Managing FX Exposure

Economic Exposure

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Definition: EE measures how changes in FX rates affect CFs

Understanding EE: Cash flows from subsidiary

Revenue: Price in FC x Quantity = PQ

Cost: Variable (α PQ) + Fixed Cost (0<α< 1, with $\alpha = \alpha_{FC} + \alpha_{DC}$)

Gross profits: (1 – α) PQ – FC

EBT = [(1 – α) PQ – FC] – IE (IE: Interest Expense)

EAT = [(1 – α) PQ – FC – IE] (1 – t) (t: tax rate)

Costs & IE have two components: a FC & a DC. Say, for VC: α_{FC} & α_{DC}.

EE: How changes in S_t affect CFs of the firm (say, EAT).

Managing Economic Exposure

• **Matching Inflows and Outflows**

If EAT = constant, independent of the FC, there is no EE

⇒ The better the match, between Revenue and Cost, the smaller the EE.

Q: How can a firm get a good match? Play with α_{FC} to establish a manageable EE. For example, if FC and IE are small relative to variable, then, the bigger α_{FC}, the smaller the exposed CF (EAT) to changes in S_t.

When a firm restructures operations (shift expenses to FC, by increasing α_{FC}) to reduce EE, we say a firm is doing an *operational hedge*.

Case Study: Laker Airways (Skytrain) (1977-1982)

After a long legal battle in the U.S. and the U.K, Sir Freddie Laker was able to fly his low cost carrier, no-frills airline from LON to NY (1977): GPB 50 OW.

Big success. Rapid expansion, financed with debt.

Situation: Rapid expansion: Laker buys planes from MD, financed in USD.

• **Cost**

(i) fuel, typically paid for in USD

(ii) operating costs incurred in GBP, but with a small USD cost component (advertising and booking in the U.S.)

(iii) financing costs from the purchase of aircraft, denominated in USD.

• **Revenue**

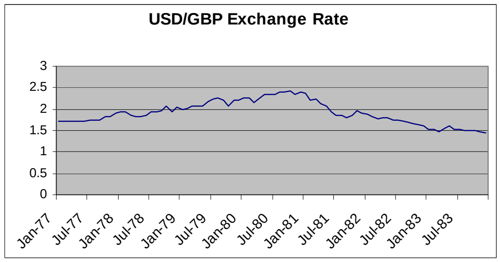
Sale of airfare (probably, evenly divided between GBP and USD), plus other GBP revenue.

Currency mismatch (gap):

Revenues: mainly GBP, USD

Payables: mainly USD, GBP

• What happened to S_t?



1977 – 1981: Big USD depreciation.

1981 – 1982: Big USD appreciation.

1982: Laker Airlines bankrupt.

Q: Can we solve Laker Airways problem (economic exposure)

• Solutions to Laker Airways problem (economic exposure):
  - Increase sales in US
  - Increase IE in GBP (borrow more in the UK)
  - Transfer cost out to GBP/Shift expenses to GBP ($\alpha_{FC}\uparrow / \alpha_{DC}\downarrow$)
  - Diversification

• Severe problems show up when there is a *currency gap* (= inflows in FC – ouflows in FC).

• Very simple approach to managing EE: Minimize currency gaps.

$\Rightarrow$ match inflows in FC and outflows in FC as much as possible.

• European and Japanese car makers have been matching inflows and outflows by moving production to the U.S. But, not all companies can avoid currency gaps: Importing and Exporting companies will always be operationally exposed.

Q: Why Operational Hedging?

- Financial hedging –i.e., with FX derivative instruments– is inexpensive, but tends to be short-term, liquid only for short-term maturities.
- Operational hedging is more expensive (increasing α_{FC} by building a plant, expansion of offices, etc.) but a long-term instrument.

