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Developing and Selecting CAPM Betas – A New Cost of Capital Navigator Module

24 May 2023

Presented by: Carla S. Nunes, Kevin Madden, and Aaron Russo

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4 Cyber Risk

Incident response, digital forensics, breach notification, managed detection services, penetration testing, cyber assessments and advisory.

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Valuation Advisory Highlights

World's Leading Independent Valuation Provider

1,427

Professionals

including 160 Managing Directors, dedicated to Valuation Advisory

In 2021 we performed over **10,667** engagements for more than **3,618** clients

Kroll professionals:

- Serve on AICPA task forces including: Business Combinations, Goodwill Impairment (Co-Chair) and Private Equity/Venture Capital
- Appointed to The Appraisal Foundation's Appraisal Practices Board
- Principal drafter of U.S. Private Equity Valuation Guidelines
- Provided public commentary to the OECD on base erosion and profit shifting action items impacting transfer pricing
- Served as panelists on IFRS and mark-to-market SEC roundtables
- Appointed to the International Valuation Professional Board by the International Valuation Standards Council (IVSC)
- Numerous involvement in IVSC Boards: Member of the IVSC Business Valuation Board, Financial Instruments Board, Tangible Assets Board, Standards Review Board and IVSC Europe Board
- Participant on the EFRAG Advisory Panel on Intangibles

Our Evolution

In Operation for Nearly 100 Years

STORIED BRAND
1932-2004

- Duff & Phelps founded as investment research firm

NEW FIRM, EXPANDING CAPABILITIES
2005-2020

- Started as valuation and corporate finance advisor
- Rapid growth into other governance, risk, compliance and complementary solutions
- Acquired 30+ businesses, including Kroll in 2018

ONE TEAM, ONE KROLL
2021-2022

- Duff & Phelps rebrands as Kroll and completes brand unification
- Full business life cycle capabilities across risk, governance and growth
- Serving clients in 140 markets across nearly every industry and sector

Awards and Rankings

We Work with the Largest Firms

- 51% of the S&P 500 companies
- 68% of Fortune 100 companies
- 93% of Am Law 100 law firms
- 20 of the 25 largest Euro STOXX® companies
- 69% of the 100 largest Euro STOXX® companies
- The 25 largest private equity firms in the PEI 300
- 21 of the 25 largest hedge funds in the Alpha Hedge Fund 100

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World's Leading Independent Valuation Provider

Refinitiv Global M&A Review – 2021*

- Ranked #1 for Announced Fairness Opinions in the U.S., EMEA and Globally in 2021
- Ranked #5 for U.S. Middle-Market Transactions Over the Past 10 years

Broad Risk Prevention and Resolution

Who's Who Legal

- Investigations Forensic Accountants 2021
- Asset Recovery Experts 2020
- Forensic Accountant Experts 2020

The National Law Journal – 2019

- Best Global Risk and Investigations Consultant
- Best End-to-End Litigation Consulting Firm

Recognized Cyber Solutions

Gartner - 2021

- Recognized as a Representative Vendor for Digital Forensics and Incident Response (DFIR) and Managed Detection and Response (MDR)

Computing Security Awards 2021

- Winner - Incident Response and Investigation Security Service Provider of the Year
- Winner - New Cloud Delivered Security Solution of the Year

IDC – 2021

- Named a Global Leader in Incident Response Readiness

Cyber Security Excellence Awards

- European Winner: Cybersecurity Service Provider of the Year, Managed Detection and Response, Managed Security Service, and Threat Detection, Intelligence and Response

*Refinitiv Data (U.S. deals $10M < $170M, including deals without a disclosed value.) Full years 2012 through 2021.

Carla S. Nunes, CFA, ABV

Managing Director

Carla S. Nunes, CFA, ABV is a Kroll Institute Fellow and a Managing Director in the Office of Professional Practice of Kroll. She has over 25 years of experience. In that role, Carla provides firm-wide technical guidance on a variety of valuation, financial reporting and tax issues. She also co-authors Kroll's U.S. and European Goodwill Impairment Studies. In addition, Carla is the Global Leader of Kroll's Valuation Digital Solutions group, which produces cost of capital thought leadership content and data housed in the Cost of Capital Navigator.

Kevin Madden

Director

Kevin Madden is a Director in the Valuation Digital Solutions group, based in the Chicago office. Kevin has more than 10 years of experience in financial services, specializing in project and product management and financial analysis. He is a lead contributor to the content and data housed in the Cost of Capital Navigator platform.

Aaron Russo

Vice President

Aaron Russo is a Vice President in the Valuation Digital Solutions group. Aaron specializes in data management, automation, and product development management for the content and data housed in the Cost of Capital Navigator platform.

Agenda

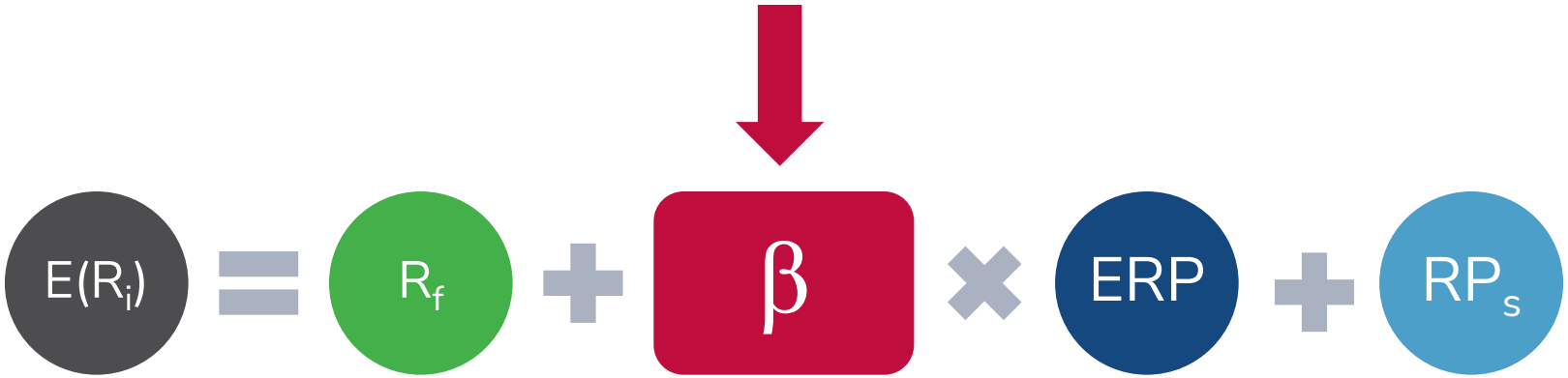
1. Beta Estimation Basics
2. Different Beta Types
3. Beta Best Practices
4. Company-level Levered Beta Resources
5. Adjusting for Financial Risk (Unlevering and Relevering)
6. Case Study
7. Demo

Beta Estimation Basics

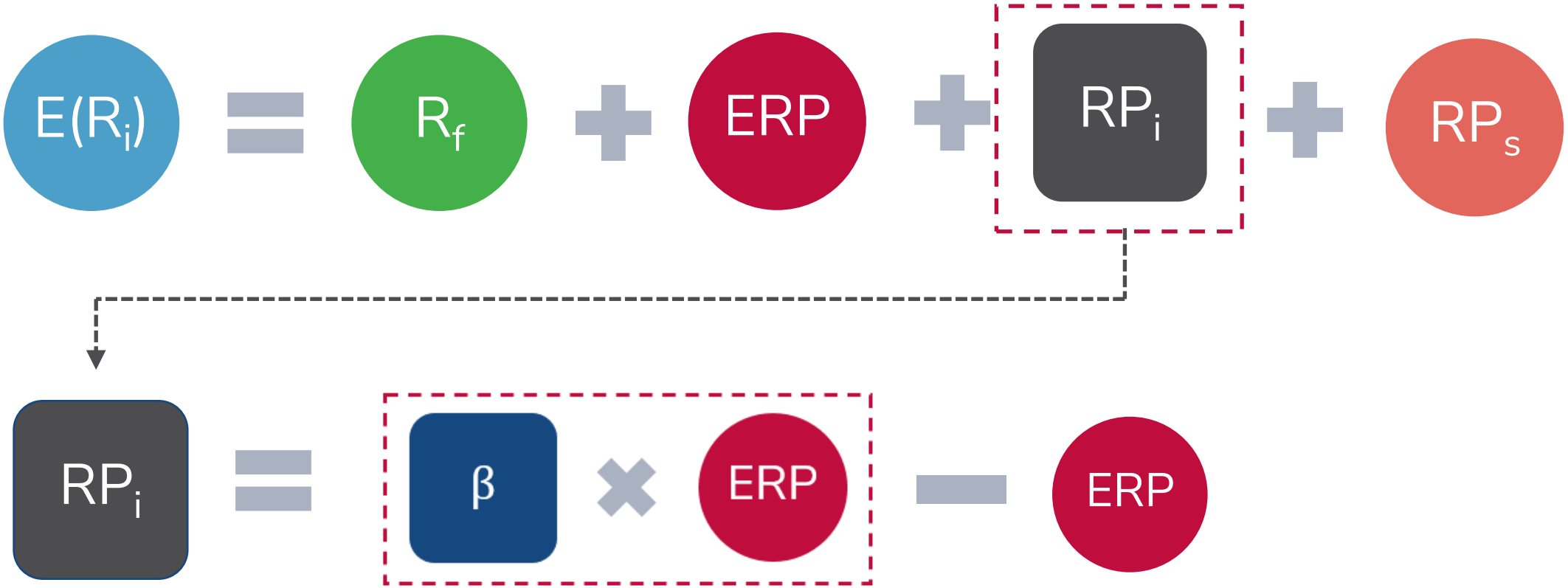
What is Beta?

Beta is a measure of systematic (i.e., “market”) risk of a stock; the tendency of a stock’s price to correlate with changes in a specific market index. Beta does not measure unsystematic risk.

Beta (β) is the CAPM measure of risk:



What is an Industry Risk Premium (IRP)?



