# A Study on the Path to Reducing Tesla's Transaction Exposure in China—Base on Hedge Models

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**Abstract.** Transaction exposure is a large risk for a multinational company. It measures gains or losses that arise from the settlement of existing financial obligations whose terms are stated in a foreign currency. The capacity at Tesla's Shanghai factory is going to reach 550,000 in 2021. With such a huge capacity in Chinese market, a small change in exchange rate can bring a large loss in Tesla's revenue. Therefore, they need to convert their revenue to the U.S. dollar in an effective way. In current years, the exchange rate between China yuan and the U.S. dollar is unstable because of the trade war and the pandemic. Based on current three years exchange rate, if Tesla decides to remain unhedged with the currency risk, it may cause up to $13,629.61 loss in revenue for each 1,000,000 China yuan convert to the U.S. dollar. The purpose of this research is to analyze the current exchange rate between China yuan and the U.S. dollar, evaluate the feasibility of each hedge, and suggest the best option to reduce the transaction risk of Tesla. Based on the data from Tesla's annual report, this research creates models with Excel and Tableau to analyze all the situations. With the results of each hedge model, the research outlines the difficulties and advantages of these hedges, but accurately presents a best-case scenario that works for Tesla.

**Keywords:** Tesla · Transaction Exposure · Exchange Rate · Hedge

## 1 Introduction

As a multinational corporation, Tesla has stepped up its focus on China in the last two years. With the support of the government, Tesla broke ground on a major Shanghai factory in 2019 and last year began delivering Model 3 vehicles made at that site to customers in China [2]. According to Tesla's annual financial report, they have 250,000 Model 3 capacity at Shanghai factory, and analysts predict that it will reach 550,000 capacities in 2021. As Tesla's first vehicle manufacturing factory outside California in the United States, the Shanghai factory is given high expectations and will undoubtedly assume more delivery responsibilities in the following years. Based on this operating model, a large portion of the Tesla's revenue is in China yuan, which will be impacted a lot by the unstable exchange rate between China yuan and the U.S. dollar. In preparing this research, relevant data was gathered from Tesla's annual report and Yahoo Finance. These


Z. Zhan et al. (Eds.): EIMSS 2022, AHCS 7, pp. 193–199, 2023.
https://doi.org/10.2991/978-94-6463-024-4_21

figures presented in this research were used to explain the computational process for each hedge option. This research also analyzed exchange rate trends in current three years to see how it will change in the following years. The first part of this research will analyze the unstable exchange rate and the risk of remain unhedged, which will explain the situation of Tesla's Shanghai factory and discuss the disadvantage of remain unhedged. The second part will discuss several available alternatives and provide the advantages and disadvantages of them. In order to compare these alternatives, this research will also build models and examples to make data visible. In the end, this research will compare these alternatives and suggest an effective way to manage the transaction exposure.

## 2 The High Cost of Remain Unhedged

### 2.1 The Unstable Exchange Rates

Since the trade war begins, the exchange rate between China yuan and U.S. dollar began to fluctuate wildly. Figure 1 presents the trend of the exchange rate from 2019 to 2021. On December 6th, 2019, the exchange rate between China yuan and the U.S. dollar has successfully broken the shackle of CHY 7/$ in current years, and the exchange rate flexibility has further improved. After that, the Covid-19 pandemic outbreak, and the Federal Reserve launched unprecedented monetary easing. In addition, the trade war negotiations continue to progress, China yuan began to appreciate during the second half of 2020.

