

Topic 6 Solutions – Economic Exposure

1. How would you define economic exposure to exchange risk?

Economic exposure can be defined as the possibility that the firm's cash flows and thus its market value may be affected by the unexpected changes in the exchange rate.

2. You have been given the following information for Argentina and Australia

Year	Argentinian Price Index	Australian Price Index	Exchange Rate
2013	100	100	\$0.02564/Peso
2023	160	130	\$0.02564/Peso

What is the change in the real value of the peso?

Year	Real Exchange Rate
2013	0.02564
2023*	$\$0.02564 / \text{Peso} \times \frac{160}{130} = 0.31557$

$$\Delta E = \frac{E_{t+1}^{A/B} - E_t^{A/B}}{E_t^{A/B}} = \frac{(0.31557 - 0.2564)}{0.2564} = 23.1\%$$

The peso in real value terms has increased by 23.1%

* The alternate way of calculating the real exchange rate in 2023 is to use the inflation rates of both countries

$$= S_t \times \frac{(1 + inf_B)}{(1 + inf_A)} = 0.02564 \times \frac{1.60}{1.30} = 0.31557$$

3. In 2022, the yen was 81.36 to the AUD. The headache for the Japan is the strength of its currency and despite this rate being below its all-time high of 79.75 which it had reached ten years earlier. Over the same 2012-2022 period, Australian prices have risen by 69.5%, whereas Japanese prices by 8.5%. What is the real exchange rate, in 2022 and by how much have the two currencies changed in real terms over the ten-year window?

$$\text{Real exchange rate} = E_t = S_t^{\text{Actual}} \times \frac{(1+inf_B)}{(1+inf_A)}$$

$$E_{2022} = ¥81.36/\$ \times \frac{1.085}{1.695} = 127.10$$

Calculating the real change exchange rates for the two currencies over the 10-year period.

$$\text{The Yen:} = \frac{(1/127.10) - (1/79.75)}{(1/79.75)} = -37\%$$

$$\text{The dollar:} = \frac{127.10 - 79.75}{79.75} = 59\%$$

The real dollar value of the yen had declined by 37% while the Aussie dollar had appreciated by 59% against the yen in real terms.

4. You have been given the following information for the Vietnamese dong (VND) and the Australian dollar.

Year	Vietnam CPI	Australia CPI	Exchange Rate
Jan 2022	100	100	\$0.02/VND
Dec 2022	200	100	\$0.02/VND

- a. What is the real exchange rate at the end of 2022?

Year	Vietnam CPI	Australia CPI	Exchange Rate	Real Exchange Rate
Jan 2022	100	100	\$0.02/VND	\$0.02
Dec 2022	200	100	\$0.02/VND	$0.02 \times \frac{2}{1} = \0.04

The dong has appreciated in real terms by 100%. In general, an appreciating currency will put pressure on a country's exporters and those producers competing with importers.

- b. Suppose Hanoi Shoes Ltd exports shoes to Australia that sell for \$10. The local price of a shoe is 500 dong and it costs 200 dong to manufacture them. Assume costs increase in line with inflation. Document the likely impact of inflation on the firm's profitability if there is no change in the exchange rate?

	Jan 2022		Dec 2022	
	VND	AUD	VND	AUD
Price	500	10	500	10
Cost	200	4	400	8
Profit Margin	300	6	100	2

If the Dong remains fixed against AUD, then the dong real exchange rate and Hanoi shoes cost of production will rise. When the real value of the dong is rising, the Vietnamese exporters will find themselves with the task of deciding of keeping the local currency prices constant and see lower sales volume (because foreign currency prices rise in line with appreciating dong) or setting prices in the foreign currency to maintain market share with a corresponding erosion of dong revenues and profit margins. Here, the price Australian customers see does not change and the consequence for the firm is the erosion of profit margins. In this scenario, the problem was the 100% appreciation of the dong.

What if the firm wants to preserve its dollar profit margin (\$6)? It would have to raise the dollar price to \$14 (the profit margin will be $\$14 - \$8 = \$6$). The downside of doing this would be a loss in competitiveness.

- c. Now consider a second scenario where the dong declines in value against the dollar to \$0.01/VND by the end of the year. What is the likely impact on the real exchange rate and on the Hanoi Shoes' profit margin?

