MOODY'S
ANALYTICS

ANALYSIS

Prepared by

Mark Zandi
Mark.Zandi@moodys.com
Chief Economist

Adam Kamins
Adam.Kamins@moodys.com
Director

Jeremy Cohn
Jeremy.Cohn@moodys.com
Economist

Jesse Rogers
Jesse Rogers@moodys.com
Economist

Contact Us

Email
help@economy.com

U.S./Canada
+1.866.275.3266

EMEA
+44.20.7772.5454 (London)
+420.224.222.929 (Prague)

Asia/Pacific
+852.3551.3077

All Others
+1.610.235.5299

Web
www.economy.com
www.moodysanalytics.com

Trump Trade War: An Uneasy Truce

Introduction

President Trump has called a truce with China in a bid to resolve the two countries' trade war. While this likely marks the end of further escalation, an agreement to end the war is by no means assured. Using the Moody's Analytics model of the global economy, we consider the fallout if current negotiations break down and trade tensions between the two economic giants reignite.

Trump Trade War: An Uneasy Truce

BY MARK ZANDI, ADAM KAMINS, JEREMY COHN AND JESSE ROGERS

President Trump has called a truce with China in a bid to resolve the two countries' trade war. While this likely marks the end of further escalation, an agreement to end the war is by no means assured. Using the Moody's Analytics model of the global economy, we consider the fallout if current negotiations break down and trade tensions between the two economic giants reignite.

Actual tariff scenario (70% probability)

Trump and Chinese President Xi Jinping agreed to press pause on their trade war during the annual G-20 meeting in November. The détente opened the door to talks to resolve the two countries' protracted trade dispute, with the Trump administration setting a March 1 deadline for a deal. In a bid to spur the two sides toward an agreement, Trump suspended plans for additional tariffs on Chinese imports until March. In exchange, Xi has pledged to buy more U.S. agricultural goods.

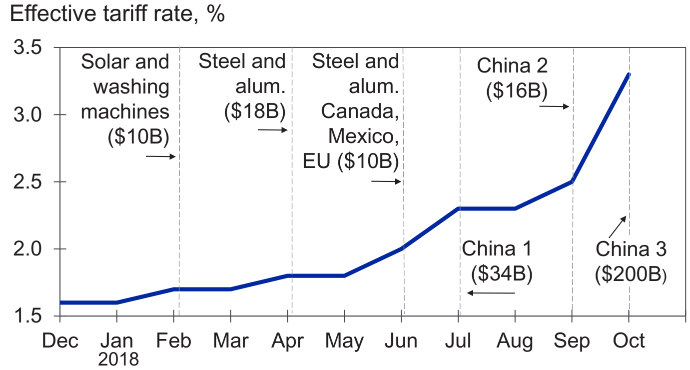
Trump's motivation for calling a cease-fire in the trade war is difficult to know, but he is likely motivated in part by the mounting toll that the tensions appear to be taking on the stock market and economy. Stock prices have slumped since Trump's intentions on trade became clear at the beginning of last year. The wear from trade tensions has been slow to show up in U.S. GDP and consumer spending data. However, figures on exports and farm incomes underscore the travails of U.S. farmers, who have been stung badly by Chinese tariffs on soybeans, pork and other agricultural goods. The factory sector has also struggled with tariffs on aluminum and steel, which have contributed in part to decisions by General Motors and Ford to idle or close several auto plants in the U.S. later this year. Broad measures of business and consumer sentiment, which surpassed two-decade highs last summer, have notably weakened.

The trade war's toll on financial markets and the broader economy cranks up the pressure on the Trump administration to strike a deal. Getting the Chinese to budge on intellectual property protections, state subsidies, and market access for U.S. firms—all longtime goals of U.S. policymakers—will prove difficult. More likely is a limited trade agreement involving greater Chinese purchases of U.S. goods and a largely ceremonial agreement on intellectual property rights. In this scenario, we assume that the two sides extend the timeline for current negotiations past March and reach a limited deal this spring similarly along the lines of the current truce.

