TWO SIGMA

Street View

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EXECUTIVE SUMMARY The ongoing US-China trade dispute may pose risks for US companies with Chinese trade exposure. Seeking to quantify those risks, we constructed a Chinese trade sensitivity factor and examined how it responds to developments in the evolving conflict. We found that trade-related announcements often precede a drop in the factor's performance and that while the explanatory power of the factor waxes and wanes with market and economic conditions, its impact is comparable to that of other, more classical, style and industry factors.

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MEASURING THE IMPACT OF THE US-CHINA TRADE WAR

Is the US-China trade war having an impact on US equities?

The economic relationship between the US and China, its top trading partner,[1] has come under increasing strain since mid-2017, when President Trump began taking steps to impose significant tariffs on Chinese imports.

As of this writing, the US was in the process of placing 25% tariffs on $50 billion worth of Chinese goods, to which China has responded with similar measures. More tariffs may be on the way; the US Trade Representative Office produced a list of $200 billion worth of Chinese goods in July that could be subject to an additional 25% duty,[2] prompting China again to threaten further retaliation.

Although the trade war has likely contributed to a bear market for Chinese equities this year, reactions in US equity markets have been sanguine thus far. This is not too surprising, since the tariffs now in effect are modest relative to the roughly $500 billion worth of goods the US imports from China annually.[3]

Still, for US companies with exposure to China trade, the ongoing dispute may pose risks, especially if the mooted tariffs on $200 billion of additional goods come into effect. Seeking to quantify those risks, we constructed a China trade sensitivity factor and examined how the factor responded to developments in the evolving conflict.

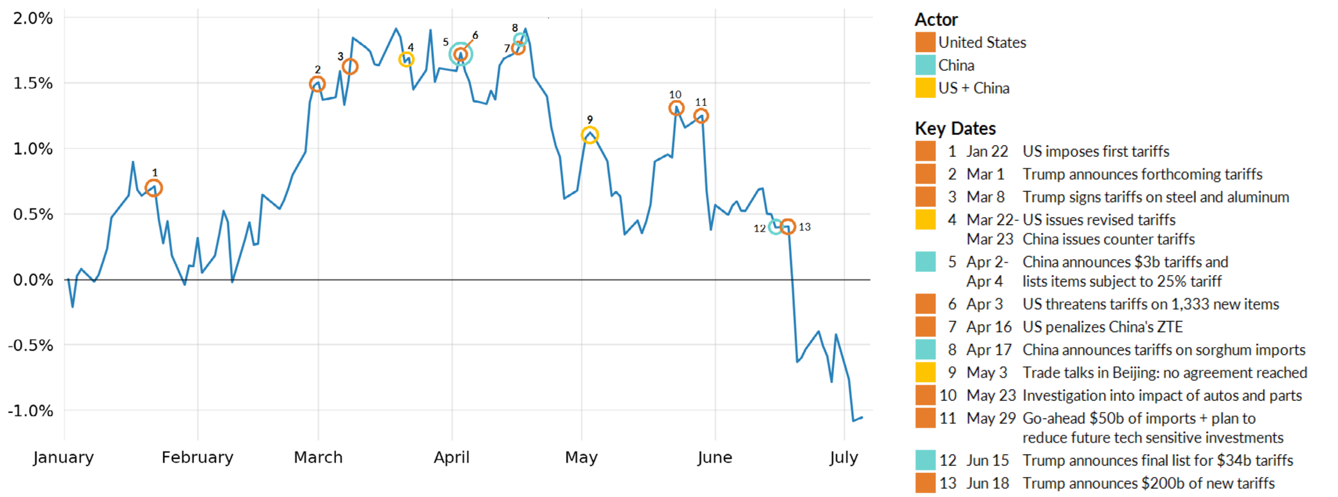
BUILDING A CHINA TRADE SENSITIVITY RISK FACTOR

We began by gathering a list of US companies that appear likely to be affected by rising trade tensions with China, whether through supply chain interruptions or potential loss of revenue. These companies have either a sizeable proportion of assets (especially manufacturing assets) located in China or a sizeable share of revenue in China disclosed in their 10-K annual report filings. We compiled the list from three baskets of stocks provided by sell-side bank research reports.[4]

Together, these baskets represented 93 publicly traded US companies which have significant exposure to "China trade" risk. To turn this basket of stocks into a risk factor with daily returns, we started with MSCI Barra's existing US Total Market Equity risk model and augmented it with the new basket of stocks. Next, we performed cross-sectional regressions on daily returns across 3,700+ of the most liquid US equities to seek to identify the unique daily price changes of stocks in the "China trade" basket, after controlling for their individual industry and style risk exposures.