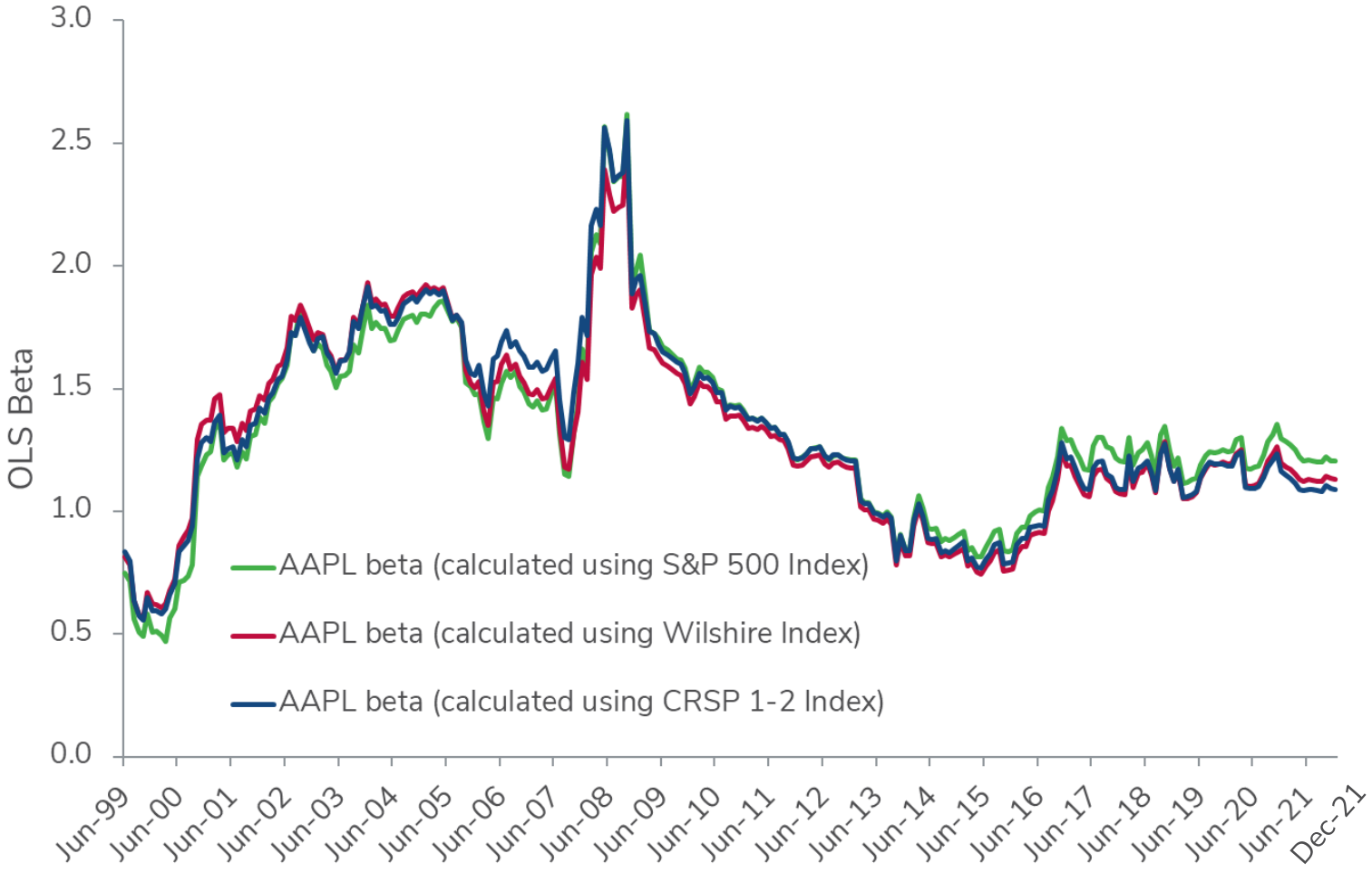
Beta Estimation Basics – Five Considerations

There are choices you will have to make when calculating a beta using historical data*

1. The market benchmark
2. Amount of history (1 year, 3 years, 5 years, etc.)
3. Stability over time
4. Frequency (daily, weekly, monthly, etc.)
5. Statistical quality

*There may be other things of course, but these are the “biggies”.

Beta Estimation Basics – The Market Benchmark



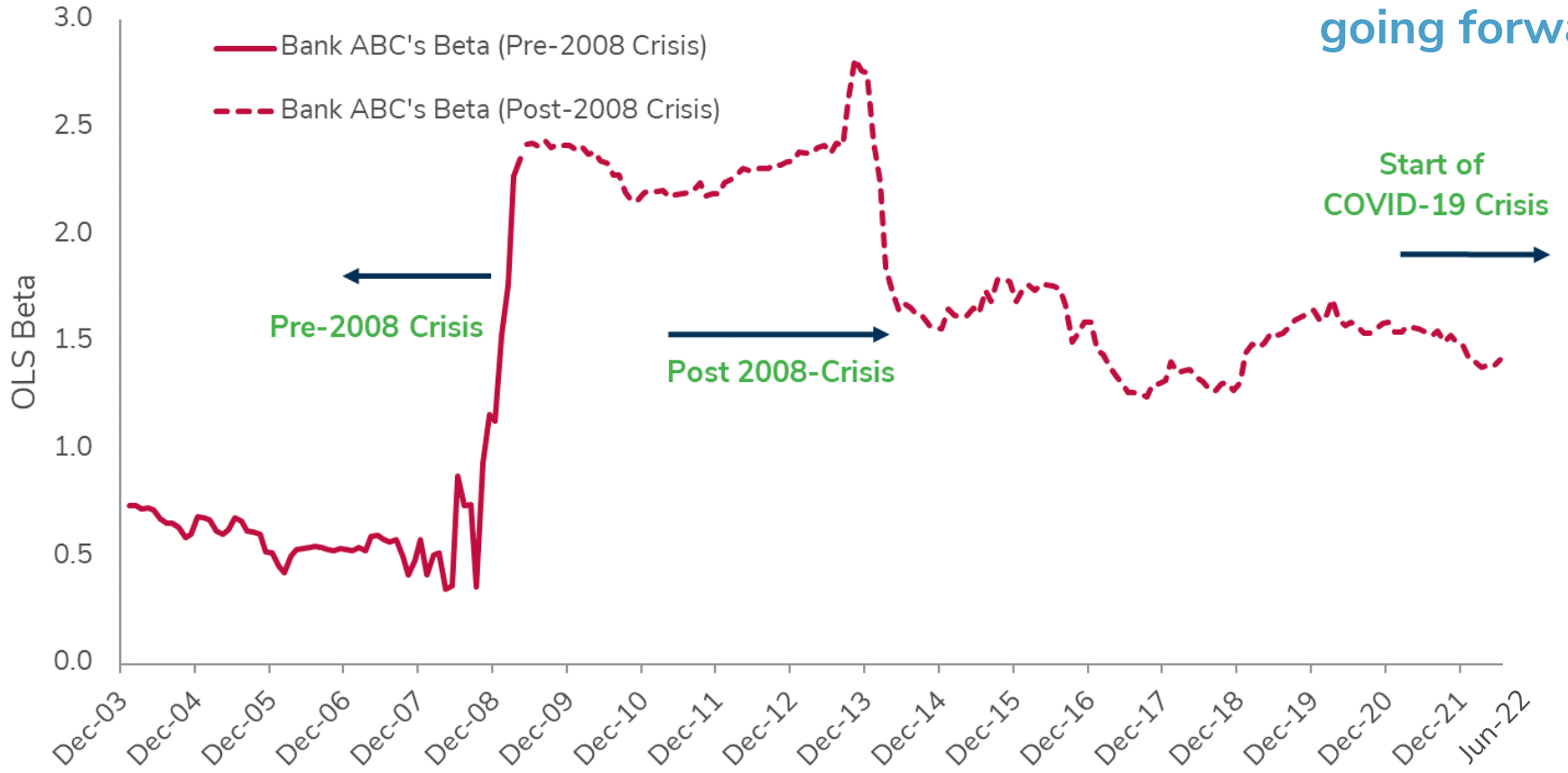
- In the U.S., the S&P 500 Index is typically selected as the market benchmark. The MSCI World Index used to be the choice for global betas. More recently, the MSCI All Country World Index (ACWI) is considered an even better proxy for a global benchmark.
- Because some market benchmarks are so highly correlated, betas calculated using each of them are also very similar. Not true if an undiversified index is chosen.

Beta Estimation Basics – Frequency and Amount of History

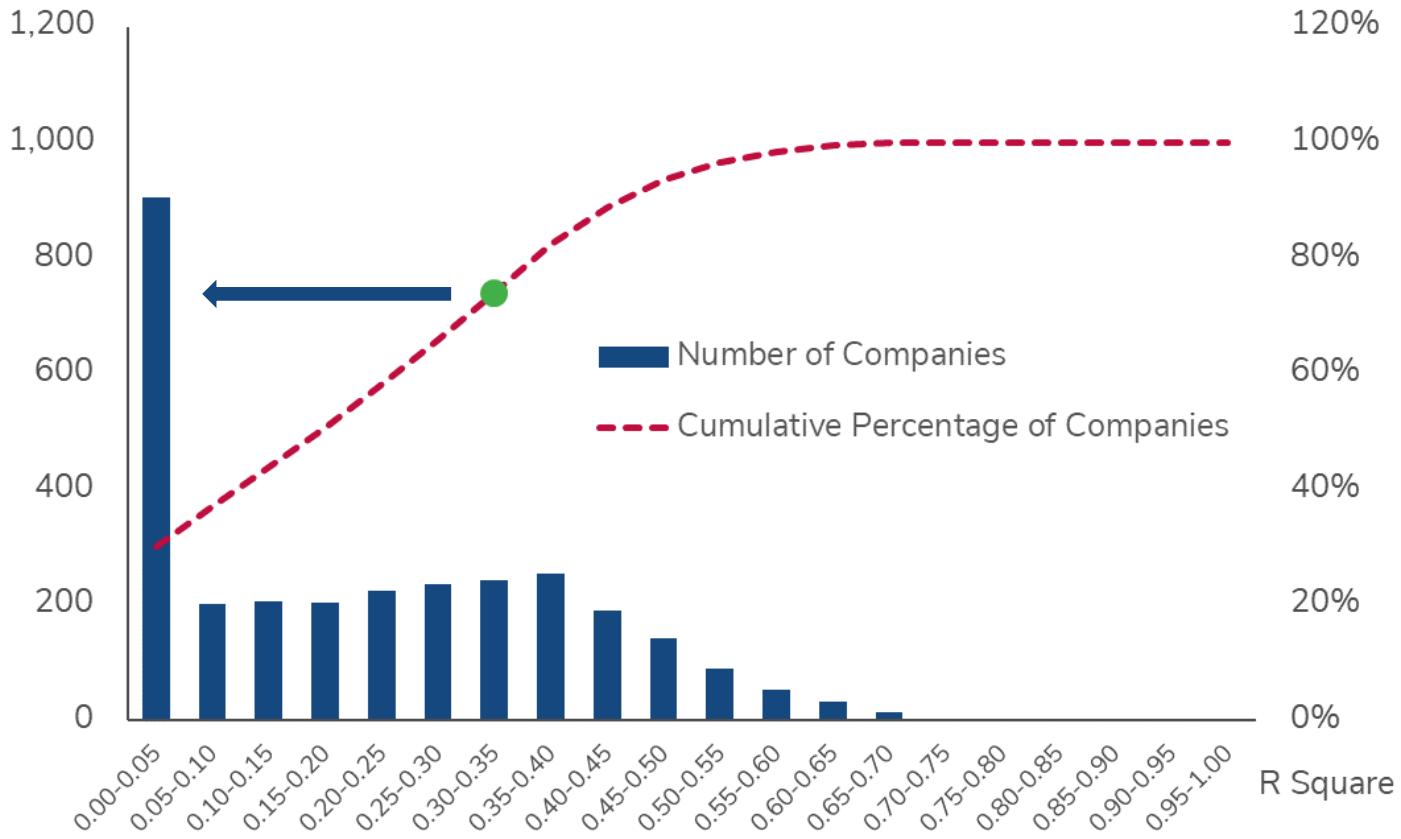
- Benchmark index and company returns can be computed based on:
  - Price Returns: often used, but without much thought
  - Total Returns: considers both price and dividend-adjusted returns, which is theoretically more correct
  - Excess Returns: subtracts the risk-free rate from index and company returns
- Frequency of returns can be computed :
  - Intra-day (mostly traders)
  - Daily
  - Weekly
  - Monthly
  - Annual
- For valuation purposes, most common or “standard” historical period used to measure returns is 5 years of monthly of returns. Another period often used is 2 years (and sometimes 3 years) of weekly returns.