Despite the de-escalation of tariff threats, existing tariffs will remain in place while the two sides negotiate, and any rollback of import duties will be gradual. This means U.S. consumers and businesses will still face higher costs for imported goods and a good dose of uncertainty as progress toward a deal ebbs and flows. Over the past year, more than $310 billion of imports, around one-eighth of the total U.S. import bill, have been slapped with tariffs. These are not only imports from China but also imports of aluminum and steel, solar panels and washing machines, and Canadian softwood lumber. Over this period, Trump's tariffs have more than doubled the effective rate paid by U.S. firms for imported goods (see Chart 1).

If this is the extent of the tariff dispute, and the two sides come to a resolution sometime this spring, then the U.S. and global economies will largely shrug it off. Based on a simulation of the Moody's Analytics global model, which covers 73 countries linked via trade flows, foreign direct investment and financial markets, U.S. real GDP will be reduced by just more than 0.1 percentage point at the peak of the impact a year from now. There will be 170,000

Chart 1: Trump's Trade War



Sources: Census Bureau, USTR, USITC, Moody's Analytics

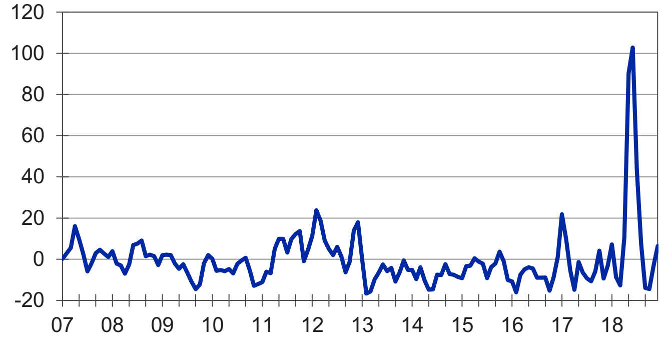
U.S. Economic Impact of Trump's Trade Policy

