

Measuring and Managing Real Exchange Risk

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1. How Real Exchange Rates Affect Real Profitability

- The real profitability of a firm - how changes in the real exchange rate affect a firm's profitability
- The real profitability of an exporting firm
 - Real profitability: the purchasing power of a firm's nominal profits (nominal profit/price level)
 - *Nominal profit for US firm* = $\$ Revenue_{US} + \$ Revenue_{UK} - \text{Firm's } \$ \text{ costs}$
 - Example: Apples Galore (A = Apples)
 - $\$ Revenue_{US} = P(A, \$) \times Q(A, US)$
 - $\$ Revenue_{UK} = S(\$/\pounds) \times P(A, \pounds) \times Q(A, UK)$
 - $\$ Costs = C(A, \$) \times [Q(A, US) + Q(A, UK)]$
 - Relative prices and components of real profit
 - Divide nominal profit by price level in US: $P(\$)$
 - $Real Revenue_{US} = [P(A, \$)/\mathbf{P}] \times Q(A, US)$
 - To keep the relative price of apples constant, the firm must ensure that the nominal price of the apples increases at the U.S. rate of inflation.
 - $Real Costs = [C(A, \$)/P(\$)] \times [Q(A, US) + Q(A, UK)]$
 - If its nominal average cost per apple increases at the U.S. rate of inflation, its real average costs are constant.

1. How Real Exchange Rates Affect Real Profitability

- Revenue:
 - To keep relative prices constant, the firm must ensure that the nominal price of apples increases at the American interest rate.
- Costs:
 - If the nominal average cost per unit increases at the American interest rate, the real average costs are constant, and the total real costs are the same when the same amount is produced.
- Firm's reaction to exchange rate changes:
 - $Real\ Revenue_{UK} = [S(\$/\pounds) \times P(A, \pounds) \times Q(A, UK)] / P(\$)$
 - $Real\ Costs = C(A, \$) / P(\$) \times [Q(A, US) + Q(A, UK)]$
 - A real appreciation of the pound increases real revenue from the United Kingdom and allows the firm to become more competitive there because it can lower its relative price of apples.
 - Exchange rate pass-through - how the managers of the firm choose to respond with their relative prices to changes in the real exchange rate.

2. Real Exchange Risk at Exporters, Importers and Domestic Firms

- Real exchange risk
 - Profitability of a firm can change because of fluctuations in real exchange rates.
 - Also known as operating or economic exposure.
 - Real depreciation of the domestic currency hurts importing firms and helps exporting firms.
 - Exactly how a firm is affected depends on the firm's type of business—that is, it depends on whether it is a net exporter, a net importer, or an import competitor.
- The real exchange rate risk of a net exporter
 - A competitive dilemma:
 - Raise prices – lose market share
 - Lower prices – lose profits
- Major factor that determines a firm's response:
 - Price elasticity of demand for its product
 - Firm's competitive situation

2. Real Exchange Risk at Exporters, Importers and Domestic Firms

- Olympia Communication Exporters (OCE) manufactures cell phones in Greece
 - Sells them in the US at \$79, and sells 2M phones per year
 - $S = \$1.25/\text{€}$
 - $\text{Revenue } \text{€} = \$79 \text{ (per phone)} \times 2M \times \text{€}1/\$1.25 = \text{€}126.4M$
 - Inflation_{US} forecasted @ 5.5%
 - Inflation_{EUR} forecasted @ 1%
 - Following interest rate parity formula - USD is expected to weaken (EUR strengthen):
 - $F_{h/f} / S_{h/f} = (1+i_h) / (1+i_f)$
 - $F_{h/f} = S_{h/f} \times (1+i_h) / (1+i_f)$
 - $\$1.3057/\text{€} = \$1.25/\text{€} \times 1.055/1.01$
 - This change just offsets the inflation differential and leaves the real exchange rate unchanged.

2. Real Exchange Risk at Exporters, Importers and Domestic Firms

- The change offsets the inflation differential and leaves the real exchange rate unchanged
- If the demand curve is constant in the US, **what \$ price** should OCE charge **to earn the same real revenue** and **sell the same quantity of phones** in the United States considering the inflation?
 - The price should increase by US inflation 5.5%:
 - $\$79/\text{phone} \times 1.055 = \$83.35/\text{phone}$
 - Revenue would increase to:
 - $\$83.35 \times 2M \times \text{€}1/\$1.3057 = \text{€}127,670,981$
 - $\text{€}127,670,981$ is 1% higher than $\text{€}126,400,000$. An increase of 1% in nominal revenue is required to keep the firm's real revenue constant.