### 2.2 The Risk of Remain Unhedged

In unhedged position, Tesla will decide to accept the transaction risk. The advantage of remaining unhedged is that there is no cost in hedged for Tesla. However, if Tesla chooses to stay unhedged, the amount of receivable will be uncertain, which will depend on the exchange rate on a specific day. For example, assume Tesla has 1,000,000 China yuan receivable, and they are going to exchange it to U.S. dollar. If Tesla decides to convert China yuan to U.S. dollar on February 1st, 2021, which has an exchange rate of CHY 6.4268/$, they will receive $155,598.43. However, if Tesla converts their account receivable at the day that exchange rate between China yuan and the U.S. dollar broke the shackle, which has an exchange rate at CHY 7.0438/$, Tesla will receive

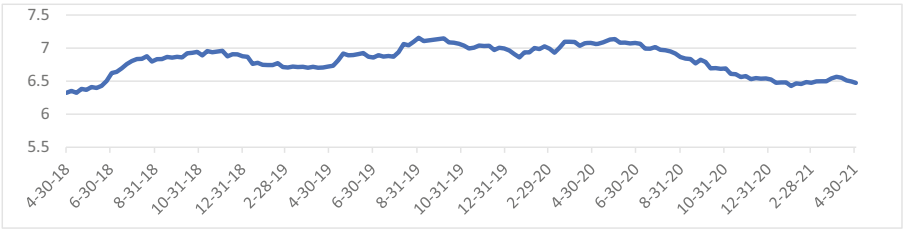


**Fig. 1.** Exchange Rate between China yuan and U.S. dollar (2019–2021)

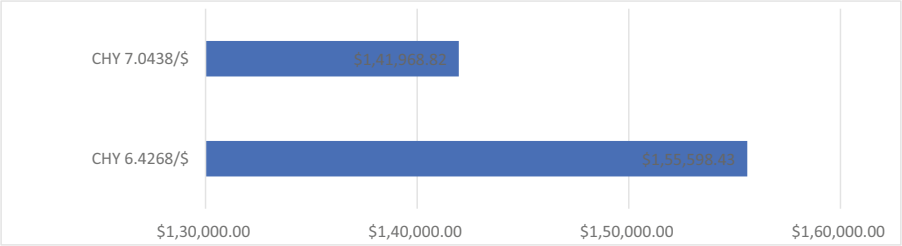


**Fig. 2.** Different Account Receivable on February 1st, 2021, and December 6th, 2019

only $141,968.82 (See Fig. 2). There is a difference of $13,629.61 in this fluctuation of exchange rate.

Obviously, the fluctuation of exchange rate has a great impact on a multinational company, especially for companies like Tesla that have big factories abroad. In the previous example, Tesla only has 1,000,000 China yuan receivable, however, with the high capacity at Shanghai factory, there will be a large number of accounts receivable in China yuan. Predictably, Tesla can lose some of their accounts receivable if they ignore the transaction exposure and remain unhedged. In the worst situation, if the exchange rate lower than the budget rate, which is the lowest acceptable China yuan per U.S. dollar exchange rate, Tesla may have a deficit at Shanghai factory.

## 3 Alternatives to Tesla to Manage the Exposure

Besides remain unhedged, there are three alternatives are available to Tesla to manage the exposure, which are hedge in forward market, hedge in the money market, and hedge in the options market. A forward market hedge involves a forward or futures contract and a source of funds to fulfill the contract. In simple terms, if a corporation expects a currency to appreciate or depreciate, it can decide to convert it account receivable on a forward rate. The advantage of forward market hedge is that Tesla can decide the exchange rate which they want to convert their account receivable. However, the hardest case for forward market hedge is that people cannot predict the forward exchange rate. It depends on how much risk shareholders want to take. In this research, since it is hard to communicate with Tesla's shareholders, a hedge in the forward market is not feasible. A money market hedge is similar to a forward contract, in that it allows Tesla to perfectly hedge a foreign account receivable. It is called a money market hedge because the process involves depositing funds into a money market, which is the financial market of highly liquid and short-term instruments like Treasury bills, bankers' acceptances, and commercial paper [3]. On the one hand, money market hedge can reduce Tesla's currency risk. On the other hand, since it use the short-term instruments which are highly liquid. Tesla can trade them effectively in any situation. However, some countries' local banks have regulations for multinational corporation. For example, some banks require the multinational corporation deposits specific years, which limit the liquid of their money. There are two types of hedges in the option market, which are call option and put option. It is something like insurance. When the changes of exchange rate result

in a large deficit, it will act, and this money will exchange at a regular exchange rate. The advantage of hedges on option market is that call option or put option can make sure the multinational corporation does not lose more. But corporation needs to pay for the option, whether or not they act the option. Therefore, option is a stable cost. This research only discusses the put option since Tesla needs to hedge an account receivable.