Beta Estimation Basics – Stability Over Time

Is Bank ABC's "pre-crisis" beta or its "post-crisis" beta more representative of risk going forward?



Beta Estimation Basics – Statistical Quality

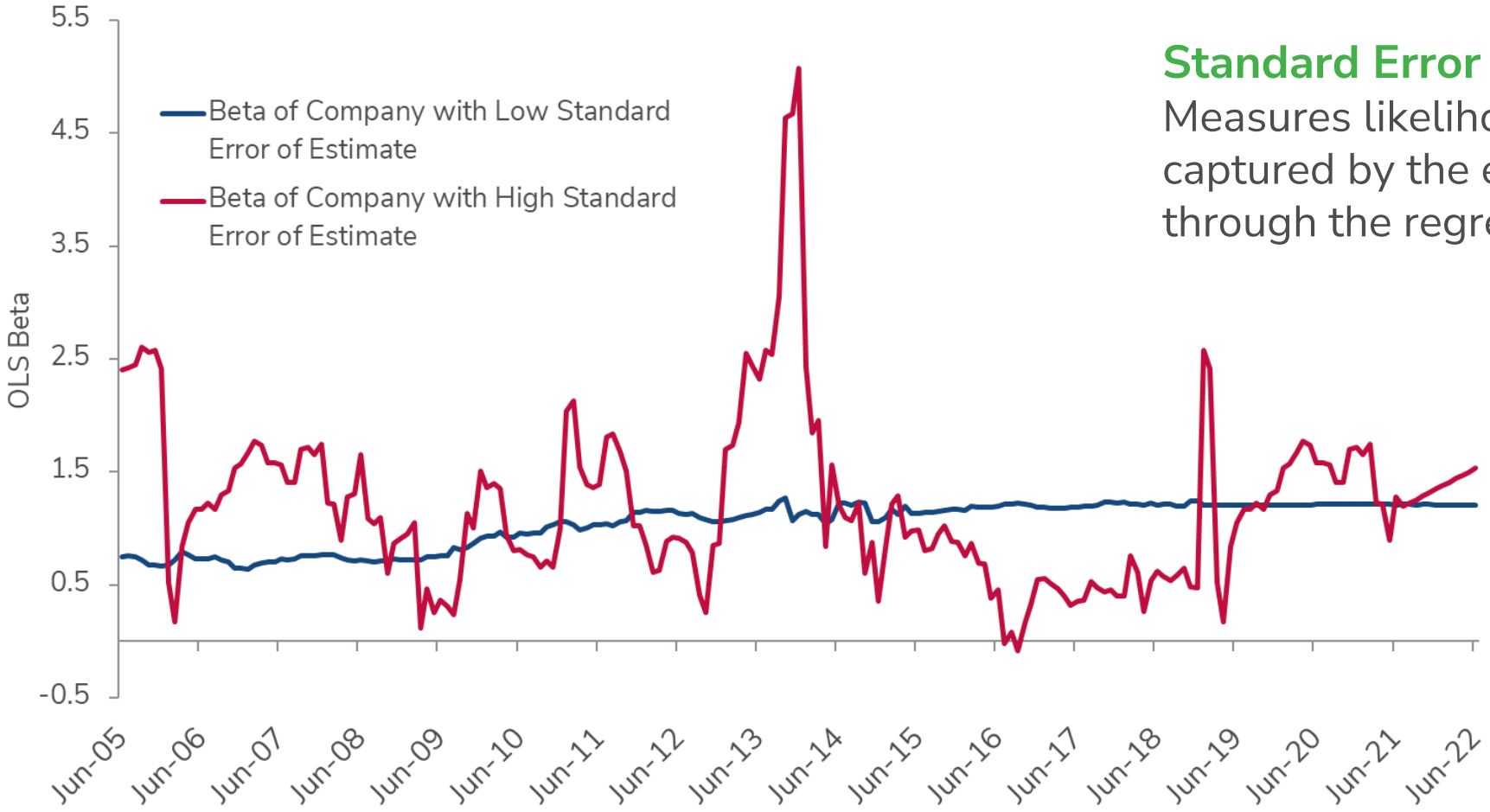


R-Squared

Commonly referred to as "Goodness of fit".

R-Squares on beta regressions are often less than 20% to 30%, indicating that other company or industry factors explain realized returns on a security

Beta Estimation Basics – Statistical Quality



Standard Error of Estimate

Measures likelihood that true beta is captured by the estimate of beta derived through the regression equation

Beta Estimation Basics – Statistical Quality

T-stat, 60-month betas

T-stat

Indicates if beta coefficient is different from zero.

t-stat = Beta / (Standard Error of the Beta Coefficient)

If the t-stat > Critical Value then the beta is “statistically different from zero”. t-stat Critical Values vary by sample size and different confidence levels (e.g., 95%)

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Beta Estimation Basics – Top down or bottom up?

Top-Down Betas

- Calculated Directly (e.g., OLS, Sum Beta)
- Individual company (historical) OLS betas are often too “noisy” from a statistical standpoint

Bottom-Up Betas

- Also called a “proxy” beta

- Requires:
  - Identifying the businesses in which the subject business operates
  - Identifying guideline public companies and estimating their levered betas, which will be used as proxy

- Can be particularly useful for a division, reporting unit, or closely-held business

Levered (Equity) vs. Unlevered (Asset) Beta

- **"Levered" betas** incorporate two risk factors that bear on systematic risk:
  (i) business operating risk and
  (ii) financial (or capital structure) risk.

  Levered betas are sometimes referred to as "equity" betas.

- **"Unlevered" betas** control for (remove the effect of) a company's financing decisions. In other words, the unlevered beta is the beta that would be expected if the company were financed 100% with equity capital (no debt).

  These types of betas are sometimes referred to as "asset" betas.

Different Beta Types

What is an OLS Beta?

$$(R_i - R_f) = \alpha + \beta_i \times (R_m - R_f) + \varepsilon$$

where:

R_i	=	Historical return on company or portfolio *i*
R_f	=	Expected return on a risk-free security
α	=	Regression constant
β_i	=	Beta coefficient of company or portfolio *i*
R_m	=	Historical return on market portfolio
ε	=	Regression error term

- Ordinary Least Squares (OLS) is also referred to as 'least squares' regression, or simply, a regression. A regression is the analysis between one variable (the dependent variable) and one or more variables (the independent variables), assuming a linear relationship.
- In the context of CAPM, the historical beta is estimated via an OLS regression (hence the term, OLS beta).
- The textbook CAPM OLS beta is the **slope of the regression line**, where the returns of a security are regressed against the returns on the market portfolio.
- Bloomberg calls this a "Raw Beta".

What is a Sum Beta?

$$\left(R_{i,n} - R_{f,n}\right) = \alpha + \beta_n \times \left(R_{m,n} - R_{f,n}\right) + \beta_{n-1} \times \left(R_{m,n-1} - R_{f,n-1}\right) + \varepsilon$$

$$\beta_{SumBeta} = \beta_n + \beta_{n-1}$$

where:

$(R_{i,n}-R_{f,n})$	=	Excess return on company or portfolio *i* in current month
α	=	Regression constant
β_n	=	Estimated market coefficient based on sensitivity to excess returns on market portfolio in current month
$(R_{m,n}-R_{f,n})$	=	Excess return on market portfolio in current month
β_{n-1}	=	Estimated market coefficient based on sensitivity to last month's excess returns on market portfolio
$(R_{m,n-1}-R_{f,n-1})$	=	Excess return on market portfolio last month
ε	=	Regression error term

- A Sum Beta is obtained through a multiple regression of a stock's current month's excess returns (over the 30-day T-Bill rate) on:*
  - The market's current month's excess returns; and
  - The market's previous month's excess returns.

