Foreign Exchange Risk Analysis and The Futures Hedging Strategy Construction--- The Case Study of Amazon

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Abstract. This paper explores the foreign exchange risk encountered by Amazon.com Inc. and proposes corresponding futures hedging strategies. With global market uncertainties, foreign exchange risk significantly impacts the financial performance of multinational companies like Amazon. The paper analyzes Amazon's foreign exchange risk factors, highlighting that the primary risks stem from international business revenues and holdings of foreign currency cash equivalents and marketable securities. Based on these risk factors, the study proposes several potential hedging strategies, including forward market hedging, futures hedging, and exchange rate options hedging. Forward market hedging mitigates risk by agreeing to exchange currencies at a predetermined rate in the future; futures hedging avoids counterparty default risk through standardized contracts; and exchange rate options hedging offers flexibility by allowing the exercise to be abandoned if the exchange rate moves favorably. The paper further develops a specific futures hedging strategy based on several key assumptions, including efficient market hypothesis, zero transaction costs, unlimited liquidity, and the absence of risk-free arbitrage opportunities. The strategy involves shorting futures contracts; if the exchange rate declines at maturity, the hedge is successful and profitable; if the exchange rate rises, the hedge is unsuccessful, resulting in a loss. The findings suggest that using futures contracts for hedging enables Amazon to stabilize its financial performance in case of market uncertainties, protecting it from adverse impacts of foreign exchange risk. Despite discrepancies between actual sales data and forecasts, the hedging strategy still demonstrates its effectiveness in maintaining financial stability.

Keywords: Amazon, risk analysis, hedging strategies, foreign exchange risk, futures.

1. Introduction

A company's financial performance may be greatly influenced by market uncertainties, and hence it involves risks in different forms, among which foreign exchange risk is one type of risk that has aroused heated discussion and intensive study both at home and abroad (Wu, 2021; Yang, 2021; Huang, 2022). Different hedging strategies may be employed by different companies based on their own specific problems in the process of their financial performance. As a cross-border company, Amazon.com Inc. is also confronted with the foreign exchange risk, and thus it's of vital significance for Amazon to adopt some effective hedging strategies to mitigate the risk.

This study provides a comprehensive analysis of Amazon's foreign exchange risk, aiming at some feasible strategy to hedge the risk. It outlines potential hedging strategies to mitigate foreign exchange risk, focusing on financial instruments such as forward contracts, futures, and exchange rate options. We focus on the development of a specific hedging strategy for an international trade scenario, utilizing futures contracts over a one-year horizon based on several key assumptions. We believe that the hedging strategy can effectively stabilize Amazon's financial performance amidst market uncertainties, protecting it from foreign exchange risk.

2. Amazon's Foreign Exchange Risk Factors and Potential Hedging Strategies

2.1. Amazon's Foreign Exchange Risk Factors

As a result of operations of international balances, which are associated with its international stores and product and service offerings, Amazon is exposed to foreign exchange rate fluctuations. Due to

these fluctuations, operating results may differ materially from expectations, and Amazon may "record significant gains or losses on the re-measurement of intercompany balances" (2017), as is stated in Amazon.com Inc's company profile. With the expansion of Amazon's international operations, its exposure to exchange rate fluctuations has increased greatly. Besides, Amazon holds "cash equivalents and/or marketable securities in foreign currencies including Euros, British Pounds, and Japanese Yen" (Dong, 2020). And it is believed that "if the U.S. Dollar strengthens compared to these currencies, cash equivalents, and marketable securities balances, when transacted, may be materially less than expected and vice versa" (ibid).

2.2. Potential Hedging Strategies for Foreign Exchange Risk

Foreign exchange rate risk management methods are divided into two categories: one is operational hedging, the other is financial hedging. Operational hedging mainly means that enterprises reduce the risk impact of exchange rate fluctuations by adopting a series of flexible decisions such as appropriate market strategy, site selection strategy and procurement strategy in operation. Financial hedging refers to the use of futures, options and other financial derivatives to reduce the risk impact of exchange rate fluctuations on corporate performance. Financial hedging is mainly used to manage foreign exchange rate risk in the short term. This type of risk can be managed through forward market hedging, futures hedging, and exchange rate options.

