The Cost of Capital in Europe
Theory, Practice and Examples

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Henk Oosterhout is Managing Director in the Amsterdam office, part of Valuation Advisory Services.

Henk has been involved in valuation engagements covering a wide variety of industries, including technology, information, communication and entertainment, consumer products, industrial products, energy and financial services. His engagement highlights include performing purchase price allocations and goodwill impairment testing for large listed companies, regulation support for energy and telecom clients and analysis, strategy, funding and mergers and acquisitions (M&A)-driven support.

Prior to Duff & Phelps, Henk was a managing director at Standard & Poor's Corporate Value Consulting in September 2003. His past experience includes valuation services and strategy/M&A consulting within the Corporate Finance group of PricewaterhouseCoopers where was responsible for setting up a sub-practice regarding valuations for financial reporting purposes. In addition, he ran the Telecom, Media and Technology industry team. Henk spent time teaching and researching corporate control and corporate governance topics. He was also an assistant professor of corporate finance at Tilburg University in the Netherlands and a visiting professor at the J.L. Kellogg Graduate School of Management at Northwestern University.

Henk received his M.B.A. in operations research/econometrics and his Ph.D. in corporate finance from Tilburg University in the Netherlands. Some of Henk's published articles include:

- Takeover barriers: the good, the bad, and the ugly, November 29, 1996, PhD. Thesis, Tilburg University

- Corporate governance: wie neemt het voortouw?, February 1997, Het Financieele Dagblad

- Chapter 5 in the book 'Financiering en macht: van financiele structuur tot beheersstructuur' edited by A.W.A Boot and P.A. Verheyen, 1997, Kluwer Bedrijfsinformatie, 135-168

- Discussie corporate governance - Tussen concurrentie en zeggenschap, March 1998, Zeggenschap, 45-47

- Achteruitkijkspiegel van bedrijf werkt anticiperend, May 2004, Het Financieele Dagblad

- Europa niet rijp voor ABN-verkoop, August 2007, Het Financieele Dagblad

About Duff & Phelps

Duff & Phelps is the premier global valuation and corporate finance advisor with expertise in complex valuation, disputes and investigations, M&A, real estate, restructuring, and compliance and regulatory consulting. The firm's more than 2,000 employees serve a diverse range of clients from offices around the world. For more information, visit   .

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Topics

- Cost of Capital: the concept

- Are country risks real? The Brexit

- Impact of Currency on the Discount Rate and Valuation

- Volatile risk-free rates: what to do?

- The Market Risk Premium

- Which International Cost of Equity Model Should I Use?

- Questions

Cost of Capital: the concept

Cost of Capital: weighting K_e and K_d and… more

$$K_e = R_f + \beta \times ERP + CRP/SSP$$

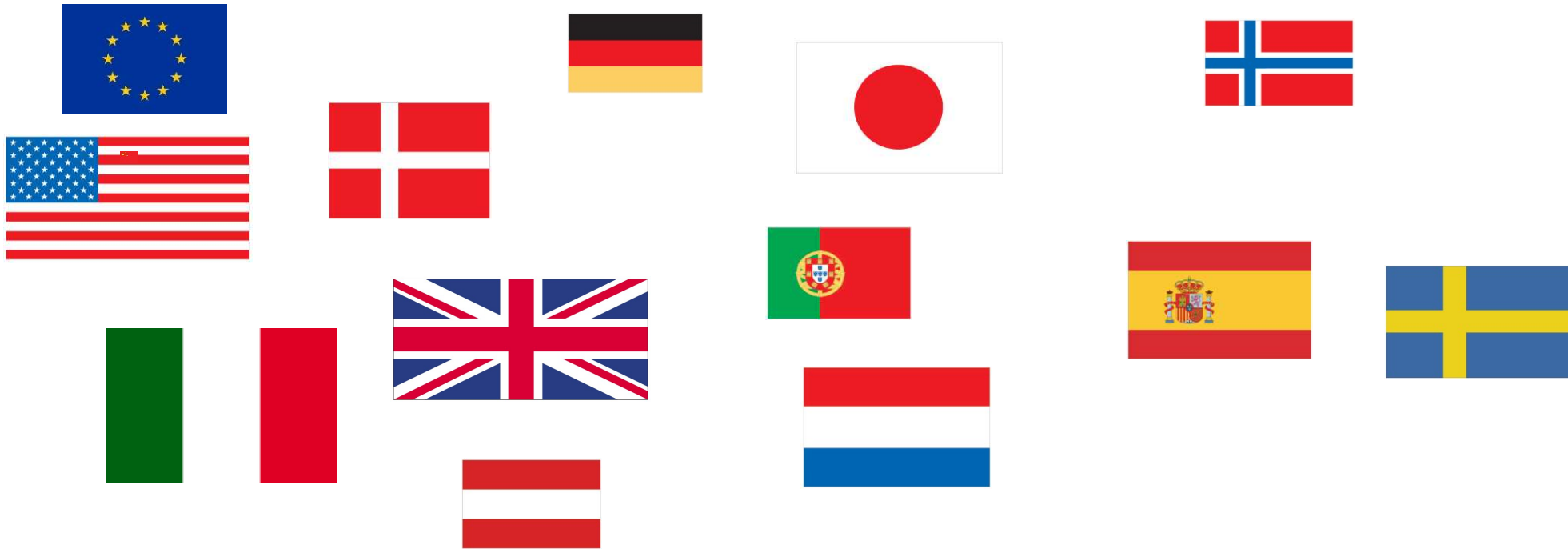| Relevant Considerations	
Weights: Market Value Based	Operational vs. Non-Operational
Duration of cash flows	Levered vs. Unlevered Beta
Other types of funding	Minority interest: market value

$$K_d = \left[R_f + spread \right] \times \left[1 - Tax\ Rate \right]$$

Are Country Risks Real?
The Brexit

Are country risks real?

" *I know how to value a company in the United States, but this one is in Europe, with Euro currency*

…what should I use for a discount rate? "

Are country risks real?

"Measuring the impact of country risk is one of most vexing issues in finance, particularly in emerging markets, where political and other country-specific risks can significantly change the dynamics of the project. *It is absolutely essential to incorporate these risks into either the expected cash flows or the discount rate.*"
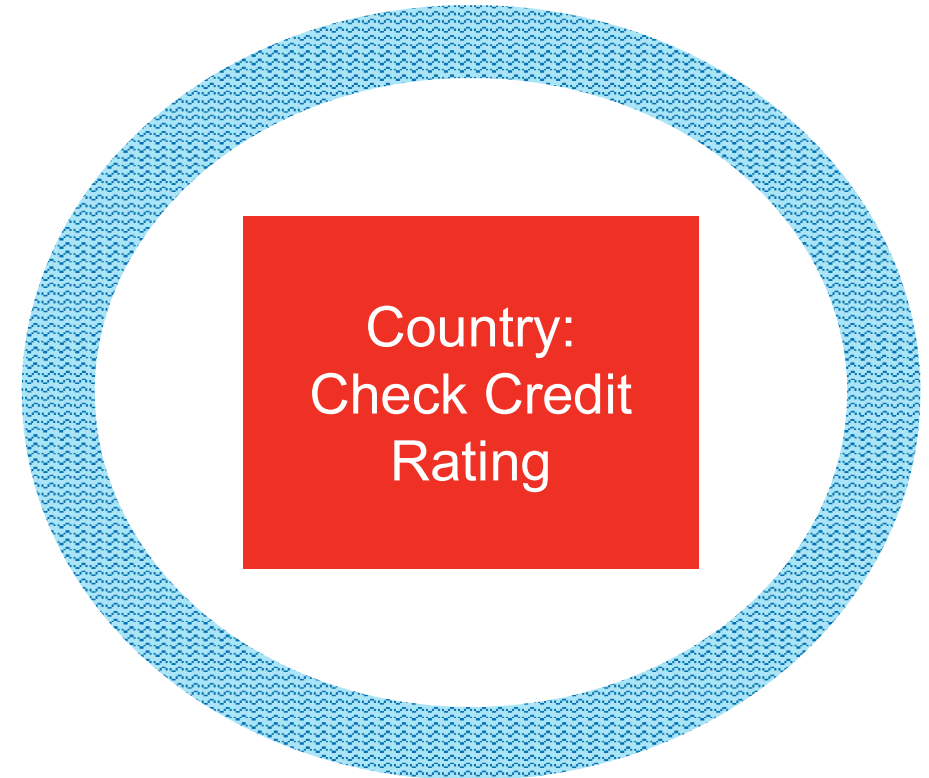
– Campbell R. Harvey, Professor of International Business at the Fuqua School of Business, Duke University

Are country risks real?

Characteristics

- Regulations that restrict foreign investment

- Taxation differences

- Legal factors

- Information

- Trading costs

- Physical barriers

Country:
Check Credit
Rating

# Risks typically associated with international investment

These risks may include:

- Political Risks

- Financial Risks

- Economic Risks

Each of these risks is a problem for the discount rate only to the extent that it is non-diversifiable from the perspective of the investor, which is often the case. Not all capital markets are mature.