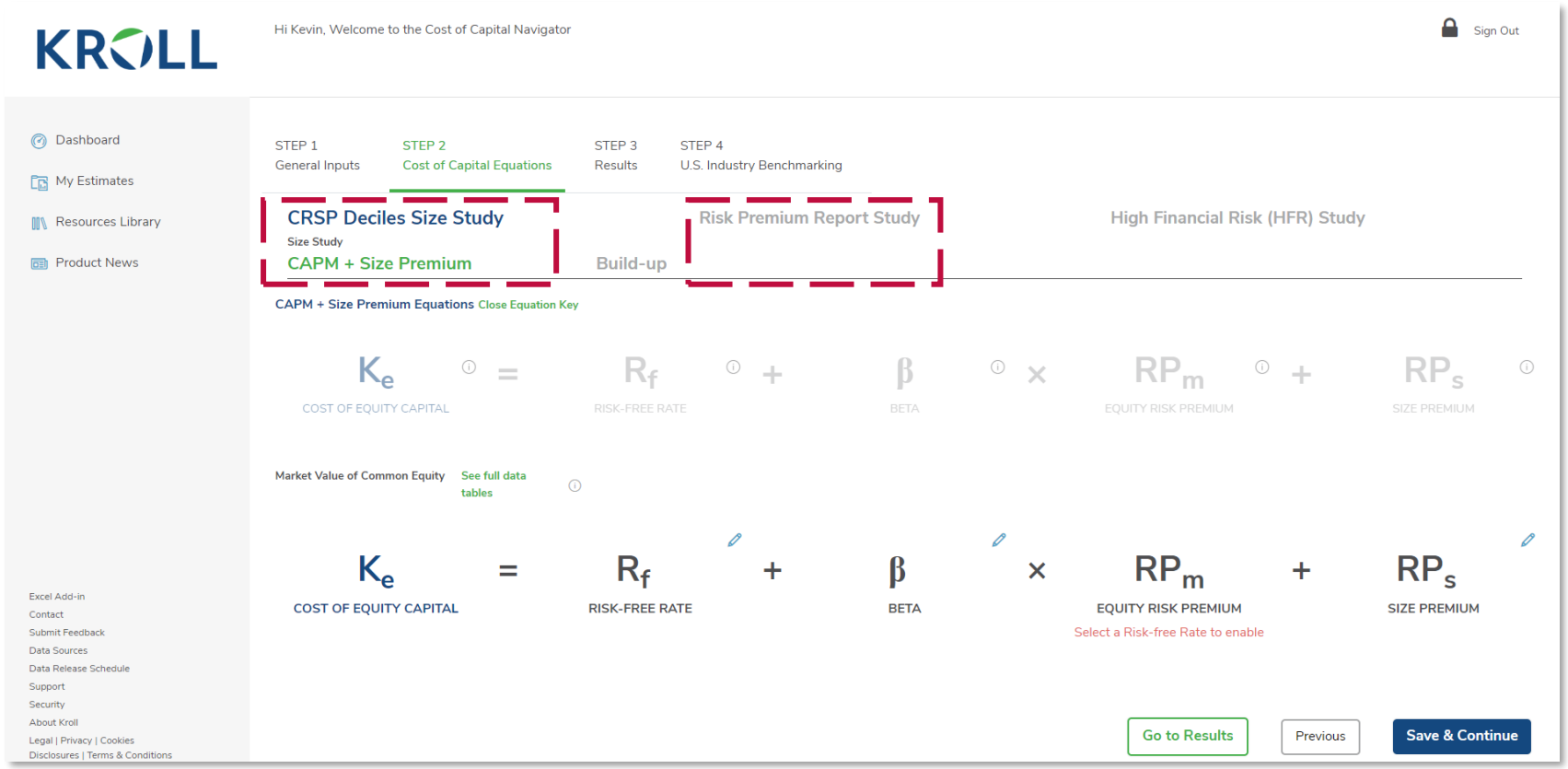
  The Sum Beta is computed by summing up the resulting beta coefficients (current and lagged).

- Sum Betas have been shown to be better predictors of smaller companies' expected returns within the context of the CAPM.

** If using monthly data. Sum Betas can also be used for other return frequencies.*

OLS Betas vs. Sum Betas in the Cost of Capital Navigator

- **CRSP Deciles Size Study:** Uses OLS betas to calculate the size premia
- **Risk Premium Report Study:** Uses Sum Betas in all calculations
- **European Size Study:** Uses Sum Betas in all calculations



Cost of Capital Navigator – U.S. Cost of Capital Module

A Forward-looking Beta is What We Really Want

Three Common Adjustments for Making a Beta More "Forward-looking"

- Like the cost of capital itself (and all of its inputs), beta is a forward-looking concept. We are trying to estimate "future" beta.

- In practice, however, beta is often estimated using historical return data. In this sense, beta is forward looking……but only to the degree that the past is expected to repeat itself.

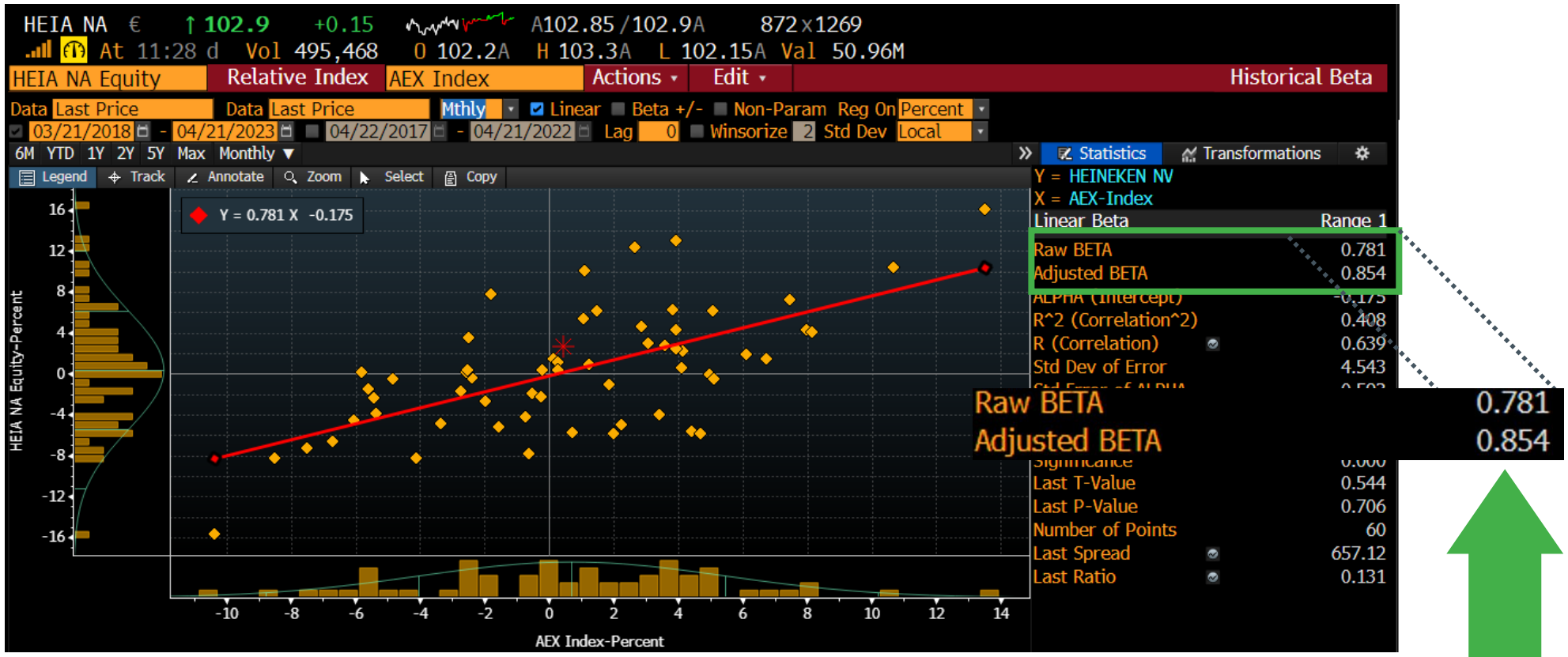
- Can a beta calculated using historical data be made more "forward-looking"? There are a few common adjustments to do this:

1) The Blume Adjustment (adjusts to the "market" beta)

2) The Vasicek Adjustment (adjusts to the "industry" beta)

3) The Portfolio (Peer Group) Beta (adjusts to "peers"/"industry")

Bloomberg's Adjusted Beta is based on the Blume Adjustment



Adjusted Beta = (0.33 x 1.0) + [0.67 x historical (Raw) beta]

0.854 = (0.33) + (0.67 x 0.781)

Why Use 0.33 in the Blume Adjustment?

$$\text{Prospective Beta} = (0.33) + (0.67 \times \text{historical beta})$$

- The adjustment is a simplification (1/3 vs. 2/3) and not an exact replication of Blume's original analysis in his 1971 paper.
- The original Blume adjustment was (based on an average of several periods from 1926 through 1968 using 7-year monthly betas):

$$\text{Prospective Beta} = (0.371) + (0.635 \times \text{historical beta})$$

- This simple adjustment of 0.33 makes the Blume adjustment a "**one size fits all**" adjustment.

Source: The original paper, "*On the Assessment of Risk*", The Journal of Finance, Vol. 26, No. 1, (Mar 1971), pp. 1-10

A Few Thoughts on the Blume Adjustment…

Blume said in his 1971 paper that:

- The coefficients themselves will change over time (i.e., the ratio at which a beta moves to the market beta of 1.0)

The use of a historical regression to correct for the future ratio:

- Will not perfectly adjust betas
- May overcorrect by introducing larger errors than in the unadjusted beta

Caution

✓ If your project may end up in litigation, be aware of these limitations

✓ You may not be able to defend the adjustment in court [See: Delaware Court of Chancery case "GT LP and Global GT LTD v. Golden Telecom, Inc."]

The Vasicek Adjustment

- Betas with higher standard error (i.e., lower statistical quality) are the least reliable estimates, and therefore are adjusted toward the market/peer group/industry average *more* than are betas with higher statistical quality.
- Also known as a "shrinkage" or "smoothing" technique.

The Vasicek Adjustment is ***not*** "one size fits all".

$$\beta_{\text{Vasicek Adj}} = \frac{\sigma^2_{\beta_i}}{\sigma^2_{\beta_m} + \sigma^2_{\beta_i}} \beta_m + \frac{\sigma^2_{\beta_m}}{\sigma^2_{\beta_m} + \sigma^2_{\beta_i}} \beta_i$$

where:

$\beta_{Vasicek\ Adj}$	=	Vasicek adjusted beta for company or portfolio *i*
β_i	=	Historical beta for company or portfolio *i*
β_m	=	Beta of the market, industry, or peer group
$\sigma^2_{\beta_m}$	=	Variance of betas in the market, industry, or peer group
$\sigma^2_{\beta_i}$	=	Square of the standard error of the historical beta for company or portfolio *i*

Portfolio Beta

- The **beta of a portfolio** is the weighted average of the betas of the securities in the portfolio, using market-cap weights.

- Portfolio beta is the measure of an entire portfolio's sensitivity to overall market changes, whereas an individual company beta is based on an individual stock's sensitivity to the market.

- Portfolio betas are calculated in the Company-level Beta Module as the market-value-of-equity (market cap) weighted average of the OLS betas of the comparable companies selected.

Beta Best Practices

Best Practices by Beta Type

- **OLS Beta**
  - Best to only use betas that are “statistically significant”. A short-cut is to look at t-stats > 2.0
  - Be careful if a company underwent a significant transaction (e.g., acquisition, divestiture, etc.), as the underlying business risk may have changed materially.
  - Look at trailing betas over time (e.g., over the last 10 years) to analyze beta stability.

