

# International Cost of Capital

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# U.S. Cost of Equity Model

$$\begin{aligned} & \text{Risk-free return } (R_f) \\ + & \text{ Equity risk premium (ERP)} \\ \underline{+/-} & \text{ Industry risk premium/discount (IRP or } \beta) \\ = & \text{ Cost of equity in diversified portfolio} \\ \underline{+} & \text{ Unsystematic risk premium (}\alpha \text{ or CSRP)} \\ = & \text{ Cost of equity} \end{aligned}$$

# International Risk Considerations

- Country equity markets and geo-political risk: Risk of volatility in fixed and equity investment returns
- Currency risk: Risk that inflation will cause currency in SuCo's economy to devalue
- Exchange rate risk: Similar to currency risk, risk that the exchange rate will be adjusted to compensate for currency inflation

# International Economics

- Global currency and interest rates fluctuate against each other
- Global economic relationships
  - Interest rate parity
  - Expectations of forward exchange rates
  - The “Fisher Effect”
  - The “International Fisher Effect”
  - Purchasing Power Parity

# Interest Rate Parity

- Difference in interest rates related to expected future exchange rates
- $\%$  difference between risk free rates =  $\%$  difference between the forward and spot exchange rates

# Interest Rate Parity

## Example:

- 1.00 USD = 13.20 Mexican Peso (MP)
- U.S. government debt interest rate = 2.4%
- Mexican government debt interest rate = 5.9%
- Mexican Peso to USD forward exchange rate  
 $(1.059 \div 1.024) \times 13.20 \text{ MP} = 13.65 \text{ MP}$

# Future Currency Expectations

- Given the interest rates above, expected currencies in one year:

$$\text{Mexico: } 13.20 \text{ MP} \times 1.059 = 13.970 \text{ MP}$$

$$\text{U.S.: } 1.00 \text{ USD} \times 1.024 = 1.024 \text{ USD}$$

- Spot rate in one year:

$$13.979 \text{ MP} \div 1.024 \text{ USD} = 13.65 \text{ MP}$$

# The Fisher Effect

- Government debt interest rate has two components
  - Real rate of return
  - Inflation
- Components are multiplicative not additive



# The Fisher Effect

- Example:
  - Real rate = 3.0%
  - Inflation = 2.5%
  - Nominal rate =  $1.030 \times 1.025 = 1.056$  or 5.6%
- Example
  - Nominal rate = 6.0%
  - Inflation = 2.5%
  - Real rate =  $1.060 \div 1.025 = 1.034$  or 3.4%

# The International Fisher Effect

- Real rate of interest is based on demand and supply of capital
- In optimal, completely efficient global market, there would be a single real rate of interest
- Therefore, difference in nominal interest rates must reflect difference in inflation rate
- Currency in country with high inflation will devalue against currency in country with low inflation

# Purchasing Power Parity

- Global product/service price equality
- Cost of product/service increases faster in country with high inflation
- fx will adjust to compensate

# Purchasing Power Parity

- Example:
  - iPhone 5 costs 500 USD or 6,600 MP (13.20 fx)
  - U.S. inflation = 2.5%; Mexican inflation = 4.0%
  - 1 year later, iPhone 5 costs 6,864 MP (6,600 x 1.04)
  - However, fx changes to 13.41:  
$$6,864 \text{ MP} \div (500 \times 1.025) = 13.41 \text{ MP/USD}$$
  - Phone cost in USD inflated only 2.5%:  
$$6,864 \text{ MP} \div 13.41 \text{ MP/USD} = 512.50 \text{ USD}$$

# Relevance to Valuation?

- Provides insight to
  - Varying inflation rates
  - Effect of inflation on future currency values
  - How economies might respond to changes

# Relevance to Valuation?

- Example:
  - Fair market value = 3.30 million Mexican Pesos
  - At 13.20 fx, fair market value = 0.25 million USD
- Has the currency exchange risk been properly addressed?
- It depends on the discount rate used

# Perspective of Valuation

- In what currency will the valuation be expressed?
- From what country(ies) does the SuCo generate cash flow?
- **The currency of the cash flows must correlate with the currency of the discount rate**