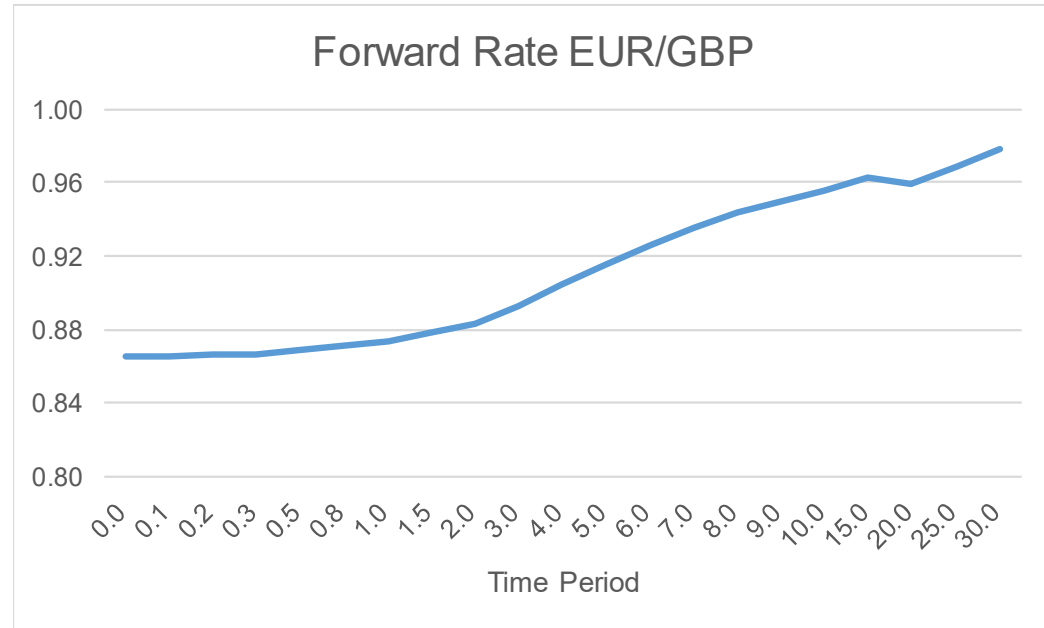# Country Risk Premium: the Brexit – June 23, 2016
Reaction 1: direct depreciation
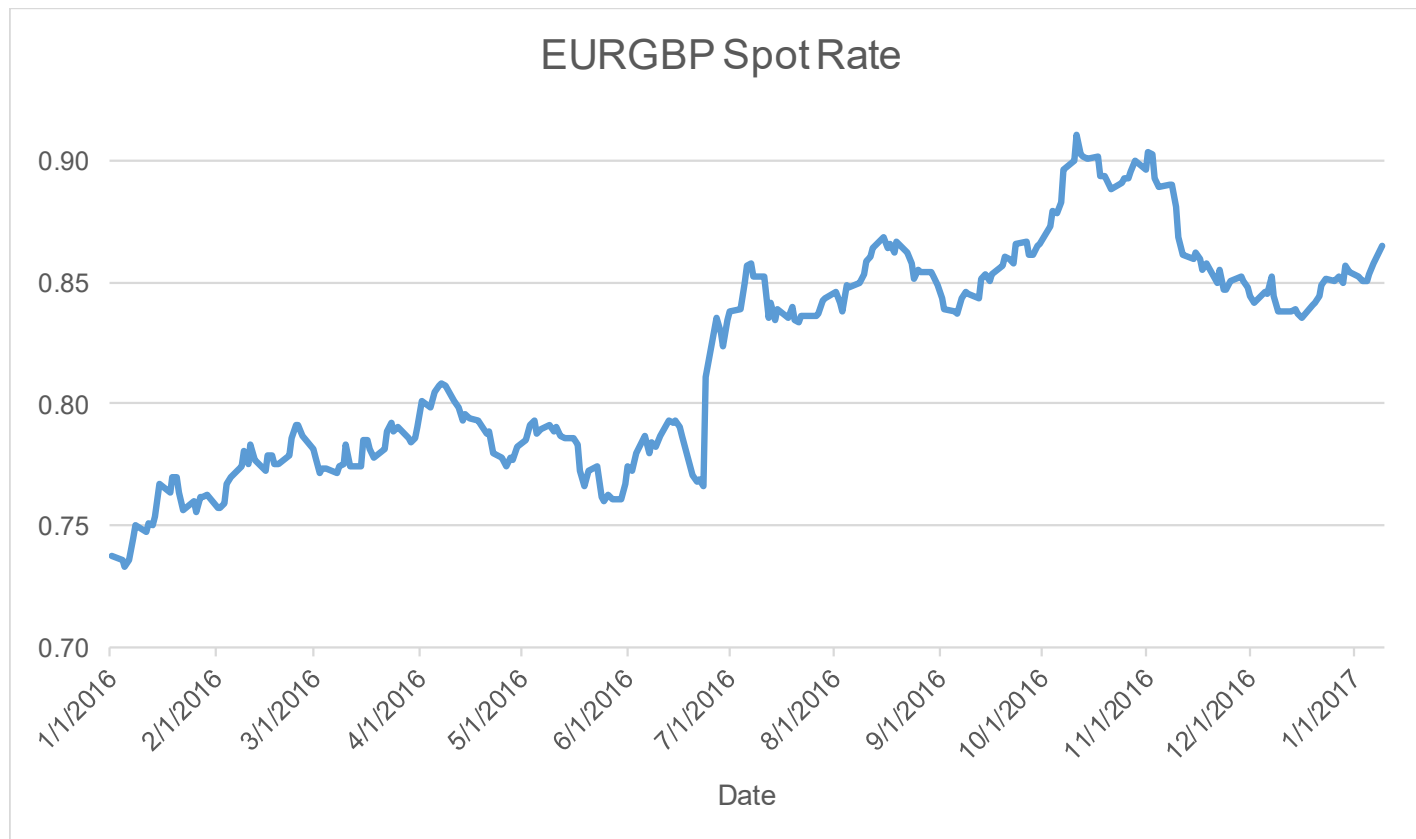
EURGBP Spot Rate

Country Risk Premium: the Brexit – June 23, 2016
Reaction 2: more depreciation expected

Maturity	Forward Rate EUR/GBP
Spot Rate	0.865
1M	0.866
2M	0.866
3M	0.867
6M	0.869
9M	0.871
1Y	0.873
18M	0.879
2Y	0.883
3Y	0.893
4Y	0.904
5Y	0.915
6Y	0.926
7Y	0.935
8Y	0.944
9Y	0.950
10Y	0.955
15Y	0.963
20Y	0.959
25Y	0.969
30Y	0.978

Forward Rate EUR/GBP

Country Risk Premium: the Brexit – June 23, 2016
But: was there already a CRP?

EUR vs GBP Risk Free Rate

Legend:
- Germany BFV Strips 15y
- BFV GBP UK Gilts 15y
- German BFV Strips Moving Average (1502 days)
- BFV GBP UK Gilts Moving Average (1502 days)
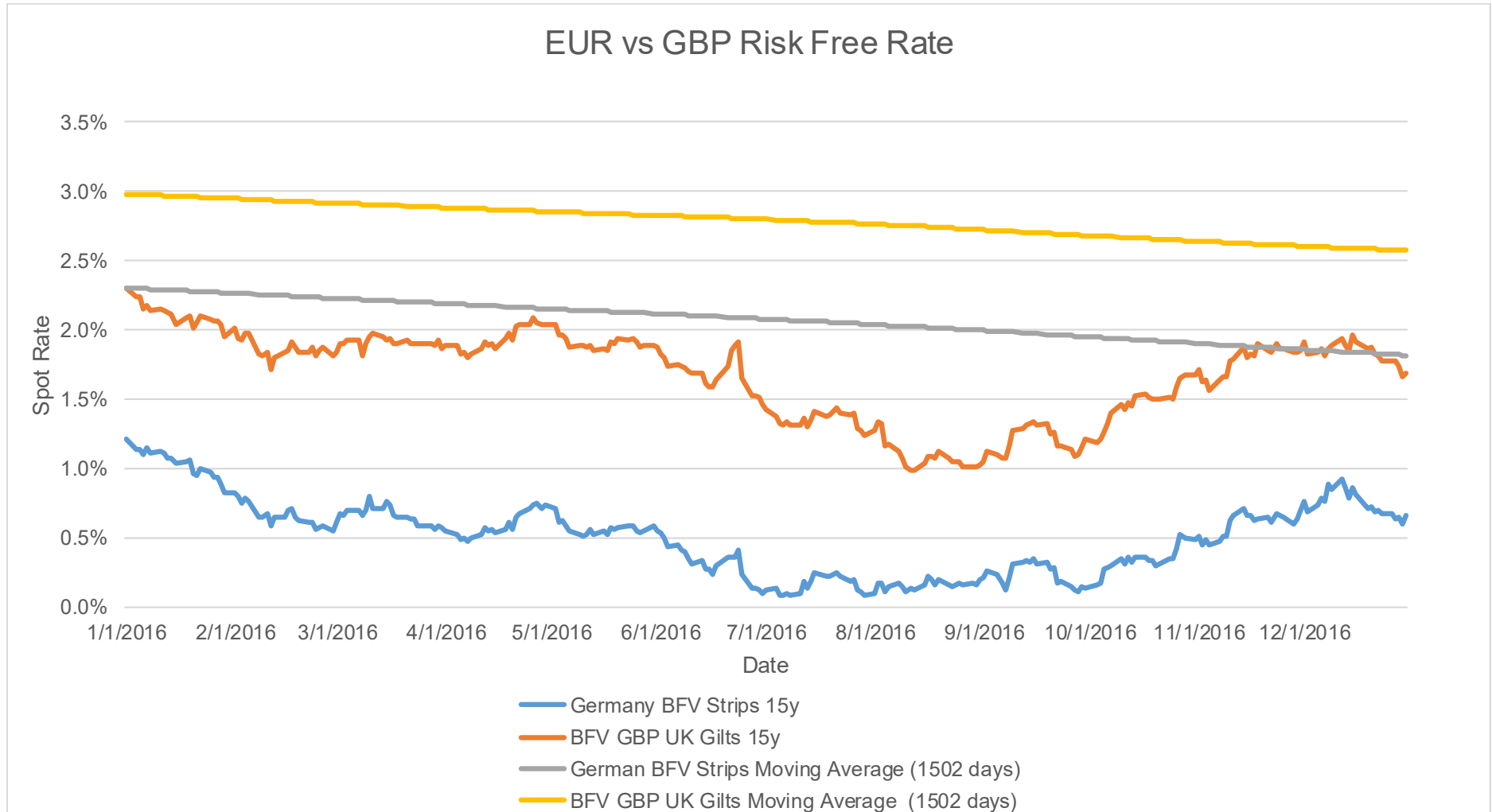
Country Risk Premium: an overview of Europe

Country	Region	D&P Implied CRP
Albania	Central and Eastern Europe	3.60%
Austria	Western Europe	0.40%
Belarus	Central and Eastern Europe	7.80%
Belgium	Western Europe	0.60%
Bosnia & Herzegovina	Central and Eastern Europe	6.20%
Bulgaria	Central and Eastern Europe	2.70%
Croatia	Central and Eastern Europe	3.10%
Cyprus	Central and Eastern Europe	3.60%
Czech Republic	Central and Eastern Europe	0.60%
Denmark	Western Europe	0.00%
Estonia	Central and Eastern Europe	0.50%
Finland	Western Europe	0.20%
France	Western Europe	0.60%
Georgia	Central and Eastern Europe	4.00%
Germany	Western Europe	0.00%
Greece	Western Europe	9.20%
Hungary	Central and Eastern Europe	0.90%
Iceland	Western Europe	1.00%
Ireland	Western Europe	0.80%
Italy	Western Europe	1.80%
Kyrgyz Republic	Central and Eastern Europe	6.20%
Latvia	Central and Eastern Europe	0.70%

Country	Region	D&P Implied CRP
Liechtenstein	Western Europe	0.00%
Lithuania	Central and Eastern Europe	0.80%
Luxembourg	Western Europe	0.00%
Macedonia	Central and Eastern Europe	4.80%
Malta	Western Europe	1.70%
Moldova	Central and Eastern Europe	7.80%
Montenegro	Central and Eastern Europe	4.70%
Netherlands	Western Europe	0.00%
Norway	Western Europe	0.00%
Poland	Central and Eastern Europe	1.40%
Portugal	Western Europe	3.90%
Romania	Central and Eastern Europe	2.70%
Russia	Central and Eastern Europe	1.50%
Serbia	Central and Eastern Europe	4.30%
Slovakia	Central and Eastern Europe	0.30%
Slovenia	Central and Eastern Europe	1.40%
Spain	Western Europe	1.60%
Sweden	Western Europe	0.00%
Switzerland	Western Europe	0.00%
Tajikistan	Central and Eastern Europe	15.50%
Turkey	Central and Eastern Europe	3.50%
United Kingdom	Western Europe	0.40%

Impact of Currency on the Discount Rate and Valuation

Country Risk Decision Tree – Part 1

Is Subject Company Exposed to Country Risk?

No ──→ **No CRP**

Yes (Alt. 2) | **Yes (Alt. 1)**

Alternative 2: Reflect Country Risk in WACC

Cash Flows: USD or EUR?

Yes ──→ **Compute WACC in USD/ EUR using available models to quantify CRP**

No ──→ **Compute WACC in USD/ EUR using available models to quantify CRP**

If LC needed, then **Translate WACC into Foreign (local) currency using International Fisher Effect.**

Alternative 1: Use Scenario Analysis

Reflect CRP in Cash Flows

No CRP in WACC

Incorporating Country Risk in a DCF Valuation

Scenario Approach

Strengths

- Some country risks are diversifiable

- Many country risks apply unequally to companies in a given country

- Analytically robust and insightful

Weaknesses

- Difficulty in estimating downside probability factors and scenarios

- Time consuming and costly to produce

Incorporating Country Risk in a DCF Valuation

Country Risk Premium Approach

Strengths

- Commonly used

- Data Availability

  (D&P estimates CRPs for over 180 countries quarterly)

- Choice of multiple indications

- Time and cost effective

Weaknesses

- Lack of consensus on estimation method

- Risk can be under or overestimated

- CRP impacts the entire forecast

Impact of Currency on the Discount Rate and Valuation

A common ERROR: mixing currencies.

Corporate finance theory tells us the currency used to project cash flows must be consistent with the currency of the discount rate.

