

Gain or Loss from this Turn's Rate Hike: Evidence from Tesla and USD Index

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Abstract. A series of grave problems caused by energy scarcity and environmental pollution have gradually become the focus of governments and automobile manufacturers, and all countries agree that energy saving, and emission reduction are the inevitable directions of the future development of industrial automobile technology. As a global pioneer of new energy pure electric vehicles, Tesla has created a new concept of using Internet thinking to produce cars. At the same time, under the influence of the epidemic disturbance and the conflict between Russia and Ukraine, the supply and demand of global commodities such as crude oil and grain are tense. In addition, the Fed has raised interest rates for three rounds since June 2022, leading to rising inflationary pressure in the global market. Rising cost pressure in industries with a high degree of global value chain integration (such as automobiles, batteries, and mechanical equipment) and Tesla's earnings are also affected by exchange rate fluctuations. This paper uses the VAR model to explain the dynamic relationship between the exchange rate of USD/offshore RMB and Tesla stock price, establishes the ARMA-GARCH model to predict and analyze how the change of exchange rate affects the volatility of Tesla stock returns, and predicts the impact on industrial enterprises like Tesla.

Keywords: Tesla, Rate Hike, Exchange Rate, Bond Market, Stock Price.

1. Introduction

Tesla was founded in July 2003 and went public in 2010. It was founded by Martin Eberhard and Mark Tarpenning, with Elon Musk leading A Series A funding round and entering the company in 2004. The development of Tesla has gone through three stages: from the initial stage of the Roadster in 2008 to continuous financing, to the subsequent launch of the explosive car Model S in 2012, which began to make profits and continuously expand the market, and finally to the mass production of Model X and 3 in 2016. Tesla's primary business is producing, manufacturing, and selling high-performance battery electric vehicles, solar power generation, and energy storage products. After 18 years of development, Tesla has become the world's leading electric vehicle company, with significant advantages over its competitors in terms of sales, revenue, scale, and product layout.

With the development of economic globalization and financial liberalization, various countries' financial markets are becoming more interrelated and influential. As a leading enterprise in the global electric vehicle market, the analysis of the impact of exchange rate changes on Tesla's stock price can reflect the investor public's objective evaluation of the company's value and evaluate the relationship between capital and profit. From June 2022 to now, the Federal Reserve has been raising interest rates to reduce the inflationary pressure in the US. The rise of the US dollar index has caused the slowdown of global growth and the tightening of US dollar liquidity. Taking Tesla's Gigafactory in Shanghai, China, as an example, this article will mainly discuss the economic relationship between the US dollar interest rate hike and the Chinese market and evaluate the impact of Tesla's earnings under exchange rate fluctuations.

The remaining parts of this paper will be organized as follows: Part 2 is a literature review, which includes the relationship between the change of the US dollar index and the Chinese market, as well as the study on the impact of exchange rate changes on Tesla's earnings volatility in 2022 and finally summarizes the development prospect of Tesla new energy vehicles in the Chinese market. Part 3 is the experimental design to test the stability of the VAR model based on some data. After that, Part 4 will analyze the ARMA-GARCH model using the relevant data. The results of the empirical analysis are used to demonstrate the income changes of Tesla under exchange rate fluctuations, and finally, the conclusions and forecasts are drawn.

2. Literature Review

2.1 Study on the Relationship Between the Change of Dollar Index and China's Market Economy

The U.S. economy grew 5.7% in 2021, the most vigorous annual growth since 1984. Against tight global supply chains, the U.S. government has offered nearly \$6 trillion in pandemic aid to spur consumer spending on goods. The record high trade deficit was driven by a surge in imports as U.S. companies restocked shelves to meet strong domestic demand amid a shift in spending from services to goods during the pandemic. There is an apparent negative correlation between the proportion of trade balance in the GDP of the United States and the dollar index, with a correlation coefficient of -0.54 [1]. This means, on the one hand, that a more robust U.S. economy tends to be characterized by increased demand for imports and a wider trade deficit, which is accompanied by a weaker dollar and inflationary pressures.