# Perspective of Valuation

- SuCo operates in a developed economy (e.g., U.S.); client wants valuation expressed in Euros
  - Cash flows in Euros
  - Discount rate based on German economic and market variables ( $Rf_G$ ,  $ERP_G$ ,  $\beta_G$ )



# Perspective of Valuation

- SuCo operates in a developing economy (e.g., Poland); but client wants valuation expressed in Euros
  - Cash flows in Euros
  - Discount rate based on German economic and market variables ( $Rf_G$ ,  $ERP_G$ ,  $\beta_G$ )
  - Additional adjustment for country risk and for currency exchange risk between the Euro and the Zloty

# Perspective of Valuation

- SuCo operates in Poland and wants valuation expressed in Zloty
  - Cash flows in Zloty
  - Discount rate based on Polish economic metrics
  - With no developed market, Polish economic metrics must be based on developed economy and adjusted for Polish economic metrics
  - $ERP_p$  &  $\beta_p$  are functions of  $ERP_G$  &  $\beta_G$

# Adjustment for Currency Risk

- Currency risk = inflation and fx volatility

$$K_L = \left\{ [1 + K_{DE}] \left( \frac{(1 + \text{Inflation}_L)}{(1 + \text{Inflation}_{DE})} \right) \right\}^{-1}$$

Where:

$K_L$  = Discount rate for local equity capital

$K_{DE}$  = Discount rate for equity capital in a developed economy

$\text{Inflation}_L$  = Inflation rate in local country

$\text{Inflation}_{DE}$  = Inflation rate in the developed economy

# Adjustment for Currency Risk

- Example:
  - 15.0%  $k_e$  derived from U.S. economy
  - 2.5% U.S. inflation rate
  - 4.0% Mexican inflation rate
  - $k_e$  to be used with cash flows in Pesos

$$k_e (\text{Mexico}) = \{[1 + 0.15] \times [(1 + 0.040) \div (1 + 0.025)]\} - 1$$
$$= 16.7\%$$

# Analysis of Country Risk

- Country risk
  - Political
  - Economic
  - Financial

# Country Political Risk

- Changes in political leadership
- External conflicts
- Government corruption
- Role of military
- Role of organized religion
- Expropriation of private investment
- Existence of middle class

# Country Political Risk

- Subjective assessment
- PRS Group ([www.PRSGroup.com](http://www.PRSGroup.com))
  - “Political Risk Services Model” for assessing and forecasting political and country risk
  - “International Country Risk Guide” – ratings of countries by risk
  - Very expensive

# Country Economic Risk

- Observations of relative economic risk
  - Inflation
  - Sovereign debt % of GDP
  - Real GDP growth
  - Exchange rate
  - Net export/import balance
  - Current account balance



# Country Financial Risk

- Observations of relative financial risk
  - National debt volatility
  - Equity market volatility
  - Loan default rates
  - fx losses

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# Measuring Country Risk

- Country bond default spreads
  - Sovereign debt yield from undeveloped economy minus that of developed economy
    - U.S. denominated bond yield in Mexico = 4.1%
    - U.S. treasury yield = 2.4%
    - Mexico country risk premium = 1.7%
    - Does not address volatility of equity market
    - Possible high volatility of yields in Mexico

# Measuring Country Risk

- Relative equity market volatility

$$ERP_x = ERP_z * RSD_x$$

Where:

$ERP_x$  = ERP in Country X

$ERP_z$  = ERP in developed Country Z

$RSD_x$  = Relative Standard Deviation of Country X equity market to Country Z equity market

# Measuring Country Risk

- Example

Std Dev of Mexican market = 2.05%

Std Dev of U.S. market = 1.75%

$$RSD_{\text{Mex}} = 2.05\% \div 1.75\% = 1.17x$$

$$ERP_{\text{US}} = 5.0\%$$

$$ERP_{\text{Mex}} = 5.0\% \times 1.17 = 5.9\%$$

# Measuring Country Risk

- Problems
  - Illiquid markets may reflect low volatility
  - Inconsistency in currencies; doesn't account for exchange risk

# Measuring Country Risk

- Default Spread + Relative Standard Deviation
  - Combines the measure of risk of default with volatility of equity market

$$ERP_{\text{Mex}} = ERP_{\text{US}} + [\text{CDS}_{\text{Mex}} * (\sigma_E \div \sigma_B)]$$

Where:

$ERP_{\text{US}}$  = ERP in U.S.