- **Sum Beta**
  - Preferably, use only for small or thinly-traded comparable companies.
  - Sum betas have been shown to be better predictors of smaller companies’ expected returns within the context of the CAPM.

- **Vasicek Adjusted**
  - Can be used for any project.
  - Particularly important when standard errors of individual betas are large (look at the size of the standard error relative to the beta estimate).

Best Practices for Market Index

– McKinsey & Company, "Valuation", 7th Edition

Quote 1

*"Most **well-diversified indexes**, such as the S&P 500 and MSCI World Index, are highly correlated (the two indexes had a 97 percent correlation between 2000 and 2018). Thus, the choice of index will have only a small effect on beta. **Do not, however, use a local market index**, which some data services provide. Most countries are heavily weighted in only a few industries, and in some cases, a few companies. Consequently, when measuring beta versus a local index, you are not measuring market-wide systematic risk, but often a company's sensitivity to a particular set of industries." [Emphasis Added]*

Quote 2

"We recommend using a local CAPM for investors and companies facing restrictions to investing abroad." [Emphasis Added]

Quote 3

"Nevertheless, we don't recommend the local CAPM approach for integrated markets. [...] [W]ith a local CAPM, you cannot make a straightforward estimate of a company's beta based on the average of the estimated betas for a sample of industry peers. [....] The reason is that if the peers are in different countries, their local betas are not directly comparable." [Emphasis Added]

Best Practices for Market Index

- By definition, the market portfolio in CAPM consists of all assets in all markets, where each asset is weighted by its market capitalization.
  - **In theory,** this include all types of assets that are held as an investment (e.g., artwork, real estate, human capital, etc.)
  - **In practice,** such market portfolio is unobservable and is substituted by a broad-based stock market index, which is comprised of a **diversified** portfolio of common stocks.

- **Choice of Index:** Should I use a Local Market Index or a Regional/Global Index?
  - **Fully Integrated Market:** Use a diversified regional or global index. Note: U.S. stock market is fully integrated
  - **Completely Segmented Market:** Use a diversified local index
  - **Not Fully Integrated/Segmented:** Consider looking it a both at diversified local and global indices

Best Practices for Market Index

Kroll Company-level Beta Module

- All indices are in the MSCI index family, so there is no inconsistency between index providers' methodologies.

- Country-level indices are not available for every comparable company's local stock market.
  - Country-level indices with a small number of constituents and indices dominated by a single industry sector are not included.
  - All country-level indices available for selection in this module had at least 25 constituents as of December 31, 2022, with the exception of MSCI Mexico and MSCI Italy, which had 23 each.

- The following academic paper is an example of the empirical evidence on why it is important to use diversified market indices for beta estimation:

  Lally, Marty, Steve Swidler (2008), "Betas, market weights and the cost of capital: The example of Nokia and small cap stocks on the Helsinki Stock Exchange", International Review of Financial Analysis.
  https://www.sciencedirect.com/science/article/abs/pii/S1057521907000610

Best Practices for Currency

- Currency of comparable companies should match the currency of the market index used when regressing betas.

Best Practices for Return Frequency and Lookback Period

- Most common or "standard" historical period used to measure returns = 5 years of monthly returns (i.e., 60 months). Another period often used = 2 or 3 years of weekly returns (i.e., 104 or 156 weeks).
- If company characteristics change significantly (e.g., major divestiture or acquisition, significant deregulation), it may be more appropriate to use a shorter period (e.g., weekly returns).
- The shorter the time period, the more "noise" is introduced, reducing the statistical quality of the regression.
- Care should be taken such that the sample size is not too small. For example, a beta based on less than 30 monthly observations may not be reliable (i.e., not statistically significant). Likewise, a beta based on less than 104 weeks may be unreliable.
- Be careful with companies that went through an IPO within the last year, as those betas are often unreliable and not a good proxy for their future risk.

Best Practices for Capital Structure

Cost of Capital Input	Post Coronavirus Considerations
(Asset) Beta – Unlevered	• Significant equity market declines can lead to greater debt % in the capital structure (particularly, if using book value). • May significantly distort the calculated unlevered betas. Hamada unlevering formula may exacerbate the issue. • Consider using other unlevering methods (e.g., Harris-Pringle) in times of heightened market volatility or when leverage is high.
Capital Structure	• Corporate finance theory tells us to use market value weights for debt component • Don't automatically assume debt book value = market value • Review Fair Value footnotes in annual & interim financials • Consider long-term averages instead of point-in-time capital structure

Company-level Levered Beta Resources

Sources Of Levered Company-level Betas

- Kroll Company-level Beta Module[1]
- S&P Capital IQ
- Bloomberg

1) Available through the Cost of Capital Navigator. Industry-level betas (levered and unlevered) can be found in the (i) U.S. Industry Benchmarking Module and (ii) the International Industry Benchmarking Module

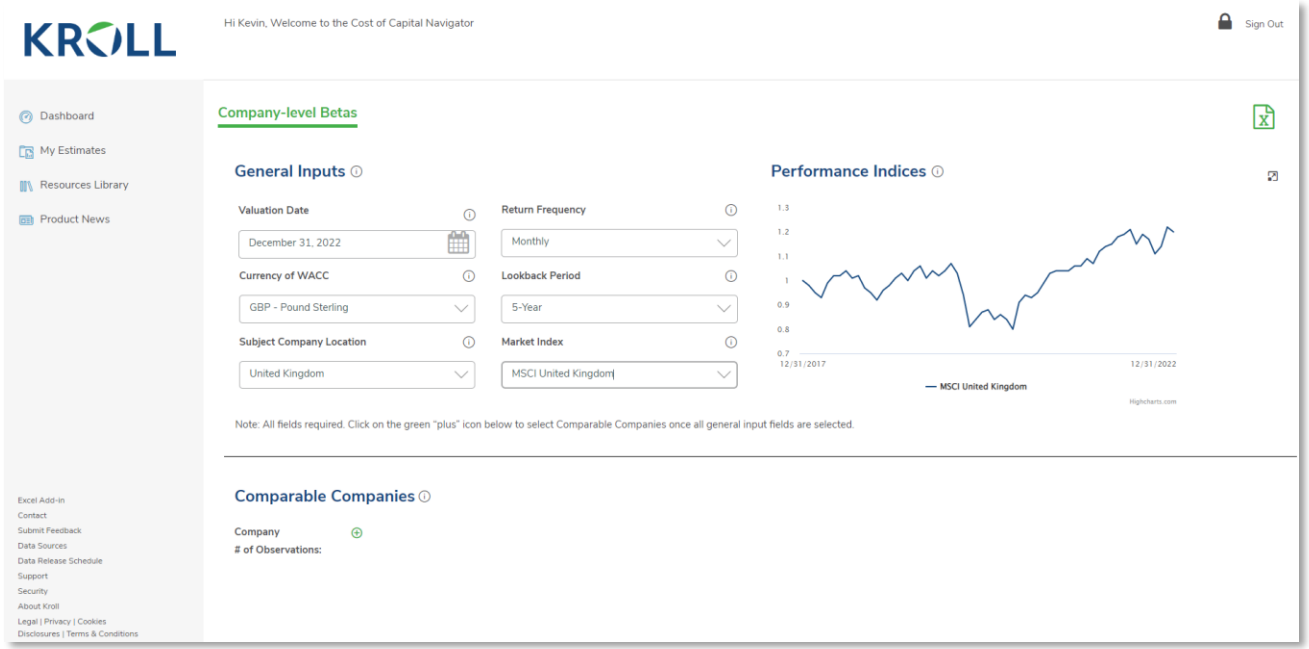
Sources of Levered Betas – Kroll Company-level Beta Module (New)

- **Coverage:**
  - **35,000+** companies located in **110+** countries that can be searched by several criteria (e.g., company name, industry, size, country).

- **Benchmark Index:**
  - **30+** market indices in the MSCI universe.
  - Guidance on index selection: multiple pre-selected indices offered based on subject company location. If a country index is too small to capture the risk of a given company, the user will not be able to select it for beta computation purposes.

- **Currency:**
  - **100+** currencies to choose from.
  - Betas are computed consistently in the same currency (an issue often ignored inadvertently by practitioners).

- **Frequency and Period of Returns:**
  - Users may select weekly and monthly returns for different look-back periods (1-,2-,3-,4-, and 5-years).



Kroll.com/costofcapitalnavigator

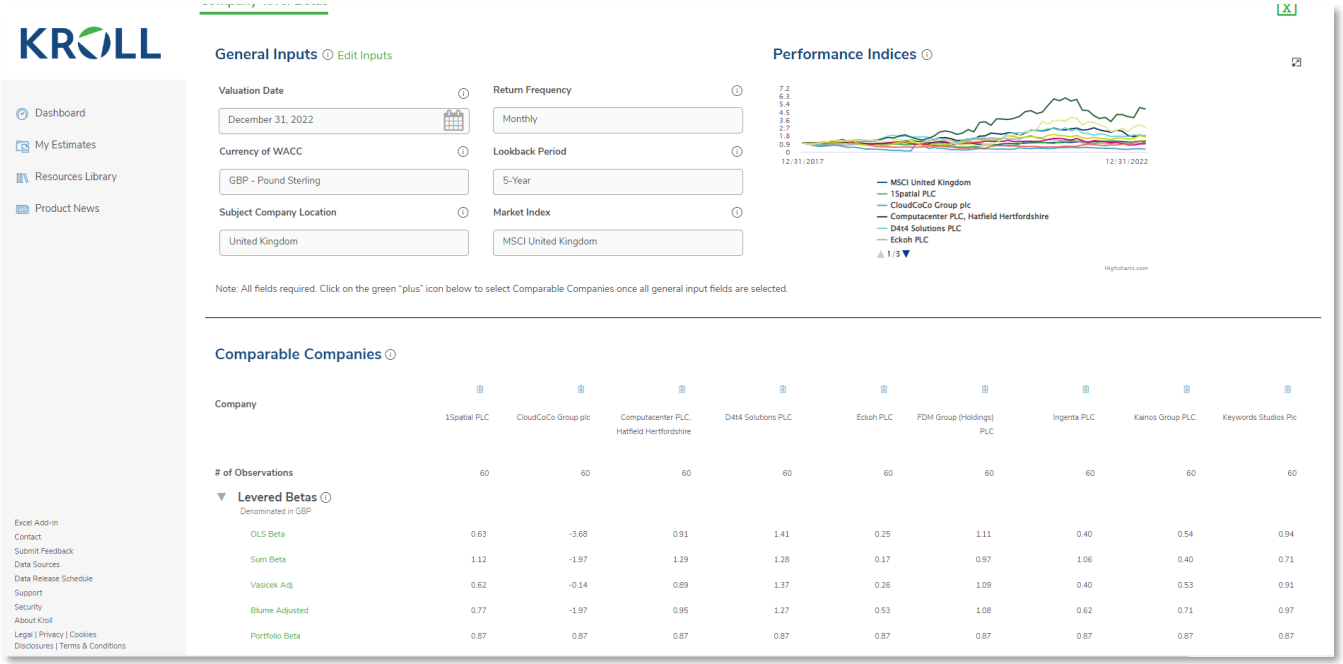
Sources of Levered Betas – Kroll Company-level Beta Module (New)

- **Beta Types:**
  - There are five different methodologies to estimate betas.
  - The methodologies are transparent and easy to explain to auditors and other stakeholders.
  - Competing products only offer betas calculated using the slope of a regression (i.e., the ordinary least squared beta)

- **Excel Download:**
  - Users can download various results into Excel without running into data provider limitations (e.g., Bloomberg)

- **Statistical Quality of Betas:**
  - We provide users with multiple indicators to assess the statistical significance of a beta

- **Source of Data:**
  - Company-level returns are sourced from S&P Global Market Intelligence, *Compustat* database. Market Index returns are sourced from MSCI Inc.



