

Original Paper

An Empirical Study on the Impact of Trade War on Both the US and Chinese Economies, Based on the Value-at-risk Approach

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Abstract

The trade war between the US and China has led to global instability, this makes studying this topic very important and sensitive. This study aims to show the impact of the trade war on both the United States and China, by studying both US and Chinese companies before and after the trade war.

Although the trade war is still ongoing and has not ended, but it is long enough to judge its impact on the two countries.

In this study, the value at risk was used as a tool to compare the size of the risks to both the US and Chinese portfolios before and after the trade war, the results showed that the VaR of the US and Chinese portfolio after the trade war was greater than the VaR before the trade war, This means that the two countries were affected by the trade war.

However, the results also showed that this change in the VaR of the US portfolio was greater than the change in the VaR of the Chinese portfolio, this means that the US portfolio has been more affected by the trade war than its Chinese counterpart.

Keywords

trade war, China, USA, Value at risk (VaR), portfolio

1. Introduction

We are all witnessing that day when President Trump declared a trade war against the People's Republic of China. On March 22, 2018, President Donald Trump imposed US \$ 50 billion in tariffs on Chinese goods in response to unfair trade practices by the Chinese state "The tariffs are the result of what the Trump administration says are its efforts to level the playing field with China, which has been long accused of dumping low-cost products in America and breaching intellectual property rights" (Note 1).

This prompted China to retaliate against the decision by imposing tariffs on more than 128 US products on April 2 of the same year.

This beginning led to a trade war between the two most powerful economies in the world, In China, there is a perception that the US is trying to curb its rise. Negotiations are ongoing but have proven difficult. The two sides remain far apart on issues including how to roll back tariffs and enforce a deal.

The uncertainty is hurting businesses and weighing on the global economy; expectations of a global economic crisis have also risen because of the impact of this trade war on the world as well as the instability in the political arena, especially the conflict between the United States and Iran.

It turned out that this trade war has affected many international companies, including US and Chinese, according to an IMF report, an escalation in the US-China trade war will damage the manufacturing industries of both countries and is likely to cause job losses, but it will not change anything in the overall trade balance of the two countries, the IMF said in its April Global Economic Outlook report that the United States and China would suffer “heavy” manufacturing losses, with production capacity shifting to Mexico, Canada and East Asia if tariffs rise to 25 percent on all products flowing between the two countries.

In this paper, we will examine the trade war between the United States and China and the most important stages it has gone through and the most affected country by this war between the two countries.

And an attempt to measure the comparison between the two countries, we used the portfolio as a tool for this measurement, by measuring the size risks to both U.S. and Chinese portfolio before and after the trade war. Value at risk is an effective tool for measuring the amount of risk a portfolio is exposed to.

1.1 Problematic Research

This trade war has affected a large number of international companies, especially U.S. and Chinese companies, which raises the following question:

- *Which companies are most affected by this trade war, U.S. companies or Chinese companies?*

1.2 Research hypotheses

- *With more robustness and experience of the U.S. economic system than the still growing Chinese economy, the Chinese economy is expected to be affected more by this trade war than the US.*

1.3 Structure and Plan of Research

The research was divided into two main parts: the first is theoretical in which we will review the concept of the trade war and the most important stages of the US-China trade war. The second part will present and study the U.S. and Chinese portfolios for two different periods, before and after the trade war using the value-at-risk method.

1.4 Research Objectives

The purpose of this study is to try to shed light on the ongoing trade war between China and the United States of America, and try to show the most affected by this war. The study also aims to demonstrate the importance of the value-at-risk method as a tool for measuring risk.

2. Literature Reviews

Due to the newness of the subject of trade war, there are few studies related to this subject, including the following:

Lazard (2017) explores China and US relations under President Trump from an emerging market perspective. According to the paper Trump began this desire to impose a 45% tariff on imported Chinese goods and described China as currency handling to suppress the value of the renminbi to boost its exports. The paper believes that the ability of the United States to impose such tariffs and the benefits of doing so are questionable.

Li, He and Lin's (2018) study uses a multi-country global general equilibrium (GE) model to numerically simulate the effects of possible China-US trade wars, the simulation results show that China will be significantly hurt by the China-US trade war, but negative impacts are affordable. The US can gain under unilateral sanction measures to China, but will lose if China takes retaliation measures. Comparing the effects under mutual trade war, China will lose more than the US.

Regarding the use of VaR as a comparative tool, we found Leila Mokamed's study (2017), by using VaR, this study try to clarify the size of the risk on the returns of shares in both the Sudanese market and the Jordanian market as a comparative study between the two markets, Thus, the size of the known market risk on the returns of the shares of both markets can be observed in light of the fact that the Islamic market is free of interest transactions and thus the absence of the risk element associated with interest rate fluctuations. The most important results indicated that the risks associated with the returns of shares in the Islamic market are lower than the risks associated with the proceeds of shares in the riba market.