	2019Q1	2019Q2	2019Q3	2019Q4	2020Q1	2020Q2	2020Q3	2020Q4	2019	2020	% change 2019	% change 2020
Real GDP (2012$ bil)												
No tariffs	18,912	19,050	19,137	19,194	19,213	19,215	19,246	19,339	19,073	19,253	2.7	1.0
Actual tariffs	18,912	19,044	19,123	19,173	19,185	19,190	19,223	19,318	19,063	19,229	2.6	0.9
Diff with no tariffs (%)	0.00	-0.03	-0.07	-0.11	-0.15	-0.13	-0.12	-0.11	-0.05	-0.13		
Threatened tariffs	18,912	19,022	19,065	19,089	19,091	19,088	19,109	19,177	19,022	19,116	2.4	0.5
Diff with no tariffs (%)	0.00	-0.14	-0.37	-0.55	-0.63	-0.66	-0.71	-0.84	-0.27	-0.71		
25% tariff on U.S.-China trade	18,912	18,960	18,990	19,004	18,950	18,881	18,835	18,828	18,967	18,873	2.1	-0.5
Diff with no tariffs (%)	0.00	-0.47	-0.77	-0.99	-1.37	-1.74	-2.13	-2.64	-0.56	-1.97		
Nonfarm employment (mil)												
No tariffs	150.6	151.1	151.5	152.0	152.2	152.3	151.8	151.6	151.3	152.0	1.5	0.5
Actual tariffs	150.6	151.0	151.5	151.9	152.0	152.1	151.7	151.5	151.2	151.8	1.5	0.4
Diff with no tariffs (ths)	0	-30	-80	-120	-170	-160	-140	-130	-50	-160		
Threatened tariffs	150.6	150.9	151.2	151.4	151.5	151.5	150.9	150.6	151.0	151.1	1.3	0.1
Diff with no tariffs (ths)	0	-130	-390	-610	-740	-790	-850	-1000	-280	-850		
25% tariff on U.S.-China trade	150.6	150.7	150.8	151.0	150.8	150.3	149.3	148.5	150.8	149.7	1.2	-0.7
Diff with no tariffs (ths)	0	-410	-740	-960	-1440	-1970	-2450	-3090	-530	-2240		
Unemployment rate (%)												
No tariffs	3.59	3.45	3.33	3.29	3.33	3.46	3.91	4.21	3.41	3.73		
Actual tariffs	3.59	3.47	3.37	3.35	3.42	3.55	3.99	4.27	3.45	3.81		
Diff with no tariffs	0.00	0.02	0.04	0.06	0.09	0.09	0.08	0.06	0.04	0.08		
Threatened tariffs	3.59	3.52	3.55	3.62	3.72	3.88	4.35	4.72	3.57	4.17		
Diff with no tariffs	0.00	0.07	0.22	0.33	0.39	0.42	0.44	0.51	0.16	0.44		
25% tariff on U.S.-China trade	3.59	3.67	3.73	3.8	4.09	4.51	5.21	5.85	3.70	4.91		
Diff with no tariffs	0.00	0.22	0.40	0.51	0.76	1.05	1.30	1.64	0.29	1.18		
Income per household ($ ths)												
No tariffs	142.7	143.91	145.18	146.56	147.7	148.56	149.42	150.3	144.59	149	3.5	3.1
Actual tariffs	142.7	143.9	145.13	146.48	147.6	148.47	149.35	150.25	144.56	148.92	3.5	3.0
Diff with no tariffs ($)	0	-10	-50	-80	-100	-90	-70	-50	-30	-80		
Threatened tariffs	142.7	143.86	144.99	146.2	147.25	148.08	148.88	149.66	144.44	148.47	3.4	2.8
Diff with no tariffs ($)	0	-50	-190	-360	-450	-480	-540	-640	-150	-530		
25% tariff on U.S.-China trade	142.7	143.68	144.65	145.79	146.62	147.14	147.54	147.83	144.21	147.29	3.2	2.1
Diff with no tariffs ($)	0	-230	-530	-770	-1,080	-1,420	-1,880	-2,470	-380	-1,710		
Federal funds rate (%)												
No tariffs	2.40	2.43	2.65	2.89	3.14	3.22	3.20	3.19	2.59	3.19		
Actual tariffs	2.40	2.43	2.63	2.87	3.13	3.21	3.22	3.21	2.58	3.19		
Diff with no tariffs (bps)	0	0	-20	-20	-10	-10	20	20	-10	0		
Threatened tariffs	2.40	2.42	2.59	2.77	3.04	3.19	3.24	3.26	2.54	3.18		
Diff with no tariffs (bps)	0	-10	-60	-120	-100	-30	40	70	-50	-10		
25% tariff on U.S.-China trade	2.40	2.23	2.23	2.59	3.08	3.33	3.37	3.23	2.36	3.25		
Diff with no tariffs (bps)	0	-200	-420	-300	-60	110	170	40	-230	60		
S&P 500 Index												
No tariffs	2,609	2,644	2,647	2,512	2,454	2,494	2,573	2,634	2,603	2,539	-5.2	-2.5
Actual tariffs	2,609	2,592	2,597	2,464	2,430	2,486	2,565	2,625	2,566	2,527	-6.5	-1.5
Diff with no tariffs (%)	0.0	-2.0	-1.9	-1.9	-1.0	-0.3	-0.3	-0.4	-1.5	-0.5		
Threatened tariffs	2,609	2,515	2,413	2,330	2,265	2,264	2,289	2,347	2,467	2,291	-10.1	-7.1
Diff with no tariffs (%)	0.0	-4.9	-8.9	-7.3	-7.7	-9.2	-11.0	-10.9	-5.2	-9.7		
25% tariff on U.S.-China trade	2,609	2,366	2,110	1,931	1,813	1,743	1,748	1,896	2,254	1,800	-17.9	-20.1
Diff with no tariffs (%)	0.0	-10.5	-20.3	-23.1	-26.1	-30.1	-32.1	-28.0	-13.4	-29.1		