This means that the inputs used to derive a discount rate (in the denominator) should be in the same currency used to project cash flows (in the numerator):

$$\frac{\$ \text{ USD Cash Flows (in the numerator)}}{\$ \text{ USD Discount Rate (in the denominator)}}$$

Impact of Currency on the Discount Rate and Valuation

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$$\frac{€\ EUR\ Cash\ Flows\ (in\ the\ numerator)}{€\ EUR\ Discount\ Rate\ (in\ the\ denominator)}$$

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This means that the inputs used to derive a discount rate (in the denominator) should be in the <u>same currency</u> used to project cash flows (in the numerator):

$$\frac{\text{£ GBP Cash Flows (in the numerator)}}{\text{£ GBP Discount Rate (in the denominator)}}$$

Etc.

Impact of Currency on the Discount Rate and Valuation

Method 1: Convert cash flows at a forecast exchange rate

Forecast Cash Flows in Local (Foreign) Currency	→	Convert to Home Currency Using <u>Forecast</u> Exchange Rate	→	Discount at a Home Currency WACC (or CoE)

Method 2: Perform valuation in local currency

Forecast Cash Flows in Local (Foreign) Currency	→	Discount at a Local (Foreign) Currency WACC (or CoE)	→	Convert to Home Currency Using <u>Spot</u> Exchange Rate

Impact of Currency on the Discount Rate and Valuation

What if the valuation <u>must</u> be performed in local currency….

….but local WACC inputs are not available or are unreliable??
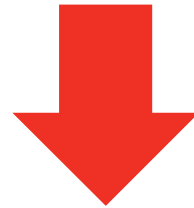
First:
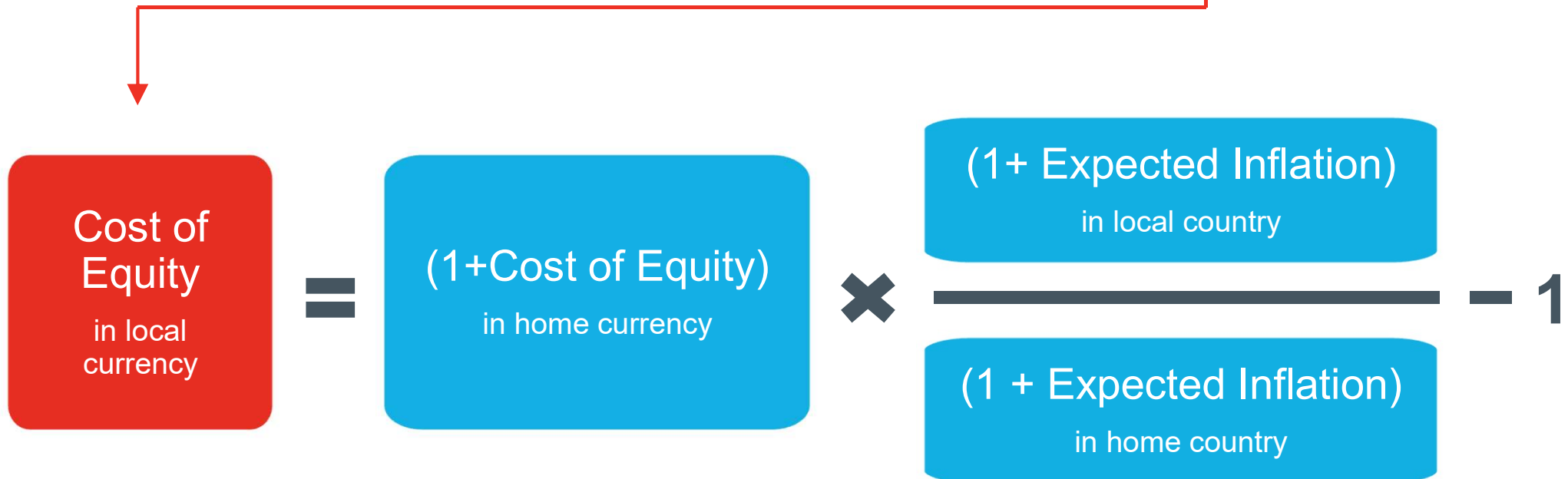Compute discount rate in the home or mature market currency (e.g., USD, EUR)
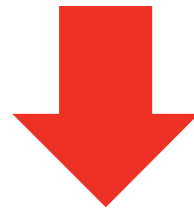
And then:
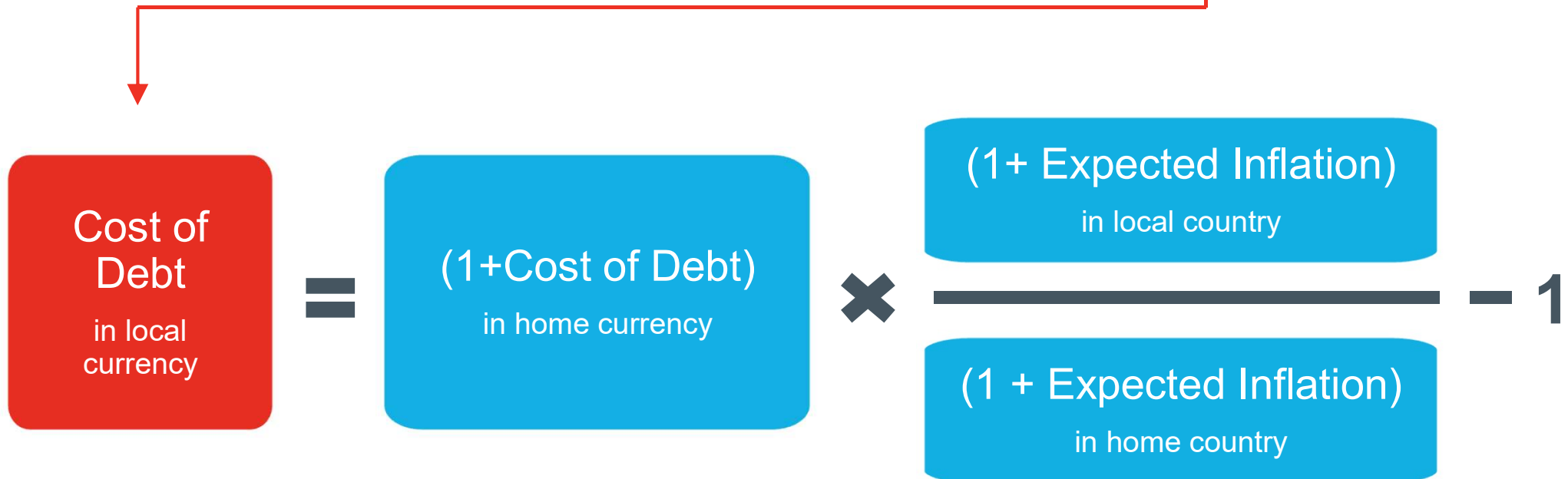Translate discount rate into the local currency using "International Fisher Effect"

Impact of Currency on the Discount Rate and Valuation

Applying the International Fisher Effect: Cost of Equity

$$\text{Cost of Equity in local currency} = (1 + \text{Cost of Equity in home currency}) \times \frac{(1 + \text{Expected Inflation in local country})}{(1 + \text{Expected Inflation in home country})} - 1$$

Impact of Currency on the Discount Rate and Valuation

Applying the International Fisher Effect: Cost of Debt

$$\text{Cost of Debt in local currency} = (1 + \text{Cost of Debt}) \text{ in home currency} \times \frac{(1 + \text{Expected Inflation}) \text{ in local country}}{(1 + \text{Expected Inflation}) \text{ in home country}} - 1$$

Impact of Currency on the Discount Rate and Valuation

Method 2 Preferred: perform valuation in local currency

Forecast Cash Flows in Local (Foreign) Currency	➡	Discount at a Local (Foreign) Currency WACC (or CoE)	➡	Convert to Home Currency Using <u>Spot</u> Exchange Rate

Potential Extra Issue: No reliable inputs for, e.g., Brazil ERP, risk-free rate, etc.

Solution: Calculate WACC in USD or EUR and translate into BRL using the International Fisher Effect (inflation differential)

Volatile risk-free rates: what to do?

Volatile parameters: use a moving average

RFR & Volatility Development

Legend: - - - Vol Yield 10-year Gov Bonds — Normalization Period — 10Y Spot Rate — 57 Month Average 10Y Rate
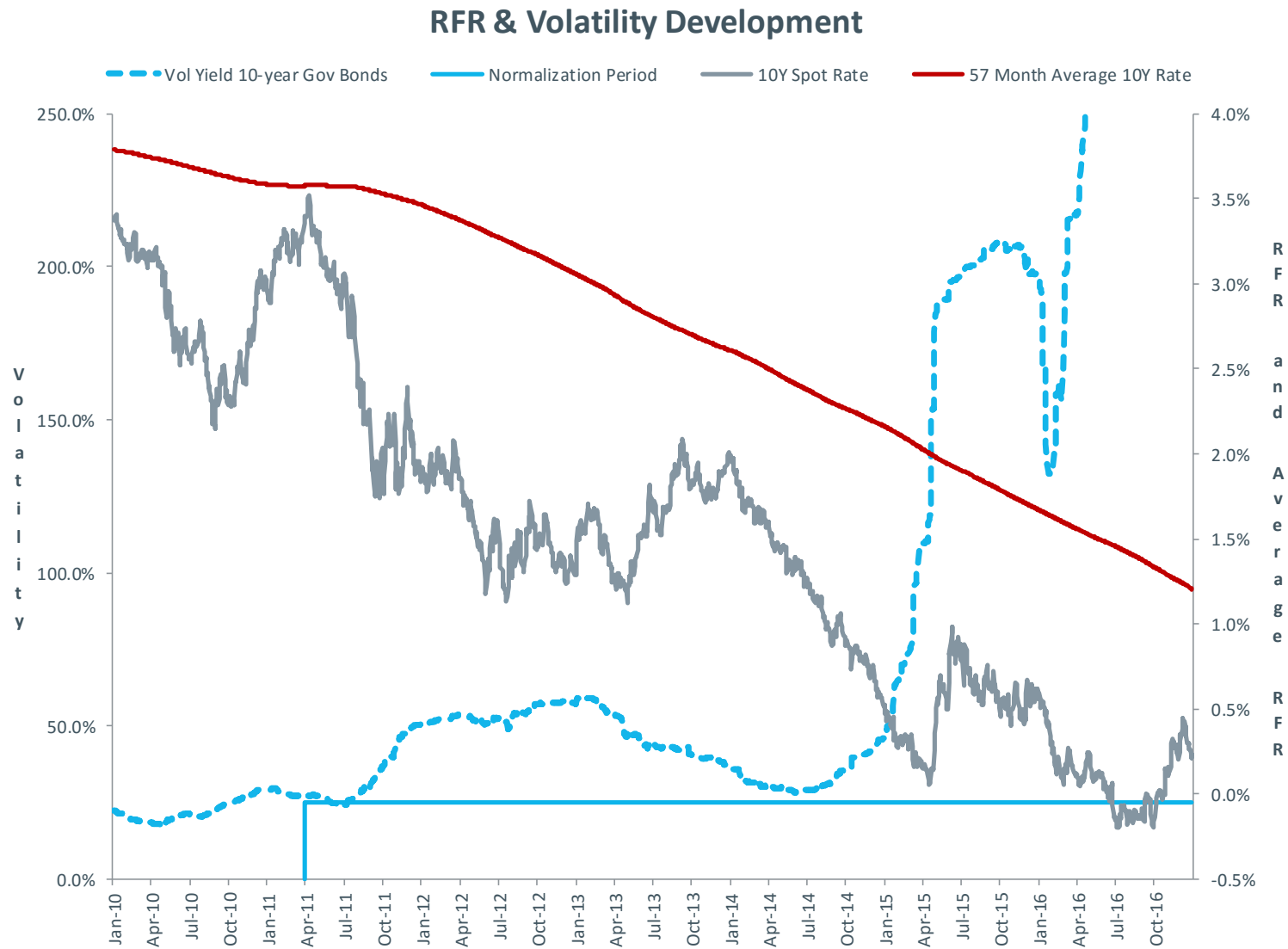
Volatile parameters: is the trend your friend?