2.2.1 Forward Market Hedging

Foreign exchange futures are futures contracts with exchange rates as the standard, and it is a standardized contract transaction in which two parties agree in advance to exchange one currency for another currency at some point in the future according to the current contractual ratio. When Amazon, as a cross-border enterprise, utilizes the foreign exchange futures market for hedging, it aims at employing the futures market as a place to transfer risks and maximize the exchange rate risk neutrality by holding certain futures positions. In order to deal with the uncertainty caused by exchange rate fluctuations, Amazon can sell a certain number of foreign currency futures contracts at a fixed exchange rate in the foreign exchange futures market, thereby fixing the exchange rate in advance, locking in costs and avoiding risk losses caused by exchange rate fluctuations.

2.2.2 Futures Hedging

The advantage of using futures contracts to hedge risks is that, as a standardized contract, there will be no counterparty default risk. Since the futures contract is traded in a fixed place, daily settlement, and need to pay a margin, credit risk can be avoided to some extent. However, futures also have the problem that cannot be customized on demand, which is imperfect hedging. Daily settlement and margin mechanisms create liquidity risks.

2.2.3 Exchange Rate Options

We can also hedge foreign exchange risk by buying exchange rate options. Option contract refers to the option granted by the legal contract to the option buyer, so that the buyer can buy or sell a certain number of marks or objects to the option seller on the expiration date according to the strike price. The option buyer pays the seller a certain currency to obtain the option, which is the option price. When the company expects the exchange rate to rise, it buys a call option. On the contrary, when the expected exchange rate falls, the company buys a put option. The advantage of using options to hedge risks is that when the exchange rate moves in its own favorable direction, the exercise can be abandoned, and the exercise can be exercised otherwise, with high flexibility. However, it is precisely because of this flexible choice of whether to exercise the model or not, resulting in higher costs to buy options. Like futures, options also cannot be customized on demand and are therefore imperfectly hedged.

3. Constructing Process of a Futures Hedging Strategy for Foreign Exchange Risk

With what is learned about Amazon, we can conclude that Amazon did confront foreign exchange risk. And Amazon revealed its foreign currency operating information in its annual report, which indicates the necessity for the firm to consider the risk. Therefore, it is of vital importance to figure out a feasible hedging strategy to deal with the foreign exchange risk.

3.1. Key Assumptions

Our futures hedging strategy is based on the following assumptions:

(1) Efficient market hypothesis: Assuming that markets are efficient, which means that all historical, public and private information is available to all investors at the same time, and investors can make rational decisions based on the information.

(2) No transaction costs: Assuming that there are no transaction expenses or costs for trading futures contracts, including fees, commissions and slippage points.

(3) Unlimited liquidity: Assuming that the futures market has sufficient liquidity, and investors can buy or sell the required number of contracts at the current market price at any time without affecting the price.

(4) Perfect arbitrage hypothesis: Assuming that there is no risk-free arbitrage opportunity, which means that investors cannot obtain risk-free profits by buying cheap contracts and selling expensive contracts at the same time.

3.2. Steps of Constructing Process

The constructing process may involve the following steps:

(1) Define the foreign exchange risk exposure

To start with, we need to recognize the foreign exchange risk exposure. Since the beginning of 2020, we have collected historical information to estimate 2020 sales.

As Amazon disclosed in the annual report, its net sales generally come from 3 resources---North America sales, international sales and AWS sales. North America sales and AWS sales are absolutely in dollars. So, all of the foreign exchange risk exposure of the firm can be seen as the number of international sales of Amazon.

Amazon discloses that its major exporting European countries include German and Britain while only German pays Eurodollar. Hence, we use German sales to stand by European sales. According to statistic result from most business report, German business takes about 39% of international income. In our study we mainly put forward a hedging strategy for European district risk.

(2) Find proper futures

In the second step, we short the futures. The whole hedging maturity would be one year.

Without one year maturity futures price, we decide to use monthly price with the same maturity to calculate the strike price. In this process, we must point out that we need to use “data in the future” though it cannot be true at the beginning of the 2020 in reality.

(3) Calculate the number of contracts we need when hedging

In the third step, we need to make sure how many contracts are required. Contract specifications reveal the contract size and daily price limit and so on.