2. Real Exchange Risk at Exporters, Importers and Domestic Firms

- Any increase in the exchange rate above $\$1.3057/\text{€}$ creates dilemma for OCE
 - Increase the price of cell phones above $\$ 83.35$?
 - NO – EUR value of revenue will decrease
 - YES – price will rise above US inflation – firm will sell less phones
- = OCE is less profitable after a real depreciation of the dollar
- BY how much?
 - Elasticity of demand

2. Real Exchange Risk at Exporters, Importers and Domestic Firms

- Trans-Malaysian Airlines (TMA) flies mostly domestic routes
 - It imports its fuel from Singapore @ \$3.50/gallon
 - Last year TMA imported 250M gallons ($S=MYR4/\$$) or MYR3.5B, while its revenue net of other costs was MYR4B, with profit of MYR0.5B
 - TMA is regulated and cannot raise prices above inflation rate (15%)
 - If fuel cost increases by the US inflation rate (4%), by how much will real profits fall if there is a 10% real appreciation of the dollar relative to the ringgit (i.e., causing their costs to increase)?
 - New price of fuel: $\$3.50/gallon \times 1.04 = \$3.64/gallon$
 - New spot rate: $(MYR4/\$ \times 1.10) \times (1.15/1.04) = MYR4.8654/\$$
 - New costs: $\$3.64 \times 250M \text{ gallons} \times MYR4.8654/\$ = MYR4.428B$
 - New profit: $MYR4B \times (1.15) - MYR4.428B = MYR0.172B$
 - Instead of profits increasing by 15%, which they would have if there was no real appreciation in the value of the \$ (or equivalently, depreciation in the ringgit), nominal profits have fallen by 65.6%
 - A real appreciation of the dollar clearly has a severe effect on the real profitability of TMA because it increases TMA's costs, and the regulation prevents the company from passing any of its increased costs due to a change in the exchange rate on to its customers in the form of higher prices.

2. Real Exchange Risk at Exporters, Importers and Domestic Firms

- Measuring real exchange risk exposure
 - Change in the present value of a firm's future after-tax profits
 - Who does not have real exchange risk?
 - A completely domestic firm?
 - Well, sort of – these firms may not face forex risk in the short-term, but may very well in the longer-term
 - Example: a restaurant in Miami that does not deal with foreign currency could suffer a drop in customers if the value of the Euro is weak

3. Sharing the Real Exchange Risk: An Example

- Safe Air's (SA) situation
 - Small US company that sells air tanks with “safe” air to fire departments
 - CEO needs to prove leadership since earnings are declining
- Metallwerke A.G.'s proposal
 - German firm that manufactures similar product prepared to manufacture tanks for SA
 - Same or better quality of current supplier
 - Lock in low dollar price
 - Want a ten year contract with indexing formula

3. Sharing the Real Exchange Risk: An Example

- Designing a contract that shares the real exchange risk:
 - Sharing the real exchange risk equally between two parties
 - Let the base dollar price of the product increase one for one with the US inflation rate
 - Adjust for changes in real exchange rate:
 - Increase base price by one-half of any real depreciation of the dollar relative to the euro
 - Decrease base price by one-half of any real appreciation of the dollar relative to the euro

3. Sharing the Real Exchange Risk: An Example

- Understanding the contract
 - a) If euro appreciates relative to the dollar by more than is warranted by the differential rates of inflation, Metallwerke's real revenue falls
 - Redesigned contract increases nominal base price in USD, such that Safe Air bears part of the losses
 - If euro weakens relative to the dollar by more than the inflation differential, Metallwerke's real revenue rises
 - Redesigned contract lowers the rate at which the dollar base price increases, such that the gains are shared with Safe Air