Sources: BEA, BLS, Federal Reserve, S&P, Moody's Analytics

Chart 2: Higher Tariffs Mean Higher Prices

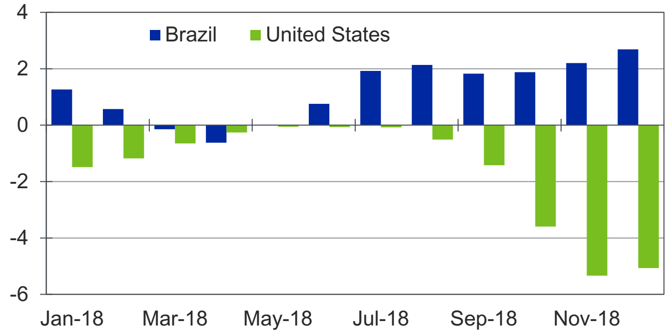
CPI for laundry equipment, annualized % change over 3 mo



Sources: BLS, Moody's Analytics

Chart 3: China Soy Tariffs a Boon for Brazil

Soybean exports to China, difference yr ago, metric ton bil



Sources: USDA, MAPA, Moody's Analytics

fewer jobs over the period (see table). The economic impacts outside the U.S. will be comparable.

Economic consequences

Tariffs hurt the economy most directly and quickly through higher prices for imported goods. For example, the price of laundry equipment to U.S. consumers has jumped 18% since spring, when a 50% hike in tariffs was imposed on Chinese imports (see Chart 2). The tariffs act much like a tax increase, weakening the purchasing power of households; if households need to spend more on imported goods, then they have less income to spend on other things.

Of course, exports also suffer as the tit-for-tat tariffs imposed by trading partners cause consumers and businesses to purchase what they need domestically or from competing nations that can now provide the goods more cheaply. Trade diversion, or the shifting of trade flows to avoid tariffs, has already figured prominently into the current dispute. For example, China has shifted almost all of its soybean purchases from the U.S. to Brazil following China's imposition of a 25% tariff on U.S. soy in July (see Chart 3).

More concerning, there is evidence that market share ceded in trade disputes is not so easily reclaimed. The U.S.'s share of global corn and soy exports to the Soviet Union fell dramatically in the decades following its 1980 embargo, and the U.S. has never recovered its share of trade with Russia and the former Soviet Bloc (see Chart 4).

Tariffs also weigh on the profitability of multinationals and their stock prices. This occurs via weaker overseas sales, and for U.S. companies a somewhat stronger U.S. dollar as the trade tensions create a risk-off environment in global financial markets. The resulting flight-to-quality lifts the dollar's value. U.S. stock prices have already suffered as a result of the trade tensions, losing an estimated near 5% of their value (all else being equal) since the trade war began.

In the longer run, the reduction in trade weighs on productivity growth, as the benefits of comparative advantage—when nations specialize in what they are especially good at producing—and global competition are diminished.

Model limitations

The economic consequences go well beyond the dollars and cents captured by the global model. It is especially difficult to gauge the impact of uncertainty on business decisions. Until there is clarity around the tariffs, businesses will be less likely to make significant investment decisions. U.S. business investment, which should have received a boost from corporate tax cuts, has gone largely flat in recent months. Tariff uncertainty could be the culprit.

It is misplaced to think that, since it will be costlier to produce in countries hit by the higher tariffs, this will quickly prompt multinationals to invest more in the U.S. The problem is that these global companies have no idea how long the tariffs will remain in place. And even if they conclude they will remain in place, the U.S. will likely not be the beneficiary, as there are many other places in the world, not subject to higher tariffs, where it is cheaper to make most of these goods.

The reworking of the global supply chain, when it occurs, will be highly disruptive, and is only partially picked up in the Moody's Analytics model. The manufacture of many goods involves multiple cross-border movements. Indeed, the U.S. trade deficit with China is significantly inflated, because China is simply where final assembly of many components produced in Japan and elsewhere in Asia occurs. Higher tariffs change the economics of the supply chain. If the tariffs remain in place long enough, they will cause the chain to shift.