1 https://www.census.gov/foreign-trade/statistics/highlights/top/top1806yr.html
2 https://ustr.gov/about-us/policy-offices/press-office/press-releases/2018/august/statement-us-trade-representative
3 https://www.census.gov/foreign-trade/balance/c5700.html
4 US Equity baskets used, with Bloomberg tickers, were: Morgan Stanley's China trade sensitive basket (MSXXCHTS), Morgan Stanley's China revenue exposure basket (MSXXCHNA), and Goldman Sachs's S&P 500 companies with 10%+ explicit asset exposure to China (GSTHAINT).

CHART A: CHINA TRADE SENSITIVE FACTOR PERFORMANCE (JANUARY 1, 2018 - JULY 5, 2018)



TRACKING THE IMPACT OF TRADE-RELATED NEWS EVENTS

A chart of the China trade sensitivity factor shows that trade-related announcements often precede a drop in the factor's performance (chart A). For example, on May 29th, after the US committed to $50 billion worth of tariffs on imports and announced its intention to curb investment in sensitive technology, the factor (and consequently the market value of China trade sensitive companies) dropped roughly one full percentage point (event 11, chart A).

Looking at a longer horizon shows that the China trade sensitive factor steadily decreased from the beginning of 2015 to mid-2016 before leveling out for about a year (chart B). It was during the 2015-2016 period that there were concerns with China's economic slowdown and stock market turbulence. Perhaps counterintuitively, given the degree of media coverage of the trade wars, the risk of economic slowdown a few years back appears to have had nearly an order of magnitude greater impact on China-sensitive US equities than the current trade war concerns.

MEASURING THE EXPLANATORY POWER OF THE FACTOR

Seeking to measure the explanatory power of the China trade sensitive factor, we calculated the improvement in r-squared from including the China factor in a cross-sectional regression. To provide context for our results, we also ran the same analysis for all Barra style factors and seven industry factors to which the China basket has particular exposure.[5] We found that including the China factor improved the r-squared by 0.0065 on average; compared to the other factors, the China trade sensitive factor had the fifth greatest marginal r-squared improvement (chart C).

Looking at the change in explanatory power over time, we see that it roughly matches our intuition for when news about trade disputes or Chinese economic growth roiled markets the most (chart D). When Chinese growth and local stock markets grew volatile in 2015, the factor appears quite relevant. Then it quieted down and appeared to be a minor factor from later 2016 into 2017, before resurging with the recent series of trade concerns. Over time, it seems reasonable to expect this factor will continue to wax and wane in importance for US equities with the flow of news on Chinese economic growth and trade relations between the two countries.

5 All Barra factors are from the MSCI Barra US Total Market Equity Long-Term Model. **Style Factors:** Country (Market), Beta, Dividend Yield, Earning Quality, Earning Yield, Growth, Leverage, Liquidity, Long-Term Reversal, Management Quality, Mid-Capitalization, Momentum, Profitability, Prospect, Residual Volatility, Size, Value. **Industry factors:** Construction and Farm Machinery, Computer Electronics, Distributors Multiline Retail, Transportation Air Freight and Marine, Electrical Equipment, Semiconductors, Semiconductor Equipment.

CHART B: CHINA TRADE SENSITIVE FACTOR PERFORMANCE (JANUARY 2, 2015 - JULY 5, 2018)