A different view: EAT = [(1 – α) PQ – FC – IE] (1 – t) (t: tax rate)

Financial hedging only covers FX risk (S_t through P), but not the risk associated with sales in the foreign country (Q-risk). For example, if the foreign country enters into a recession, Q will go down, but not necessarily S_t. An operational hedge works better to cover Q-risk.

From this view, financial hedging does not work very well if the correlation between price in FC (P) and quantity sold (Q) is low. On the other hand, if Corr(P,Q) is high, financial hedging will be OK.

Example: A U.S. firm exports to the European Union. Two different FX scenarios:

(1) ***S_t = 1.00 USD/EUR***

Sales	in US	USD 10M	
	in EU	EUR 15M	
Cost of goods	in US	USD 5M	
	in EU	EUR 8M	

(2) ***S_t = 1.10 USD/EUR***

Sales	in US	USD 11M	
	in EU	EUR 20M	
Cost of goods	in US	USD 5.5M	
	in EU	EUR 10M	

Taxes:	US	30%	
	EU	40%	
Interest:		US	USD 4M
		EU	EUR 1M

Example (continuation):

CFs under the Different Scenarios (in USD)

	S_t=1 USD/EUR	***S_t=1.1 USD/EUR***
Sales	10M+15M=25M	11M+22M=33M
CGS	5M+8M= 13M	5.5M+11M=16.5M
Gross profit	5M+7M=12M	5.5M+11M=16.5M
Int	4M+1M=5M	4M+1.1M=5.1M
EBT	7M	11.4M
Tax	0.3M+2.4M=2.7M	0.45M+3.96M=4.41M
EAT	4.3M	6.99M

Q: Is the change in EAT significant?

Elasticity: For a 10% depreciation of the USD, EAT increases by 63% (probably very significant!). That is, this company benefits by an appreciation of the Euro against the USD. The firm faces economic exposure. ¶

Example (continuation):

Q: How can the US exporting firm avoid economic exposure? (match!)

- Increase US sales
- Borrow more in Euros (increase outflows in EUR)
- Increase purchases of inputs from Europe (increase CGS in EUR)

(A) US firm increases US sales by 25% (unrealistic!)

EAT (S_t=1 USD/EUR) = USD 6.05M

EAT (S_t=1.1 USD/EUR) = USD 8.915M

$\Rightarrow$ a 10% depreciation of the USD, EAT increases by only 47%.

(B) US firm borrows only in EUR: EUR 5M

EAT (S_t=1 USD/EUR) = USD 4.7M

EAT (S_t=1.1 USD/EUR) = USD 7.15M

$\Rightarrow$ a 10% depreciation of the USD, EAT increases by 52%.

Example (continuation):

(C) US firm increases EU purchases by 30% (decreasing US purchases by 30%)

EAT (S_t=1 USD/EUR) = USD 3.91M

EAT (S_t=1.1 USD/EUR) = USD 6.165M

⇒ a 10% depreciation of the USD, EAT increases by 58%.

(D) US firm does (A), (B) and (C) together

EAT (S_t=1 USD/EUR) = USD 6.06M

EAT (S_t=1.1 USD/EUR) = USD 8.25M

⇒ a 10% depreciation of the USD, EAT increases by 36%. ¶

Note: Some firms will always be exposed!

• International Diversification

For the firms that cannot do matching. They still have a very good FX risk management tool: Diversifying internationally the firm. (Portfolio approach.)

True international diversification means to diversify:

location of production, sales, input sources, borrowing of funds, etc.

• In general, the variability of CF is reduced by diversification:

ΔS_t is likely to increase the firm's competitiveness in some markets while reducing it in others.

⇒ EE should be low.

• Not surprisingly big MNF do not have EE.

• Case Study: Walt Disney Co.

Four divisions (in 2006): Media Networks Entertainment; Theme Parks and Resorts; Studios; & Consumer Products.