3.3. Calculation Process

As far as the clalculation process is concerned, we need to do as follows:

(1) Define the foreign exchange risk exposure

Net sales collected from 2015 to 2019 are 35418, 43983, 54297, 65866 and 74723 million respectively, as is shown clearly in Figure 1.

	year	International sales	German sales	European sales
2,015	1	35,418.00	13,813.02	13,813.02
2,016	2	43,983.00	17,153.37	17,153.37
2,017	3	54,297.00	21,175.83	21,175.83
2,018	4	65,866.00	25,687.74	25,687.74
2,019	5	74,723.00	29,141.97	29,141.97
estimated2020	6			

Figure 1. Net Sales Data (2015-2020)

In order to estimate 2020 data, we plan to use regression model. Before that, we employ the graph in Figure 2 to test whether the decision is proper or not.

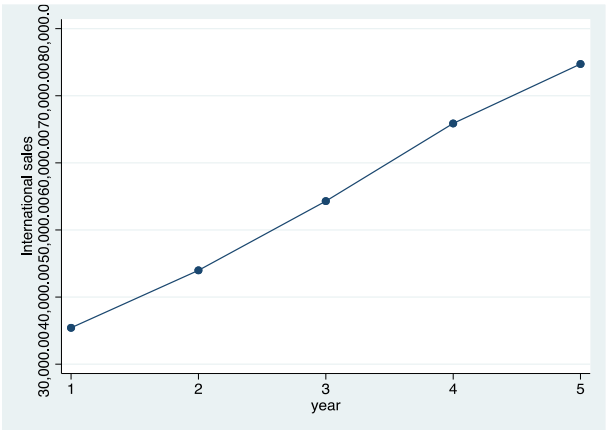

Figure 2. Relationship Between International Sales and the Length of Maturity

The graph shows that international sales and the length of maturity are generally of positive linear relationship, and thus it is feasible to do regression.

And thus the estimated function to calculate 2020 international sales is (referring to Figure 3):

International sales (in millions of dollars) =10049.3+24709.5

International sales in year 6 (2020) =10049.3*6+24709.5=85005.3

European sales 2020 (in millions of dollars) =33.152.07 (European district foreign exchange risk)

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. regress Internationalsales year
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Source	SS	df	MS	Number of obs	=	5
				F(1, 3)	=	1260.29
Model	1.0099e+09	1	1.0099e+09	Prob > F	=	0.0000
Residual	2403928.3	3	801309.433	R-squared	=	0.9976
				Adj R-squared	=	0.9968
Total	1.0123e+09	4	253072058	Root MSE	=	895.16

Internatio~s	Coefficient	Std. err.	t	P>|t|	[95% conf.	interval]
year	10049.3	283.0741	35.50	0.000	9148.432	10950.17
_cons	24709.5	938.8506	26.32	0.000	21721.66	27697.34

Figure 3. Estimated International Sales in 2020

(2) Find proper futures

In order to hedge Euro's exchange rate risk from German, our choice is to select EUR/USD future derivatives. And the contract specifications in Figure 4 can be referred to.

Dollar Based Currency Pairs Euro/US Dollar

Contract Specifications

Description	ICE Futures U.S. lists futures contracts on most key currency pairs, including U.S. Dollar-based, Euro-based and other cross rate pairs. These futures contracts are listed on the ICE electronic trading platform, alongside futures and options contracts on the ICE U.S. Dollar Index
Contract Series	March, June, September and December
Trading Hours	Open on Sunday night is 6:00 PM ET; Pre-Open at 5:30 PM ET
Contract Symbol	KEO
Contract Size	125,000 Euro
Price Quotation	U.S. dollars per euro to 5 decimal places
Minimum Price Fluctuation	.00005 or 6.25 U.S. dollars per contract
Daily Price Limit	None
Last Trading Day	9:16 a.m.Central Time (CT) two business days prior to the third Wednesday of the expiring month
Final Settlement	Physical delivery on the third Wednesday of the expiring month.

Figure 4. EUR/USD Futures Contract Specifications

The firm is supposed to take short position of this EUR/USD futures with one-year expiration on the first trading date of 2020, which will be delivered on maturity date, 31/12/2020. The specific trading is selling EUR and buying USD using future exchange rate, in order to hedge the risk of Euro's depreciation.