3. Trade War Overview

In this section, we will touch on the most important points related to this trade war between the United States of America and China, and since the beginning of 2018 the whole world has worked on this sensitive issue that affects the global economy", *Trade wars are not an invention of modern society. Such battles have been going on for as long as nations have conducted trades with one another. Colonial powers fought with each other over the rights to trade exclusively with overseas colonies in the 17th century* (Note 2).

3.1 What is a Trade War?

Time magazine (Note 3) published on its website, a report explaining what the trade war is, and how Trump is now starting a series of legislation against a number of countries, the report defines the trade war as stated in the dictionary as" an economic conflict in which countries impose import restrictions on each other in order to harm each other's trade". The article also mentioned that this definition applies to Trump's tariffs and retaliatory threats from other countries, as well as to centuries of protectionist skirmishes by a number of countries in many sectors.

Some relevant points were identified on the Investopedia (Note 4) website as follows:

-A trade war happens when one country raises tariffs on another country imports in response to increased tariffs from the first country.

-Trade wars are a side effect of protectionist policies.

-Trade wars are controversial.

-Advocates say trade wars protect national interests and provide advantages to domestic businesses.

-Critics of trade wars claim they ultimately hurt local companies, consumers, and the economy.

Trade wars can begin if a country notices that the competing state has unfair trade practices. Local trade unions or industrial lobbies can put pressure on politicians to make imported goods less attractive to consumers, pushing international politics into a trade war. Trade wars are also often the result of a misunderstanding of the broad benefits of free trade.

“A trade war that begins in one sector can grow to affect other sectors. Likewise, a trade war that begins between the two countries can affect other countries not initially involved in the trade war. As noted above, this import tit-for-tat battle can result from a protectionist penchant” (CHEN, 2019).

And in the same previous report of Time magazine, talked about who can win behind the trade war *“No one, if history is any guide. When President George W. Bush raised steel tariffs in 2002, U.S. gross domestic product declined by \$30.4 million, according to the U.S. International Trade Commission. The U.S. lost about 200,000 jobs, about 13,000 of which were in raw steel-making, by one estimate. A report by the pro-free trade Peterson Institute for International Economics estimated that Bush’s tariffs cost about \$400,000 for every steel-industry job saved. The World Trade Organization also ruled that the Bush tariffs were illegal”.*

3.2 The Beginning of the Trade War between the United States and China

Starting in January 2018, President Donald Trump began imposing a series of tariffs on everything from steel and aluminum to solar panels and washing machines. These duties affected goods from the EU and Canada as well as China and Mexico. Canada imposed a series of temporary duties on American steel and other products. The EU also imposed tariffs on US agricultural imports and other products including Harley-Davidson motorcycles.

According to Time magazine (Note 5) on March 2, in a tweet, Trump said the trade wars “good and easy to win”. His focus is on reducing the US trade deficit, which shows that the country’s imports exceed exports by hundreds of billions of dollars, Stepping back from trade deals like the North American Free Trade Agreement and the Trans-Pacific Partnership also appeals to Trump’s base of voters in America’s Rust Belt. But talk of a trade war is alarming to many U.S. business leaders, who largely support existing trade deals, and the securities markets, which fear lower profits and slower economic growth if the U.S. turns protectionist and other countries retaliate.

By May 2019, tariffs on Chinese imports had affected about \$200 billion of imports. As with all trade wars, China responded and imposed strict import duties. According to a report by CNBC (Note 6), a study by the International Monetary Fund (IMF) showed that US importers of goods had primarily

borne the cost of tariffs on Chinese goods. Many believe that these costs will, in turn, be transferred to the American consumer in the form of higher product prices.

3.3 The Chronology of Events

A summary of what we found in Wikipedia (Note 7), we can list the sequence of events as follows:

2018	2019
January 22, 2018: Trump announced a tariff on solar panels and washing machines. About 8% of US solar panel imports in 2017 came from China. Imports of residential washing machines from China were about \$ 1.1 billion in 2015.	May 5, 2019: Trump stated that the previous tariffs of 10% levied in \$200 billion worth of Chinese goods would be raised to 25% on May 10. With notification by USTR, the Federal Register on May 9 published the modification of duty on or after 12:01 a.m. Eastern Time Zone May 10 to 25% for the products of China covered by the September 2018 action. The stated reason being that China reneged upon already agreed upon deals.
March 1, 2018: Trump announced steel and aluminum tariffs on imports from all countries. The United States had imported about 3% of its steel from China.	June 1, 2019: China will raise tariffs on \$60 billion worth of US goods.
March 22, 2018: Trump asked the United States trade representative (USTR) to investigate applying tariffs on US\$50–60 billion worth of Chinese goods. He relied on Section 301 of the Trade Act of 1974 for doing so, stating that the proposed tariffs were “a response to the unfair trade practices of China over the years”, including theft of U.S. intellectual property. Over 1,300 categories of Chinese imports were listed for tariffs, including aircraft parts, batteries, flat-panel televisions, medical devices, satellites, and various weapons.	June 29, 2019: During the G20 Osaka summit, Trump announces he and Xi Jinping agreed to a “truce” in the trade war after extensive talks. Prior tariffs are to remain in effect, but no future tariffs are to be enacted “for the time being” amid restarted negotiations. Additionally, Trump said he would allow American companies to sell their products to Huawei, but the company would remain on the U.S. trade blacklist. However, the extent of how much this plan to temporarily exempt Huawei from previous bans would be implemented later became unclear and, in the weeks later, there was no clear indication of the reversal of Huawei bans.
April 2, 2018: Ministry of Commerce of China responded by imposing tariffs on 128 products it imports from America, including aluminum, airplanes, cars, pork, and soybeans (which have a 25% tariff), as well as fruit, nuts, and steel piping (15%). U.S. commerce secretary Wilbur Ross said that the planned Chinese tariffs only reflected 0.3% of U.S. gross domestic product, and Press Secretary Sarah Huckabee Sanders stated that the moves would have “short-term pain” but bring “long-term success”. On April 5, 2018, Trump responded saying that he was considering another round of tariffs on an additional \$100 billion of Chinese imports as Beijing retaliates. The next day the World Trade Organization received request from China for consultations on new U.S. tariffs	June 29, 2019: After a meeting with Chinese leader Xi Jinping, Trump announces “China is going to be buying a tremendous amount of food and agricultural products, and they’re going to start that very soon, almost immediately”. China disputed making such a commitment and one month later no such purchases had materialized. July 11, 2019: Trump tweeted “China is letting us down in that they have not been buying agricultural products from our great Farmers that they said they would”. People familiar with the trade negotiations said China had made no firm commitments to purchase farm goods unless it was part of a comprehensive trade agreement.
May 20, 2018: Chinese officials agreed to “substantially reduce” America’s trade deficit with China by committing to “significantly increase” its purchases of American goods. As a result, Treasury Secretary Steven Mnuchin announced that “We are putting the trade war on hold”. White House	July 17, 2019: China announced an accelerated decrease in holdings of US treasury holdings, targeting 25% of its current holdings of \$1.1 trillion.

<p>National Trade Council director Peter Navarro, however, said that there was no “trade war”, but that it was a “trade dispute, fair and simple. We lost the trade war long ago”.</p>	
<p>May 29, 2018: The White House announced that it would impose a 25% tariff on \$50 billion of Chinese goods with “industrially significant technology;” the full list of products affected to be announced by June 15, 2018: It also planned to impose investment restrictions and enhanced export controls on certain Chinese individuals and organizations to prevent them from acquiring U.S. technology. China said it would discontinue trade talks with Washington if it imposed trade sanctions”.</p>	<p>August 1, 2019: Trump announced on Twitter that additional 10% tariff will be levied on the “remaining \$300 billion of goods”.</p>
<p>June 15, 2018: Trump declared that the United States would impose a 25% tariff on \$50 billion of Chinese exports. \$34 billion would start July 6, 2018, with a further \$16 billion to begin at a later date. China’s Commerce Ministry accused the United States of launching a trade war and said China would respond in kind with similar tariffs for US imports, starting on July 6, 2018: Three days later, the White House declared that the United States would impose additional 10% tariffs on another \$200 billion worth of Chinese imports if China retaliated against these U.S. tariffs. The list of products included in this round of tariffs was released on July 11, 2018, and was set to be implemented within 60 days.</p>	<p>August 5, 2019: The central bank of China (PBOC) let the Renminbi fall over 2% in three days to the lowest point since 2008 as it was hit by strong sales due to the threat of tariffs</p> <p>. August 5, 2019: The U.S. Department of Treasury officially declared China as a Currency Manipulator, reportedly under personal pressure from Trump. In July 2019 the IMF found the yuan to be correctly valued, while the dollar was overvalued, and some analysts found that market forces, rather than Chinese intervention, had recently caused the yuan to lose value. China denied manipulating its currency, citing currency market reaction to Trump’s announcement of tariff increases days earlier.</p>
<p>June 19, 2018: China retaliates, threatening its own tariffs on \$50 billion of U.S. goods, and stating that the United States had launched a trade war. Import and export markets in a number of nations feared the tariffs would disrupt supply chains which could “ripple around the globe”.</p>	<p>August 5, 2019: China ordered state-owned enterprises to stop buying US agricultural products, totaling \$20 billion per year before the trade war. Zippy Duvall, president of the American Farm Bureau Federation, called the move “a body blow to thousands of farmers and ranchers who are already struggling to get by”, adding, “Farm Bureau economists tell us exports to China were down by \$1.3 billion during the first half of the year. Now, we stand to lose all of what was a \$9.1 billion market in 2018, which was down sharply from the \$19.5 billion U.S. farmers exported to China in 2017”.</p>
<p>July 6, 2018: American tariffs on \$34 billion of Chinese goods came into effect. China imposed retaliatory tariffs on US goods of a similar value. The tariffs accounted for 0.1% of the global gross domestic product. On July 10, 2018, U.S. released an initial list of the additional \$200 billion of Chinese goods that would be subject to a 10% tariff. Two days later, China vowed to retaliate with additional tariffs on American goods worth \$60 billion annually.</p>	<p>August 13, 2019: Trump delayed some of the tariffs. \$112 billion worth will still take place on September 1 (which means that on September 1, \$362 billion total worth, including the newly imposed \$112 billion, of Chinese products will face a tariff), but the additional, not yet imposed, \$160 billion will not take effect until December 15. Trump and his advisors Peter Navarro, Wilbur Ross and Larry Kudlow conceded the tariffs were postponed to avoid harming American consumers during the Christmas shopping season.</p>