Sharing the Real Exchange Risk: An Example

- Basic data an analysis

- Some basic prices and notations (the zeros indicate current-period values) related to the deal proposed by Metallwerke:
 - Safe Air's contractual base purchase price = $B(0,\$)$ = \$400 per tank
 - Safe Air's other variable production costs = $C(0,\$)$ = \$313 per tank
 - Safe Air's retail sales price = $T(0,\$)$ = \$856 per tank
 - Safe Air's profit margin = $M(0,\$)$ = 20%
 - U.S. price level = $P(0,\$)$ = \$140 per U.S. general good
 - Exchange rate = $S(0,\text{€}/\$)$ = €1.40/\$
 - German price level = $P(0,\text{€})$ = €100 per German general good
 - Metallwerke's profit margin $M(0,\text{€})$ = 20%
 - Metallwerke's production cost = $C(0,\text{€})$ = €238 per tank

Profitability Under a Contract That Shares Real Exchange Risk

	Safe Air (dollars)			Metallwerke (euros)		
	\$1.26/€	\$1.40/€	\$1.54/€	\$1.26/€	\$1.40/€	\$1.54/€
Sales						
Exported				302	286	273
Local	856	856	856			
Costs of Goods Sold						
Imported	(380)	(400)	(420)			
Local	(313)	(313)	(313)	(238)	(238)	(238)
Operating Profit	163	143	123	63.6	48	35
Profit Margin	23.5%	20%	16.8%	26.7%	20%	14.7%

Safe Air loses some if \$ falls
but gains some if \$ rises

Metallwerke trades off some
profit when \$ rises for a higher
profit when \$ falls

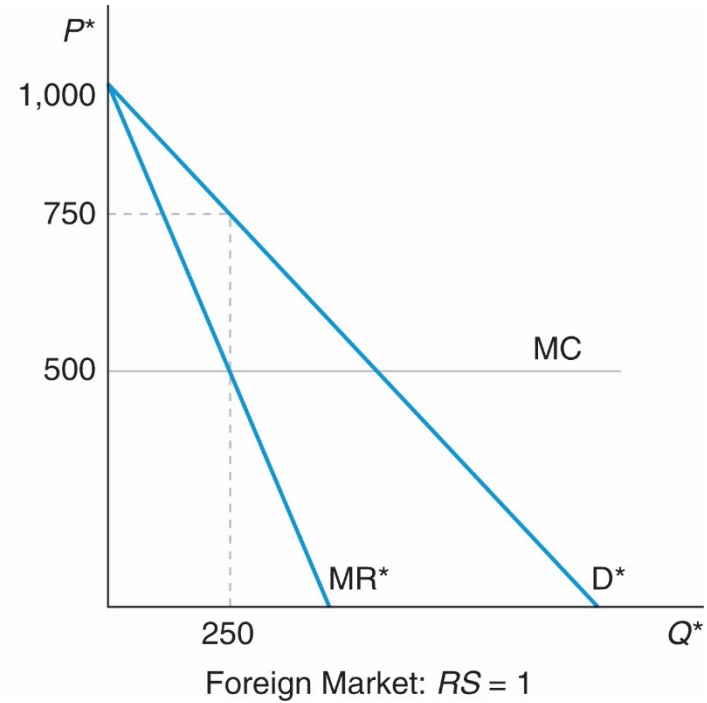
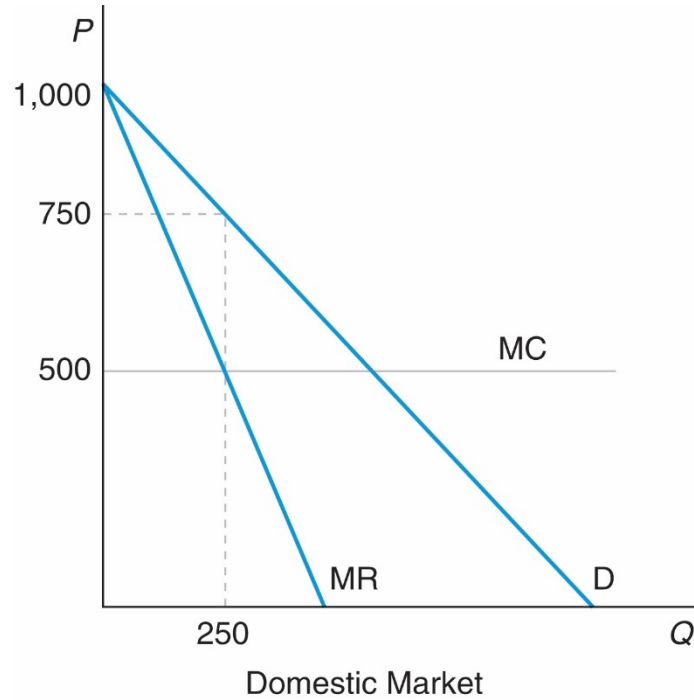
3. Sharing the Real Exchange Risk: An Example