Spot RFR versus Historical Averages

—— 10Y Spot Rate —— 6 yr
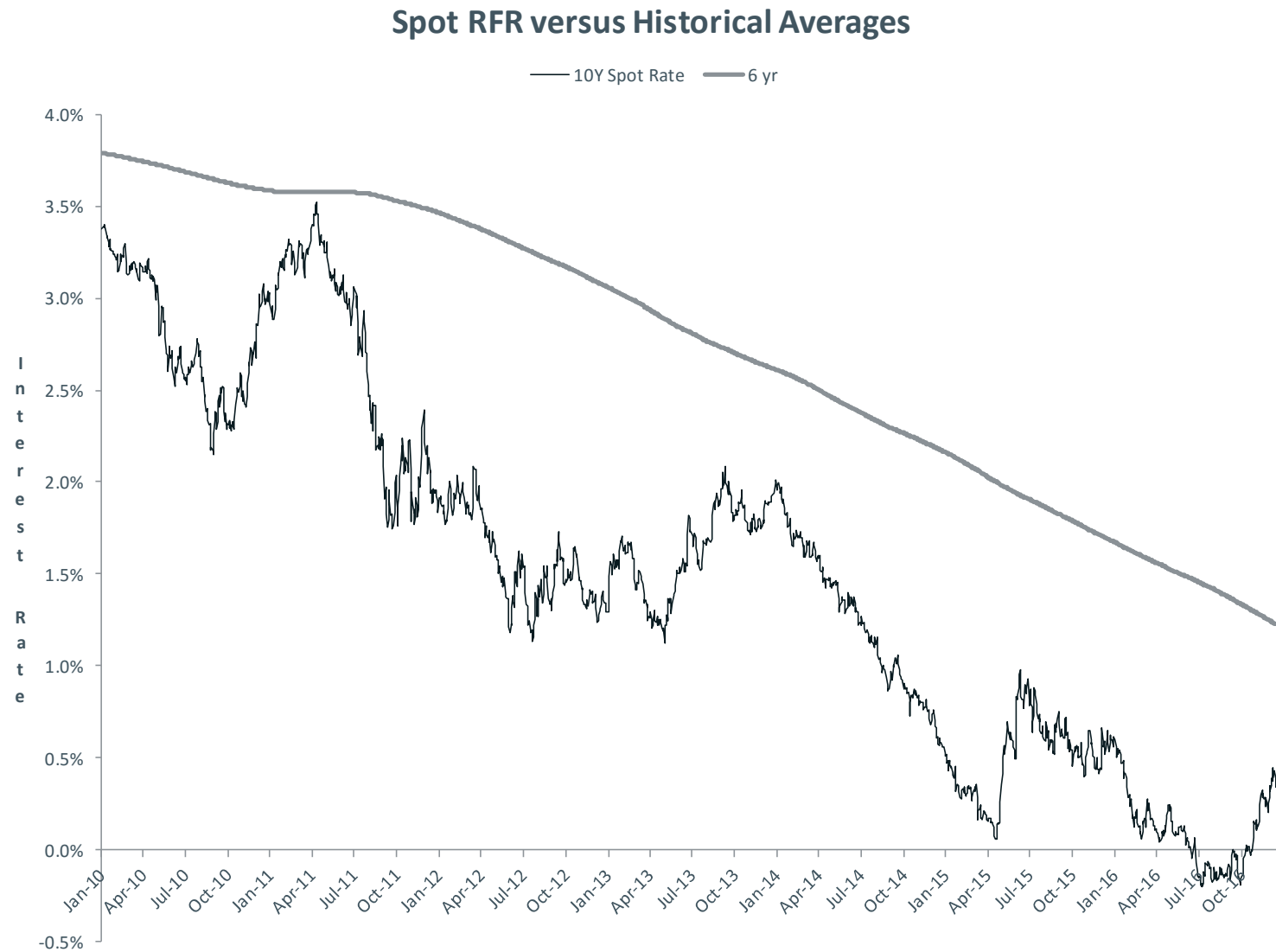
The Equity / Market Risk Premium

Implied EMRP: derive risk-aversion from market

EMRP on the basis of DD Model
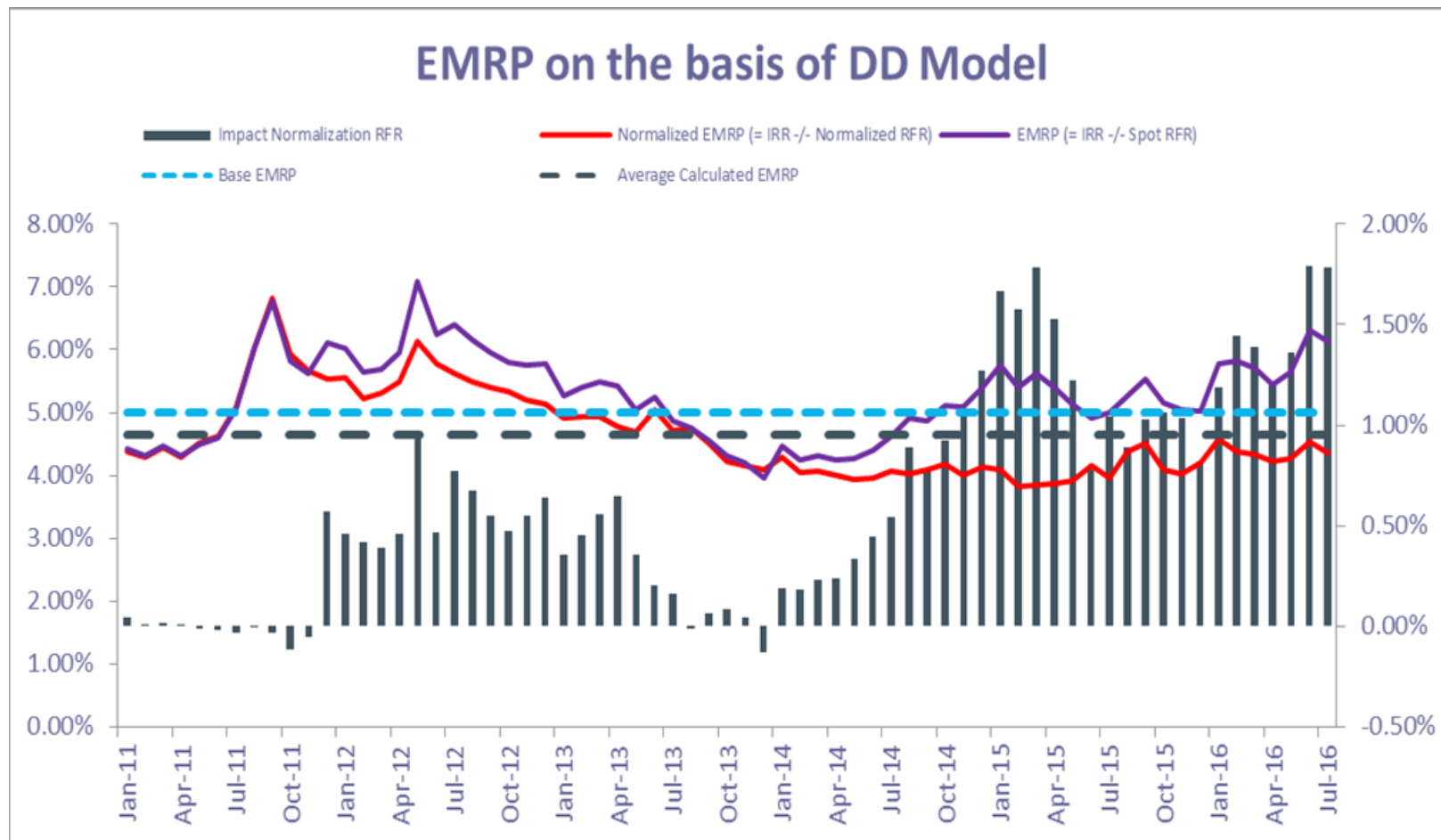
Market development: decrease in risk-aversion