Year	Vietnam CPI	Australia CPI	Exchange Rate	Real Exchange Rate
Jan 2022	100	100	\$0.02/VND	\$0.02
Dec 2022	200	100	\$0.01/VND	$0.01 \times \frac{2}{1} = \0.02

As the real exchange rate is constant which means its competitiveness is unchanged. Its inflation adjusted profit margin remains the same.

	Jan 2022		Dec 2022	
	VND	AUD	VND	AUD
Price	500	10	1000	10
Cost	200	4	400	4
Profit Margin	300	6	100	6

5. Explain the competitive and conversion effects of exchange rate changes on the firm's operating cash flow.

Competitive effect: Exchange rate changes may affect operating cash flows by altering the firm's competitive position.

Conversion effect: A given operating cash flow in terms of a foreign currency will be converted into higher or lower home currency amounts as the exchange rate changes.

6. Discuss the determinants of operating exposure.

The main determinants of a firm's exposure are:

- (1) The structure of the markets in which the firm sources its inputs, such as labour and materials, and sells its products.
- (2) The firm's ability to mitigate the effect of exchange rate changes by adjusting its markets, product mix, and sourcing.

- 7. General Motors exports cars to Spain, but the strong dollar against the euro hurts sales of GM cars in Spain. In the Spanish market, GM faces competition from Italian and French car makers, such as Fiat and Renault, whose operating currencies are the euro. What kind of measures would you recommend so that GM can maintain its market share in Spain?**

Possible measures that GM can take include:

- 1) diversify the market; try to market the cars not just in Spain and other European countries but also in say, Asia;
- 2) locate production facilities in Spain and source inputs locally,
- 3) locate production facilities, say, in Mexico where production costs are low and export to Spain from Mexico.

- 8. Exchange rate uncertainty may not necessarily mean that firms face exchange risk exposure. Explain why this may be the case.**

A firm can have a natural hedging position due to, for example, diversified markets, flexible sourcing capabilities, etc. In addition, to the extent that PPP holds, nominal exchange rate changes do not influence firm's competitive positions. Under these circumstances, firms do not need to worry about exchange risk exposure.

- 9. If PPP holds, does the firm face any exchange rate risk? Explain.**

If PPP holds, it does not face operating exposure. However, firms may face transaction and translation exposure.

- 10. In the annual results of Nestle, a large diversified Swiss-based food company with operations in more than 100 countries, management states that it does not hedge foreign exchange exposure. What might be the rationale behind this policy?**

- a) Hedging cash flows in numerous currencies might be expensive due to the transaction costs incurred.
- b) The way it has chosen to minimise exposure is by adopting a "diversification of the market" strategy. Reduced sales in one country due to the appreciation of CHF may

be offset by an increase in sales in a 2nd country due to the depreciation of the CHF against the 2nd currency.

- 11. In order to avoid speculation, Honda hedges only the sales it has clinched, not the ones it expects. Comment on Honda's currency risk strategy.**

Honda is, in fact hedging its TRANSACTION exposure. It is hedging cash flows that can be viewed as being certain. However, it is leaving itself open to changes in the level of competition that it might face. In other words, it is not hedging its competitive exposure.

- 12. A proposed foreign investment involves a plant whose entire output of 1 million units per annum is to be exported. With a selling price of \$10 per unit, the yearly revenue from this investment equals \$10 million. At the present rate of exchange, dollar costs of local production equal \$6 per unit. A 10 percent devaluation is expected to lower unit costs by \$0.30, while a 15 percent devaluation will reduce these costs by an additional \$0.15. Suppose a devaluation of either 10 percent or 15 percent is likely, with respective probabilities of .4 and .2 (the probability of no currency change is .4). Depreciation at the current exchange rate equals \$1 million annually, while the local tax rate is 40 percent.**

- a. What will annual dollar cash flows be if no devaluation occurs?**

The cash flows associated with each exchange rate scenario are:

Cash Flow Statement (in millions of dollars)			
Devaluation:	0%	10%	15%
Revenue	\$10.0	\$10.00	\$10.00
Variable Cost	6.0	5.70	5.55
Depreciation	1.0	0.90	0.85
Taxable income	3.0	3.40	3.60
Tax @ 40%	1.2	1.36	1.44
After-tax income	1.8	2.04	2.16
Depreciation	1.0	0.90	0.85
Cash Flow	\$2.8	\$2.94	\$3.01

With no devaluation, the annual cash flow will equal \$2.8 million.