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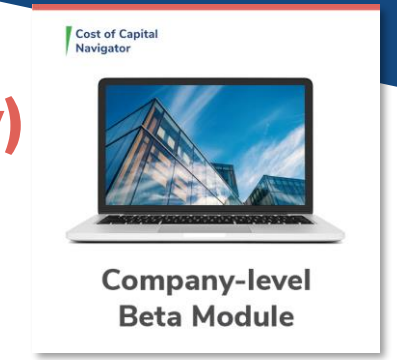
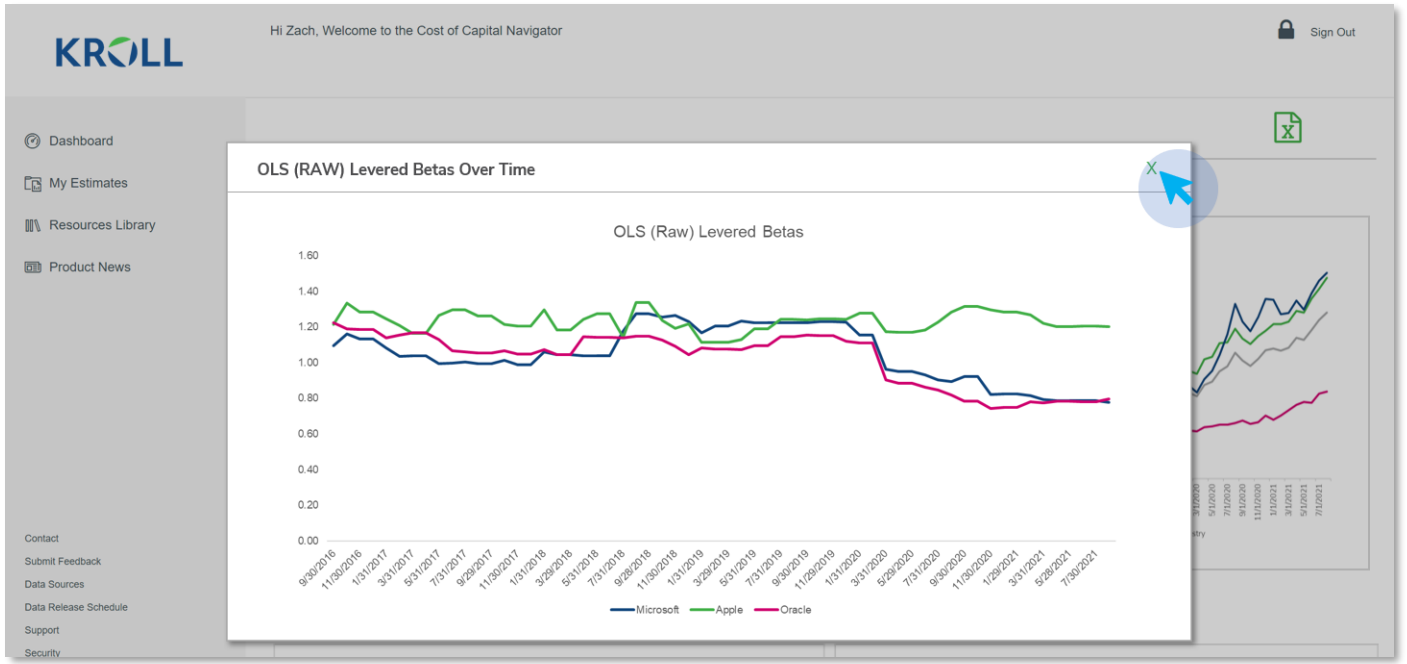
Sources of Levered Betas – Kroll Company-level Beta Module (New)



- **Features and Functionality Coming Soon**
  - The ability to save estimates
  - Option to include/exclude operating leases from Total Debt
  - Option to include/exclude cash from Total Debt (i.e., Net Debt)
  - Harris Pringle Unlevering
  - Company tearsheet view
  - Beta and other metric trends over time
  - Dataset added to Navigator Excel Add-in



Sources of Levered Betas – S&P Capital IQ

S&P Capital IQ's ("CIQ") levered historical betas, also known as raw levered betas, are derived from an ordinary least squares regression analysis using individual stock and benchmark index returns based on a monthly or weekly frequency and over a given period of time.

- Three off-the-shelf betas are available through CIQ:
  - 1-year ("IQ_BETA_1YR") – 52-week OLS beta
  - 2-year ("IQ_BETA_2YR") – 104-week OLS beta
  - 5-year ("IQ_BETA_5YR") – 60-month OLS beta
- The benchmarks for these off-the-shelf betas are the S&P 500 for all U.S. stocks, the S&P/TSX Composite for all Canadian stocks, the MSCI EAFE for all developed market stocks in Europe, Australasia, and the Far East, and the MSCI Emerging Markets for all other international stocks.
- CIQ also offers a custom beta function ("IQ_CUSTOM_BETA") where you define the market benchmark, date range (i.e., lookback period), monthly or weekly return frequency, and currency.

https://www.capitaliq.com/

Sources of Levered Betas – S&P Capital IQ

Notes:

When using the three CIQ "off-the-shelf" betas:

- If your comp set includes U.S. and International stocks, betas will be regressed against different local indices
- **U.S. stocks:** companies and market index are denominated in USD
- **Canadian stocks:** companies and market index are denominated in CAD
- **Developed market stocks in EAFE:** companies denominated in local currency, market index denominated in USD
- **Emerging market stocks:** companies denominated in local currency, market index denominated in USD

Scenarios	Ticker	Company	Currency of Company	Currency of Index	Index
U.S. Stock	NasdaqGS:MSFT	Microsoft Corporation	USD	USD	S&P 500
Canadian Stock	TSX:RY	Royal Bank of Canada	CAD	CAD	S&P/TSX Composite
Intl - Developed	ENXTPA:MC	LVMH Moët Hennessy - Louis Vuitton, Société Européenne	EUR	USD	MSCI EAFE
Intl - Developed	TSE:7203	Toyota Motor Corporation	JPY	USD	MSCI EAFE
Intl - Developed	SWX:NESN	Nestlé S.A.	CHF	USD	MSCI EAFE
Intl - Emerging	KOSE:A005930	Samsung Electronics Co., Ltd.	KRW	USD	MSCI Emerging Markets
Intl - Emerging	NSEI:TCS	Tata Consultancy Services Limited	INR	USD	MSCI Emerging Markets

https://www.capitaliq.com/

Sources of Levered Betas – S&P Capital IQ

Notes:

- CIQ "off-the-shelf" and "custom" betas define the **number of observations** based on price not return.
  - Sometimes there is a difference in the value pulled using IQ_BETA (1 year, 2 year, and 5 year) and IQ_CUSTOM_BETA for the same time period due to the way the price is picked for calculation
  - Depending on your valuation date, a 5-year off-the-shelf ("IQ_BETA_5YR") may be based on 60 prices and regressed against **59 returns** (i.e., 59 observations)
  - Depending on your valuation date, a "custom" beta using 60 months before the end date, the beta may be based on 60 prices and regressed against 59 returns

- When using the "Custom" beta function and **changing currency**:
  - Make sure to change the market index to be denominated in the currency you've selected. For example, the S&P 500 (CIQ identifier = ^SPX) is denominated in USD. If you want to regress betas against EUR, you will need to update the S&P 500 index to be denominated in EUR by changing to the appropriate CIQ identifier