Market Multiples
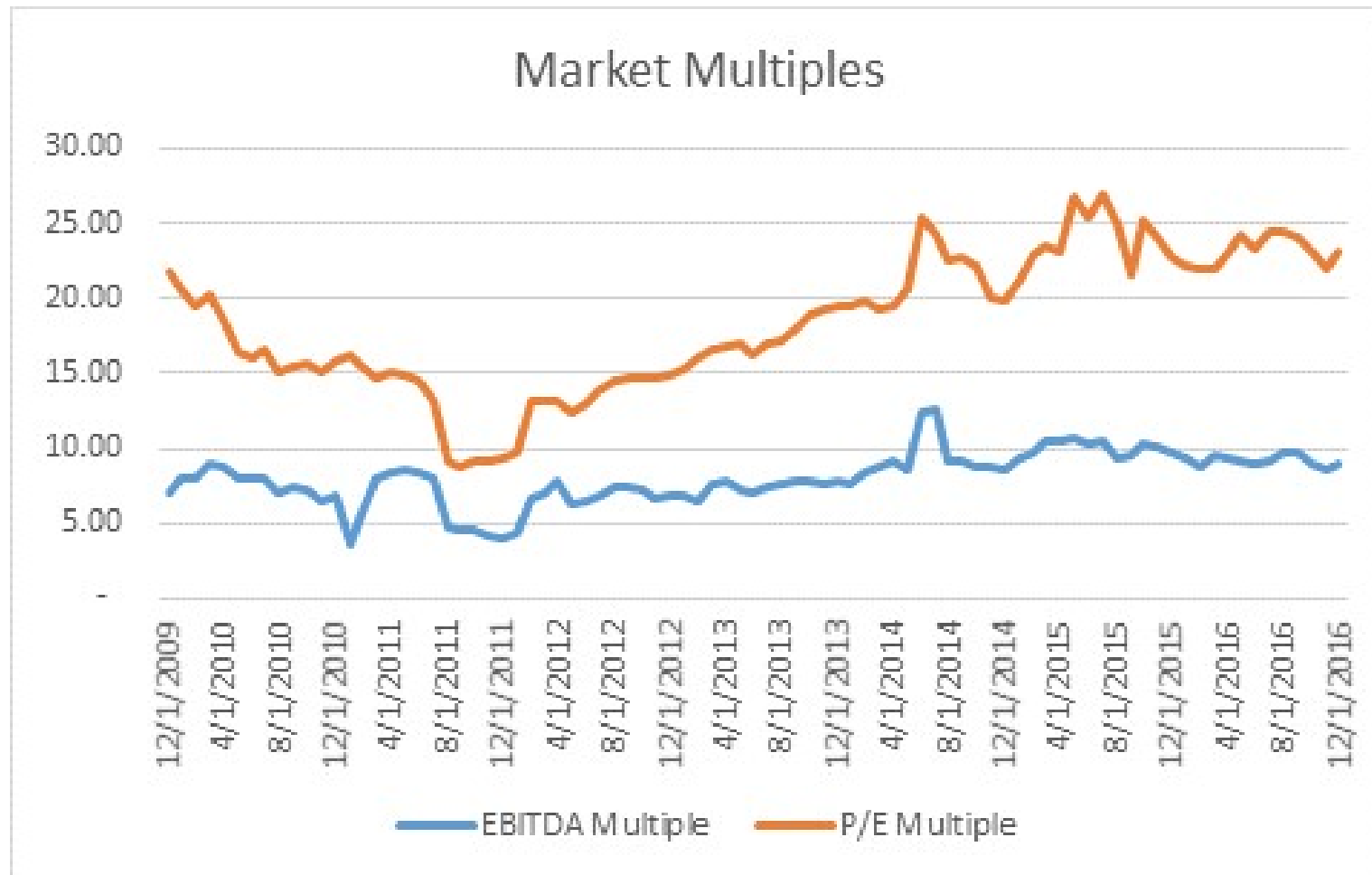
Implied EMRP: is the market getting abnormal?
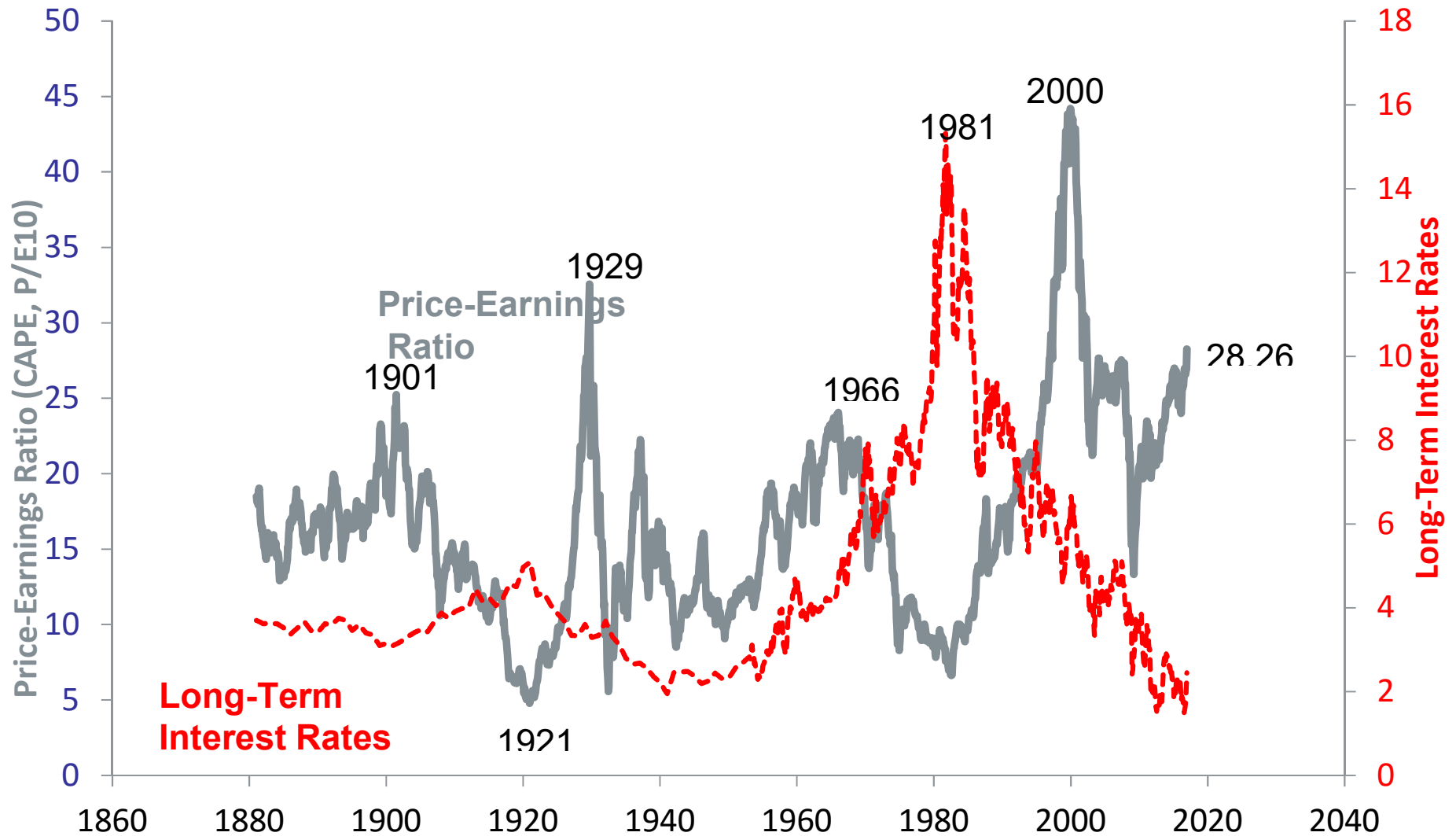
Small Stock Premium: still US data based

Size Premia (market capitalizations USD in millions)

Decile	Smallest Company	Largest Company	Size Premium (Return in Excess of CAPM)
Mid-Cap (3-5)	2,090.566	9,611.187	1.00%
Low-Cap (6-8)	448.502	2,083.642	1.70%
Micro-Cap (9-10)	1.963	448.079	3.58%
Breakdown of Deciles 1-10			
1-Largest	22,035.313	629,010.254	-0.36%
2	9,618.053	21,809.433	0.57%
3	5,205.841	9,611.187	0.86%
4	3,195.898	5,199.952	0.99%
5	2,090.566	3,187.480	1.49%
6	1,400.931	2,083.642	1.63%
7	845.509	1,400.208	1.62%
8	448.502	844.475	2.04%
9	209.880	448.079	2.54%
10-Smallest	1.963	209.406	5.60%
Breakdown of the 10th Decile			
10a	108.692	209.406	4.04%
10w	148.934	209.406	3.04%
10x	108.692	148.813	5.30%
10b	1.963	108.598	8.76%
10y	64.846	108.598	7.32%
10z	1.963	64.747	11.79%

Which International Cost of Equity Model Should I Use?

Which International Cost of Equity Model Should I Use?

In choosing a model, the goal is to balance several objectives:

- **Acceptance and use:** The model has a degree of acceptance, and the model is actually used by valuation analysts.

- **Data Availability:** Quality data is available for consistent and objective application of the model.

- **Simplicity:** The model's underlying concepts are understandable, and can be explained in plain language.

Which International Cost of Equity Model Should I Use?

When selecting a model (or models), it is important to remember:

There is no consensus among academics and practitioners as to the best model to use in estimating the cost of equity capital in a global environment, particularly with regards to companies operating in emerging economies.

There are several common approaches to incorporating country factors into a cost of equity capital estimate. None are perfect.

Which International Cost of Equity Model Should I Use?

The following are examples of the more commonly used "international" cost of capital models:

- Global CAPM (a.k.a. World CAPM model)

- Single country version of the CAPM

- Damodaran Model

● Country (or Sovereign) Yield Spread model

● Relative Volatility model

● Erb-Harvey-Viskanta Country Credit Rating model

Note: The case study in this presentation utilizes the models shown in red.

Estimating the Cost of Capital from Empirical Data:
2016 International Valuation Handbook – Guide to Cost of Capital

- **Data Exhibit 1:** International Equity Risk Premia (ERPs)

- **Data Exhibit 2:** Country Yield Spread Model, Country Risk Premia (CRPs)

- **Data Exhibit 3:** Relative Volatility Model, Relative Volatility (RV) Factors

- **Data Exhibit 4:** Erb-Harvey-Viskanta Country Credit Rating Model, Country Risk Premia (CRPs)

- **Data Exhibit 5:** Study of Differences in Returns Between Large and Small Companies in Europe
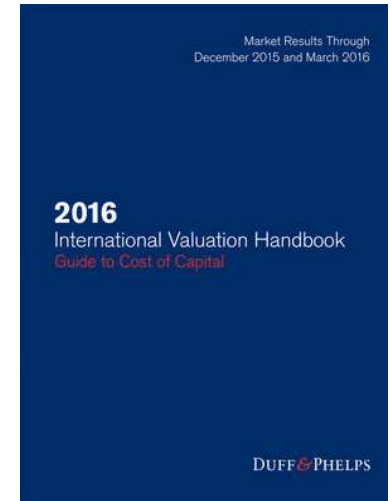
Country-level data

Note: The case study in this presentation utilizes the data exhibits shown in red.

Practical Application: A Case Study

Practical Application: A Case Study

Domestic Investor
No CRP needed

- A U.S. investor investing in the U.S.

- A German investor investing in Germany

Etc.

International Investor
Country risk premium (CRP) needed

- A U.S. investor investing in Brazil

- A German investor investing in China

Etc.

In today's presentation, the case study focuses on the "International Investor".

Case Study:
U.S. Investor Investing in Brazil

Overview

A U.S. institutional investor ("U.S. Investor") plans to make an investment in CyberBrasil, a company providing information technology services in South America.

- The majority of CyberBrasil's cash flows are generated in Brazil.

- U.S. Investor needs to estimate an appropriate WACC to price the investment.

Assumptions

Assumptions	
Valuation Date:	June 30, 2016
Investor Perspective	United States (USD)
Investee County	Brazil (BRL)
Cash Flow Projections	Real (BRL)

Industry
     Sub-Industry
	Information Technology
	     Software & Services

Industry Beta	1.5
Capital Structure: D/TC	10%
Tax Rate	34% (Brazil)
Company Credit Rating	BB

Cross-Border Valuation Framework

Case Study

We are not doing a "Domestic Investor" case study today.

Home Currency

Are cash flows in:

Home Currency of investor?

Foreign (Local) Currency?

Are "foreign" (local) currency inputs available?

(e.g., risk-free foreign government bonds, ERP, betas, etc.)

Foreign Currency

Method 2   Method 1   ← Used in

Yes   No

Single Country CAPM
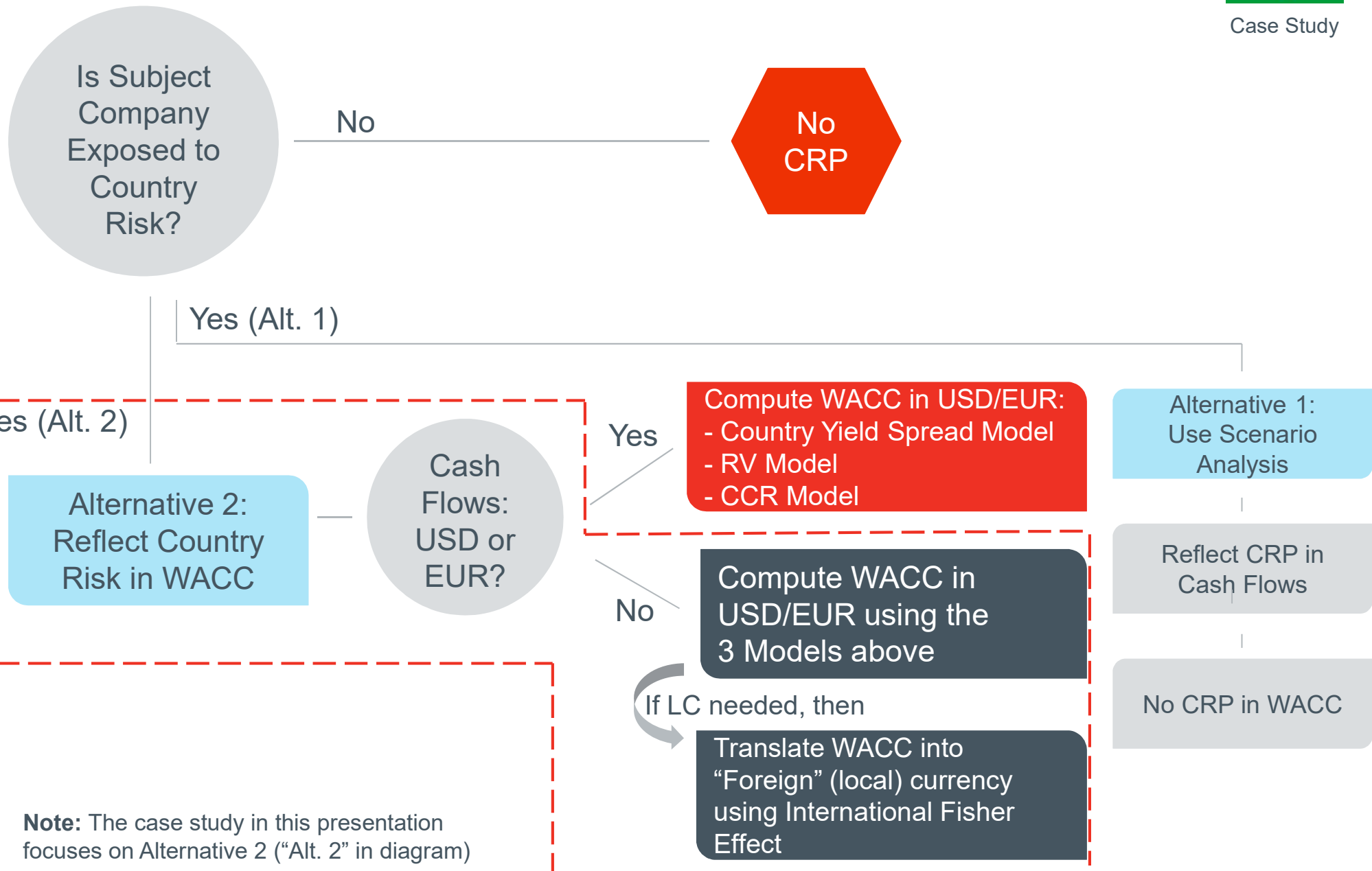
Continue to "Country Risk Decision Tree"