- b. Given the currency scenario described above, what is the expected value of annual after-tax dollar cash flows assuming no repatriation of profits to the United States?**

The expected dollar cash flow will equal the sum of the cash flows under each possible devaluation percentage multiplied by the probability of that devaluation occurring or $2.8 \times (0.4) + 2.94 \times (0.4) + 3.01 \times (0.2) = \2.9 million. Thus expected dollar cash flows actually increase by \$100,000.

If the impact of the expected devaluation of 7% ($0.1 \times 0.4 + 0.15 \times 0.2$) is calculated by reducing expected cash flows by 7%, the expected result would be a loss of \$196,000 (2.8×0.07).

- 13. Why should managers focus on marketing and production strategies to cope with foreign exchange risk?**

Unlike transaction exposure, which is amenable to financial hedging, competitive exposures -- those arising from competition with firms based in other currencies -- are longer-term, harder to quantify, and cannot be dealt with solely through financial hedging techniques. Rather, they require more strategic manoeuvres involving changes in operating strategies. For this reason, the major burden of exchange risk management must fall on the shoulders of marketing and production executives. These executives deal in imperfect product and factor markets where their superior knowledge and specialized skills provide them with a comparative advantage in adjusting to the relative price changes caused by currency changes.

Market selection and market segmentation provide the basic parameters within which a company may adjust its marketing mix over time. Short-term tactical responses include adjustments of pricing, promotional, and credit policies. Product sourcing and plant location are the principal variables companies manipulate to manage competitive risks that can't be dealt with through marketing changes alone. This could include building plants overseas, buying more components overseas, allocating production among plants in line with their changing relative costs, and designing new facilities to provide added flexibility in making substitutions among various sources of goods so as to be better able to respond to relative price differences among domestic and imported inputs.

14. Intel, a large US semiconductor company, has 15% of the microprocessor market. Its closest foreign competitors Samsung Electronics and Synix of South Korea have 12.5% and 5.4% of the market respectively. Since, both these firms are based in South Korea, most of their costs are denominated in Korean Won (hereafter denoted as won). A depreciation of the won lowers cost structures of Korean firms relative to their U.S. based competitors. This reduction in costs should lead to higher gross margins which can be passed on to customers in the form of lower prices thereby allowing Korean firms to increase their U.S. market share. For U.S. firms however, this means lower profits which impacts on their firm value.

Industry sources estimate that the Korean firms are unprofitable when their currency was stronger than 1100 won per dollar and profitable when it is 1200 or more won per dollar. A semiconductor that is made in Korea is comprised of 30% locally sourced inputs. The costs for these inputs, given in won terms, include the price of labour, silica etc. Given a large fraction of costs are sourced in Korea, it allows the Korean manufactures to reduce the prices they charge U.S. based customers when the won depreciates. Industry estimates indicate that the Korean manufacturers pass on 30% of cost savings to American customers. It is estimated that American firms, to maintain market share, give up \$19.20, a third of their profits, to retain their existing customers.

Sales numbers are highly dependent on prices, where a 5% increase in price reduces the number of units sold by 10% (i.e., elasticity is 2 ($0.10/0.05$)). A depreciating won would affect sales of the three American manufactures equally. It is expected that the two Korean manufactures have sold 179 million microprocessors in the U.S. this year (17.9% of the total unit sales). The average price of a microprocessor in the U.S. is \$120.

- (a) Assume that that won depreciates against the dollar by 20%. By how much would the costs of Korean sourced inputs decline, in USD terms?

The decline in costs depends on how much of the content of Korean made chip is sourced locally – given to be 30% here. In this question we should expect costs should decrease by 6% ($20\% \text{ depreciation} \times 30\%$)

- (b) If the reduction in costs determined in (a) is passed on to American customers, by how much (in percentage terms) would the prices these customers see decline by?

$$6\% \times 30\% = 0.018 \text{ (1.8\%)}$$

- (c) How would you expect the sales of Korean manufactures to change by? Provide an estimate of this.

It depends on the price elasticity of demand. A decline in prices should increase sales by 2 or by 3.6% ($1.8\% \times 2$). $179\text{m} \times 3.6\% = 6.446\text{m}$ additional sales.

- (d) How many fewer microprocessors will Intel, the U.S. firm, sell?

As the information provided says “A depreciating won would affect sales of the three American manufactures equally”.

Total reduction in sales lost to the Koreans is 6.444million. So, a third is attributable to Intel’s lost sales (2,126,520 units).

- (e) By how much would Intel’s profits drop by?