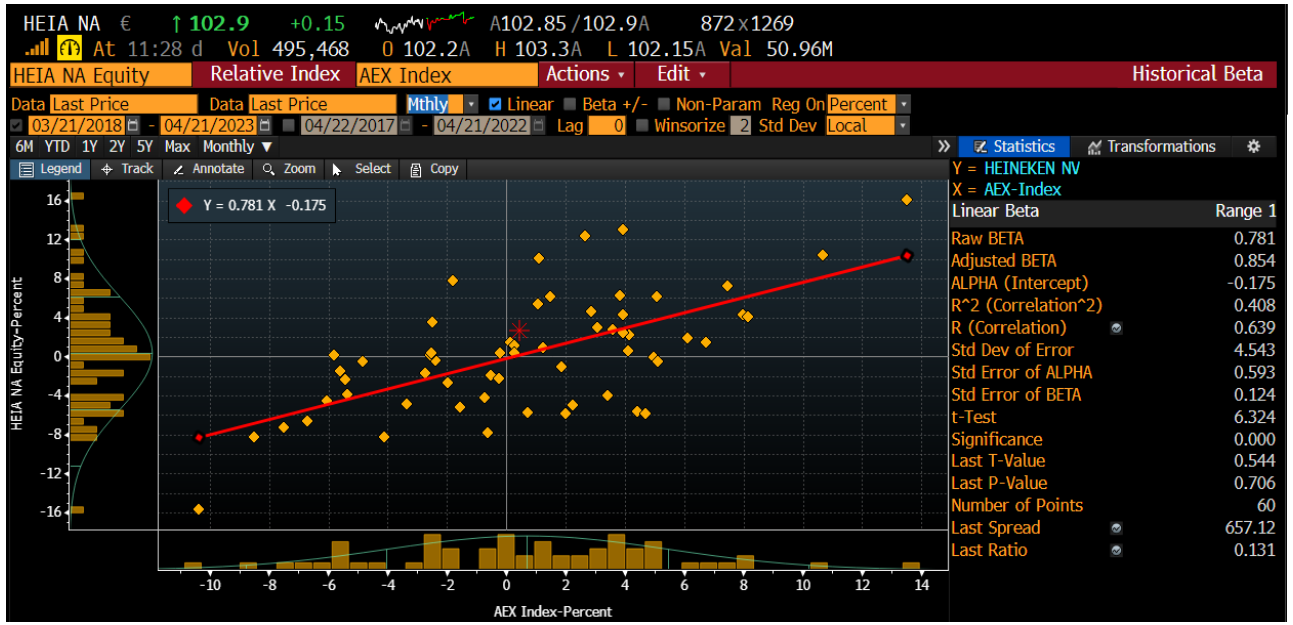
https://www.capitaliq.com/

Sources of Levered Betas – Bloomberg

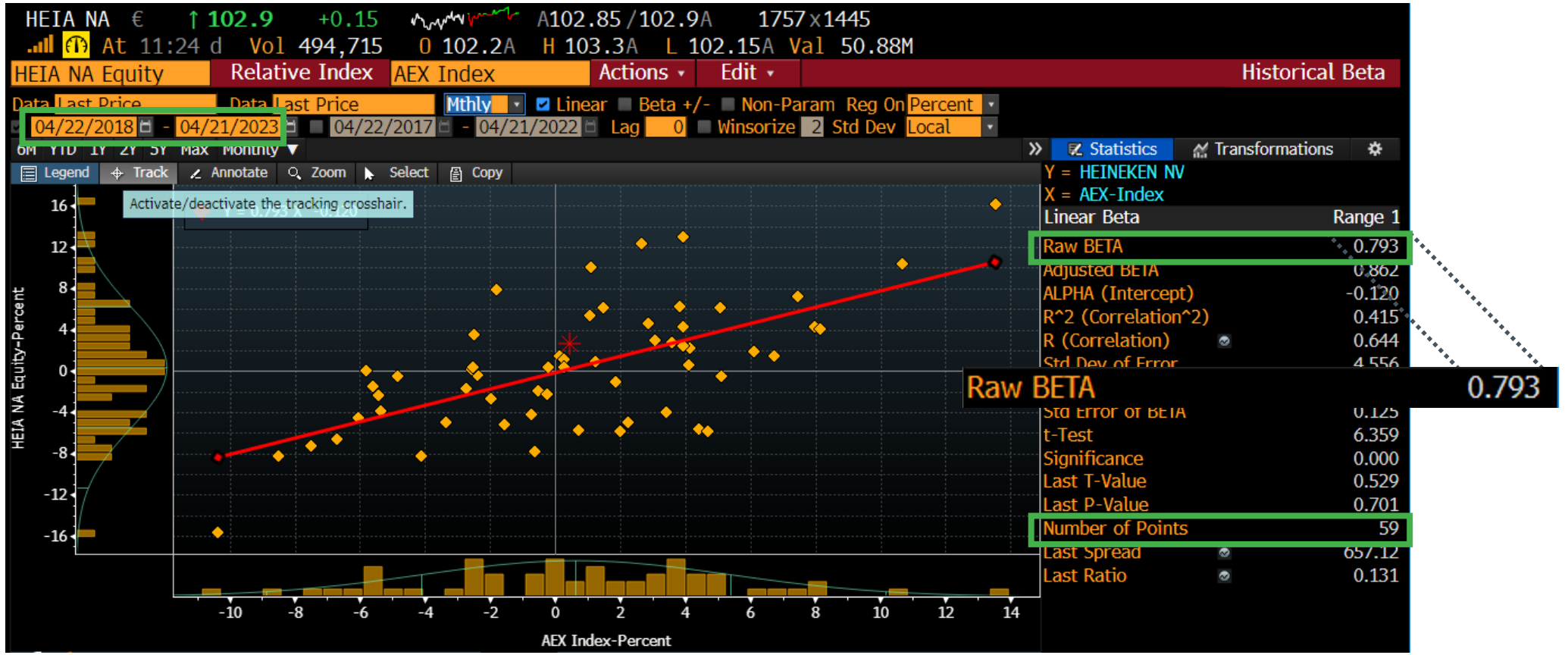
- Type the ticker symbol, hit <EQUITY>, type BETA and hit GO
- Can only access at Bloomberg Terminal, unless using Bloomberg Anywhere
- View one security at a time
- Betas calculated include Raw (i.e., OLS) and Adjusted (i.e., simplified version of the Blume adjustment)
- Lots of features and functionality:
  - Select between monthly, weekly, and daily returns
  - Select start and end date for regression
  - Select different market indices
  - Select different currencies

Note:

- If you select a different currency for the equity, you will also need to change the currency of the market index (its not automatic)
- Be mindful of data download limits at Bloomberg Terminals
- US equity default index is S&P 500 in USD
- International equity default index is local country index in local currency

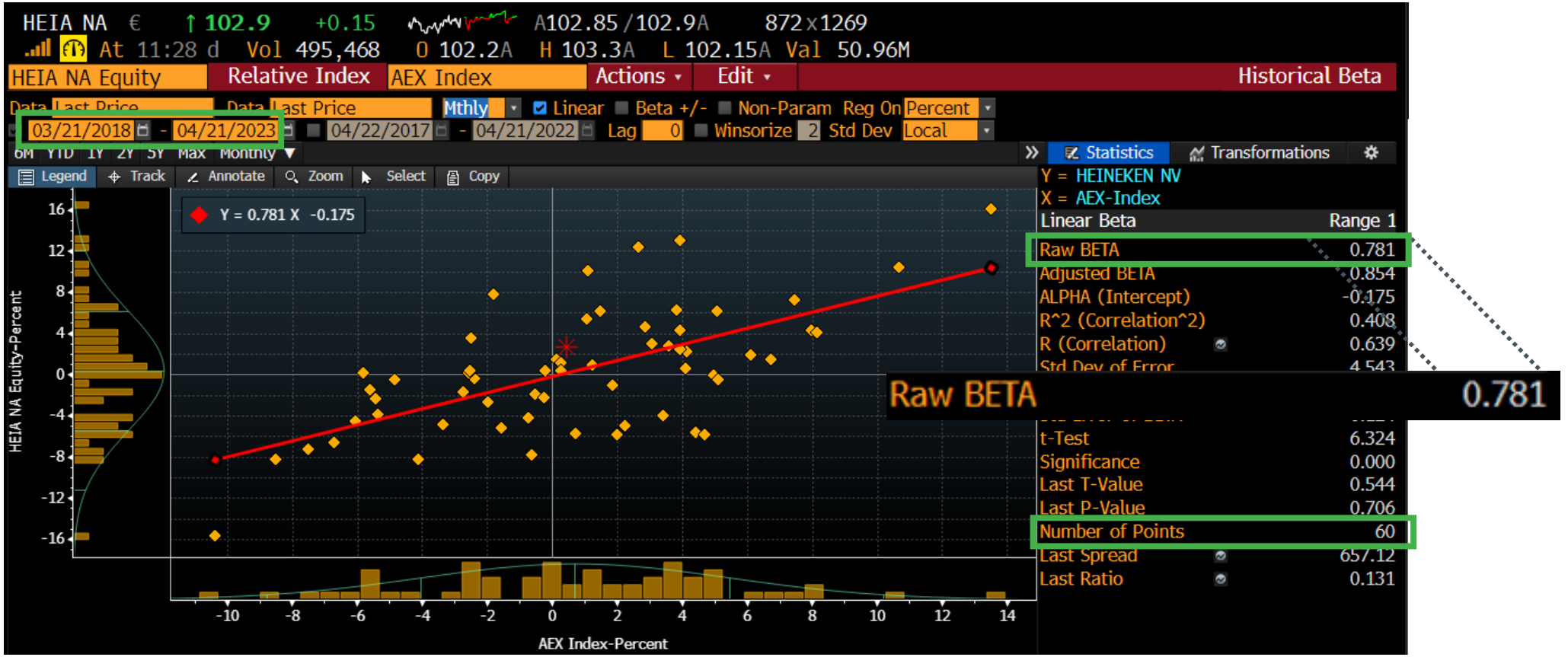


Bloomberg Default: 59 Months of Returns for 5-yr Monthly Betas



Bloomberg Default: 59 Months of Returns for 5-yr Monthly Betas

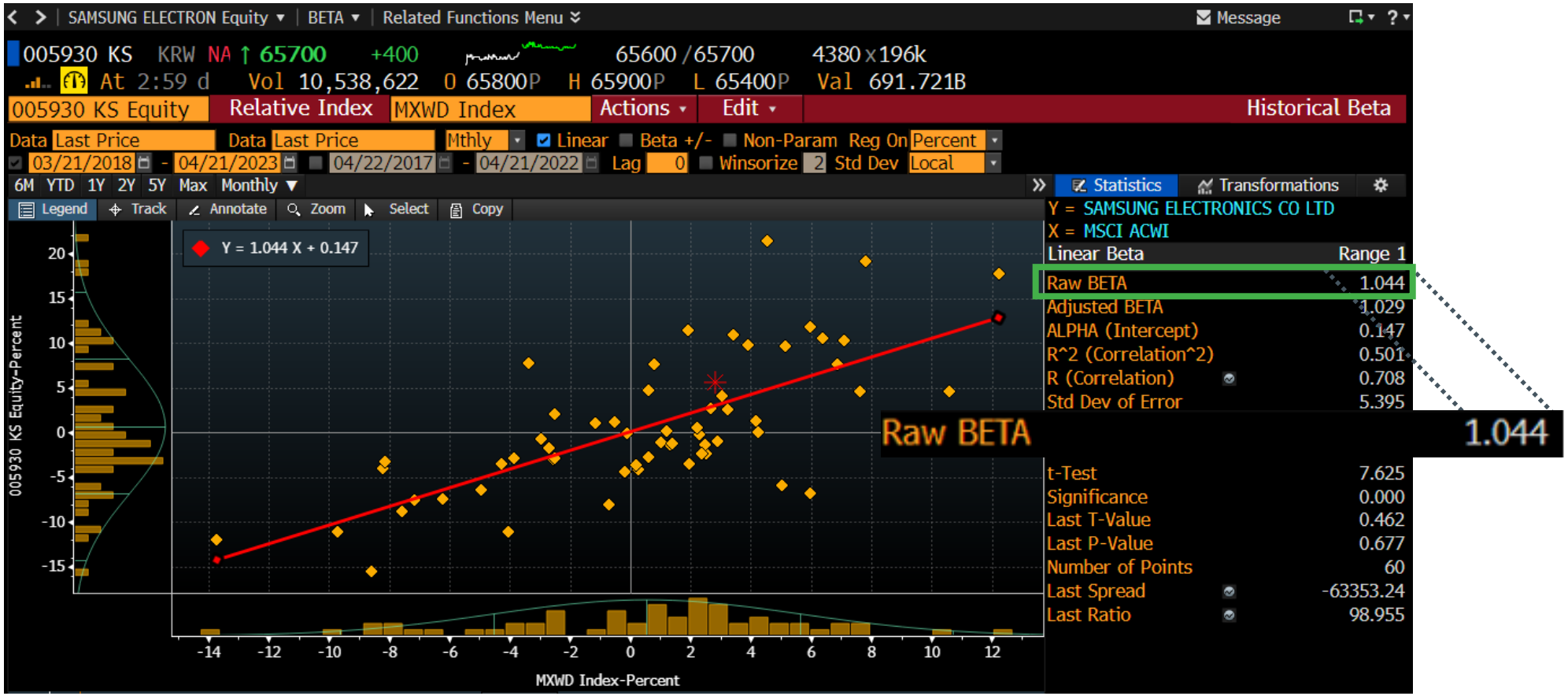
Results can differ using 60 months of returns!