So how are the dollar index and the U.S. trade deficit linked to the renminbi? From 1994 to 2015, China's three significant pegs to the Reform of the dollar exchange rate system caused the yuan to the dollar range to be small. Therefore, the change of the dollar index implies the renminbi against other significant international currency changes. This change in the way of trade between our country and central non-us countries, in turn, affects our country's economic growth. This affects the Chinese bond market. Because of China's large foreign exchange reserves, foreign trade has been an essential driver of China's economic growth over the past decades. China is a global manufacturing factory with a complete industrial chain layout. Though China also has a vast consumer market, overall, China's exports are significantly greater than imports, has a continued trade surplus, many export goods, pay with dollars abroad, earn \$. However, domestic circulation is RMB, and foreign trade enterprises such as Tesla will need to store the dollar as a reserve in exchange for RMB used in China from the bank. In terms of investment, China has implemented the Foreign Investment Law since 2020 to further improve the business environment in the Chinese market, open wider to the outside world and guide foreign investment. For example, Tesla set up a Gigafactory in Shanghai, China, in 2019 to produce Tesla Model3 and Model Y.

At the end of July 2022, the Federal Reserve raised interest rates for the fourth time this year to combat urgent inflationary pressures and slow economic growth. China's import and export trade surplus increased by the U.S. \$387 billion in the first half of this year. From January to May, China reduced its holdings of U.S. Treasury bonds by the U.S. \$87.9 billion. However, in the first half of this year, China's foreign exchange reserves decreased by the U.S. \$1789 billion, more than twice the reduction of U.S. Treasury bond holdings [2]. However, China's central bank has had to sell U.S. Treasury bonds and dollars to buy yuan to stabilize the exchange rate due to the severe capital outflow from China caused by the continued interest rate hike in the U.S. dollar since March. Meanwhile, the European Central Bank announced on July 21 the start of a cycle of interest rate hikes in the euro to stabilize dollar-induced inflationary pressures. The RMB will bear at least four times more pressure in the first half of the year when the U.S. dollar and the euro raise interest rates together [2].

2.2 The Impact of US Exchange Rate Changes on Tesla's Profits

According to Tesla's financial data [3], Tesla delivered a total of 254,695 vehicles in the second quarter of this year, achieving a revenue of 16.934 billion dollars, a year-on-year increase of 42% compared with the second quarter of last year. However, a quarter-on-quarter decrease of 55,000 vehicles compared with the first quarter of this year. In addition, the automotive gross margin was 27.9% in the second quarter, but significantly lower than 32.9% in the first quarter and 28.4% in the second quarter of last year. In terms of capital flow analysis, Tesla's capital expenditure in the second quarter was \$1.73 billion, up 15% year on year, higher than the market expectation of \$1.66 billion; Q2 free cash flow of \$621 million, zero year-over-year growth and below market expectations of \$625.2 million; Cash and cash equivalents in the second quarter were \$18.32 billion, up 13% year on year and below market expectations of \$18.92 billion [4]. The analysis said that inflation, the pandemic, competition for supplies of batteries and components, and a rising dollar weighed on profits. The analysis said that inflation, the pandemic, competition for supplies of batteries and components, and a rising dollar weighed on profits.

Raising interest rates to curb inflation means dampening investor enthusiasm, depressing consumer demand, slowing economic growth, cutting jobs, and pushing unemployment. According to the Wall Street Journal, Tesla closed its office in SAN Mateo, California, in June this year and laid off about 200 employees [5]. At the same time, the fluctuation of the international market price caused by the fluctuation of the dollar index will impact China's inflation through the cost channel. As an American company, Tesla's RMB income in China eventually needs to be converted into US dollars, so the depreciation of RMB caused by the interest rate hike will lead to higher costs for China to purchase overseas commodities. In addition, since 2022, the Russia-Ukraine situation has dramatically affected the global battery supply chain. The price of battery materials has been soaring, and the production cost of new energy electric vehicles has increased significantly. The most immediate forecast is the rising cost of Tesla's Gigafactory in Shanghai.

