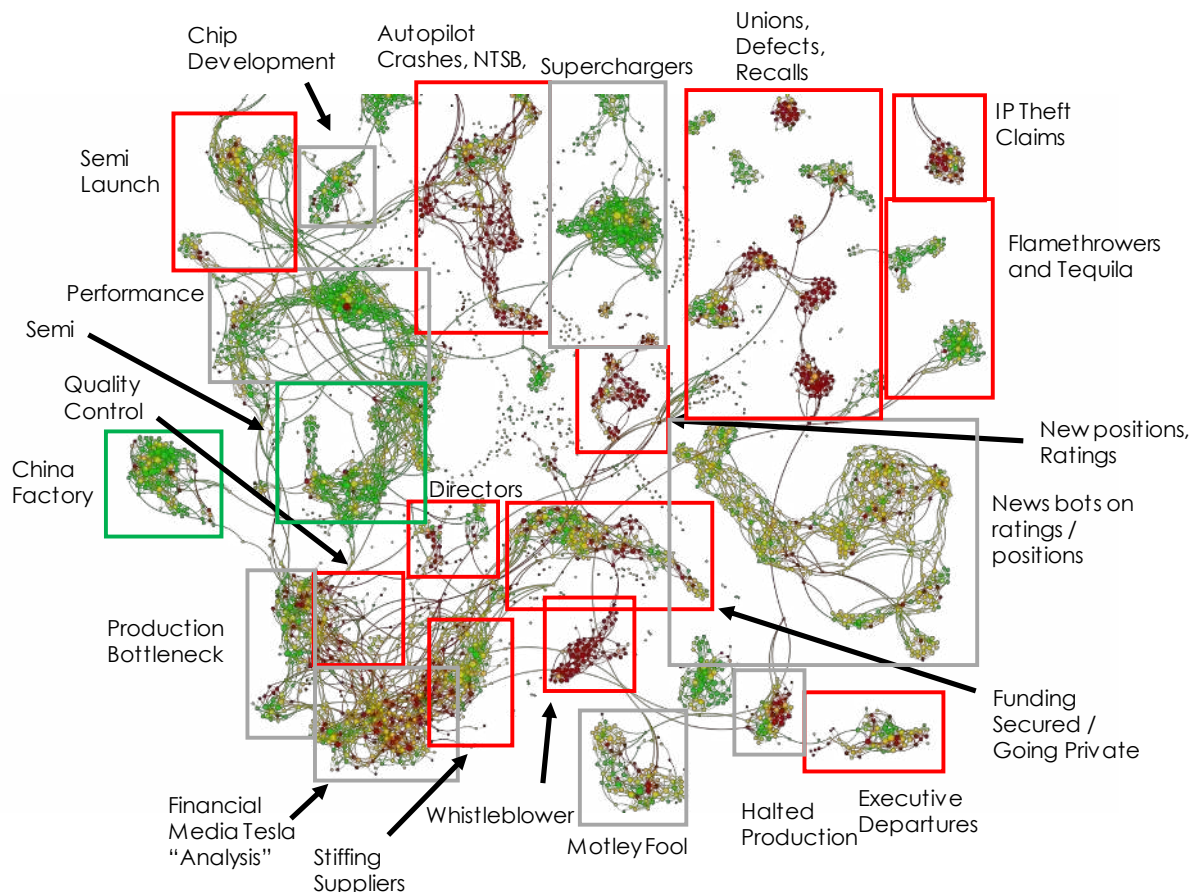
Source; Bloomberg, Epsilon Theory. Note: This is not a recommendation to buy or sell any security, or to take any portfolio action. Past performance is not indicative of future results. You cannot invest directly in an index, and we do not invest directly in any individual securities.

A Ballet in Three Acts, Act III: Broken Tesla

The third Tesla – Broken Tesla – existed between August 2017 and the present.