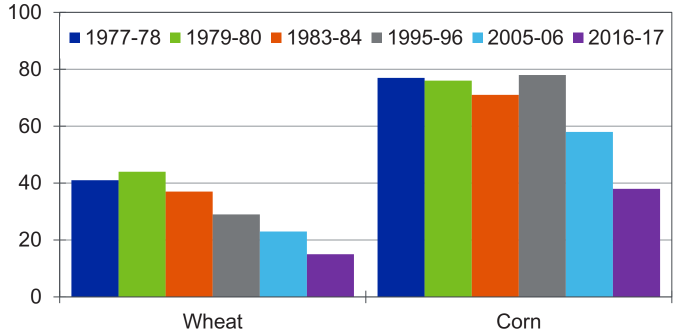
The global model also fails to adequately account for the fallout on businesses' and Investors' confidence, which would surely be substantial as they contemplate the broader geopolitical implications of the trade war. Sentiment is very fickle; it is fine, until it is not. There is no telling when sentiment will swing significantly, but when it does, the economic pain will intensify quickly.

Threatened tariff scenario (25% probability)

Mounting wear on the U.S. and Chinese economies makes a re-escalation of the trade war less likely, but the Trump administration has threatened to impose additional tariffs should the U.S. prove unable to get China to agree to modest concessions on market access and intellectual property as well as a gradual reduction in trade imbalances. Trump has threatened to raise tariffs on the existing $200 billion of Chinese

Chart 4: Lasting Hit From Soviet Embargo

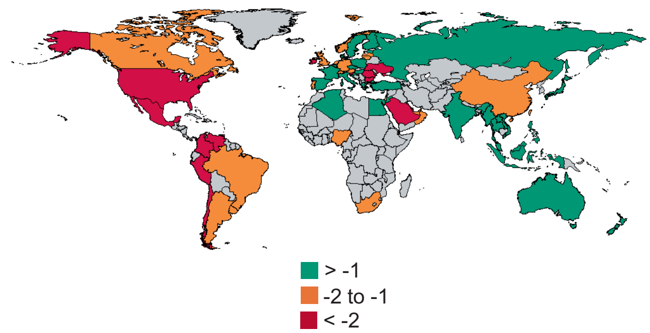
Average U.S. share of world corn and wheat exports, %



Sources: Iowa State University, Moody's Analytics

Chart 5: Everyone Loses in a Trade War

Peak % difference in real GDP, trade conflagration vs. no tariff



Source: Moody's Analytics

imports from 10% to 25% and impose a 10% tariff on the remaining $270 billion of Chinese imports to the U.S. Additionally, the president has threatened about $275 billion in vehicle imports with a 25% hike, although a side agreement with Mexico and Canada that would likely be honored following the successful conclusion of U.S.-Mexico-Canada Agreement negotiations would significantly lower this amount.

If actually implemented, close to one-third of all imported goods into the U.S. would be subject to higher tariffs. Assuming that impacted U.S. trading partners respond with in-kind tariffs on U.S. goods, the macroeconomic consequences would be more serious. Using the Moody's Analytics global model, such an escalation would reduce real GDP by 0.8 percentage point and employment by 1 million jobs by the final quarter of 2020 (see table). This is still not enough to derail the fiscal-stimulus-fueled economic expansion, but it would be enough to be felt, particularly in the nation's agricultural and manufacturing industries.

Although odds of such an escalation are still low, Trump could make good on threats in a bid to gain leverage in current talks. The Trump administration wants China to respect the intellectual property of U.S. companies and to more fully open its markets. The president also appears fixated on reducing the size of the U.S. trade deficit. Getting China to play by the rules is a laudable goal, but focusing on the trade deficit makes little economic sense, and both goals are unlikely to be achieved, at least not soon.

It is also increasingly hard to see U.S. trading partners backing down and purchasing more U.S. goods and services. Even if they were inclined, it is unclear how they would do this. Given Trump's claim that he is imposing the higher tariffs largely on national security grounds, which is clearly not the case for U.S. allies, they appear offended and thus not inclined.