2.3 Study the Impact of China's Policies on the Development of New Energy Vehicles

Although the auto industry is affected by chip shortage, raw materials, and other adverse factors to double the pressure, in 2021, China's auto market maintained the growth trend, especially since the new energy vehicle is surging. Recently, the China Association of Automobile Manufacturers held the "2022 China Auto Market Development Forecast Summit". Shihua Chen, deputy secretary-general of the association, believes that the overall Chinese auto market will maintain a moderate growth trend. China Association of Automobile Manufacturers predicts that in 2022, China's automobile sales will reach 27.5 million units, with a year-on-year growth of 5.4%, among which the sales of new energy vehicles will reach 5 million units, with a year-on-year growth of 47% [6].

According to the Notice of the Ministry of Finance, the Ministry of Industry and Information Technology, the Ministry of Science and Technology, and the National Development and Reform Commission on Fiscal Subsidy Policies for the Promotion and Application of New Energy Vehicles in 2022. Since 2009, the Department of Finance and the appropriate departments have been strongly supportive of the development of the new fuel vehicle industry. Thanks to the joint efforts of all parties, China's new energy vehicle technology has taken in continuous progress, product performance has been significantly improved, and its production and marketing scale has ranked first in the world for six consecutive years. In 2021, new fuel vehicles, in response to the global epidemic, the shortage of chips and other harmful effects. Recently, the Ministry of the Fourth Committee issued a notice that, according to the provisions of No. 86, 2020 Document of Financial Construction, the purchase subsidy standard of new energy vehicles in 2022 will be reduced by 30% based on 2021. In order to maintain the excellent development momentum of new energy vehicles and stabilize the expectations of the industry and consumers, the notice postponed the termination of the subsidy to the end of 2022 [7].

In September 2021, under the exchange rate of RMB and the US \$6.4, Model 3, the highest sales Model of Tesla, is sold at \$39,990 (about ¥258000) in the United States and \$36,500 (¥235,900) in

China, which is nearly \$3,500 (¥22) compared with the United States. 000) discount [8]. However, at the end of August 2022, under the exchange rate of RMB and US dollar 1:7, Model3 is quoted at \$48,440 (about ¥245,000) [9] in the United States, and its price in China is about \$40,000 (¥279,900) [10], which is nearly \$8400 (about ¥58,800) better than that in the United States. In general, Tesla has a tremendous sales advantage in the Chinese market under the subsidies of China's policies.

3. Research Design

3.1 Data Source

This paper uses "investing.com" as a search engine to find out and obtain data about the daily stock price of TESLA [11]. Also, the daily exchange rate between the US dollar and the Chinese yuan has been obtained from the website. Data on the impact of Federal Reserve policies on the dollar and currency flows in international capital markets will also be collected because these changes will have a real impact on Tesla's operating income and stock price, especially as Tesla is an American company with global operations.

3.2 ADF-Test

After building the model, we first need to perform a unit root (smoothness test) on the model using Stata software. The null hypothesis for the test is that the time series model is not smooth, and the alternative hypothesis is that the model is stable and feasible. After putting the data into Stata, we can see from the output (Table 1) that the p-value for the log return is 0. Under this test, we can reject the null hypothesis. The time series model is not smooth, and we conclude that the time series model is stable and feasible.

Table 1 ADF test

Variables		t-statistics	p-value
Price	Tesla	-2.4180	0.3700
	USD-RMB	-1.5750	0.8019
Yield	Tesla	-10.8350	0.000***
	USD-RMB	-12.7130	0.000***

3.3 VAR Model

After performing the Unit root test, the first model we need to design is the VAR model. VAR model is also called Vector autoregressive model. It is an excellent statistical model which can well analyze the relationship between multiple variables when the value of these variables could change over time. VAR models do not need to distinguish between endogenous and exogenous variables. Because the explanatory variables required by the model are all lagged variables, it is easy to predict the future. Var models can be used to estimate the dynamic relationship of joint endogenous variables, and all current variables in the model can be used to perform regression on several lagged variables. The establishment of the VAR model cannot be based on strict economic theory without imposing zero constraints on parameters. Most importantly, the explanatory variables of the VAR model do not include any variables of the current period, which is helpful for data estimation and prediction. When building the VAR model, two points need to be determined. The first point is to determine the number of variables that interact with each other in the model, and the second point is to determine the number of lagged variables that the model needs to clearly explain the endogenous variables that interact with each other (k value). Several criteria can be used to determine the lag order, including FPE, AIC, HQIC, SBIC, and LR.