### 3.1 Money Market Hedge Model

To make a money market hedge, there are three steps of covered interest arbitrage, which are borrowed, convert spot, and invest. In detail, at first, corporation need to borrow the present value of foreign receivable. Secondly, corporation will sell foreign currency and buy U.S. dollars. Finally, investing in U.S. dollars and turning the foreign receivable into a U.S. dollar receivable.

In Tesla's situation, they have China yuan receivable and need to convert to U.S. dollar. To build the money market hedge model, assume Tesla still has 1,000,000 China yuan receivable, due in 12 months. And set the present day on April 30, 2021. On that day, the exchange rate between China yuan and U.S. dollar is CNY 6.4712/$, the U.S. dollar 12 months interest rate is 0.2811%, and the China yuan 12 months interest rate is 3.85% [4]. At the beginning of this hedge, Tesla can borrow CNY 962,927.30 from a Chinese bank. Then, Tesla would convert the money to U.S. dollar and invest in U.S. bank for 12 months. Finally, after a year, they will withdraw money from U.S. banks, and repay China yuan they borrowed with interest payment to Chinese banks when they receive the 1,000,000 China yuan receivable. The final amount of Tesla's account receivable will be $149,220.30 (Table 1).

On the money market hedge model, Tesla could avoid the transaction exposure by depositing their future account receivable to money market. Since money market are very liquid and therefore allow Tesla quick access to their capital, which means they can control cash flow more flexibly. In addition, there is a stated return on money market hedge. By hedge account receivable on money market, Tesla can assure that at least this account receivable will bring in a return since the interest payment from U.S. bank can provide additional funds to them. Tesla can simply select a day with a suitable exchange rate and convert their fund to U.S. dollar, which will not influence by the unstable future exchange rate. However, Tesla also needs to consider the regulation of the local banks when they borrow or invest. In order to limit multinational corporation make profit from

**Table 1.** Details of money market hedge model

| April 30, 2021 | | | |
|---|---|---|---|
| U.S. dollar 12 months interest rate | 0.2811% | Account receivable | 1,000,000 |
| China yuan 12 months interest rate | 3.8500% | China yuan/$ | 6.4712 |
| Borrow | 962927.30 | | |
| Convert | 148801.97 | | |
| Invest | 149220.30 | | |

money market, some local banks will lock multinational corporation's deposit in several years. In these years, they can only use this amount of money in this country. In this situation, money market model loses the biggest advantage, which is highly liquid, and Tesla has to re-build the model.

### 3.2 Put Options Hedge Model

Put option hedge is a safer selection of hedge for corporation. Buyers of put options can hedge their downside price risk for a period of time and still benefit from potential price gains if the market should increase. Options are much like insurance policies. The purchaser pays a premium to protect against a possible loss [5]. Unlike the forward contract, which is free, the put option costs money. There is a strike price in put option, which means the option will exercise if the spot rate breaks this price.

Usually, the worst-case scenario when corporation hedge with an option is that they have to exercise it. Therefore, based on this rule, the put option hedge model will calculate the minimum Tesla will receive. Assume the same amount of China yuan receivable, which is CNY 1,000,000. Currently, the strike price is CNY 6.4768/$, and the premium of put option is 3% [6]. In this situation, when Tesla exercises the put option, they will receive $154,397.23. Minus the future cost of put option, which is $4,648.96, the net proceeds are $149,748.27 (Table 2).