Trade conflagration scenario (5% probability)

There is still a chance that trade negotiations between China and the U.S. could go very wrong, triggering an all-out trade war. While it would take a severe deterioration in trade relations to derail the U.S. and global expansions, an across-the-board hike in tariffs on U.S.-China trade could do it. The U.S.-China trade relationship is the largest in the world, with Chinese imports to the U.S. running a more than $520 billion per annum—more than one-fifth of total U.S. imports. U.S. exports to China total more than $130 billion—close to one-tenth of total U.S. exports. This is arguably the world's most economically significant bilateral relationship. As such, a rapid re-escalation of trade tensions would have dire consequences globally.

A scenario that includes a 25% tariff on all this trade, coupled with Chinese "qualitative" measures that complicate doing business in China for American companies, would overwhelm the global economic expansion. There is a range of qualitative steps China could take, from more aggressive inspections of U.S. imports to stiffer visa requirements for visiting American workers, to ensure that they match the economic pain created by the U.S. tariffs on their products.

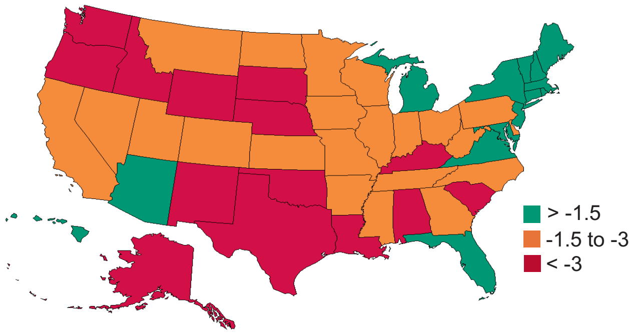
In this scenario, the U.S. economy descends into recession by the first quarter of 2020. The increase in import prices and accelerating inflation and decline in exports would overwhelm the U.S. expansion, particularly since the entire global economy and financial markets would also be reeling. Real GDP is cut by 2.6 percentage points at the economy's nadir at the end of 2020, costing the economy around 3 million jobs (see table). Unemployment rises to well over 5%. The rest of the global economy suffers, although a stronger U.S. dollar moderates the blow somewhat. The economic and political turmoil created by the war causes a selloff in global financial markets and a risk-off environment. Global investors flock to the safety of U.S. Treasury bonds, resulting in an appreciation of the U.S. dollar against most other currencies, most notably vis-à-vis the euro and Chinese yuan. Therefore, the Chinese economy ironically weathers the trade war storms more gracefully than the U.S. (see Chart 5).

Regions in the crosshairs

The trade war impacts U.S. regional economies differently, given how important trade is to their economies, particularly with China. China and other U.S. trading partners are also targeting higher tariffs on farm products and manufactured goods produced in parts of the U.S. that are politically supportive of Trump.

Chart 6: Northwest & South Take the Brunt

Peak % difference in real GDP, trade conflagration vs. no tariff



Sources: BEA, Moody's Analytics

The Northwest U.S. is especially vulnerable to a trade war given the region's significant trade with China (see Chart 6). Slightly less than 4% of Washington state's gross product comes from exports to China, while Alaska and Oregon are also far more reliant on Chinese trade than the U.S. as a whole. Since much of what the U.S. ships to China is commodity based, the nation's farm belt and the oil patch are also vulnerable. Alabama and South Carolina also stand out, as many of the vehicles produced in these states are for export.

While not explicitly considered in the trade war scenarios, immigration and foreign direct investment are closely linked to trade. Immigrants tend to establish a home, and investment occurs, in places that do a lot of trading with their home countries. So if trade is impaired because of a trade war, so too will immigration and investment flows, exacerbating the hit to the region's economy.

The Northeast and Florida will be the least impacted economies from the trade war. They rely less on trade, especially with China. They are also not in the political crosshairs, as they are either blue or purple states, and thus their industries and firms are not targets of higher tariffs.