<p>August 8, 2018: The Office of the United States Trade Representative published its finalized list of 279 Chinese goods, worth \$16 Billion, to be subject to a 25% tariff from August 23, 2018: In response, China imposed 25% tariffs on \$16 billion of imports from the US, which was implemented in parallel with the US tariffs on August 23, 2018.</p>	<p>August 23, 2019: Chinese Ministry of Finance announced new rounds of retaliative tariffs on \$75 billion worth of U.S. goods, effective beginning September 1, 2019</p>
<p>August 14, 2018: China filed a complaint with the World Trade Organization (WTO), stating that US tariffs on foreign solar panels clash with WTO ruling and have destabilized the international market for solar PV products. China stated that the resulting impact directly harmed China's legitimate trade interests.</p>	<p>August 23, 2019: Trump tweeted that he "hereby ordered" American companies to "immediately start looking for an alternative to China". Aides and analysts clarified that the tweet was without legal force. Furthermore, tariffs are to be raised from 25% to 30% on the existing \$250 billion worth of Chinese goods beginning on October 1, 2019, and from 10% to 15% on the remaining \$300 billion worth of goods beginning on December 15, 2019.</p>
<p>September 17, 2018: The US announced its 10% tariff on \$200 billion worth of Chinese goods would begin on September 24, 2018, increasing to 25% by the end of the year. They also threatened tariffs on an additional \$267 billion worth of imports if China retaliates, which China promptly did on September 18 with 10% tariffs on \$60 billion of US imports. So far, China has either imposed or proposed tariffs on \$110 billion of U.S. goods, representing most of its imports of American products.</p>	<p>August 26, 2019: At the G7 summit, Trump stated, "China called last night our top trade people and said 'let's get back to the table' so we will be getting back to the table and I think they want to do something. They have been hurt very badly but they understand this is the right thing to do and I have great respect for it". Chinese Foreign Ministry spokesman Geng Shuang said he was unaware of such a call and Trump aides later conceded the call didn't occur but the president was trying to project optimism.</p>
	<p>September 1, 2019: New USA and Chinese tariffs previously announced went into effect at 12:01 pm EST. China imposed 5% to 10% tariffs on one-third of the 5,078 goods it imports from America, with tariffs on the remainder scheduled for December 15. The United States imposed new 15% tariffs on about \$112 billion of Chinese imports, such that more than two-thirds of consumer goods imported from China were then subject to tariffs.</p>
	<p>September 6, 2019: The People's Bank of China announces a 0.5 percent reduction in its reserve requirement ratio in response to the slowing of China's economic growth rates caused by the trade war.</p>
	<p>September 11, 2019: After China announced it was exempting 16 American product types from tariffs for one year, Trump announced he would delay until October 15 a tariff increase on Chinese goods previously scheduled for October 1. Trump asserted he granted the delay at the request of Chinese vice premier Liu He.</p>
	<p>September 12, 2019: Bloomberg News and Politico reported that Trump advisors were increasingly concerned that the trade war was weakening the American economy going into the 2020 election campaign and were discussing ways to reach a limited interim deal. The Wall Street Journal reported China was seeking to narrow the scope of negotiations to place national security matters on a separate track from trade issues.</p>

3.4 The Effects of the Trade War

The trade war seems to have affected not only the two big economies, but also the global economy, as economic growth slowed around the world. The International Monetary Fund’s World Economic Outlook report released in April 2019 lowered the global economic growth forecast for 2019 from 3.6% expected in 2018 to 3.3%, and said that economic and trade frictions may further curb global economic growth and continue to weaken the investment (Note 8).