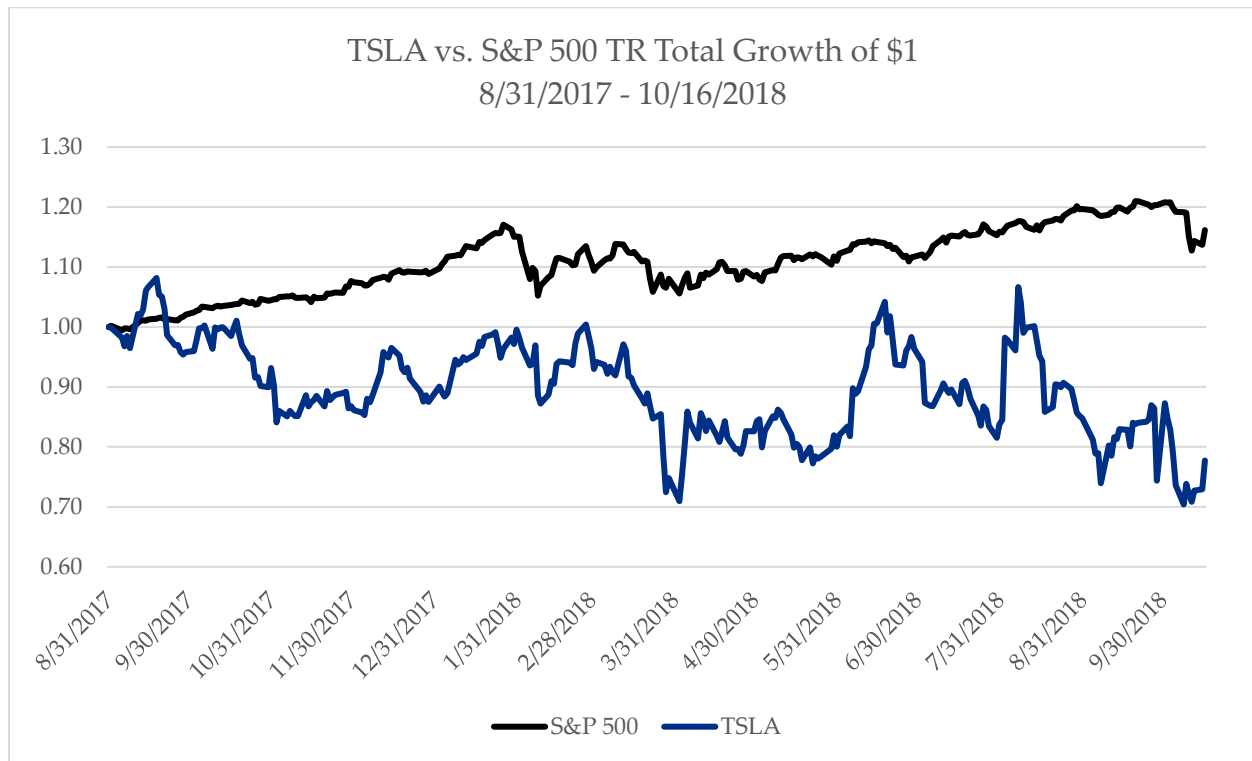
The growing concern about production and vehicle deliveries entered the nucleus of the narrative about Tesla Motors in late summer 2017 and propagated. The stories about production shortfalls now began to mention canceled reservations. The efforts to increase production also resulted in some quality control issues and employee complaints, all of which started to make their way into those same articles. When stories about suppliers not getting paid were coupled with a failed MBO, writers all too easily related these concepts with the management and oversight of the company. Once writers connect these items, then the previously peripheral issues of autopilot crashes, recalls and union disputes start finding their way in as well.

Now, almost all of these things were obviously very real, very tangible problems. That's not the point. The point is that there was already broad private knowledge that there were issues with Tesla's manufacturing process. There was already broad private knowledge that senior finance executives had been leaving the company. There was already broad private knowledge that Elon was eccentric. There was already broad private knowledge about the previously peripheral problems for the company. But none of those things really mattered until they became part of the common knowledge around the stock. Once that happened, a new narrative formed: *Tesla is a visionary company, sure, but one that doesn't seem to have any idea how to (1) make cars, (2) sell cars or (3) run a real company that can make money doing either.*



Source: Quid, Epsilon Theory

But that's all the music. So what is the dance? Well, the performance of the stock in this period is probably familiar. This was a model trade for most trend-followers, especially those with more basic strategies. A long-term positive trend, followed by a flat period to roll off old signals, followed by relatively quick transition to a new trend. The funds incorporating more basic long-term cross-sectional signals only probably got hurt a little in Q3 2017, but have been in the money since then.



Source: Bloomberg, Epsilon Theory. Note: This is not a recommendation to buy or sell any security, or to take any portfolio action. Past performance is not indicative of future results. You cannot invest directly in an index, and we do not invest directly in any individual securities.