Before checking the Impulse response, the stability of the VAR model also needed to be checked. The requirement for the stability of the model is that all roots are inside the unit circle. Overall, the

goal of the VAR model used in the paper is to try to explain the relationship between the exchange rates and Tesla's stock price. The relationship can be explained by the impulse response in the paper later. The two-order VAR model can be described as:

$$y_t = \alpha_0 + \alpha_1 y_{t-1} + \alpha_2 x_{t-1} + \epsilon_{1t} \quad (1)$$

$$x_t = \beta_0 + \beta_1 y_{t-1} + \beta_2 x_{t-1} + \epsilon_{2t} \quad (2)$$

3.4 ARMA-GARCH Model

ARMA is also called Autoregressive Moving Average. ARMA is the combination of two simple models, the Autoregressive Model (AR) and the Moving average Model (MA). ARMA model can be used here to describe stationary random processes. ARMA can predict the future value based on past performance.

The ARMA model can be described as:

$$x_t = \phi_0 + \sum_{i=1}^p \phi_i x_{t-i} + a_t - \sum_{i=1}^q \theta_i a_{t-i} \quad (3)$$

ARCH, in short for autoregressive conditional heteroskedasticity, is a statistical model for the variance of a time series. The ARCH model can be used to describe a volatile variance. Mostly, the ARCH model is used in a situation where the increased or decreased variation happens in a short time. The model was created according to the econometric and finance problem, aiming to solve economic and financial problems. For the GARCH model (generalized autoregressive conditionally heteroscedastic), the model uses values from past squared observations and past variance to predict the variance at time t .

The ARCH model can be described as

$$\sigma_t^2 = \alpha_0 + \alpha_1 x_{t-1}^2 + \dots + \alpha_m x_{t-m}^2 \quad (4)$$

ARMA-GARCH model is a combination model of ARMA and GARCH model. The GARCH (1,1) model can be written as follow:

$$\sigma_t^2 = \alpha_0 + \alpha_1 u_{t-1}^2 + \beta \sigma_{t-1}^2 \quad (5)$$

4. Results and Analysis

4.1 The Selection of VAR Lag Rrder

The likelihood ratio (LR) test was applied to determine the lag order in this paper. LR is defined as the following:

$$LR = -2(\log|L_k| + \log|L_{k+1}|) \sim \chi_{(N^2)}^2 \quad (6)$$

where N is the number of variables with mutual influence, L_k and L_{k+1} is the maximum likelihood estimate of the variance-covariance matrix of the residuals with the VAR lag order to be k and $(k+1)$ respectively. Starting from the maximum lag order, LR are compared with the critical value at the 5% level. When LR is smaller than the critical value, the lag order is appropriate, and when LR is larger than the critical value, the lag order should be larger.

As shown in Table 2, the most used information criteria, including FPE, AIC, HQIC and SBIC, chose the maximum lag 0, which is not practical. So, the Likelihood Ratio test (LR) was applied, which chose the 12th order.

Table 2 VAR model identification

Lag	LL	LR	df	p	FPE	AIC	HQIC	SBIC
0	1438.04				8.7e-09*	-12.8793*	-12.8669*	-12.8487*
1	1439.42	2.7748	4	0.596	9.0e-09	-12.8558	-12.8188	-12.7642
2	1439.50	0.1456	4	0.997	9.3e-09	-12.8206	-12.7589	-12.6678
3	1441.47	3.9401	4	0.414	9.4e-09	-12.8024	-12.7160	-12.5885
4	1446.86	10.7840	4	0.029	9.3e-09	-12.8149	-12.7039	-12.5399
5	1446.98	0.2361	4	0.994	9.7e-09	-12.7801	-12.6444	-12.4439
6	1449.78	5.6091	4	0.230	9.8e-09	-12.7693	-12.6090	-12.3721
7	1454.25	8.9275	4	0.063	9.7e-09	-12.7735	-12.5885	-12.3151
8	1456.87	5.2430	4	0.263	9.8e-09	-12.7611	-12.5514	-12.2417
9	1459.58	5.4165	4	0.247	1.0e-08	-12.7496	-12.5152	-12.1690
10	1464.41	9.6636	4	0.046	9.9e-09	-12.7570	-12.4980	-12.1153
11	1466.98	5.1531	4	0.272	1.0e-08	-12.7443	-12.4605	-12.0414
12	1472.21	10.4420*	4	0.034	9.9e-09	-12.7552	-12.4468	-11.9913

After choosing the lag order, stability test was conducted. As displayed in Figure 1, no root is outside the unit circle, which determines the VAR model is stable.