In the same report, a 25% tariff scenario for both China and the United States would result in the US real GDP dropping by 0.3-0.6% per annum, and China’s real GDP falling by 0.5-1.5% per annum.

The following table and figure shows the developments in the global growth rate compared to the growth rates of China and the United States, based on the data of the International Monetary Fund:

Table 1. Developments in the Global Growth Rate

Real GDP growth (Annual percent change)	2017	2018	2019	2020	2021	2022	2023	2024
People’s Republic of China	6,8	6,6	6,3	6,1	6	5,7	5,6	5,5
United States	2,2	2,9	2,3	1,9	1,8	1,6	1,6	1,6
World	3,8	3,6	3,3	3,6	3,6	3,6	3,6	3,7

Published by IMF, 2019.



Figure 1. Real GDP Growth (Annual Percent Change)

Based on a series of reports, the US economy appears to have been hit by this trade war, as quoted by Wikipedia: “According to a January 14, 2019 article in the Wall Street Journal, despite US-imposed tariffs, in 2018 China’s annual trade surplus was \$323.32 billion, a record high. On February 6, 2018, The New York Times reported that in 2017 the trade deficit had also reached a record high. In March 2019, U.S. Department of Commerce stated that in 2018 the U.S. trade deficit reached \$621 billion, the

highest it had been since 2008. According to a study by the National Retail Federation of the United States, a 25% tariff on Chinese furniture alone would cost US consumers an additional \$4.6 billion in annual payments”.

It also added: “American farmers were particularly hard-hit by China’s retaliatory trade actions. According to the American Farm Bureau, agricultural exports from the US to China decreased from \$24 billion in 2014 to \$9.1 billion in 2018, including decreases in sales of pork, soybeans, and wheat. Farm bankruptcies have increased, and agricultural equipment manufacturer Deere & Company cut its profit forecast twice between January and August 2019. In response to the difficulties faced by farmers, the Trump administration allocated \$28 billion in relief, mostly in direct payments, in two tranches through July 2019. With the second \$16 billion tranche, Trump tweeted, ‘Farmers are starting to do great again, after 15 years of a downward spiral. The 16 Billion Dollar China ‘replacement’ money didn’t exactly hurt!’ Trump stated that he would spend tens of billions of dollars in tariffs from China to buy products from ‘Great Patriot Farmers’ and distribute the food to starving people in nations around the world. According to an August 2019 USDA report, as American wheat exports ‘plunged’, Canadian wheat exports ‘rocketed’ from 32% to more than 60% of Chinese wheat imports during the most recent marketing year Farm equipment manufacturers were negatively affected by the reluctance of farmers to invest in new equipment, with sales dropping significantly during the first quarter of 2019”.

In an analysis published in The Diplomat magazine (Note 9), researchers Viola Rothschild and Benjamin Della Rocca highlight the crisis in China’s technology sector following the US-led war on several Chinese technology companies. The analysis draws attention to the social effects of the crisis and the policies China has taken to limit its damage: “Just two years ago, the rise of China’s tech sector (often termed its ‘new economy’) looked unstoppable. Between 2014 and 2017, Chinese telecommunications giant Huawei doubled its revenue, and a whopping 34 Chinese tech startups topped \$1 billion valuations. By one forecast, the new economy was on track to create over 1 million jobs annually. But today, the once-prolific sector has reversed course: startups and tech giants alike have been reeling the past year. In the last quarter of 2018, WeChat owner Tencent saw net income fall by a third, and e-commerce giant JD.com lost \$700 million. Alibaba forecasts that, this year, its sales will drop over 20 percent. And across publicly listed technology, media, and telecommunications (TMT) companies, last year’s earnings dropped 140 percent from 2017—a larger plunge than any other Chinese sector”.

The authors added that the new economic companies, and of course new economic workers, have suffered since 2017 from a volatile mix of political, economic and social pressures, the authors say.

But they consider that one of the main driving forces behind the turmoil in the Chinese technology sector, the conflict that has prevailed in US-China relations since last year, particularly the ongoing trade war and disagreements over data security and intellectual property, has led to a significant drop in profits and panic for investors, It also created new operational risks for Chinese technology companies.