Translate projected cash flows at future/expected Fx Rate into "Home" currency (or "Mature Market" currency)

Compute WACC in "Home" currency (or "Mature Market" currency)

Country Risk Decision Tree – Part 2

Is Subject Company Exposed to Country Risk?

No → **No CRP**

Yes (Alt. 1)

Yes (Alt. 2)

Alternative 2: Reflect Country Risk in WACC

Cash Flows: USD or EUR?

Yes → **Compute WACC in USD/EUR:**
- Country Yield Spread Model
- RV Model
- CCR Model

No → **Compute WACC in USD/EUR using the 3 Models above**

If LC needed, then → **Translate WACC into "Foreign" (local) currency using International Fisher Effect**

Alternative 1: Use Scenario Analysis

Reflect CRP in Cash Flows

No CRP in WACC

Note: The case study in this presentation focuses on Alternative 2 ("Alt. 2" in diagram)

Country Yield Spread Model:
Country Risk Premia (CRP)

Case Study

$$K_e = R_f + \beta \times ERP + CRP$$

K_e foreign country, in home currency

R_f home country

β home country

ERP home country

CRP

Where:

$K_{e,\text{ foreign country}}$ = Cost of equity capital in the foreign country (denominated in the home country currency)

$R_{f,\text{ home country}}$ = Risk free rate on government-issued bonds (in the home country currency)

$\beta_{\text{ home country}}$ = Beta appropriate for a company located in the home country in a similar industry as the foreign country's subject company (i.e., beta is measured using returns expressed in the home currency)

$ERP_{\text{ home country}}$ = Equity risk premium of home country

CRP = Country risk premium, determined as the difference between the yield-to-maturity on a foreign country government bond (issued in the home country's currency) and the yield-to-maturity on a home country government bond with a similar maturity

Case Study: Calculating Cost of Equity in USD and apply a Brazil Country Risk Premium (CRP)

$$K_e \text{ (foreign country, in home currency)} = R_f \text{ (home country)} + \beta \text{ (home country)} \times ERP \text{ (home country)} + CRP$$
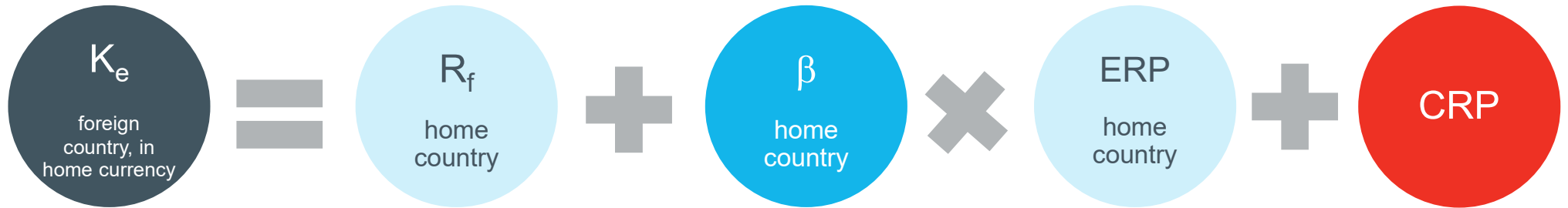
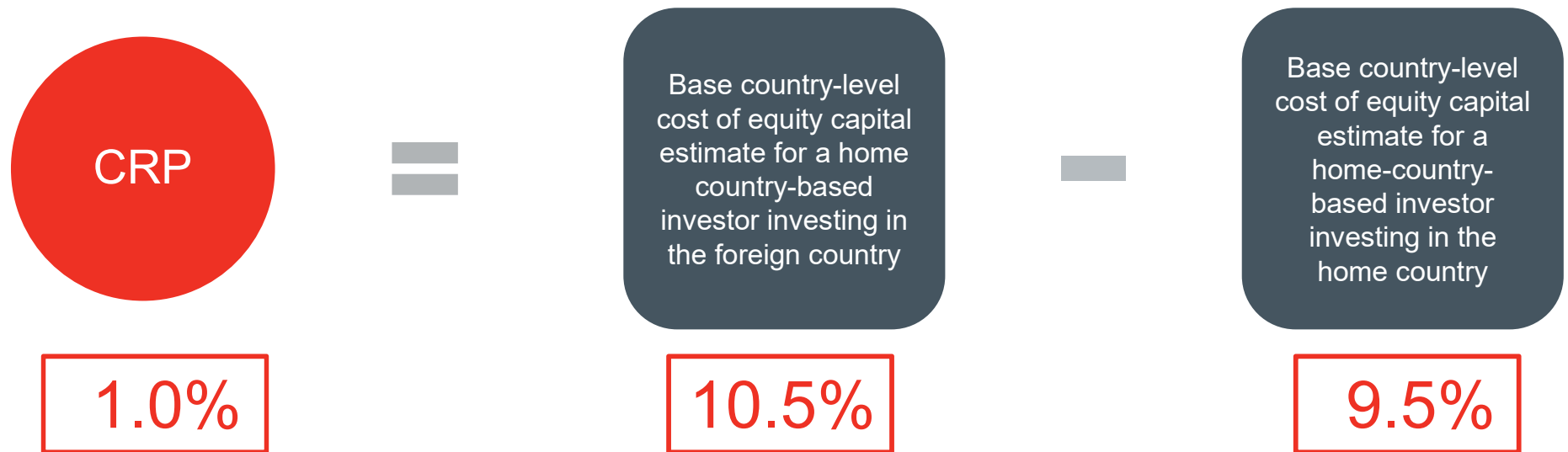| Assumptions	
U.S. Normalized Risk-free Rate	4.0%
U.S. ERP	5.5%
Industry Beta	1.5

$$K_e \text{ (Brazil, USD)} = 4.0\% + 1.5 \times 5.5\% + CRP$$

Country Risk Premium

A country risk premium (CRP) is designed to be a gauge of the relative risks between investing in the "home" country and the "foreign" country:

CRP = Base country-level cost of equity capital estimate for a home country-based investor investing in the foreign country − Base country-level cost of equity capital estimate for a home-country-based investor investing in the home country

1.0% **10.5%** **9.5%**

Example:

- Assume the base country cost of equity for a U.S. investor (the "home country") investing in Country ABC (the "foreign country") is 10.5%.

- Assume the base country cost of equity for a U.S. investor investing in the U.S. is 9.5%.

The CRP for a U.S. investor investing in Country ABC is 1.0% (10.5% - 9.5%).

Brazil CRP

D&P 2016 International Valuation Handbook – Guide to Cost of Capital
Country Yield Spread Model as of June 30, 2016 **[Semi-Annual Update]**

Case Study

Investor Perspective: United States
Currency: United States dollar (USD)

Country Yield Spread Model:
Country Risk Premia (CRPs)

The country risk premium (CRP) is not the cost of equity capital (COE). The CRP is to be added to base COE.

	Data Updated Through June 2016		Data Updated Through September 2016			
Investee Country	June 2016 Country Risk Premium (CRP) (%)	Tier Method*	September 2016 Country Risk Premium (CRP) (%)	Tier Method*	S&P Sovereign Credit Rating §	MSCI Market Classification †
Afghanistan	10.5	4	8.4	4		
Albania	5.7	3	4.7	3	B+	
Algeria	5.3	4	4.3	4		
Angola	8.2	2	8.0	2	B	
Antigua & Barbuda	2.3	2	1.7	2		
Argentina	4.7	2	4.3	2	B-	Frontier

– /// –   – /// –   – /// –

Bosnia & Herzegovina	7.1	3	5.7	3	B	
Botswana	1.3	3	1.1	3	A-	
Brazil	4.1	2	3.6	2	BB	Emerging

Brazil 4.1%

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Country Yield Spread Model:
Country Risk Premia (CRP)
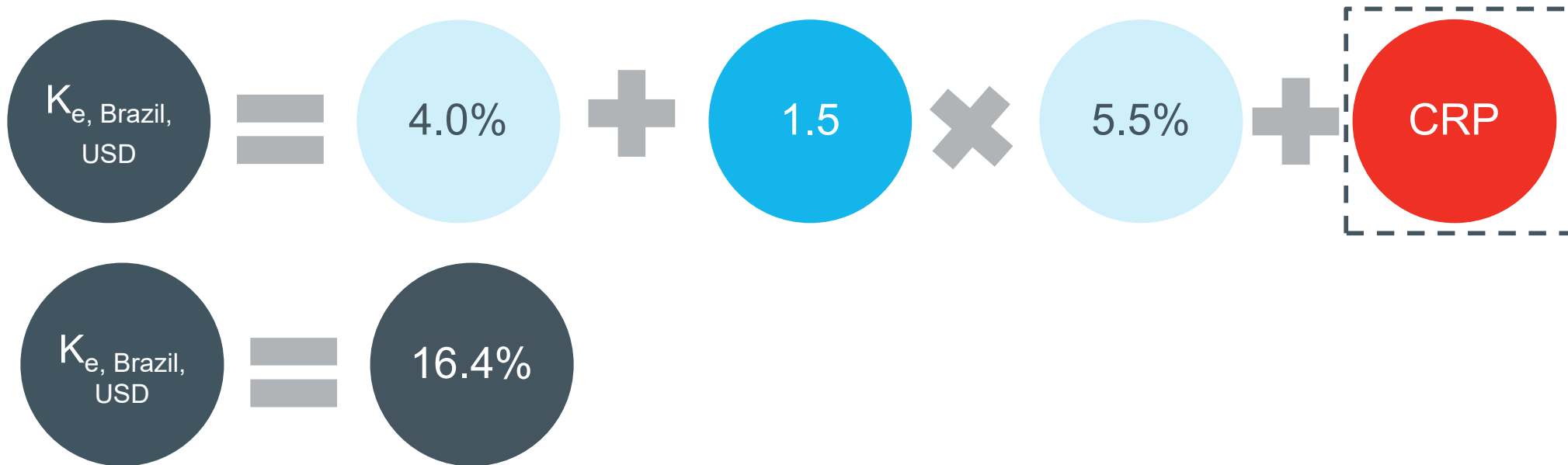
$K_{e, Brazil, USD}$ = 4.0% + 1.5 × 5.5% + CRP