De-escalation on the Mexican front

The signing of the USMCA dampens the risk of a breakup of the NAFTA trade bloc and the reopening of a second major front in the global trade war on top of the current dispute with China. The successor deal to NAFTA will preserve tariff-free access for most goods, underpinning trade and investment in the world's second largest trade bloc. Given the sharp escalation in trade and diplomatic tensions between the U.S. and fellow NAFTA members over the past year, the new agreement heads off an important source of downside risk. We simulated several outcomes of a NAFTA breakup using the Moody's Analytics global model and found the negative impact on jobs and output to be worrisome.

The USMCA will mean stricter rules for regional trade in autos, although changes will be introduced gradually and will do little to disrupt regional supply chains. Under the new pact, North American automakers will have to use more parts produced in the region while ensuring that 40% of all parts and assembly work is done by workers earning an hourly wage of at least $16. However, most automakers already incorporate significant U.S. content, making the new rules less burdensome. It is also unclear how and whether wage and content requirements will be enforced. Content origin is already self-reported by automakers, and market forces such as the plant closures recently announced by GM and Ford will shift the production landscape long before content and wage rules become binding.

An uneasy truce

The trade war between the U.S. and China dominated the global geopolitical landscape in 2018, but tensions have begun to ease as economic pressures push the two sides to the negotiating table. After exchanging blows for much of the past year, signs of economic wear in both the U.S. and China have increased the urgency of extending the current cease-fire and enabling negotiators to work out a deal.

Despite the negative responses of financial markets and large swaths of the U.S. and Chinese economies to tariffs and trade tensions, the thornier elements of the two countries' trade relationship are unlikely to be worked out in the current negotiations. Indeed, when it comes to key U.S. objectives such as market access and intellectual property protections, it is unlikely that anything substantive will arise from these negotiations save for steps the Chinese were likely to take anyway. However, that will not stop Trump from making some type of deal and declaring victory. This is much like the recent deal he struck with Canada and Mexico, or this past summer's handshake deal with the EU that has, to date, led to no meaningful change in the U.S.-EU trade relationship.

If Trump follows the expected script—a deal with the Chinese sometime this spring and a de-escalation in the trade war—then the Moody's Analytics outlook will not change appreciably. Yet, given the outsize personalities and tricky politics involved, it is not difficult to envisage the talks breaking down. If the negotiations do falter and the trade war re-escalates, the economic outlook will quickly turn darker.

About the Authors

Mark Zandi is chief economist of Moody's Analytics, where he directs economic research. Moody's Analytics, a subsidiary of Moody's Corp., is a leading provider of economic research, data and analytical tools. Dr. Zandi is a cofounder of the company Economy.com, which Moody's purchased in 2005.

Dr. Zandi's broad research interests encompass macroeconomics, financial markets and public policy. His recent research has focused on mortgage finance reform and the determinants of mortgage foreclosure and personal bankruptcy. He has analyzed the economic impact of various tax and government spending policies and assessed the appropriate monetary policy response to bubbles in asset markets.

A trusted adviser to policymakers and an influential source of economic analysis for businesses, journalists and the public, Dr. Zandi frequently testifies before Congress on topics including the economic outlook, the nation's daunting fiscal challenges, the merits of fiscal stimulus, financial regulatory reform, and foreclosure mitigation.

Dr. Zandi conducts regular briefings on the economy for corporate boards, trade associations and policymakers at all levels. He is on the board of directors of MGIC, the nation's largest private mortgage insurance company, and The Reinvestment Fund, a large CDFI that makes investments in disadvantaged neighborhoods. He is often quoted in national and global publications and interviewed by major news media outlets, and is a frequent guest on CNBC, NPR, Meet the Press, CNN, and various other national networks and news programs.

Dr. Zandi is the author of Paying the Price: Ending the Great Recession and Beginning a New American Century, which provides an assessment of the monetary and fiscal policy response to the Great Recession. His other book, Financial Shock: A 360º Look at the Subprime Mortgage Implosion, and How to Avoid the Next Financial Crisis, is described by the New York Times as the "clearest guide" to the financial crisis.