Firstly we collect data of EUR/USD spot exchange rate on 01/01/2020 (counted monthly), which is equal to 1.1213(S_0), as is clearly listed in Figure 5.

date	Close	open	high	low	Percent of change
2020/12/1	1.2213	1.1928	1.2311	1.1926	2.39%
2020/11/1	1.1928	1.1658	1.2004	1.1603	2.41%
2020/10/1	1.1647	1.1719	1.1882	1.1639	-0.61%
2020/9/1	1.1718	1.1936	1.2012	1.1612	-1.83%
2020/8/1	1.1936	1.1783	1.1967	1.1696	1.38%
2020/7/1	1.1774	1.1233	1.191	1.1185	4.83%
2020/6/1	1.1231	1.1097	1.1423	1.1095	1.20%
2020/5/1	1.1098	1.0956	1.1146	1.0766	1.31%
2020/4/1	1.0955	1.1031	1.104	1.0726	-0.67%
2020/3/1	1.1029	1.1003	1.1494	1.0637	0.04%
2020/2/1	1.1025	1.1092	1.1096	1.0776	-0.61%
2020/1/1	1.1093	1.1213	1.1227	1.0991	-1.04%

Figure 5. EUR/USD Spot Exchange Rate on 01/01/2020

Then we use German ten-year Treasury yields as domestic risk free rate (r) and US 10-year Treasury yields as foreign exchange rate (r_f) to lock one-year forward exchange rate (F_0), as is displayed in Figure 6 and Figure 7 respectively.

Date	Close	Open	High	Low	Percent of change
2020/12/1	-0.575	-0.572	-0.505	-0.643	0.70%
2020/11/1	-0.571	-0.626	-0.456	-0.671	-8.64%
2020/10/1	-0.625	-0.512	-0.479	-0.646	19.96%
2020/9/1	-0.521	-0.395	-0.372	-0.552	30.90%
2020/8/1	-0.398	-0.522	-0.372	-0.56	-25.05%
2020/7/1	-0.531	-0.455	-0.382	-0.561	17.22%
2020/6/1	-0.453	-0.437	-0.257	-0.488	1.12%
2020/5/1	-0.448	-0.589	-0.386	-0.593	-23.94%
2020/4/1	-0.589	-0.51	-0.287	-0.593	25.59%
2020/3/1	-0.469	-0.619	-0.142	-0.909	-22.86%
2020/2/1	-0.608	-0.431	-0.339	-0.627	40.09%
2020/1/1	-0.434	-0.18	-0.157	-0.445	132.09%

Figure 6. German Ten-Year Treasury Yields

Date	Close	Open	High	Low	Percent of change
2020/12/1	0.916	0.847	0.986	0.834	8.82%
2020/11/1	0.842	0.855	0.975	0.718	-3.61%
2020/10/1	0.874	0.689	0.877	0.653	27.42%
2020/9/1	0.686	0.713	0.731	0.604	-2.93%
2020/8/1	0.706	0.535	0.789	0.504	32.51%
2020/7/1	0.533	0.658	0.724	0.52	-18.94%
2020/6/1	0.658	0.64	0.959	0.618	0.78%
2020/5/1	0.653	0.63	0.745	0.59	1.08%
2020/4/1	0.646	0.663	0.785	0.543	-3.34%
2020/3/1	0.668	1.105	1.283	0.318	-42.59%
2020/2/1	1.163	1.514	1.684	1.116	-22.71%
2020/1/1	1.505	1.919	1.946	1.503	-21.58%

Figure 7. US Ten-Year Treasury Yields

Concrete hedging calculating process is as follows:

$F_0 = S_0 * e^{(r - r_f) * T}$

$F_0 = 1.1213 * e^{(-0.180\% - 1.191\%) * 1}$

F_0=1.098 EUR/USD

F_0 is the future price with one year maturity selling on 01 /01/2020.

(3) Calculate the number of contracts we need when hedging

With European sales equal to 33152.07 million, the number of contracts = 33152.07million/125,000=0.26521656million≈264217 (Every contract size equals 125,000 Euros). Now all of the European foreign exchange risk can be hedged, as long as the yearly sales won't diverge too much from the estimated 2020 European sales.

We use forward exchange rate to convert Euro to dollar. The foreign exchange rate on 31/12/ 2020 could be seen as the same as the foreign exchange rate on 01/01/2020, which is 1.1213 EUR/USD.

*33152.07*1.1213= 37173.41609*

37173.41609/1.098= 33855.57021

And thus we draw the conclusion: The firm should take short position of 264217 contracts of EUR/USD futures, selling 37173.41609 million Euros and buying 33855.57021 million dollars on the delivery date.