3.5 What is Next

China-U.S. economic relations have expanded substantially over the past three decades, their mutual total merchandise trade rose from \$2 billion in 1979 to \$579 billion in 2016. China is now the U.S. second-largest merchandise trading partner, third largest export market, and biggest source of imports (Li et al., 2018) And it seems that both sides benefited from these exchanges, however, this advantage has shrunk after the trade war, this trade war that seems to drag on for a period of time in the future. After all that we have mentioned above, only it seems that things do not stop there, what the BBC (Note 10) site, things will evolve in the future also, where the site stated in his report as follows: *“Both sides have threatened to take more action with new tariffs and hikes to existing duties in the coming months.*

On 1 October, the US plans to raise an existing 25% tariffs on some Chinese products to 30%. Washington then plans to deliver a wave of new tariffs on Chinese goods, ranging from footwear to telephones, on 15 December.

If this happens, effectively all Chinese goods imported to the US will be subject to tariffs. China also plans to hit another 3,000 American products with tariffs by the end of the year”.

4. Comparison Study between U.S. and Chinese Portfolios

In this part we will study the investment affected in the financial portfolio, where we will build a portfolio of five US companies, as well as a portfolio of five Chinese companies, for the Chinese portfolio, we will choose the Chinese companies listed in the US stock market, we will measure the portfolio in two different times, before the trade war and after the trade war. Since this study means measuring the companies most affected by the trade war, we will compare the two portfolios in the different times and see most affected by this war. We will use in this comparison process both returns and risk as well as the Value at Risk.

For the U.S. portfolio, we will choose the following companies: Google and Netflix and Apple and Amazon and Tesla, and for the Chinese portfolio: Alibaba, JD.com, Tencent, Kendi and Weibo. In two periods using weekly data between September 2016 19 to March 19, 2018, before the trade war, and between 19 Mars 2018 to 02 September 2019, after the trade war.

4.1 The Risk and the Return

Risk and return are considered the main component of the financial portfolio, And the equation of both return and risk as follows:

Any rational investors would seek to maximize or minimize the utility. That is, maximum expected return at a given level of risk or minimum risk at a given level of return. If we assume that there are only two risky assets, A and B, available for consideration in an investment portfolio. Since the portfolio contains two assets of different proportions, x and $(1-x)$, the functional relationship between risk and return can be easily determined. (Amenawo et al., 2016)

So we have:

$$R_p = x_a R_a + x_b R_b$$

Where R_p is the portfolio return, X_A and X_B are the portfolio weights.

The portfolio weights sum to one.

$$X_A + X_B = 1$$

by taking expectations of equation

$$E(R_p) = x_A E(R_A) + x_B E(R_B)$$

The mean portfolio return is found to be:

$$\mu_p = X_A \mu_A + X_B \mu_B$$

Consequently the portfolio variance is

$$\sigma_p^2 = x_A^2 \sigma_A^2 + x_B^2 \sigma_B^2 + 2x_A x_B \rho_{AB} \sigma_A \sigma_B$$

And the portfolio standard deviation is

$$\sigma_p = \sqrt{x_A^2 \sigma_A^2 + (1 - x_A)^2 \sigma_B^2 + 2x_A (1 - x_A) \rho_{AB} \sigma_A \sigma_B}$$

And if we assume that there are N risky assets

We have:

$$\text{Expected portfolio return} = \mathbf{M} * \mathbf{W}$$

Where: \mathbf{M} is the Matrix of means and \mathbf{W} is the matrix of weights

And the portfolio's variance is given by

$$\text{Expected portfolio variance} = \mathbf{W}^T * (\text{Covariance Matrix}) * \mathbf{W}$$

Where \mathbf{W}^T is the transpose matrix of Weights and \mathbf{W} is the matrix of Weights

Covariance matrix:

Once we have the de-meaned price series, we establish the covariance of different stocks by multiplying the transpose of the de-meaned price series with itself and divide it by 'm' (number of data points), this gives us the covariance matrix:

$$\text{Covariance Matrix} = \begin{pmatrix} \sigma_1^2 & \sigma_{12} & \sigma_{1n} \\ \sigma_{21} & \sigma_2^2 & \sigma_{2n} \\ \sigma_{31} & \sigma_{32} & \sigma_{3n} \\ \sigma_{41} & \sigma_{42} & \sigma_{4n} \\ \sigma_{51} & \sigma_{52} & \sigma_{5n} \\ \sigma_{n1} & \sigma_{n2} & \dots & \sigma_n^2 \end{pmatrix}$$

By using the adjusted closing prices downloaded from Yahoo finance we will calculate the return and risk of U.S. and Chinese portfolio as shown in the following tables.