Total Inflows (2006) - Revenue USD 34.3B, Operating income: USD 6.49B, EPS: USD 2.06:

Media (ABC, ESPN, Lifetime, A&E, etc. *Low*). Rev: 14.75B, OI: 3.61B

Amusement Parks (Cruise Line & 10 parks: Euro Disney, Tokyo Disney + HK park, etc. *Medium*). Rev: 9.95B, OI: 1.53B

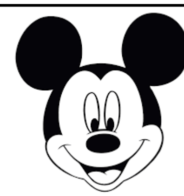
Studios (Disney, Pixar, Touchstone, etc. *High*). Rev: 7.2B, OI: 0.73B

Consumer products (Licensing, Publishing, Disney store (Europe). *Medium*) Rev: USD 2.4B, OI: 0.62B

Outflows (2006) – around 80% in USD

$S_{Dec\ 06}$ = 106.53 TWC/USD (TWC = Trade-weighted currency index)

$Price_{Dec\ 06}$ = USD 34.19



• Case Study: Walt Disney Co.

UPDATE (2006-2013):

- DIS bought Marvel for USD 4B in 2009 and Lucasfilm for USD 4B in 2012.
- DIS introduced a new division: Interactive Media (Kaboosee.com, BabyZone.com, Playdom (social gaming), etc.)
- DIS ordered two new cruises with 50% more capacity each in 2011.
- Shangai theme park to be opened in 2016.

Q: Economic Exposure? Yes. Probably: Medium

• Check intuition: Calculate a pseudo-elasticity to check EE. We need data. Let's use 2013 data:

Inflows (Revenue USD 45.04B, OI: USD 10.72B, EPS: USD 3.38):

S_{13} = 101.923 TWC/USD (USD depreciated by 5.73% against TWC)

$Price_{13}$ = USD 65.30.

• Case Study: Walt Disney Co.

Summary:

	2006 (in USD)		2013 (in USD)	
	Revenue	Operating Income	Revenue	Operating Income
Media	14.75B	3.61B	20.35B	**6.82B**
Theme Parks	9.95B	1.53B	14.09B	**2.22B**
Studios	7.2B	0.73B	5.98B	**0.66B**
Consumer Products	2.4B	0.62B	3.56B	**1.11B**
Interactive Media	-	-	1.06B	**-0.09B**
Total	**34.3B**	**6.49B**	**45.04B**	**10.72B**

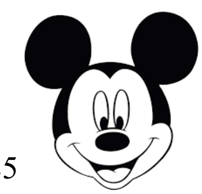
13-06 Change in Revenue = USD 10.74B (31.31%)

13-06 Change in OI = USD 4.23B (**65.18%**)

13-06 DIS Stock Return = **111.32%**

13-06 $e_{f,t}$ = - 0.05725 (or 5.73% depreciation of the USD)

⇒ CF-elasticity = Δ OI (%) / $e_{f,t}$ = **.6518**/-.05725 = -11.385



• Case Study: Walt Disney Co.

⇒ CF-elasticity = % Change in OI / $e_{f,t}$ = **.6518**/-.05725 = **-11.385**

(<u>Interpretation</u>: a 1% depreciation of the USD, EAT increases by **11.4%**)

If stock market numbers are more trusted, recalculate pseudo-elasticity:

⇒ CF-elasticity = DIS Stock Return/$e_{f,t}$ = **1.1132**/-.05725 = -19.45

• According to these big elasticities, DIS behaves like a net exporter, a depreciation of the USD increases cash flows.

• Disney can reduce EE with operational hedging or by diversifying.

• Case Study: Walt Disney Co.

• Managing Disney's EC

1. Increase expenses in FC
   - Make movies elsewhere
   - Move production abroad
   - Borrow abroad
2. Diversify revenue stream
   - Build more parks abroad
   - New businesses

We can see from the 2006-2013 evolution of the company, DIS have been taking measures along these lines for a while.

• Case Study: Walt Disney Co.

• Let's revisit the measurement Disney's EE:

Q: Is this pseudo-elasticity informative? Is S_t the only variable changing from 2006 to 2013?