The Epilogue

If you're reading this note on Tuesday, October 23rd, you'll know that Tesla has moved up its earnings call to tomorrow evening. As of mid-day today, TSLA stock is up about 5.6%. As always, these things are overdetermined, but it's hard to think that chirps from management about a 'near-profitable' quarter and record production and deliveries don't have something to do with it.

Tesla valuations are built on the basis of phenomenal projected future growth. The idea that anyone is going to update some model assumption after tomorrow's results and legitimately come up with a massively different valuation is nonsense. And yet. **If I were short the stock based on the supportive environment for a continued negative price trend, I'd be looking very closely at the following:**

- Can Elon and team put on a performance that starts to put distance between how media and Wall Street talk about the company in the same breath that they talk about credibility issues for management? Can they stay on-point and look like adults?
- Will the 'near-profitability' story *and* facts dispel the swirling attachment of debt / cash flow / failed MBO concerns to the principal stories about Tesla?
- Will they be able to bring the topics that have remained positive (e.g. China production, Panasonic's progress, even Semi, believe it or not) into the main narrative about the stock?

Perhaps most importantly, can Elon step back into the role of Missionary? Or will he continue to let other people determine his cartoon?

The Story of the Three Acts

Let me address a couple legitimate criticisms of this way of complementing trend-following in advance.

The first is that this all seems very easy to see in retrospect. Would I have seen this in advance? Would you? Not sure. There is predictive power in this, but it is hard. It is also systemizable. It is also a new way of looking at things that requires us to build some new muscles to see clearly – and to avoid the confirmation bias that inevitably creeps into this kind of analysis.

The second criticism – and this one comes up a lot – is that professional investors and analysts don't make judgments about companies and securities based on the content of news pieces. Assuming that this is a serious observation, I would only respond by recommending that you talk to more fund managers and read more sell side pieces. Still, there is a lot to be gained by understanding how common knowledge and broad private knowledge alike DO differ by and among different groups – from broad media, to specialized media, the sell side, long-only fund managers, hedge fund managers and macro strategists. This is something we are working on expanding as part of our research effort.

The third is skepticism that the existence of what we're calling narrative can predict the direction of a stock. Well...yeah. I mean, I agree. I'm not at all convinced that it can, and there's nothing I've written here today that should convince us that we could have used this ex ante to bet on or against TSLA. This isn't about predicting the direction of a stock. It's about updating our predictions about whether it is an environment more or less conducive to investing with or allocating to various types of trend-following strategies. **You may not be able to predict the trend, but you may have some ability to project its stability. It's about understanding how the music changes the dance. It's not about the answer, it's about the process.**

What else do we take away from all this? What else do I think?

- I think allocators should be more actively engaging our trend-following managers to be curious about why their signals work. Ask questions about how they try to develop economic intuition for them. They don't have to buy into how we are conceptualizing this. But they should be constantly curious.
- I think I'm more inclined toward simple strategies that are heavy on long-term trend. While abstractions are just as capable of creating choppy periods, I think conducive environments for long-term trends will be more common. I think the cause will be broader awareness of these tools by CEOs and other missionaries. . That's pure conjecture on my part. But even if I'm wrong, long-term trend's traits in major equity market drawdowns are a very nice second prize.
- I'm less inclined toward the managed futures / CTA behemoths. By definition, I think more adaptable strategies capable of turning off models that aren't suited for the environment – maybe on similar grounds to what we're arguing, and maybe on more sophisticated ones – will be the winners. The megashops in this space have created capacity and liquidity through strategy stratification that tether them to relatively more static approaches, or else would force them to significantly reduce risk budgets (which many have already done as they've transformed themselves into management fee shops).
- I think, at the margin, I prefer strategies more heavily driven by absolute time-series momentum vs. cross-sectional strategies, although they are perfectly acceptable complements, as well. Both

have a role. But I think the bigger abstractions and narratives will require us to capture beta effects (i.e. I want strategies more capable of making non-offsetting directional bets).

- As an aside, I think if Elon Musk wants to get this thing back on track, he needs to control his own cartoon and embrace his role as Tesla's missionary again. Among...uh...a few other things. I've never owned the stock and I never will. But unlike most people at this point, I really do want Elon to succeed. Yes, really.
- Maybe most importantly, we have all intuitively adopted 'trend-following' thinking in our normal portfolio construction behaviors. After a pleasant decade for risky assets, most of us have internalized a sense of stability in the trend in something like the S&P 500. It won't allow you to predict the future. But awareness of narrative stability may help you to understand if and when the narratives supporting the "just keep it simple and buy SPY" heuristics start to break down.

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