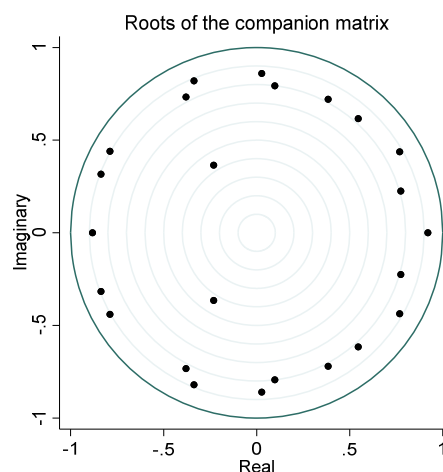


Figure 1 Unit circle test
Photo credit: Original

4.2 Impulse Response Estimation

The appreciation of the US dollar caused by the Fed's interest rate hike will promote international capital flows. The international capital market and international hot money will increase their holdings of the US dollar due to profit seeking factors, and with the further rise of the exchange rate, they will go long in the US dollar and short in the RMB.

Based on theoretical analysis, the possible economic consequences of US dollar appreciation are as follows:

First, the increase of international capital's holdings of US dollars may cause a large amount of US dollars to flow into the US stock market or bond market. This behavior means that there is a net inflow of US domestic capital, and simultaneously, there is a net outflow of foreign capital. The direct economic consequence of this behavior is to raise (lower) the share price or yield of the US (foreign) stock market.

Second, the appreciation of the US dollar means that the purchasing power of the US dollar increases, which will certainly promote the import of the United States, suppress the export of

American enterprises, promote the export of foreign enterprises, and suppress China's import. There are a large number of multinational enterprises in the US market. Suppressing exports will obviously harm the interests of these enterprises but will promote the interests of foreign export dependent enterprises.

Third, as an American enterprise operating globally, Tesla's final revenue is denominated in US dollars. If we refer to the basic economic assumption, that is, enterprises cannot adjust product prices in a short term, then the appreciation of the US dollar will reduce Tesla's operating income.

From the above possible economic results, it is impossible to directly judge which of the above-mentioned economic consequences caused by the Fed's interest rate increase plays a leading role.

If the first economic consequence dominates, Tesla's share price or yield will increase with the rise of exchange rate; otherwise, the latter two influence mechanisms will dominate, or these effects will offset each other.

From the estimation results of impulse response displayed by Figure 2, the net effect of one unit of exchange rate shock on Tesla's stock return is negative in the period of $T = 0$. In specific, the largest negative effect appeared in the period of $T = 4$, slightly larger than 0.5%, and the second highest value appeared in the period of $T = 1$, which was slightly lower than 0.5%.

To sum up, this paper believes that the Fed's interest rate hike will harm Tesla's interests.