USA before the trade war:

1- Covariance matrix

Table 2. Covariance Matrix of U.S. Portfolio before the Trade War Prepared by the Researchers Using Excel

	Amazon	TSLA	APPL	GOOGLE	NETFLIX
Amazon	0,000965	0,000449	0,000359	0,000561	0,000916
TSLA	0,000449	0,002213	0,000411	0,000415	0,00048
APPL	0,000359	0,000411	0,000748	0,000391	0,000268
GOOGLE	0,000561	0,000415	0,000391	0,000768	0,000883
NETFLIX	0,000916	0,00048	0,000268	0,000883	0,003189

2- And by assuming equal weights

Table 3. Return and Risks of U.S. Portfolio before the Trade War Prepared by the Researchers Using Excel

The portfolio return	0,86%
The portfolio variance	0,07%
The Standard deviation	2,69%

USA after the trade war:

1- Covariance matrix

Table 4. Covariance Matrix of U.S. Portfolio after the Trade War Prepared by the Researchers Using Excel

	AMAZON	TSLA	APPL	GOOGLE	NETFLIX
AMAZON	0,00149	0,000292613	0,00067	0,000758697	0,001299
TSLA	0,000293	0,005735491	0,000627	-0,000106023	0,000301
APPL	0,00067	0,000627033	0,001472	0,000421825	0,000657
GOOGLE	0,000759	-0,000106023	0,000422	0,000992974	0,000919
NETFLIX	0,001299	0,00030105	0,000657	0,000919483	0,003115

2- And by assuming equal weights

Table 5. Return and Risks of U.S. Portfolio after the Trade War Prepared by the Researchers Using Excel

The portfolio return	0,19%
The portfolio variance	0,10%
The Standard deviation	3,13%

Comparison before and after the trade war (USA)**Table 6. Return and Risks of U.S. Portfolio before and after the Trade War**

	Before trade war	After trade war	% Change
Rp	0,86%	0,19%	-77,73%
Sd	2,69%	3,13%	16,15%

Based on the Table 6 shows that the return of US portfolio has dropped from 0.86% to 0.19% by a decrease equivalent to 77.73%, at the same time the risk rose by 16.15%, from 2.69% to 3.13%.

China before the trade war:

1- Covariance matrix

Table 7. Covariance Matrix of Chinese Portfolio before the Trade War Prepared by the Researchers Using Excel

	KANDI	TENCENT	ALIBABA	JD	WEIBO
KANDI	0,010704	0,000981	0,000977	0,000869	0,001539
TENCENT	0,000981	0,001182	0,000982	0,000996	0,001401
ALIBABA	0,000977	0,000982	0,001645	0,001003	0,001351
JD	0,000869	0,000996	0,001003	0,002397	0,001479
WEIBO	0,001539	0,001401	0,001351	0,001479	0,004197

2- And by assuming equal weights

Table 8. Return and Risks of Chinese Portfolio Before the Trade War Prepared by the Researchers Using Excel

The portfolio return	0,89%
The portfolio variance	0,17%
The Standard deviation	4,16%

China after the trade war:

1- Covariance matrix

Table 9. Covariance Matrix of Chinese Portfolio after the Trade War Prepared by the Researchers Using Excel

	KANDI	TENCENT	ALIBABA	JD	WEIBO
KANDI	0,012456	0,001529	0,001587	0,001128	0,001675
TENCENT	0,001529	0,001689	0,000923	0,001077	0,001561
ALIBABA	0,001587	0,000923	0,001992	0,001789	0,001879
JD	0,001128	0,001077	0,001789	0,00341	0,002188
WEIBO	0,001675	0,001561	0,001879	0,002188	0,004252

Comparison between 2018-2019 (CHINA)**Table 10. Return and Risks of U.S. Portfolio before and after the Trade War Prepared by the Researchers Using Excel**

	2018	2019	% Change
Rp	0,89%	-0,18%	-119,72%
Sd	4,16%	4,56%	9,59%

Based on the Table 10 shows that the return of the Chinese portfolio has dropped from 0.89% to -0.18% by a decrease equivalent to 119,72%, at the same time the risk rose by 9.59%, from 4.16% to 4.56%

Comparison between the U.S. and Chinese portfolio % change in risks and returns

After we measured the percentage change in returns and risks before and after the trade war for both the U.S. and the Chinese portfolio we will now compare the most affected by the trade war between them.

Table 11. Comparison between the U.S. and Chinese Portfolio % Change in Risks and Returns

	USA	China
Rp	-77,73%	-119,72%
Sd	16,15%	9,59%

We conclude from Table 11 that the returns and risks of both portfolios have been affected, however, the return on the US portfolio appears to have been less affected than its Chinese counterpart, as it fell 77.73% compared to the Chinese return which fell 119.72%. Concerning risks, the US portfolio seems to have a higher risk change than the Chinese one.

4.2 Value at Risk (VaR)

In this part we will use VaR as a tool for comparison, where we will use the wot ways related to this tool. Value-at-Risk (VaR), is a widely used measure of financial risk, which provides a way of quantifying and managing the risk of a portfolio.