This put option hedge model provides consider a worst-case on this hedge, which is Tesla must exercise the put option. In this situation, the spot rate is higher than the strike price, and Tesla can only convert their account receivable to the strike price. However, in the real world, Tesla does not have to exercise the put option if the spot rate is better than strike price. This model only picks the minimum net proceeds to make a comparation with other models.

On the put option hedge model, Tesla will face the unstable future spot exchange rate. However, they do not need to take this risk, if there is worse exchange rate in the future, put option will response to it. Put option is more suitable for risk-averse corporation to hedge. When Tesla expects a better future spot exchange rate, they definitely would wait and convert their account receivable in the future. However, Tesla also respond to avoid the risk, so they will buy put options to hedge. With put option, Tesla will benefit from a better future spot exchange rate without risk. There is also a disadvantage of put

**Table 2.** Details of put option hedge model

| April 30, 2021 | | | |
|---|---|---|---|
| Strike price | 6.4768 | Account receivable | 1,000,000 |
| Option Premium | 3% | China yuan/$ | 6.4712 |
| U.S. dollar 12 months interest rate | 0.2811% | | |
| Exercise the put option | 154397.23 | | |
| FV cost of put option | 4648.96 | | |
| Net Proceeds | 149748.27 | | |

option hedge model. Since Tesla must subtract the future value cost of the put option even when they do not exercise the put, it is going to cost more on hedge.

## 4 Discussion

Existing available global observations of Covid-19 and the situation of trade war suggest that the unpredictable exchange rate between China yuan and U.S. dollar will generate long-run and possibly persistent to Tesla, which could result a large deficit on Tesla's Shanghai factory. There are two possible ways for Tesla to deal with the transaction exposure in recent years. Remain unhedged or hedge in a forward market are understandable during years of stable exchange rate. However, currently the exchange rate between China yuan and U.S. dollar has fluctuated wildly, and it is hard to predict the future spot rate. Therefore, Tesla has to select a way to hedge their annual account receivable on Shanghai factory.

Tesla should be able to hedge the currency risk by taking either of these two ways. On the one hand, according to money market, borrow the same future value of their account receivable from Chinese bank and convert this amount of money to U.S. dollar. Then Tesla can invest this fund in the United State. After a period, on the day they receive money from Shanghai factory. By hedging on the money market, Tesla will avoid the risk of currency risk and control this amount of money more flexibly. On the other hand, in the model of hedge on the put option, Tesla will buy a put option and wait until the day they receivable money, then convert to U.S. dollar. In this model, Tesla can make profit if the future spot rate is better than now. If the future spot rate breaks the strike price, the put option will exercise and take the risk. By hedging on put option, Tesla is like buying an insurance for their account receivable. They can make profit from a better exchange rate, and they will not take the risk.

## 5 Conclusion

Based on Tesla's situation, both money market hedge and put option hedge are acceptable. However, if consider the current exchange rate between China yuan and U.S. dollar, and the Tesla's situation, it is better for Tesla to hedge on put option. At first, on the one hand, as Covid-19 vaccines become more widely available, the economy are beginning return normal. The worst year of pandemic has passed. On the other hand, the trade war between China and the United State is coming to an end, and the trade between the two countries has gradually returned to normal. There is no evidence to prove that the exchange will be as higher as last year in next several years, which means Tesla can try to expect a better exchange rate on the future. Certainly, future exchange rates are still volatile and unpredictable since it is hard to predict the future trend of pandemics and the new policy of President Biden. But the put option will take the risk if there is any problem in the future. Secondly, there is a weakness in money market hedge model in Tesla's situation. Currently, the 12 months interest rate of Chinese bank is 3.85%. However, U.S. bank only offer a 0.28% annual interest rate. Under such a huge gap in interest rate, Tesla needs to pay much more interest when they borrow from Chinese bank, and the interest from investing in the United State is low. As a result, Tesla will be

hard to make profit from money market. Therefore, Tesla can consider hedging on put option first.

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