- Should the redesigned contract be adopted?
 - Other factors affecting costs
 - Wage pressure when the buying power of employees at SA is squeezed (i.e., when domestic currency is weak in real terms relative to foreign currency)
 - Solution: smaller increase in base price when \$ is weak and smaller decrease when the dollar is strong
 - Competitiveness and pricing ability
 - Demand is fairly elastic given budgets of fire departments – this means SA is not able to increase prices above inflation
 - Foreign competitors complicate matters in that they become aggressive when \$ is strong
 - Could fix this by allowing SA to receive > 50% of benefit when \$ is strong
 - Relative bargaining strength

4. Pricing-to-Market Strategies

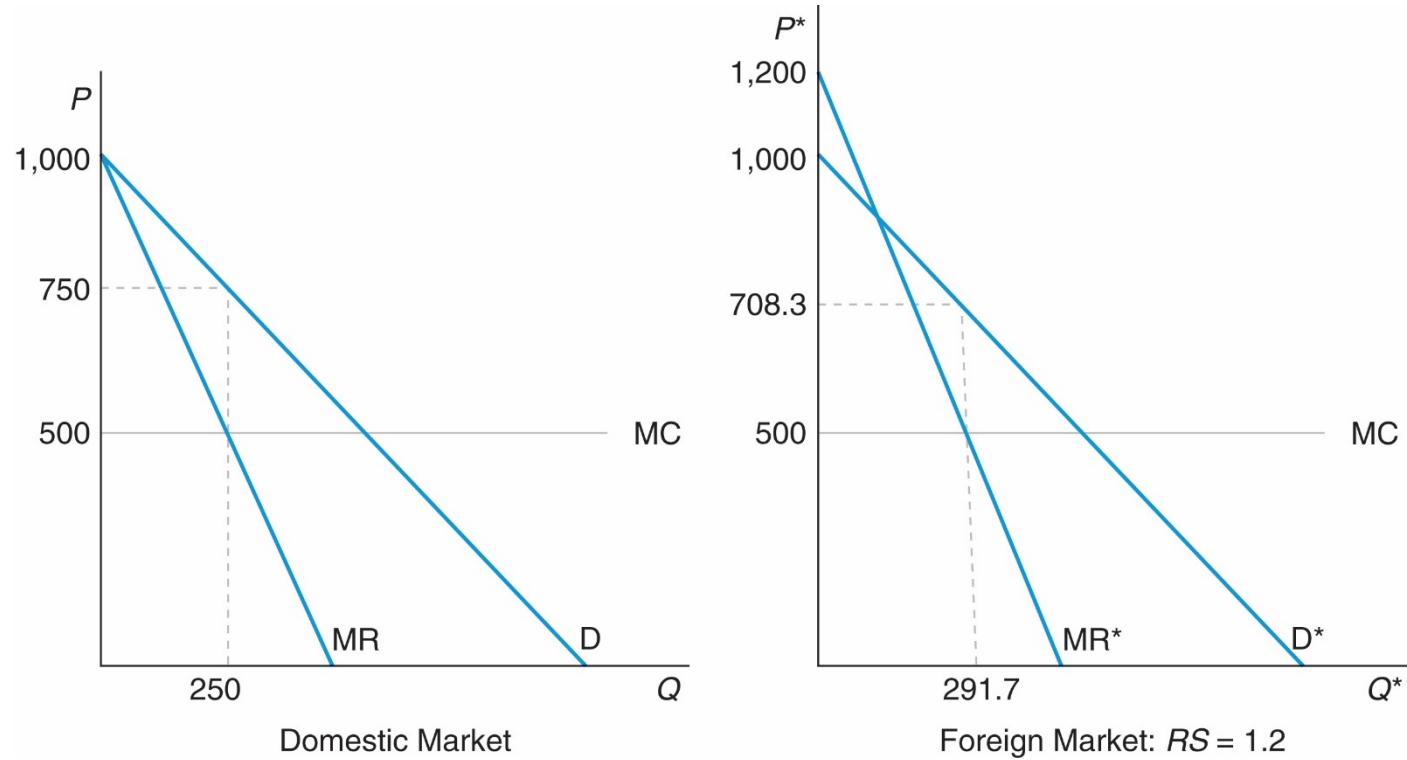
- Pricing to market
 - Occurs when a producer charges different prices for the same good in different markets
- Example of pricing-to-market strategies
 - French handbags: Louis Vuitton bags cost 40% more in Japan than in Europe