$K_{e, Brazil, USD}$ = 16.4%

Country Yield Spread Model:
Country Risk Premia (CRP)

$$K_{e, Brazil, USD} = 4.0\% + 1.5 \times 5.5\% + 4.1\%$$

$$K_{e, Brazil, USD} = 16.4\%$$

Relative Volatility Model:
Relative Volatility (RV) Factors

Case Study

$$K_e = R_f + \beta \times ERP \times RV$$

| K_e foreign country, in home currency | = | R_f home country | + | β home country | × | ERP home country | × | RV |

Where:

$K_{e, \text{ foreign country}}$ = Cost of equity capital in the foreign country (denominated in the home country currency)

$R_{f, \text{ home country}}$ = Risk free rate on government-issued bonds (in the home country currency)

$\beta_{\text{ home country}}$ = Beta appropriate for a company located in the home country in a similar industry as the foreign country's subject company (i.e., beta is measured using returns expressed in the home currency)

$ERP_{\text{ home country}}$ = Equity risk premium of home country

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RV = Relative Volatility (RV) factor determined as the ratio of the annualized monthly standard deviation of the foreign country equity returns (as denominated in home country currency) relative to the annualized monthly standard deviation of the home country equity returns (as denominated in home country currency)

Brazil RV

D&P 2016 International Valuation Handbook – Guide to Cost of Capital
Relative Volatility Model as of June 30, 2016 [Semi-Annual Update]

Investor Perspective: United States
Currency: United States dollar (USD)

Relative Volatility Model:
Relative Volatility RV Factors

The RV Factor is to be multiplied to the ERP
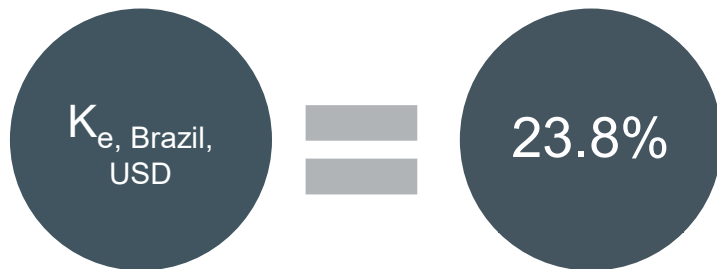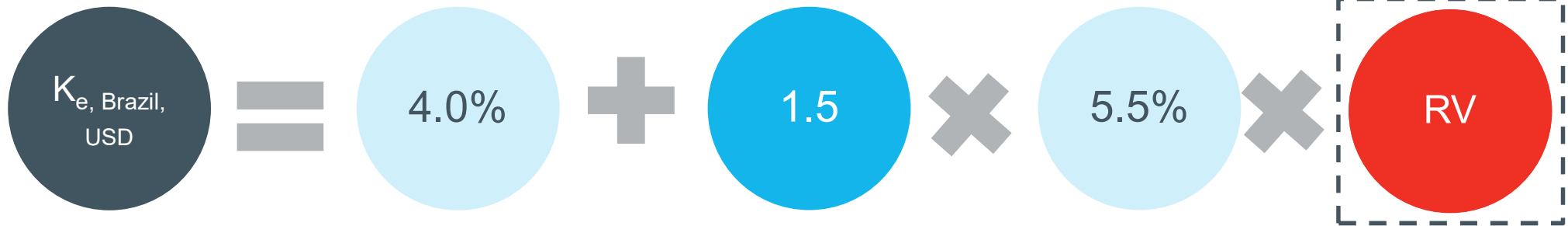
Data Updated Through September 2016

Investee Country	June 2016 Relative Volatility Factor (RV)*	September 2016 Relative Volatility Factor (RV)*	S&P Sovereign Credit Rating §	MSCI Market Classification †
Argentina	3.6	4.0	B-	Frontier
Australia	1.0	1.0	AAA	Developed
Austria	1.8	1.9	AA+	Developed
Bahrain	1.2	1.2	BB	Frontier
Bangladesh	1.9	2.0	BB-	Frontier
Belgium	1.3	1.4	AA	Developed
Botswana	1.5	1.6	A-	
Brazil	2.4	2.6	BB	Emerging

Brazil 2.4

Relative Volatility Model:
Relative Volatility (RV) Factors

$$K_{e,\ Brazil,\ USD} = 4.0\% + 1.5 \times 5.5\% \times RV$$

$$K_{e,\ Brazil,\ USD} = 23.8\%$$

Relative Volatility Model:
Relative Volatility (RV) Factors

$$K_{e, Brazil, USD} = 4.0\% + 1.5 \times 5.5\% \times 2.4$$

$$K_{e, Brazil, USD} = 23.8\%$$

Erb-Harvey-Viskanta Country Credit Rating Model
Country Risk Premia (CRP)

Case Study

$$K_e \text{ (foreign country, in home currency)} = R_f \text{ (home country)} + \beta \text{ (home country)} \times ERP \text{ (home country)} + CRP$$

Where:

$K_{e, \text{ foreign country}}$ = Cost of equity capital in the foreign country (denominated in the home country currency)

$R_{f, \text{ home country}}$ = Risk free rate on government-issued bonds (in the home country currency)

$\beta_{\text{ home country}}$ = Beta appropriate for a company located in the home country in a similar industry as the foreign country's subject company (i.e., beta is measured using returns expressed in the home currency)

$ERP_{\text{home country}}$ = Equity risk premium of home country

CRP = The incremental risk associated with investing in the foreign country vs. investing in the home country (as calculated by the Country Credit Rating Model)

Brazil CRP

D&P 2016 International Valuation Handbook – Guide to Cost of Capital
Erb-Harvey-Viskanta Country Credit Rating Model as of June 30, 2016

Investor Perspective: United States
Currency: United States Dollar (USD)

Erb-Harvey-Viskanta
Country Credit Rating (CCR) Model

The country risk premium (CRP) is not the cost of equity capital (COE). The CRP is to be added to base COE.

Data Updated Through September 2016

Investee Country	June 2016 Country Risk Premium (CRP) (%)	September 2016 Country Risk Premium (CRP) (%)	S&P Sovereign Credit Rating §	World Rank Out of 179*	MSCI Market Classification †	Institutional Investor Region ‡	Regional Rank ‡
Afghanistan	24.1	22.9		169		Asia/Pacific (South & East)	23 out of 24
Albania	10.4	10.0	B+	83		Eastern Europe/Central Asia	18 out of 29
Algeria	8.4	8.4		73		North Africa/Middle East	9 out of 19
Angola	12.4	12.8	B	99		Africa (Sub-Saharan)	10 out of 49
Argentina	13.4	11.9	B-	92	Frontier	Latin America/Caribbean	18 out of 29
Armenia	11.7	11.9		91		Eastern Europe/Central Asia	21 out of 29

– /// –　　　　　　　　　　– /// –　　　　　　　　　　– /// –

Bosnia & Herzegovina	13.4	12.3	B	94		Eastern Europe/Central Asia	22 out of 29
Botswana	5.1	5.6	A-	52		Africa (Sub-Saharan)	1 out of 49
Brazil	6.4	6.3	BB	59	Emerging	Latin America/Caribbean	10 out of 29

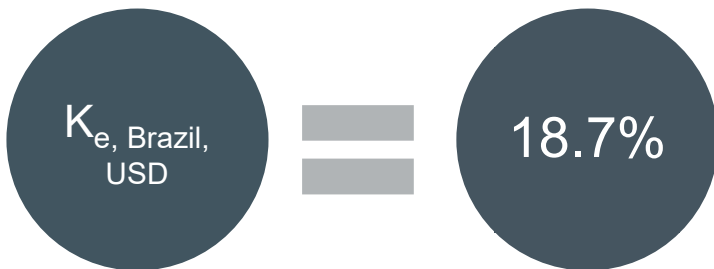## Brazil **6.4%**

Erb-Harvey-Viskanta Country Credit Rating Model
Country Risk Premia (CRP)
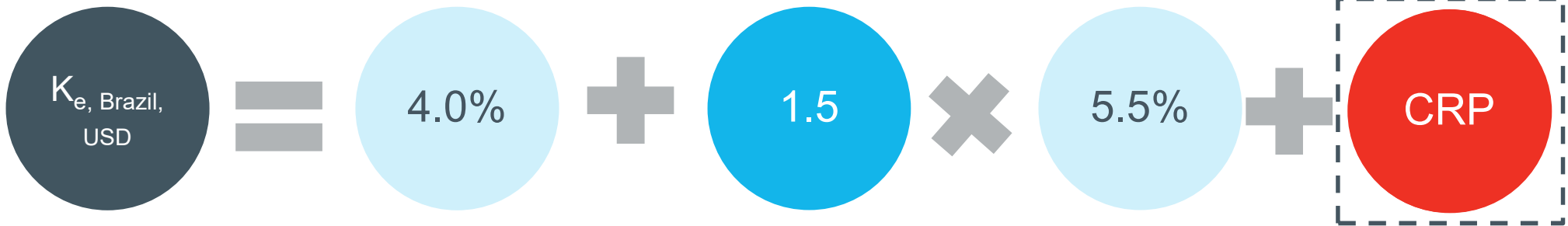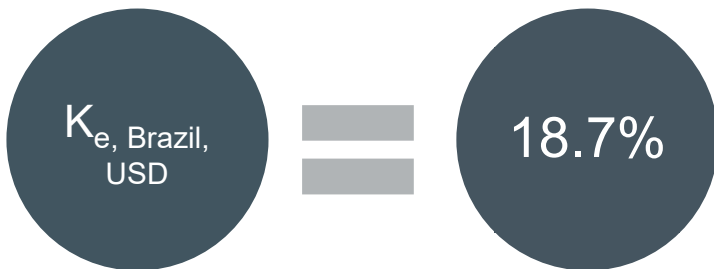
$$K_{e,\,Brazil,\,USD} = 4.0\% + 1.5 \times 5.5\% + CRP$$

$$K_{e,\,Brazil,\,USD} = 18.7\%$$

Erb-Harvey-Viskanta Country Credit Rating Model
Country Risk Premia (CRP)

$$K_{e, Brazil, USD} = 4.0\% + 1.5 \times 5.5\% + 6.4\%$$

$$K_{e, Brazil, USD} = 18.7\%$$
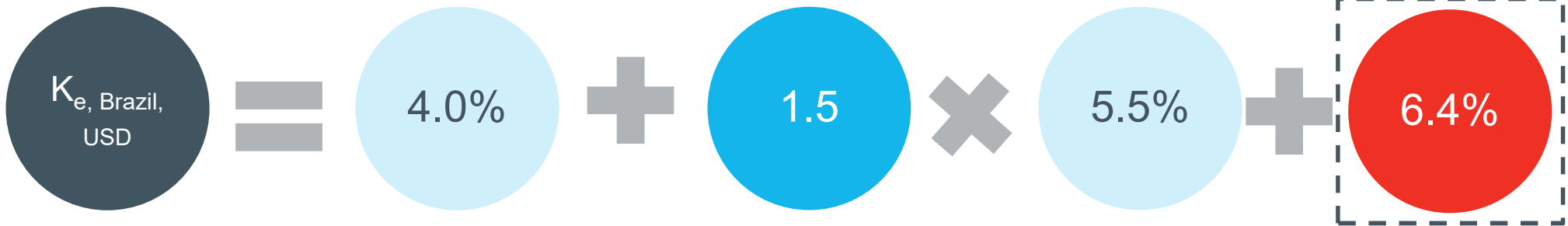
Calculating Cost of Equity in USD and apply a Brazil Country Risk Premium (CRP)

Range of estimates of custom Cost of Equity for a U.S.-based investor investing in Brazil:

Model	Cost of Equity
Country Yield Spread	16.4%
Relative Volatility Model	23.8%
Country Credit Rating Model	18.7%