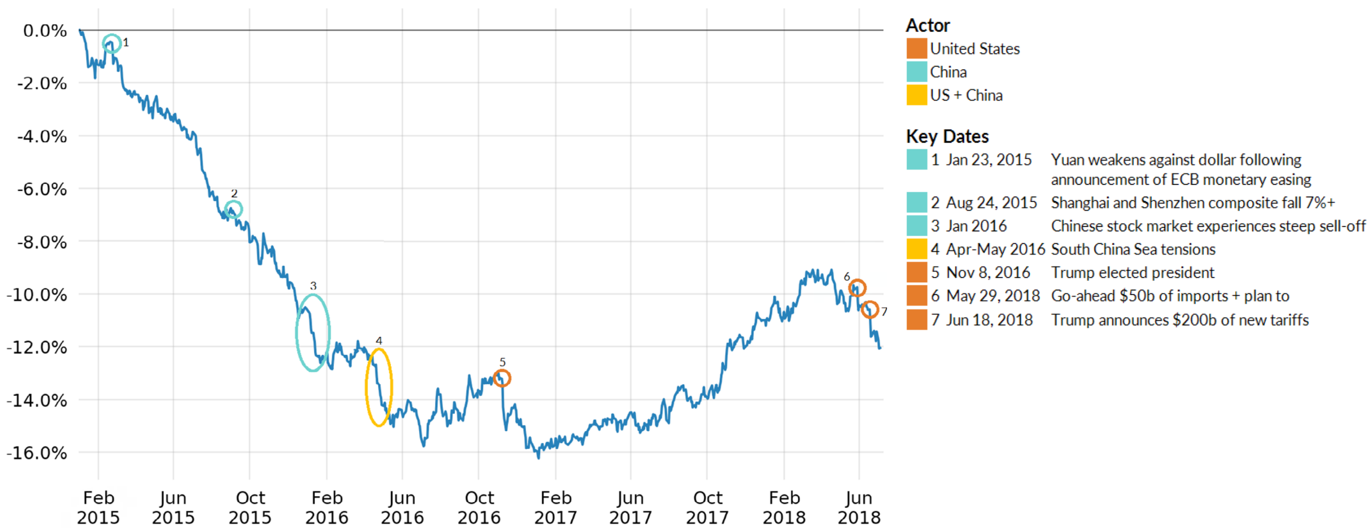


CHART C: AVERAGE MARGINAL R-SQUARED IMPROVEMENT

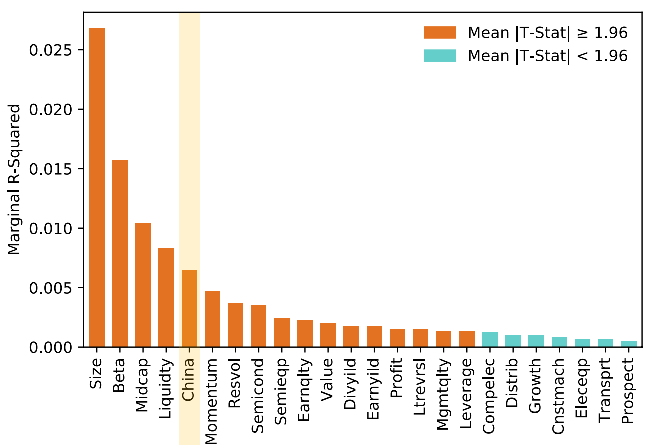
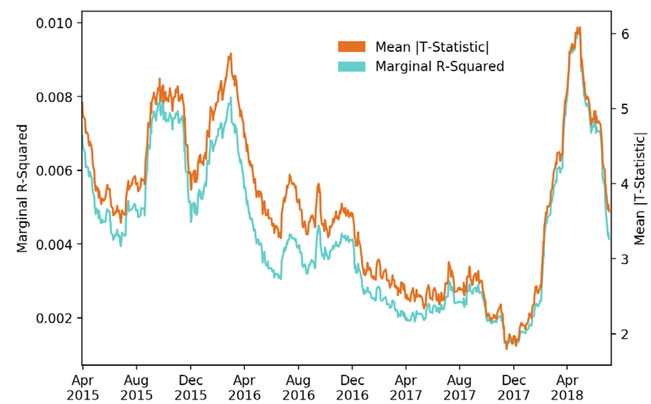


CHART D: CHINA MARGINAL R-SQUARED IMPROVEMENT - ROLLING 3 MONTH (MARCH 30, 2015 - JULY 5, 2018)



POTENTIAL IMPLICATIONS FOR INVESTORS

Given that trade tensions between the US and China (not to mention other trading partners) seem likely to persist for a while, the China trade sensitivity factor may be worth monitoring—especially given that it appears that the magnitude of its impact is comparable to that of other, more classical style and industry factors. While it is difficult to forecast with any certainty which direction this factor ultimately will go, any concentration of US companies with substantial China trade exposure (either through revenues or their supply chains) may well see elevated volatility in months to come.