$\text{CDS}_{\text{Mex}}$  = Mexico country default spread

$\sigma_E$  = Std dev of Mexican equity market

$\sigma_B$  = Std dev of Mexican gov't bond market

# Measuring Country Risk

- Example:

- $ERP_{US} = 5.0\%$
- $CDS_{Mex} = 1.7\%$
- $STDEV_E = 2.05\%$
- $STDEV_B = 3.02\%$

$$ERPMex = 5.0\% + [1.7\% * (2.05\% \div 3.02\%)]$$
$$= 6.2\%$$



# Measuring Country Risk

- Damodaran Country Risk Premiums
  - Uses variations of the default spread and relative volatility methods
  - Updated annually
  - <http://www.stern.nyu.edu/~adamodar/pc/datasets/ctryprem.xls>

# Measuring Country Risk

- Damodaran Country Risk Premiums

	Country Risk Premium
U.S.	0.0%
United Kingdom	0.0%
Canada	0.0%
Germany	0.0%
Mexico	1.7%
Russia	7.6%
Jamaica	16.3%

# Application of Country Risk Premium

- Can country risk be diversified away?
  - Perspective of the market participant

# Developing Cost of Equity

- Local country CAPM
  - Must have diversified, active, and liquid equity market
  - Use  $R_f$ , ERP, and  $\beta$  from that country
  - May not apply for undeveloped countries

# Developing Cost of Equity

- International CAPM Method

$$k_L = R_{f-L} + \beta_{SC} * (ERP_W) + \text{alpha}$$

Where:

$k_L$  = Cost of equity of local company

$R_{f-L}$  = Local government bond yield

$\beta_{SC}$  = SuCo beta in Mexican market

$ERP_W$  = ERP of world =  $ERP_{DE} \div \beta_{DE}$

$ERP_{DE}$  = ERP of developed economy (e.g., U.S.)

$\beta_{DE}$  = Beta of developed economy to world

# Developing Cost of Equity

- Country (Default) Spread Method

$$k_L = R_{f-US} + CDS + \beta_{US} * (ERP_{US}) + \text{alpha}$$

Where:

- $k_L$  = Cost of equity of local company
- $R_{f-US}$  = U.S. Treasury yield
- CDS = Country default spread: difference between yield of \$-denominated local government bonds and  $R_{f-US}$
- $\beta_{US}$  = SuCo beta in US market
- $ERP_{US}$  = ERP of US Market

# Developing Cost of Equity

- Relative Standard Deviation Model

$$k_L = R_{f-US} + [(\sigma_L \div \sigma_{US}) * (ERP_{US})] + \text{alpha}$$

Where:

- $k_L$  = Cost of equity of Mexican company
- $R_{f-US}$  = U.S. Treasury yield
- $\sigma_L$  = Standard deviation of equity returns in local equity market
- $\sigma_{US}$  = Standard deviation of equity returns in US equity market
- $ERP_{US}$  = ERP of US Market

# Developing Cost of Equity

- Damodaran Model

$$k_L = R_{f-US} + (\beta_{US} * ERP_{US}) + \lambda(CRP)$$

Where:

- $k_L$  = Cost of equity of Mexican company
- $R_{f-US}$  = U.S. Treasury yield
- $\beta_{US}$  = Beta of company in U.S. equity market
- $ERP_{US}$  = ERP of US Market
- $\lambda$  = Exposure to local country risk
- CRP = Country risk premium



# Resources

- Political risk data sources
  - Country Forecasts by Political Risk Services
    - <http://www.prsgroup.com>
  - Institutional Investor
    - <http://www.institutionalinvestor.com>
  - Standard and Poor's
    - <http://www.StandardAndPoors.com>
  - Moody's Investors Services
    - <http://www.Moodys.com>

# Resources

- International Cost of Capital
  - Credit Suisse: <https://publications.credit-suisse.com>
  - NYU Professor Aswath Damodaran: <http://pages.stern.nyu.edu/~adamodar/>
  - Interest Rate Data
    - *The Economist*: <http://www.Economist.com>
    - *Financial Times* (International Capital Markets): <http://markets.ft.com/RESEARCH/Markets/Interest-Rates>

# QUESTIONS?

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