The profit per chip is $= 19.2/0.33 = \$58.18$. If sales are going to drop by 2.126m units, then profits will have to drop by \$123,724,800.

- (f) How should Intel manage the competitive exposure it faces?

Start sourcing in South Korea, so it gets the same cost advantage that its Korean competitors. A more drastic move would be to start manufacturing chips in Korea. Alternatively, Intel could lower its own domestic prices to prevent its Korean competitors gaining an upper hand (this is a response and not necessarily a hedge). Also, it could borrow in won. If the won depreciates, its won borrowings will decline in value offsetting some of the

- (b) It's early March 2022 and the Commonwealth Serum Laboratories (CSL) has just started exporting COVID vaccines from its facilities in Melbourne to Europe. This has resulted in an accounts receivable of €5 million due in late June. Its treasury department which is tasked with hedging the resultant exposure due to this transaction, gets the following information from Bloomberg.

- Spot rate: 158.34 cents per Euro (EUR).
- EUR 90-day interest rate: 0.40% p.a.
- AUD 90-day interest rate: 0.20% p.a.
- Forward rate (90 day): 158.05 cents per EUR.

Exercise Price	Call Price (cents/EUR)	Put Price (cents/EUR)
158 cents/EUR	5.00	4.81
159 cents/EUR	4.52	5.33
160 cents/EUR	4.08	5.89

- (i) What is the minimum net revenue the firm will receive if it uses options contracts?

Today: $S(\text{AUD}/\text{€}) = \text{AUD } 158.34 \text{ cents}/\text{€}$

Using strike price of the put option, $X = 158 \text{ cents}/\text{€}$ (Closest to the current spot rate); premium for this option: 4.81 cents/€

Premium paid today: $\text{€}5,000,000 \times 0.0481 = \$240,500$

In June 2022:

If $S(\text{AUD}/\text{€}) < \$1.58/\text{€}$, exercise the put option to sell €5,000,000 at the strike price of \$1.58/€

AUD received from selling euros: $\text{€}5,000,000 \times \$1.58/\text{€} = \$7,900,000$

If $S(\text{AUD}/\text{€}) > \$1.58/\text{€}$, sell €5,000,000 in the spot market.

Revenue = $\text{€}5,000,000 \times S_{\text{June } 2022} > \$7,900,000$

FV of Premium in June 2022 = $\$240,500 \times \left(1 + \frac{0.2}{100} \times \frac{90}{360}\right) = \$240,620.25$

The minimum net revenue is $\$7,900,000 - \$240,620.25 = \$7,659,379.75$

[Note, the actual cost of the June put option is $4.81 \text{ cents}/\text{€} \times 1.0005 = 4.812 \text{ cents}/\text{€}$]

- (ii) At what future exchange rate would the cashflow from using options exceed that from using forward contracts?

Your answers to both parts should be detailed and include graphical aids if necessary.

$$S^* - 4.812 \text{ ¢/€} = 158.05 \text{ ¢/€}$$

$$S^* = 162.862405 \text{ ¢/€}$$

15. Consider the operations of Asahi Beverages of Australia in Poland. It produces all its soft drinks (e.g., Solo, Schweppes Lemonade) in Poland and all of its costs of production are at local Polish prices. It sells some fraction of its output to Poland and some fraction to Czech Republic. See the following information below.

Sales: 600,000 cans in Poland and 400,000 cans in Czech Republic

Price per can of Solo: 1 zloty in Poland and 2 koruna in Czech Republic

Cost of manufacturing a can of Solo: 0.5 Polish zloty

Nominal exchange rate relative to the AUD:

Poland – 1 zloty/Australian dollar; Czech Republic – 2 koruna/Australian dollar

- (a) Calculate the Australian dollar profits of Asahi Beverages of Australia. **(1)**

$$\begin{aligned}\text{PROFITS in AUD} &= 600,000 \times 1 \times 1 + 400,000 \times 2 \times 0.5 - 1,000,000 \times 0.5 \times 1 \\ &= \$1,000,000 - \$500,000 = \mathbf{AUD\ 500,000}\end{aligned}$$

- (b) Following a currency crisis in Poland the zloty devalued to 3 zloty to the dollar. Recalculate the profits for Asahi Beverages. Have the profits declined or increased? **(1)**

$$\begin{aligned}\text{PROFITS in AUD} &= 600,000 \times 1 \times (1/3) + 400,000 \times 2 \times 0.5 - 1,000,000 \times 0.5 \times (1/3) \\ &= \$200,000 + \$400,000 - \$166,666.6 = \$433,333.4\end{aligned}$$

There is a **decline** in profits relative the previous case.