Cost of Debt (K_d): United States in USD

		BS475 Mid YTM USD US TECHNOLOGY BB BVAL YIELD CURVE	BS475 Mid YTM USD US TECHNOLOGY BB BVAL YIELD CURVE	BS475 Mid YTM (Change)
	Tenor	09/27/16	06/30/16	09/27/16-06/30/16
11)	3M	2.135	2.363	-22.8
12)	6M	2.240	2.489	-24.9
13)	1Y	2.438	2.727	-28.9
14)	2Y	3.034	3.469	-43.5
15)	3Y	3.526	4.090	-56.4
16)	4Y	3.927	4.595	-66.7
17)	5Y	4.285	5.029	-74.3
18)	7Y	4.891	5.700	-80.9
19)	8Y	5.132	5.965	-83.3
20)	9Y	5.345	6.202	-85.7
21)	10Y	5.560	6.442	-88.2
22)	15Y	6.360	7.299	-93.9

K_d = 7.299% (7.3% rounded)

Source: Bloomberg

Calculating Cost of Debt in USD and apply Brazil CRP

Range of estimates of custom Cost of Debt for a U.S.-based investor investing in Brazil:

Model	Pre-tax Cost of Debt	CRP	Implied Pre-tax Cost of Debt
Country Yield Spread	7.3%	4.1%	11.4%
Relative Volatility Model	7.3%	7.7%	15.0%
Country Credit Rating Model	7.3%	4.1%	11.4%

WACC Calculation

Assumptions	
Capital Structure: D/TC	10%
Tax Rate	34%

Range of estimates of custom WACC for a **U.S.-based investor investing in Brazil:**

Model	Implied Pre-tax Cost of Debt	Cost of Equity	WACC
Country Yield Spread	11.4%	16.4%	15.5%
Relative Volatility Model	15.0%	23.8%	22.4%
Country Credit Rating Model	11.4%	18.7%	17.5%

Applying International Fisher Effect to Cost of Equity and Cost of Debt

Brazil: Interim Annual Forecast
Last updated: 15 September 2016

	Data Source	Units	Historical Data Edge	2016	2017	2018	2019		2046
Prices									
GDP Deflator	IHS Economics calculation[1]	% chg., y/y	2015	7.2	4.5	5.6	5.7	– /// –	2.8
Consumer Price Index (Annual average)	IHS Economics calculation[1]	% chg., y/y	2015	8.3	5.4	5.1	5.0		3.9
Wholesale Price Index (Annual average)	IHS Economics calculation[2]	% chg., y/y	2015	12.2	6.1	5.3	4.9		3.8

[1]Using data from Brazilian Institute of National Statistics and Geography (IBGE)

[2]Using data from Getulio Vargas Foundation (FGV)

United States: Interim Annual Forecast
Last updated: 15 September 2016

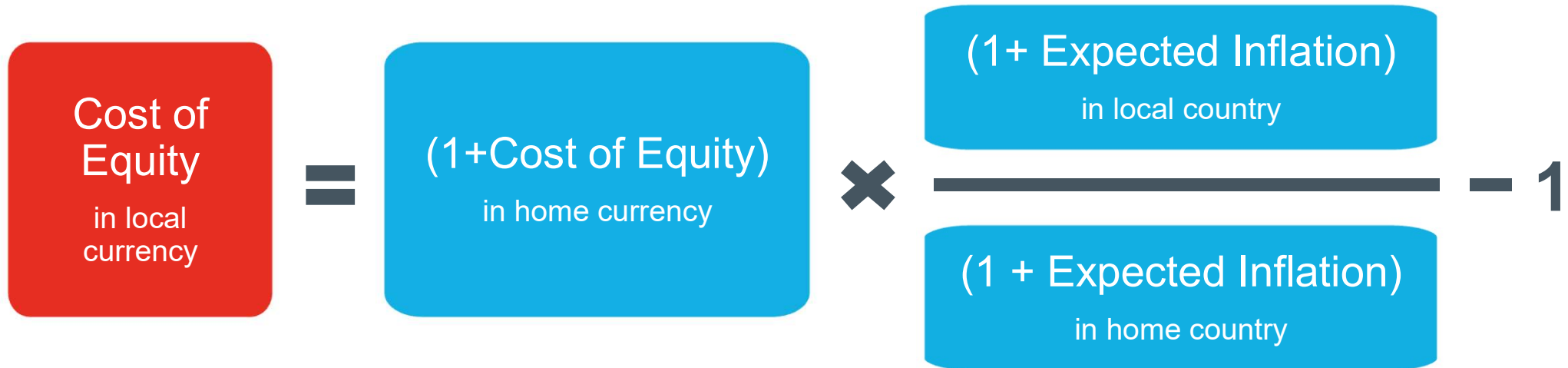|	Data Source	Units	Historical Data Edge	2016	2017	2018	2019		2046
Prices									
GDP Deflator	Bureau of Economic Analysis, Department of Commerce	% chg., y/y	2015	1.4	2.1	1.9	2.0	– /// –	2.2
Consumer Price Index (Annual average)	Bureau of Labor Statistics, Department of Labor	% chg., y/y	2015	1.2	2.6	2.3	2.6		2.4
Wholesale Price Index (Annual average)	Bureau of Labor Statistics, Department of Labor	% chg., y/y	2015	-2.8	3.1	1.8	2.9		1.7

Inflation estimates per IHS (average of 2016 – 2046 forecasts):

Long-term inflation of Brazil = 4.2%

Long-term inflation of U.S. = 2.4%

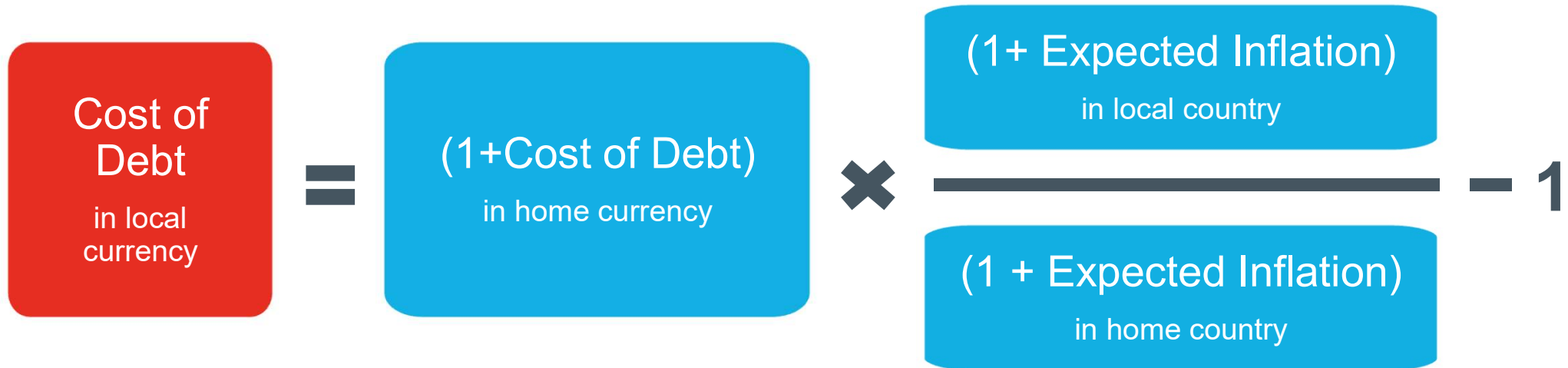# Applying International Fisher Effect to <u>Cost of Equity</u>

$$
\begin{array}{c}
\text{Cost of Equity in local currency}
\end{array}
=
\begin{array}{c}
\text{(1+Cost of Equity)} \\
\text{in home currency}
\end{array}
\times
\dfrac{
\begin{array}{c}
\text{(1+ Expected Inflation)} \\
\text{in local country}
\end{array}
}{
\begin{array}{c}
\text{(1 + Expected Inflation)} \\
\text{in home country}
\end{array}
}
- 1
$$

Applying International Fisher Effect to Cost of Debt

$$\text{Cost of Debt in local currency} = (1+\text{Cost of Debt}) \text{ in home currency} \times \frac{(1+\text{Expected Inflation}) \text{ in local country}}{(1+\text{Expected Inflation}) \text{ in home country}} - 1$$

WACC in Brazilian Reals
AFTER International Fisher Effect

Range of estimates of custom WACC in Brazilian Reals for a U.S.-based investor investing in Brazil

Model	Pre-tax Cost of Debt	Cost of Equity	WACC
Country Yield Spread	13.4%	18.4%	17.4%
Relative Volatility Model	17.0%	26.0%	24.5%
Country Credit Rating Model	13.4%	20.7%	19.5%

Key Points to Remember

- Cash flows generated in foreign currency and country risk may have a significant impact in a valuation

- There are different forms of country risk

- Currency used to project cash flows MUST always be consistent with the currency of the discount rate

- There is no single cost of capital model in the context of foreign-based valuations

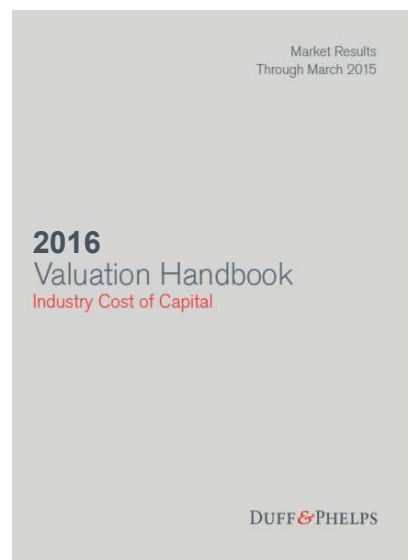- Evaluating multiple methods may be prudent

The Duff & Phelps *2016 International Valuation Handbook – Guide to Cost of Capital* provides *multiple* models that can be used when estimating international cost of capital.
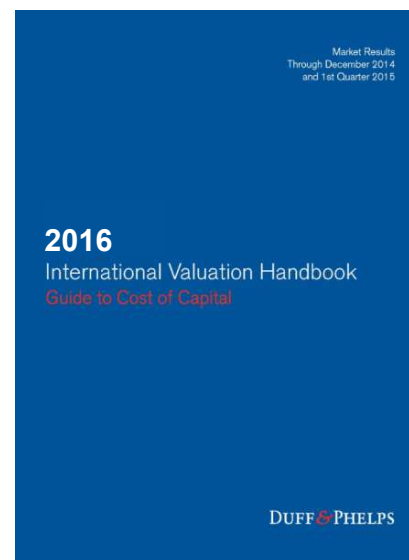
The Duff & Phelps *Valuation Handbook* series
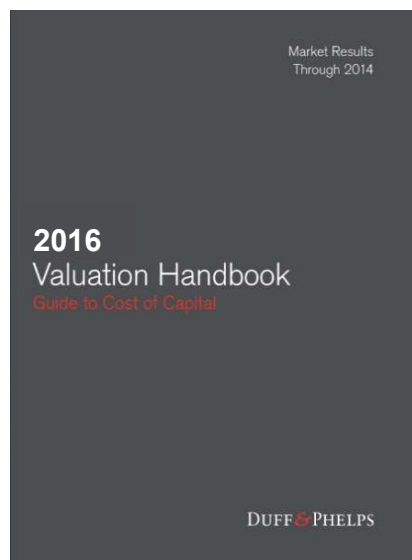
Company-level U.S. data	Industry-level U.S. data	Country-level data	International Industry-level data
• 2014 Edition Available	• 2014 Edition Available	• 2014 Edition Available	• 2015 Edition Available
• 2015 Edition Available	• 2015 Edition Available	• 2015 Edition Available	• 2016 Edition Available
• 2016 Edition Available	• 2016 Edition Available	• 2016 Edition Available	

Questions?