4.2.1 Historical Simulation

The main hypothesis of the historical simulation is that the set of possible future scenarios is entirely represented by what happened in a specific historical window. This methodology involves collecting all changes in risk factors on a historical window: for example, daily changes over the last five years. The set of scenarios thus obtained is supposed to represent all the possibilities that could arise between today and tomorrow. The portfolio instruments are then reevaluated several times with respect to each scenario (M ária, 2007).

We used weekly historical data in this study for the above companies, after calculating the weekly returns for each portfolio and assuming an investment of \$ 500,000. With equal weight of assets, we get the following VaR:

-U.S. PORTFOLIO

Table 12. The Historical Simulation VaR of the U.S. Portfolio before and after the Trade War Prepared by the Researchers Using Excel

	Before the trade war	After the trade war	% Change
VaR 95% HISTORICAL	\$ -13322,4	\$ -21494	61,34%
VaR 99% HISTORICAL	\$ -24391	\$ -40549,2	66,25%

From Table 12, it appears to us that the maximum loss to the US portfolio after the trade war is greater than the maximum loss before the trade war. This is in the confidence interval 95% and 99%.

-CHINESE PORTFOLIO

Table 13. The Historical Simulation VaR of the Chinese Portfolio before and after the Trade War Prepared by the Researchers Using Excel

	Before the trade war	After the trade war	% Change
VaR 95% HISTORICAL	-30313	-36409,8	20,11%
VaR 99% HISTORICAL	-39899,9	-43637,4	9,37%

From Table 13, it appears to us that the maximum loss to the Chinese portfolio after the trade war is greater than the maximum loss before the trade war. This is in the confidence interval 95% and 99%.

4.2.2 Parametric Method

The parametric method, also known as the variance-covariance method, is a risk management technique for calculating the value at risk (VaR) of a portfolio of assets.

The parametric method looks at the price movements of investments over a look-back period and uses probability theory to compute a portfolio's maximum loss. The variance-covariance method for the value at risk calculates the standard deviation of price movements of an investment or security. Assuming stock

price returns and volatility follow a normal distribution, the maximum loss within the specified confidence level is calculated (Note 11). Using the same weekly data and the same amount of investment \$ 500000, the parametric VaR will give us the following results:

-U.S. PORTFOLIO

Table 14. The Parametric Method VaR of the U.S. Portfolio before and after the Trade War Prepared by the Researchers Using Excel

	Before the trade war	After the trade war	% Change
VaR 5% PARAMETRIC	17823,28	24791,96	39,10%
VaR 1% PARAMETRIC	26989,38	35457,34	31,38%

From Table 14, using the parametric method, it appears to us that the maximum loss to the U.S. portfolio after the trade war is greater than the maximum loss before the trade war. This is in the confidence interval 95% and 99%.

-CHINESE PORTFOLIO

Table 15. The Parametric Method VaR of the Chinese Portfolio before and after the Trade War Prepared by the Researchers Using Excel

	Before the trade war	After the trade war	% Change
VaR 5% PARAMETRIC	29762,96	38402,66	29,03%
VaR 1% PARAMETRIC	43938,04	53940,73	22,77%

From Table 15, using the parametric method, it appears to us that the maximum loss to the Chinese portfolio after the trade war is greater than the maximum loss before the trade war. This is in the confidence interval 95% and 99%.

Comparison between the U.S. and Chinese portfolio % change in VaR before and after the trade war

Table 16. Comparison between the U.S. and Chinese Portfolio % Change in VaR before and after the Trade War

	U.S.	CHINA
VaR 95% HISTORICAL	61,34%	20,11%
VaR 99% HISTORICAL	66,25%	9,37%
VaR 5% PARAMETRIC	39,10%	29,03%
VaR 1% PARAMETRIC	31,38%	22,77%

5. Summary

This study showed that the US portfolio returns have been affected less than its Chinese counterpart, but it showed and remarkably that the size of this portfolio risk was greater than Chinese portfolio, after measuring the portfolio risk in the two periods before and after the trade war, it shows that the risk increased after the trade war compared to the period before the trade war for both U.S. and Chinese portfolio, But the amount of change in risk in the US portfolio was higher than the Chinese one.

As for the magnitude of risks, and by using the value at risk to measure it, we found that both financial portfolios had a higher exposure to risk after the trade war than before the trade war, by using both the parametric method and the historical simulation.

But as a comparison between the two portfolios, we found that the evolution of the size of the risk value of the US portfolio was greater than the Chinese portfolio by using the two methods in the confidence interval 95% and 99%. This denies our hypothesis that Chinese companies may be more affected than their US counterparts by the trade war.

We have also demonstrated the effectiveness of value at risk as a tool to measure financial risk on the one hand and as a tool for comparing portfolios or markets on the other.

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Notes

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