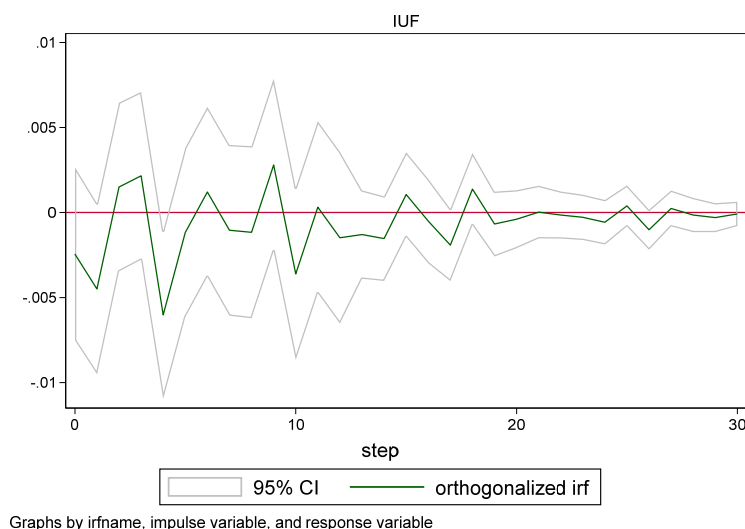


Figure 2 Impulse and response
Photo credit: Original

4.3 The ARMA (p, q) Model Identification

In this section, partial autocorrelation function (PACF) and autocorrelation function (ACF) are used to determine p and q in ARMA (p, q) model, respectively. As shown in Figure 3, the partial autocorrelations are all within the confidence interval after the 7th lag, so this lag is determined to be the order p . Similarly, the autocorrelations are all within the confidence interval after the 7th lag, so this lag is determined to be the order q .

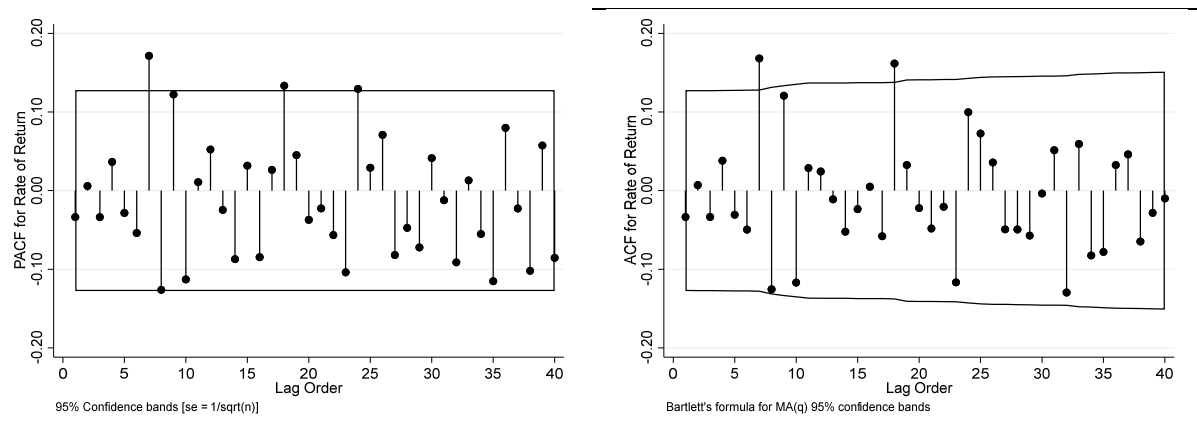


Figure 3 PACF and ACF

Photo credit: Original

4.4 ARMA-ARCH Estimation

According to the estimation results of ARMA-ARCH as shown in Table 3, the ARCH term is significant at the level of 1%, which indicates that Tesla's stock return has significant conditional heteroscedasticity and can be modeled by ARCH. In addition, from the estimation results of external explanatory variables, the change of exchange rate does not improve the volatility of Tesla's stock return. A possible explanation is that the impact of internal capital flows and enterprises' net losses is slow, so it does not cause the increase of daily volatility.

Table 3 ARMA-ARCHX estimation results

	Coefficient	Std. err	$p > Z $
Mean Equation			
AR, L7	-0.2159	0.3423	0.5280
MA, L7	0.3929	0.3300	0.2340
Constant	0.0015	0.0029	0.6060
ARCHX			
Exchange rate	13.1606	25.9226	0.6120
ARCH, L1	-0.0748	0.0290	0.0100
Constant	-6.3623	0.0852	0.0000

5. Discussion

The result of this paper displays that the exchange rate of US dollar against offshore RMB can negatively impact Tesla's stock price, and the change of exchange rate did not increase the volatility of Tesla's stock return. According to Jorion's research on the exchange rate exposure of US multinationals, industries such as Chemicals, Mining and Retail have considerable exchange rate exposure, but the research involve little about the automobile and new energy industry [12]. From Hyde's research, the exchange rate beta, the sensitivity of asset returns to exchange rate risk, varies according to the country and industries [13]. Recent research of Tesla shows that the exchange rate of US dollar against offshore RMB has a significant influence on Tesla stock yields and markers, which is consistent with the result of this paper [14]. However, that research also displays that CNYUSD lead to violent fluctuations in Tesla's stock price, which is inconsistent with our results [14]. A possible reason is that the former research used daily data before 2020 to avoid the effect of the novel coronavirus pandemic. The novel coronavirus pandemic and the tightening monetary policy of the Federal Reserve both can have an impact on Chinese consumers' investment strategy.