A Monopolistic Exporter

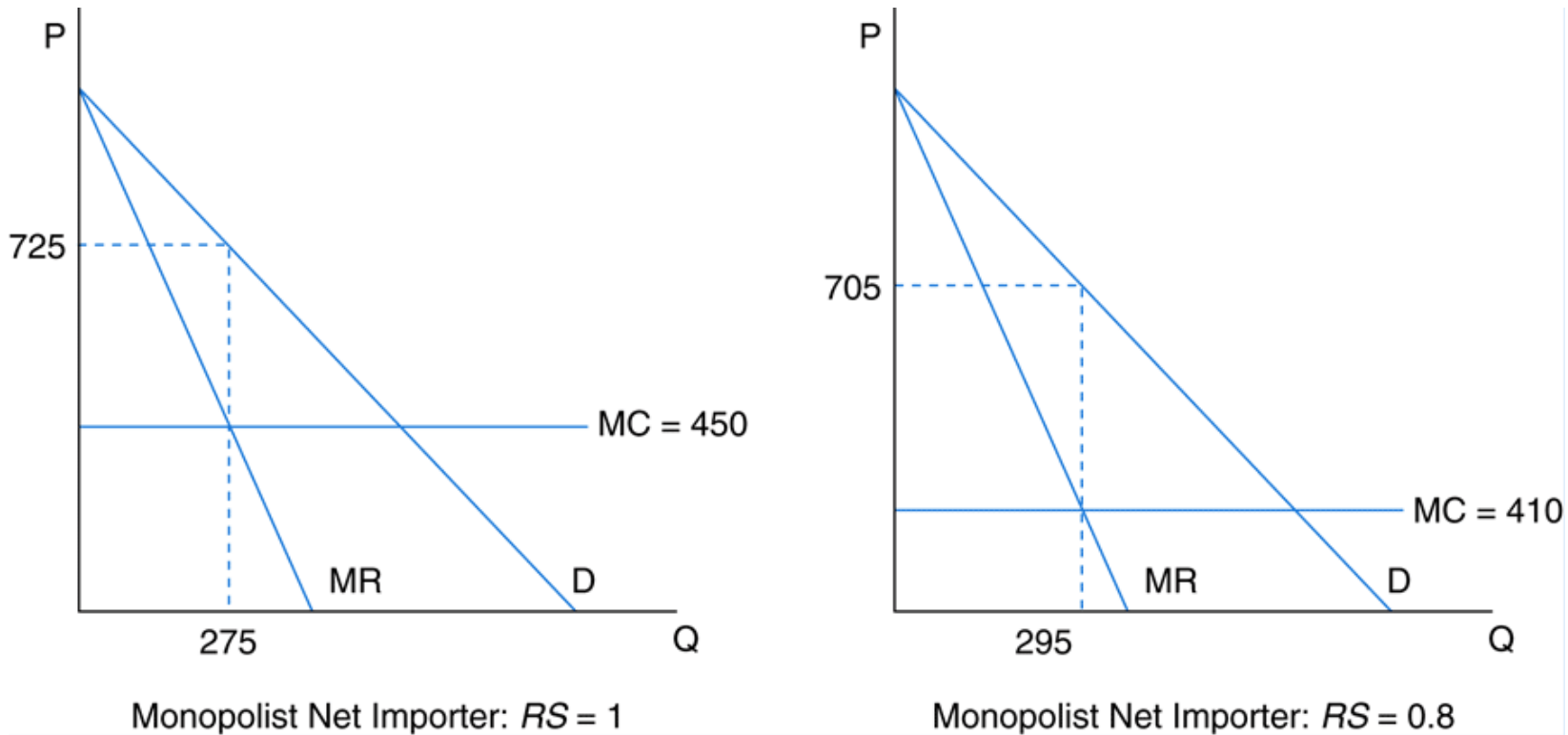


The real exchange rate is initially equal to 1.