A: No! For example, DIS added assets, then more revenue and OI are expected. We need to be careful with these numbers. We need to "control" for these changes, to Isolate the effect of $e_{f,t}$.

A multivariate regression will be more informative, where we can include other independent ("control") variables (income growth, inflation, sales growth, assets growth, etc.), not just $e_{f,t}$ as determinants of the change in OI (or DIS stock return).

• We can also borrow from the investments literature and use as controls the 3 popular Fama-French factors: Market, Size (SMB), Book-to-Market (HML).

• Case Study: Walt Disney Co.

Using the Fama-French 3 factor model:

DIS Stock $\text{Return}_t = \alpha + \beta\, e_{f,t} + \theta\, \text{Assets}_t + \delta_1\, \text{FF Factors}_t + ... + \varepsilon_t$

Example: Disney's EE.

We use Disney's monthly excess returns from the past 30 years (1984:1, 2014:9), we run a regression against $e_{f,t}$ (using USD/TW, TW=Trade Weighted Basket of currencies) and the FF factors (Market, SMB, HML)

$R^2 = 0.20409$

Standard Error = 8.0665

Observations = 369

	Coefficients	Standard Error	t Stat	P-value
Intercept	1.2865	0.43149	2.9815	0.0031
$e_{f,t}$	**0.4002**	0.24512	1.6329	0.1034
Market - r_f	0.2223	0.09912	2.2428	0.0255
SMB	0.1787	0.14391	1.2423	0.2149
HML	0.5013	0.15226	3.2924	0.0011

• Case Study: Walt Disney Co.

After controlling for other factors that affect Disney's excess returns, we cannot reject H_0, since $|t_\beta = 1.63| < 1.96$ (at 5% level, no EE).

Note: The coefficient of $e_{f,t}$ in the regression is 0.40 ⇒ a 1% depreciation of the USD, stock returns increase by **0.4%**, a more realistic number!

Q: Why is economic exposure not showing up?

A: Disney has been diversifying and taking a lot of the measures discussed above to reduce economic exposure for many years. It seems to be working. ¶

• Case Study: Walt Disney Co.

According to Disney's 2006 Annual Report:

The Company utilizes *option strategies and forward contracts* that provide for the sale of foreign currencies *to hedge probable*, but not firmly committed transactions. The Company also uses *forward contracts to hedge foreign currency assets and liabilities*. The principal foreign currencies hedged are the AUD, British pound, Japanese yen and Canadian dollar. *Cross-currency swaps are used to effectively convert foreign currency denominated borrowings to USD denominated borrowings*. By policy, the Company *maintains hedge coverage between minimum and maximum percentages of its forecasted foreign exchange exposures generally for periods not to exceed five years*. The gains and losses on these contracts offset changes in the value of the related exposures.

• EE: Evidence

Using a regression like the one above for Disney, Ivanova (2014) estimates the EE for 1,231 U.S. firms. She finds that the mean β is 0.57 (a 1% USD depreciation increases returns by 0.57%). However, only 40% of the EE are statistically significant at the 5% level. In general, large firms have lower exposures (average β is 0.063).

He and Ng (1998) and Doukas et al. (2003) find that only 25% of Japanese firms have significant EE.

<u>Interesting result</u>: Ivanova reports that 52% of the EEs come from U.S. firms that have no international transactions (a higher S_t "protects" these domestic firms).

• **Observation taken from Bloomberg.com** (November 20, 2007)

(Dollar Will Weather the Whines, Jeers and Jokes: John M. Berry)

[...] As for jokes, one attempt really wasn't very funny. A cartoon by Mike Luckovich of the Atlanta Journal-Constitution reprinted in the Nov. 18 New York Times showed Treasury Secretary Henry Paulson, in the Oval Office with President George W. Bush, asking, ``Can I get paid in euros?"'

Paying in Euros

Actually, Zodiac SA, Europe's biggest maker of airplane seats, would like to get paid in euros.