APPENDIX

1/23/2015	Chinese yuan opens sharply weaker after the European Central Bank unveils aggressive monetary easing program. The People's Bank of China lowers the yuan's daily reference rate against the U.S. dollar by the most since March 2014.
8/24/2015	Main Shanghai share index drops 8.5% (steepest one-day drop in eight years) and the main Shenzhen index falls 7%.
1/2016	From January 4-15, China's stock market falls 18% (the Dow Jones Industrial Average drops 8.2%).
3/4/2016	Increased tensions between China and the US over the status of the South China Sea.
11/8/2016	Donald Trump is elected president of the United States (N.B. event occurred aftermarket trading hours, so impact of event would be seen the following day).
1/22/2018	Trump announces tariffs on washing machine and solar cell imports.
3/1/2018	Trump announces forthcoming tariffs on all trading partners of 25% on steel and 10% on aluminum.
3/8/2018	Trump signs tariffs on imported steel and aluminum from all nations, including China.
3/22/2018	Section 301 investigation on Chinese imports publicly released. US proposes tariffs in response to China's "unfair trade practices" related to technology transfer, IP, and innovation; says it will complain to WTO and look at restricting investment from China.
3/23/2018	Steel and aluminum tariffs go into effect.
3/23/2018	China unveils tariffs on $3 billion of US imports in response to steel and aluminum tariffs.
4/2/2018	China announces tariffs on $3 billion of US imports including fresh fruits, nuts, wine, aluminum, and pork.
4/3/2018	The Trump administration releases its list of 1,333 Chinese products under consideration for 25% tariffs, which cover $46.2 billion of US imports.
4/4/2018	China complains to WTO about the Section 301 tariff action by the US
4/4/2018	China responds to Trump's Section 301 tariffs, publishing list of 106 products subject to forthcoming 25% tariffs, covering $49.8 billion of China's imports.
4/16/2018	US penalizes China's ZTE for violating a previous agreement by conducting business with Iran and North Korea. ZTE is banned from buying US technology for seven years.
4/17/2018	China announces it will collect anti-dumping tariffs on sorghum imports from the US
5/3/2018	US-China trade talks in Beijing. No agreement is reached.
5/23/2018	The Commerce Department initiates another national security investigation into imported autos and parts, the third such investigation under Trump, following the steel and aluminum cases. Public hearings are scheduled for July 19–20, 2018
5/29/2018	US announces that it's moving ahead with tariffs on about $50 billion of imports (announced 4/3-4/2018) and a plan to curb investment in sensitive technology.
5/29/2018	US announces plan to limit some visas for Chinese citizens to protect intellectual property.
6/15/2018	US announces final product list for first $34b of tariffs (see 4/3-4/18 and 5/29/18). Additional $16b will be finalized at later date. China responds by issuing an updated retaliation list of 25% tariffs targeting nearly $45 billion worth of US exports. China also plans a two-phase approach, covering $29.6 billion of US goods starting 7/6/18, and the remaining $15.3 billion of products to be announced at a later date.
6/18/2018	In response to China's retaliatory tariffs (June 15, 2018), Trump directs the US Trade Representative to identify an additional $200 billion worth of Chinese goods for additional tariffs. Trump also threatens a further $200 billion of tariffs if China retaliates again.

INTERESTING TECHNOLOGY-RELATED ARTICLES

Two Sigma views itself as a technology company that applies a rigorous, scientific method-based approach to investment management. Our technology is inspired by a diverse set of fields including artificial intelligence and distributed computing. Occasionally, we read articles in the popular press that describe applications of technology that we find interesting, thought-provoking, and relevant for people thinking about improving the investment management process. Below is a subset of the articles we read this month. Please do not view the inclusion of these articles as an endorsement by Two Sigma of their viewpoints or the companies discussed therein. Two Sigma welcomes discussions (and contributions) about these and other such technology-related articles.

"DeepMind's AI Can Detect Over 50 Eye Diseases as Accurately as a Doctor" by James Vincent

https://www.theverge.com/2018/8/13/17670156/deepmind-ai-eye-disease-doctor-moorfields

Artificial intelligence technologies are still rife with limitations, but their abilities continue to progress. In a recent example highlighted by The Verge, researchers from DeepMind, University College London, and Moorfields Eye Hospital have developed a deep learning algorithm that "identifies dozens of common eye diseases from 3D scans and then recommends the patient for treatment." After having trained on roughly 15,000 eye scans, the software made the same diagnoses and recommendations as a panel of doctors more than 94 percent of the time. While researchers don't believe the technology should replace the expertise of doctors, they hope that it will dramatically increase the rate at which doctors can scan patients' eyes and diagnose problems—a time-consuming task, given that millions of such scans are performed each year (Moorfields alone performs more than 1,000 per day).

"How Grubhub Analyzed 4,000 Dishes to Predict Your Next Order" by Adam Rogers

https://www.wired.com/story/how-grubhub-analyzed-4000-dishes-to-predict-your-next-order/

A recent article on the online food-delivery service Grubhub's efforts to quantify the nationwide popularity of various take-out dishes amusingly illustrates some of the common challenges data scientists face when wrangling unstructured data. Wanting to know which dishes were most popular with customers, Grubhub struggled to interpret restaurant menus (an example of "found data") algorithmically, at scale, because they were unstructured and don't share common definitions—or even spellings. Eventually, the company was able to build an algorithm that combined messy menu data, search logs and reviews, and customer order histories to try to determine "what menus were really saying." But it wasn't until the company contracted with a chef and food writer for additional, human interpretation that it was able to come up with a usable database of 4,000 dishes, categorized and subcategorized in analytically useful ways.

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