Dr. Zandi earned his BS from the Wharton School at the University of Pennsylvania and his PhD at the University of Pennsylvania. He lives with his wife and three children in the suburbs of Philadelphia.

Adam Kamins is a director at Moody's Analytics. He manages the firm's U.S. subnational forecasting service, overseeing the generation of all state and metro area baseline figures while working closely with clients on customized scenarios. In addition, Adam covers a wide variety of topics related to regional economics and serves as the firm's primary expert on the New York and Northeast economies. Other responsibilities include developing and maintaining a variety of specialized models, including the Moody's Analytics commercial real estate forecasts and client-specific databases.

Adam's work has been featured by such outlets as CBS, NBC, CNBC, Fox, the Wall Street Journal, and the New York Post, among others. He has also been cited frequently by Crain's New York Business on a wide variety of issues. Adam regularly presents to a diverse group of audiences on the national and regional economic outlook, as well as specific areas of interest including commercial real estate, single-family rental homes, and urban migration patterns.

Prior to joining Moody's Analytics, Adam was a research manager at the Initiative for a Competitive Inner City, where he analyzed urban economies across the U.S. He holds a master's degree in business administration from the University of Chicago Booth School of Business and a bachelor's degree in quantitative economics from Tufts University.

Jeremy Cohn is an economist at Moody's Analytics, where he works on the state and metro area forecasting systems. He is the state analyst for Alabama, the country analyst for Qatar, and he works on data releases for Russia and American consumer confidence. Jeremy holds a master's degree in applied economics from Johns Hopkins University and a bachelor's degree in public policy from Stanford University.

Jesse Rogers is an economist at Moody's Analytics and covers Latin American and U.S. state and metropolitan area economies. He holds a master's degree in economics and international relations from the Johns Hopkins School of Advanced International Studies. While completing his degree, he interned with the U.S. Treasury and Institute of International Finance. Previously, he was a finance and politics reporter for El Diario New York and worked in Mexico City for the Center for Research and Teaching in Economics (CIDE). He received his bachelor's degree in Hispanic studies at the University of Pennsylvania.

About Moody's Analytics

Moody's Analytics provides financial intelligence and analytical tools supporting our clients' growth, efficiency and risk management objectives. The combination of our unparalleled expertise in risk, expansive information resources, and innovative application of technology helps today's business leaders confidently navigate an evolving marketplace. We are recognized for our industry-leading solutions, comprising research, data, software and professional services, assembled to deliver a seamless customer experience. Thousands of organizations worldwide have made us their trusted partner because of our uncompromising commitment to quality, client service, and integrity.

Concise and timely economic research by Moody's Analytics supports firms and policymakers in strategic planning, product and sales forecasting, credit risk and sensitivity management, and investment research. Our economic research publications provide in-depth analysis of the global economy, including the U.S. and all of its state and metropolitan areas, all European countries and their subnational areas, Asia, and the Americas. We track and forecast economic growth and cover specialized topics such as labor markets, housing, consumer spending and credit, output and income, mortgage activity, demographics, central bank behavior, and prices. We also provide real-time monitoring of macroeconomic indicators and analysis on timely topics such as monetary policy and sovereign risk. Our clients include multinational corporations, governments at all levels, central banks, financial regulators, retailers, mutual funds, financial institutions, utilities, residential and commercial real estate firms, insurance companies, and professional investors.

Moody's Analytics added the economic forecasting firm Economy.com to its portfolio in 2005. This unit is based in West Chester PA, a suburb of Philadelphia, with offices in London, Prague and Sydney. More information is available at www.economy.com.

Moody's Analytics is a subsidiary of Moody's Corporation (NYSE: MCO). Further information is available at www.moodysanalytics.com.

About Moody's Corporation

Moody's Analytics is a subsidiary of Moody's Corporation (NYSE: MCO). MCO reported revenue of $4.2 billion in 2017, employs approximately 11,900 people worldwide and maintains a presence in 41 countries. Further information about Moody's Analytics is available at www.moodysanalytics.com.