6. Conclusion

The purpose of this article is to study the impact of the exchange rate of US dollar against offshore RMB on Tesla's stock price. In the paper, Methods such as ADF tests, VAR model, and ARMA-GARCH model have been used to test the effect. For the ADF test (smoothness test), according to the test result that the p-value for the log return is 0, which can reject the null hypothesis, the model is not smooth, and conclude that the model is stable and feasible because the p-value for the log return is 0. For the VAR model, after choosing the 12th order under the Likelihood Ratio test, this paper find that there is no root outside the unit circle, determining that the VAR model is stable. For the impulse response estimation and ARMA-ARCH estimation, the results tell that the Tesla's stock price would be harmed from the exchange rate of US dollar against offshore RMB, and the change of exchange rate would not increase the volatility of Tesla's stock return. Overall, there might be other factors such as the effect of novel coronavirus pandemic needed to be concerned, and these factors should be included in the further research.

References

- [1] Tencent news, The main currency exchange rate changes and our bond market impact logic analysis. (2020-08-04) [2022-09-20]
https://view.inews.qq.com/k/20200804A0O24K00?web_channel=wap&openApp=false&f=newdc
- [2] NetEase news, What is the impact of the US dollar's fourth 75 basis point interest rate increase on the US economy and the exchange rate of RMB. (2022-07-29) [2022-09-20].
https://3g.163.com/dy/article/HDD8N3TN055325NQ.html?referFrom=bing&spss=adap_dy
- [3] Tesla, Shareholder Deck, 2022 Q2 Financial Summary. (2022-07-20) [2022-09-20]. https://tesla-cdn.thron.com/static/EIUQEC_2022_Q2_Quarterly_Update_Deck_J8VLIK.pdf?xseo=&response-content-disposition=inline%3Bfilename%3D%22tesla-q2-22-update.pdf%22
- [4] Economic News of the Day, Tesla Q2 results: Revenue of \$16.9 billion, higher than expected; Sold 75% of its bitcoin holdings for \$936 million. (2022-07-21) [2022-09-20].
http://finance.ce.cn/stock/gsgdbd/202207/21/t20220721_37891437.shtml
- [5] Tesla Lays Off Some Staff in Closing San Mateo, Calif., Office. (2022-06-08) [2022-09-20].
<https://www.wsj.com/articles/tesla-lays-off-some-staff-in-closing-san-mateo-calif-office-11656462461>
- [6] Chi Gao. CAAC forecast: In 2022, China's auto sales increased by 5.4% year on year, and new energy vehicles exceeded 5 million. *Automobile and Accessories*, 2022(01):47.
- [7] Qi Chen. Four ministries and commissions adjust the subsidy policy of new energy vehicles and reduce the subsidy slope by 30% in 2022. *Automobile and Accessories*, 2022(01):48.
- [8] Sina car. Tesla price comparison between China and America, this is the example of luxury brands. (2021-09-03) [2022-09-20]. <https://auto.sina.com.cn/zz/hyxx/2021-09-03/detail-iktzscyx1995644.shtml>
- [9] Car and driver. 2022 Tesla Model 3 prices in USA. [2022-09-20].
<https://www.caranddriver.com/tesla/model-3>
- [10] Sina car. 2022 Tesla Model 3 prices in China. [2022-09-20].
https://db.auto.sina.cn/3654/?c=spr_auto_trackid_779101331f0deca2
- [11] Stock market quotes & financial news. Investing.com. (n.d.). [2022-09-20]. <https://www.investing.com/>
- [12] Jorion P. The exchange-rate exposure of US multinationals. *Journal of business*, 1990: 331-345.
- [13] Hyde S. The response of industry stock returns to market, exchange rate and interest rate risks. *Managerial Finance*, 2007.
- [14] Gong Z, Li X, Shi X. Dynamic Changes in Exchange Rate Movements and Tesla Stock Yields. 2022 7th International Conference on Social Sciences and Economic Development (ICSSSED 2022). Atlantis Press, 2022: 1615-1621.