A Monopolistic Exporter When $RS=1.2$



A Monopolist with Imported Costs



20% Real depreciation of foreign currency
Monopolist will want to produce more in foreign market

5. Evaluating the Performance of a Foreign Subsidiary

- Evaluation the performance of a foreign subsidiary
 - Tough because of the effect of real changes in forex
- Example: three Japanese subsidiaries operating in Thailand
 - **The net importer – ThaiComp** imports personal computer parts from Japan, assembles and sells mostly in Thailand. its costs increase more than its revenues when there is a real depreciation of the baht. The Japanese owners of ThaiComp then experience an additional loss in real terms when they convert baht profit into yen.
 - **The net exporter – WeRToys** produces and mostly exports toys from Japan to Thailand. its operating performance improves with a real depreciation of the baht, but its Japanese owners experience less of this increase in real profitability when the yen strengthens.
 - **The neutral firm – RiceNoodle serves** the Thai market with no export revenues or foreign costs but has Japanese owners. real depreciation of the baht relative to the yen does adversely affect the real value of RiceNoodle's profits for the company's Japanese owners.

Operating Profit with a One-to-One Real Exchange Rate Between the Baht and the Yen

Exhibit 9.7 Operating profit with a one-to-one real exchange rate between the baht and the yen

	RiceNoodle		ThaiComp		WeRToys	
	Real Baht	% of Sales	Real Baht	% of Sales	Real Baht	% of Sales
Sales						
Exported	0	0	696	30	1,607	70
Local	2,303	100	1,607	70	696	30
Costs of goods sold						
Imported	0	0	(900)	(39)	(825)	(36)
Local	(1,725)	(75)	(825)	(36)	(900)	(39)
Local fixed costs	(350)	(15)	(350)	(15)	(350)	(15)
Operating profit in real baht	228	10	228	10	228	10
Operating profit in real yen	228	10	228	10	228	10

Actual Operating Profit After a 10% Real Appreciation of the Yen

Exhibit 9.8 Actual operating profit after a 10% real appreciation of the yen

	RiceNoodle		ThaiComp		WeRToys	
	Real Baht	% of Sales	Real Baht	% of Sales	Real Baht	% of Sales
Sales						
Exported	0	0	830	35	1,900	75
Local	2,188	100	1,526	65	648	25
Costs of goods sold						
Imported	0	0	(980)	(42)	(945)	(37)
Local	(1,656)	(76)	(810)	(34)	(969)	(38)
Local fixed costs	(333)	(15)	(349)	(15)	(355)	(14)
Operating profit in real baht	199	9	217	9	279	11
% change in real baht profit	(12.7)		(4.8)		22.4	
Operating profit in real yen	181	9	197	9	254	11
% change in real yen profit	(20.6)		(13.5)		11.4	

Operating Profit After a 10% Real Appreciation of the Yen: No Response by Managers

Exhibit 9.9 Operating profit after a 10% real appreciation of the yen: no response by managers

	RiceNoodle		ThaiComp		WeRToys	
	Real Baht	% of Sales	Real Baht	% of Sales	Real Baht	% of Sales
Sales						
Exported	0	0	766	32	1,768	70
Local	2,303	100	1,607	68	696	30
Costs of goods sold						
Imported	0	0	(990)	(42)	(908)	(37)
Local	(1,725)	(75)	(825)	(35)	(900)	(37)
Local fixed costs	(350)	(15)	(350)	(15)	(350)	(14)
Operating profit in real baht	228	10	208	8	306	12
% change in real baht profit	0		(8.8)		34.2	
Operating profit in real yen	207	10	189	8	278	12
% change in real yen profit	(9.2)		(17.1)		21.9	

Operating Profit After a 10% Real Appreciation of the Yen: Managers Respond Optimally

Exhibit 9.10 Operating profit after a 10% real appreciation of the yen: managers respond optimally

	RiceNoodle		ThaiComp		WeRToys	
	Real Baht	% of Sales	Real Baht	% of Sales	Real Baht	% of Sales
Sales						
Exported	0	0	815	35	1,848	74
Local	2,303	100	1,522	65	644	26
Costs of goods sold						
Imported	0	0	(969)	(41)	(920)	(37)
Local	(1,725)	(75)	(807)	(35)	(913)	(37)
Local fixed costs	(350)	(15)	(350)	(15)	(350)	(14)
Operating profit in real baht	228	10	211	9	309	12
% change in real baht profit	0		(7.5)		35.5	
Operating profit in real yen	207	10	192	9	281	12
% change in real yen profit	(9.2)		(15.8)		23.2	