- (c) Suppose Poland and the Czech Republic have a free-trade agreement. Following the zloty's devaluation, Asahi Beverages can decide to relocate its sales between Poland and Czech Republic to maintain the same level of dollar profits as in part (a). What amount of relocation of sales will give them the original level of profits (assume that the total sales volume is unchanged at 1m cans of Solo and the local prices and costs of production are unchanged)? Explain clearly. **(2.5)**

How many cans should the firm sell in either location? The profit is that same as in (a) which is 0.5 million. The total number of cans sold remain the same.

$$500,000 = x \times \frac{1}{3} + (1 - x) \times 2 \times 0.5 - \left(\frac{1}{3}\right) \times 0.5 \times 1,000,000$$

$$500,000 = x \times \frac{1}{3} + 1 - x - \left(\frac{1}{3}\right) \times 0.5 \times 1,000,000$$

$$500,000 = -\left(\frac{2}{3}\right)x + \left(\frac{5}{6}\right); x = \mathbf{500,000 \text{ cans}}$$

Coke should sell 500,000 cans in Poland and 500,000 in Czech Republic

- (d) Alternatively, Asahi can try to negotiate the lowering of wages of their Polish workers. What should the new cost of production be to maintain the level of profits in part (a) and given no change in the relocation of sales. All other information stays the same. **(2.5)**

Everything stays the SAME, **except** costs. Need to determine this.

$$500,000 = 600,000 \times \frac{1}{3} + 400,000 \times 2 \times 0.5 - \left(\frac{1}{3}\right) \times x \times 1,000,000$$

$$-100,000 = -\frac{x}{3} \times 1,000,000$$

$$x = 0.3 \text{ zloty}$$

The new cost of production should be 0.3 zloty

(e) Compare the two options in (c) and (d) and comment on which one is more feasible, and the possible obstacles Asahi could face to implementing them.

- 1) The government of the Czech Republic could restrict imports from Poland. The sharp de valuation of the zloty might cause concern that the Czech Republic will be flooded with cheap goods from Poland and to protect its local producers might restrict imports.

The other issue is that Asahi, to sell more cans of soft drink, might have to reduce prices in *REAL* terms in the Czech Republic and the impact on profits will depend on the elasticity of demand for Solo/Schweppes in these markets.

A strategy based on increasing sales might not work in Poland if it goes into recession which could reduce demand.

- 2) A strategy of reducing costs for example by cutting wages is not feasible as it is generally difficult to cut *NOMINAL* wages. Workers will resist wage cuts. Given Asahi is a foreign company this will not play well in the local media, and with the governments of both countries. The firm must reduce costs by 40% to maintain profits and that is a *LARGE* number; passing it on to workers in the form of lower wages will be a difficult sell.

15. PART B

The iTunes store, owned by Apple Inc. sells songs, movies and tv shows. These stores operate in several countries and the songs are priced in local currency terms.

What factor(s) could potentially explain the different prices charged for songs on iTunes? What advantage does the iTunes index have over the Big Mac index?

	iTunes Song Price (Local currency)	PPP exchange Rate	Current US\$ exchange rate	Over (+)/under (-) valuation (iTunes)	Over (+)/under (-) valuation (Big Mac)*
USA	US\$ 0.99	-	-	-	-
Australia	A\$1.69	A\$1.70	A\$1.33	+28%	-21%
Canada	C\$0.99	C\$1	C\$1.12	-11%	+1%
Japan	¥200	¥202	¥112	+80%	-28%
UK	£0.79	£0.79	£0.53	+51%	+18%

- (1) International price discrimination. Generally, the wealthier countries are charged a higher price – here the wealthiest country (in terms of GDP) – the US has the second cheapest price. It could be that the demand is less price sensitive (elasticity of demand is lower) in Australia and Japan.
- (2) iTunes price is free of variation in local costs unlike the Big Mac (ex. Price of beef could differ reflecting tariffs) and therefore the price differences of iTunes prices should reflect purely demand related issues. Thus, it should out predict the Big Mac index if Apple based the prices on long-term forecasts of exchange rates.
- (3) Hard to take advantage of price differences (buy in the market where it is trading at a low price and sell where it is trading at a high price) due to digital rights management (DRM). Countries tend to have their own stores and the song will be allocated to a user's account and password protected.