Zodiac sells both to Boeing Co. and its European competitor Airbus SAS, the world's two largest manufacturers of commercial aircraft. It's hardly surprising that Boeing insists on paying its suppliers in USD. However, so does Airbus because so many of its own sales are priced in USD.

Should a Firm Hedge?

• Fundamental question: Does hedging add value to a firm?

There are two views:

(1) Modigliani-Miller Theorem (MMT): $\Rightarrow$ hedging adds no value.

(2) MMT assumptions are violated $\Rightarrow$ hedging adds value.

The MMT depends on a set of assumptions:

MM requires that a firm operates in perfect markets.

- **Hedging is Irrelevant: The MMT**

Intuition: What is the value of your car?

Example: You bought a last year car using a bank loan.

Q: Is the value of your car affected by the loan you took to pay for it?

- MMT provides a similar story to value a firm.
  - Firms make money if they make good investments.
  - The financing source of those good investments is irrelevant.
  - Different mechanisms of financing will determine how the cash flows are divided among shareholders or bondholders.

- MMT's hedging implications.

If the methods of financing and the character of financial risks do not matter, managing them is not important:

$\Rightarrow$ hedging should not add any value to a firm.

- On the contrary, since hedging is not free, hedging might reduce the value of a firm.

- MM also say that investors can diversify their portfolio of holding.

Example: Ms. Sternin holds shares of a U.S. exporting firm and shares of a U.S. importing firm. Ms. Sternin's portfolio is hedged.

A USD depreciation will negatively affect the importing firm and will positively affect the exporting firm.

Hedging at the firm level -since it is expensive- will negatively affect the value of Ms. Sternin portfolio. ¶

- **Hedging Adds Value**

Key: MMT assumptions are violated in the "real-world."

(1) Investors might not be able to replicate an optimal hedge

Sometimes firms can do a better job at hedging than individuals.

Example: Investors might not — be big enough
— have enough information

(2) Hedging as a tool to reduce the risk of bankruptcy

If cash flows are very volatile, a firm might be faced with the problem of needing cash to meet its debt obligations.

Conclusion: Firms with little debt or with good access to credit have no need to hedge.

Note: Under this view, large corporations may be wasting their capital.

(3) Hedging as a tool to reduce investment uncertainty

Firms should hedge to ensure they always have sufficient cash flow to fund their planned investment plan.

For example, an exporting firm might have cash flows problems in periods when the USD appreciates.

Example: Merk, a U.S. pharmaceutical firm, has used derivatives to ensure that investment (R&D) plans can always be financed. ¶

(4) Stable CFs to get bank financing.

(5) Herding: "Everybody else is hedging. I should hedge too; otherwise, I may not look good."

• **Do U.S. Firms Hedge?**

From a survey of the largest 250 U.S. MNCs, taken in (2001):

(1) Most of the MNCs in the survey understood translation, transactions, and economic exposure completely or substantially.

(2) A large percentage (32% - 44%) hedged themselves substantially or partially. However, a larger percentage did not cover themselves at all against transactions and economic exposure.

(3) A significant percentage of the firms' hedging decisions depended on future FX fluctuations.

(4) Over 25% of firms indicated that they used the forward hedge.

(5) The majority of the firms surveyed have a better understanding of transactions and translation exposure than of economic exposure.

• **Canadian Evidence**

The Bank of Canada conducts an annual survey of FX hedging. The main findings from the 2011 survey are:

- Companies hedge approximately 50% of their FX risk.
- Usually, hedging is for maturities of six months or less.
- Use of FX options is relatively low, mainly because of accounting rules and restrictions imposed by treasury mandate, rules or policies.
- Growing tendency for banks to pass down the cost of credit (credit valuation adjustment) to their clients.
- Exporters were reluctant to hedge because they were anticipating that the CAD would depreciate. On the other hand, importers increased both their hedging ratio and duration.