Actual Versus Optimal Operating Profit After a 10% Real Appreciation of the Yen

Exhibit 9.11 Actual versus optimal operating profit after a 10% real appreciation of the yen

	RiceNoodle		ThaiComp		WeRToys	
	Real Baht		Real Baht		Real Baht	
	Opti- mal	Actual	Opti- mal	Actual	Opti- mal	Actual
Sales						
Exported	0	0	815	830	1,848	1,900
Local	2,303	2,188	1,522	1,526	644	648
Costs of goods sold						
Imported	0	0	(969)	(980)	(920)	(945)
Local	(1,725)	(1,656)	(807)	(810)	(913)	(969)
Local fixed costs	(350)	(333)	(350)	(349)	(350)	(355)
Operating profit in real baht	228	199	211	217	309	279
% change in real baht profit	0	(12.7)	(7.5)	(4.8)	35.5	22.4
Operating profit in real yen	207	181	192	197	281	254
% change in real yen profit	(9.2)	(20.6)	(15.8)	(13.5)	23.2	11.4

Operating Profit After a 10% Real Depreciation of the Yen: Managers Respond Optimally

Exhibit 9.12 Operating profit after a 10% real depreciation of the yen: managers respond optimally

	RiceNoodle		ThaiComp		WeRToys	
	Real Baht	% of Sales	Real Baht	% of Sales	Real Baht	% of Sales
Sales						
Exported	0	0	574	25	1,361	65
Local	2,303	100	1,687	75	745	35
Costs of goods sold						
Imported	0	0	(822)	(36)	(725)	(34)
Local	(1,725)	(75)	(838)	(37)	(878)	(42)
Local fixed costs	(350)	(15)	(350)	(15)	(350)	(17)
Operating profit in real baht	228	10	251	11	153	7
% change in operating profit	0		10.1		(32.9)	
Operating profit in real yen	253	10	279	11	170	7
% change in real yen profit	11		22.4		(25.4)	

6. Strategies for Managing Real Exchange Risk

- Transitory versus permanent changes in real exchange rates
 - How long is change supposed to persist?
- Production management
 - Production scheduling
 - Use inventory to avoid paying employees overtime to meet excess demand
 - Input sourcing
 - Weighing ability to switch back and forth between domestic/foreign suppliers and the value of long-term relationships
 - Plant location
 - Expand locations
 - Shift production among existing locations

6. Strategies for Managing Real Exchange Risk

- Marketing management
 - Pricing policies (with respect to price elasticity)
 - The frequency of price adjustments (customers like price stability)
 - Market entry decisions
 - Brand loyalty

A Checklist for Managers of Real Exchange Risk

- Production Inputs**—Source inputs from suppliers in countries suffering real depreciations of their currencies.
- Production Location**—Shift production to plants located in countries suffering real depreciations of their currencies or countries with low-cost production.
- Pricing-to-Market**—Allow a real appreciation of the foreign currency to increase the profitability of foreign sales but lower foreign prices to expand market share.
- Market Entry**—Begin selling in foreign markets after a real appreciation of the foreign currency.
- Brand Loyalty**—Create loyal customers who will not “buy foreign” when the domestic currency strengthens in real terms.
- Price Consistently**—Recognize that exchange rates will be more volatile than prices of goods. Be prepared for short-run swings in profitability due to exchange rates.
- Hedging**—Use derivatives securities such as forward contracts or options to hedge foreign exchange risk to assure cash flow when changes in exchange rates would make the firm unprofitable.
- Currency of Denomination of Debt**—Denominate long-term debt in foreign currencies in which the firm has substantial assets or sales to reduce exposure to foreign exchange risk.

Questions:

- Given that real exchange rates fluctuate, when would be the best time to enter the market of a foreign country as an exporter to that market?
- You have been asked to evaluate possible sites for an Asian production facility that will manufacture your firm's products and sell them to the Asian market. What real exchange rate considerations should you entertain in your evaluation?
- Why is it important for an exporter to understand the distinction between a temporary change in the exchange rate and a permanent change in determining whether to respond to a real depreciation of the home currency with increased production or sales out of inventories?
- What do economists mean by *pricing-to-market*?