Hence are the possible outcomes:

If exchange rate of Euro falls to S_1:

$S_1 < F_0$

Risk exposure (in Eurodollar) /S_1> Risk exposure (in Eurodollar) /F_0. The company will sell 37173.41609 million Euro as exchange for buying 37173.41609/S1 million dollar on the delivery date. Because it can exchange more dollar with the same amount of Euro, it will make profit from hedging strategy and the amount is T_1 =(37173.41609 /F_0-37173.41609/S_1) million dollar. And through the firm's European district business, it will receive T_2 =37173.41609/S1 million dollar.

Then the total sales of the firm in European district would be $T_1 + T_2 = 37173.41609/F_0$ and the company can successfully lock the price of foreign exchange between EUR and USD.
If exchange rate of Euro increase to S_2:

$S_2 > F_0$

Risk exposure (in Eurodollar) /S_2 < Risk exposure (in Eurodollar) /F_0. The company will sell 37173.41609 million Euro as exchange for buying 37173.41609/S1 million dollar on the delivery date. Because it can exchange more dollar with the same amount of Euro, it will make profit from hedging strategy and the amount is T_1 =(37173.41609 /F_0-37173.41609/$\mathbf{S_2}$) million dollar. And through the firm's European district business, it will receive T_2 =37173.41609/S1 million dollar. Then the total sales of the firm in European district would be $T_1 + T_2 = 37173.41609/F_0$ as well and the company can successfully lock the price of foreign exchange between EUR and USD.

If exchange rate of Euro holds unchanged this year, the result will be the same as the two above.

4. Evaluation of Outcomes

If our forecast of Amazon's eurozone risk exposure in 2020 is valid, it is close to or equal to the eurozone risk exposure in reality. We can obtain the foreign exchange futures commodities mentioned in the article. In reality, we can successfully hedge Amazon's foreign exchange trading risk in the eurozone with little transaction friction. This part of the risk comes from uncertainty of the dollar's price movement against the euro.

The truth is if we look at international sales in 2020, the total amount is 104412 million dollars, which is much lower than the 85005.3 million dollars we predicted at the beginning of the year. The econometric analysis method that uses historical data to estimate sales in a new year still needs to be improved, and it may be necessary to consider the impact of more other variables on net sales.

At the same time, it is acknowledged that after 2022, the price of the dollar will continue to remain high. Although the United States has a plan to issue interest rate cuts, it has not taken action. The eurozone confronts severe downward pressure, with each additional ECB rate cut likely to cause the euro to fall by 1 per cent against the dollar. This means that Amazon's holding of euro has a large depreciation risk, and thus it is very necessary to hedge this part of the risk. We are justified to believe that such hedging will make the company more lucrative.

5. Conclusion

With the comprehensive analysis of the foreign exchange risk encountered by Amazon.com Inc., we have developed a specific futures hedging strategy for an international trade scenario, utilizing futures contracts over a one-year horizon based on several key assumptions. This strategy involves taking a short position in the futures market to hedge against foreign exchange risk. We conduct a review of the entire hedging process and an evaluation of the outcomes under two potential conditions: if the exchange rate declines at the maturity date, the strategy will result in profits; conversely, if the exchange rate increases, the strategy will incur losses. The findings demonstrate that effective hedging can stabilize Amazon's financial performance amidst market uncertainties, thereby protecting the company from adverse financial impacts caused by fluctuations in exchange rates. The study underscores the importance of hedging foreign exchange risk to ensure financial stability and mitigate potential losses in international operations.

References

[1] *Amazon five force*. (2017). Retrieved February 3, 2024, from http://www.docin.com

[2] Dong, Y. J. (2020). *A report on the English Chinese Translation of nominalization structures in Amazon.com Inc's 2018 annual financial report*. Unpublished master's thesis, Dalian Maritime University, Dalian, Liaoning.

[3] Huang, Y. (2022). *Research on the business risk control of cross-border e-commerce company M*. Unpublished master's thesis, Nanchang University, Nanchang, Jiangxi.

[4] Wu, Y. (2021). *Operational hedging strategy of multinational enterprises' foreign exchange risk research — the case study of BROS*. Unpublished master's thesis, Guangdong University of Foreign Studies, Guangzhou, Guangdong.

[5] Yang, J. (2021). *Research on cross-border supply chain decision-making considering exchange rate fluctuation*. Unpublished master's thesis, Southwest Jiaotong University, Chengdu, Sichuan.

[6] Yu, X. (2018). A brief discussion on use of IRS in hedging interest risk in bond portfolio. *China Money*, (08), 55-59.