Difference = 0.781 – 0.793 = -0.012 => In this case, not very material, but it can be at times

Bloomberg Defaults to Currency of Country Where Share Trades

Currency of Market Index returns may be different from the currency in which the share trades

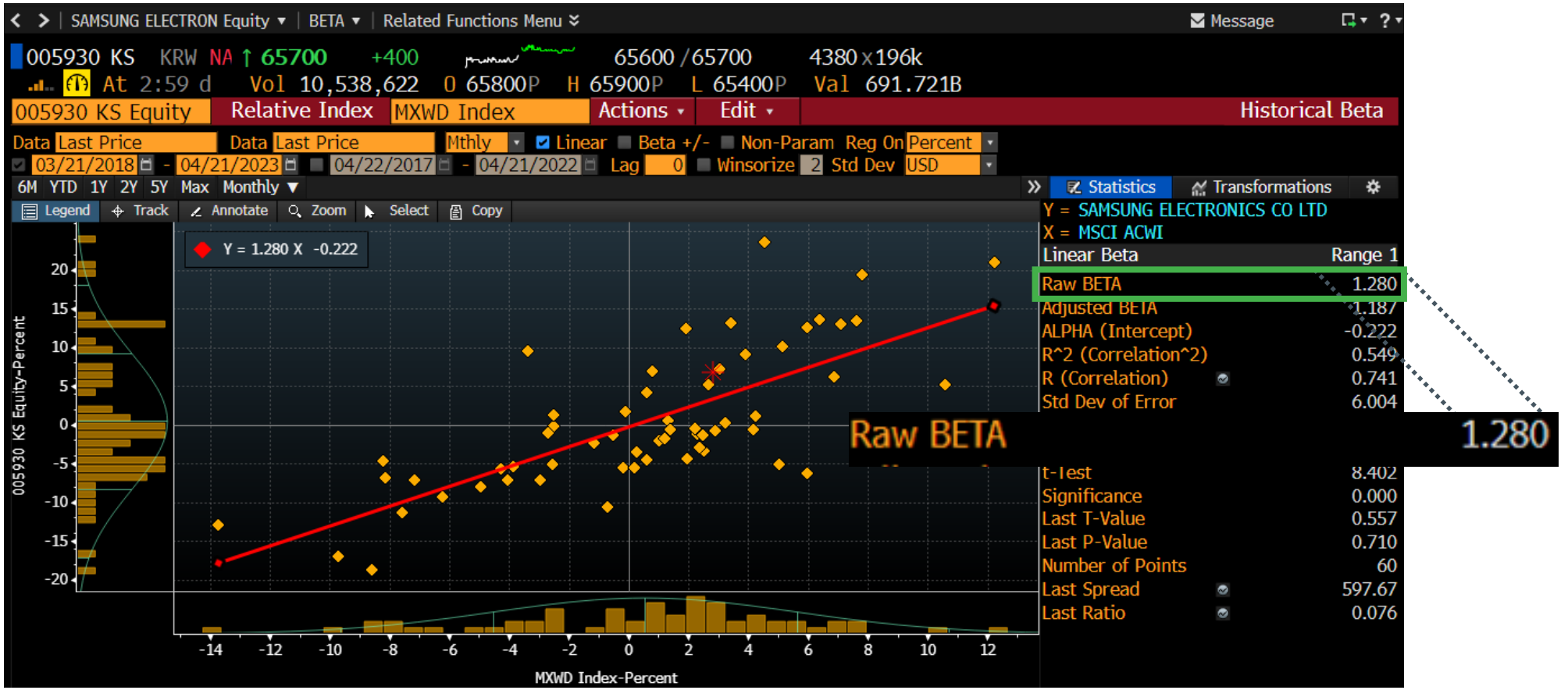


Index ▶ **MSCI ACWI**

Currency ▶ **LCL (KRW)**

Bloomberg Defaults to Currency of Country Where Share Trades

Changing index currency can affect results!



Index ▶ **MSCI ACWI**

Currency ▶ **USD**

Difference = 1.280 – 1.044 = 0.236 => In this case, very material difference

Sources of Levered Betas – Comparison of all Beta Databases

	Company-level Beta Module	S&P Capital IQ	Bloomberg
Access	Online Platform	Online Platform	Bloomberg Terminal or Bloomberg Anywhere
Excel Add/Plug-in	On Roadmap	Yes	Yes (only at a Terminal/Anywhere)
# of Beta Types	5	1	2
Return Frequency	Monthly & Weekly	Monthly & Weekly	Monthly, Weekly, and Daily
Return Type	Total (Excess) Return	Default setting: Price Return	Default setting: Price Return
Lookback Periods	1-, 2-, 3-, 4-, and 5-year	1-, 2-, and 5-year, and custom range	6M, YTD, 1-, 2-, 5-year, and custom range
Off-the-shelf 2-year Beta # of Observations	2-year weekly = 104 2-year monthly = 24	2-year weekly = 103/104 (inconsistent)	Default setting: 2-year weekly = 103
Off-the-shelf 5-year Beta # of Observations	5-year weekly = 260 5-year monthly = 60	5-year monthly = 59/60 (inconsistent)	Default setting: 5-year monthly = 59
Market Indices	Minimum of 2 options based on subject company location	Off-the-shelf betas = 4 depending on if U.S. or int'l stock Custom = multiple	Multiple, U.S. equity default = S&P 500 Intl equities default = based on location
Currency	150	Off-the-shelf betas = multiple, mostly with a currency mismatch Custom = multiple	Multiple, U.S. equity default = USD Intl equities default = based on local currency

Sources of Levered Betas – Advantages and Disadvantages

	Advantages	Disadvantages
Company-level Beta Module	• Access anywhere through online Cost of Capital Navigator • Five different methods to estimate betas, with methodologies being transparent and easy to explain to auditors and other stakeholders • Betas are computed consistently in the same currency • Select weekly and monthly returns for different look-back periods • Pre-selected and screened market indices (that consider diversification) • View multiple comps at the same time • Statistical quality of betas provided • Download results to Excel	• No Excel Add-in (on our Roadmap) • Still needs to gain recognition with stakeholders (e.g., auditors)
S&P Capital IQ	• Access through Excel plug-in or platform • Select weekly and monthly returns for different look-back periods • Easy to update for recurring engagements • View multiple comps at the same time (only with Excel plug-in) • Well recognized by stakeholders (e.g., auditors, clients)	• Betas may not be computed consistently in the same currency unless adjustments are made (biggest issue with off-the-shelf betas) • For custom betas, users have to select their own market index and identify the ticker for the correct currency • At times, the computation doesn't pick up the correct number of return observations (e.g., 59 vs 60)
Bloomberg	• Select daily, weekly and monthly returns for different look-back periods • Both Raw (OLS) and Adjusted (based on Blume) Betas are provided • Statistical quality of betas provided • Well recognized by stakeholders (e.g., auditors, clients)	• Can only access at Bloomberg Terminal, unless using Bloomberg Anywhere • Betas may not be computed consistently in the same currency, unless adjustments are made • Can only view one comp at a time • Bloomberg (Blume) Adjusted Beta has been rejected in Delaware Court

What Types of Betas are Available by Database?

Levered Beta Type	Company-level Beta Module	S&P Capital IQ	Bloomberg
OLS	X	X	X
Sum	X		
Blume-Adjusted	X		X
Vasicek-Adjusted	X		
Portfolio	X		

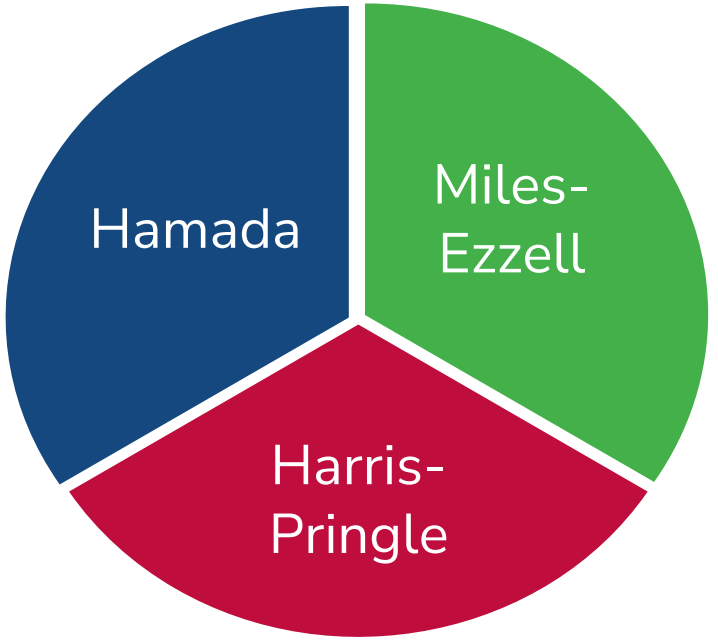
Adjusting for Financial Risk (Unlevering and Relevering)

There are Various Formulas for Unlevering and Relevering Betas

- These alternative formulas vary depending on the likelihood that tax deductions on interest will be realized.
- We will focus on 3 of these formulas:

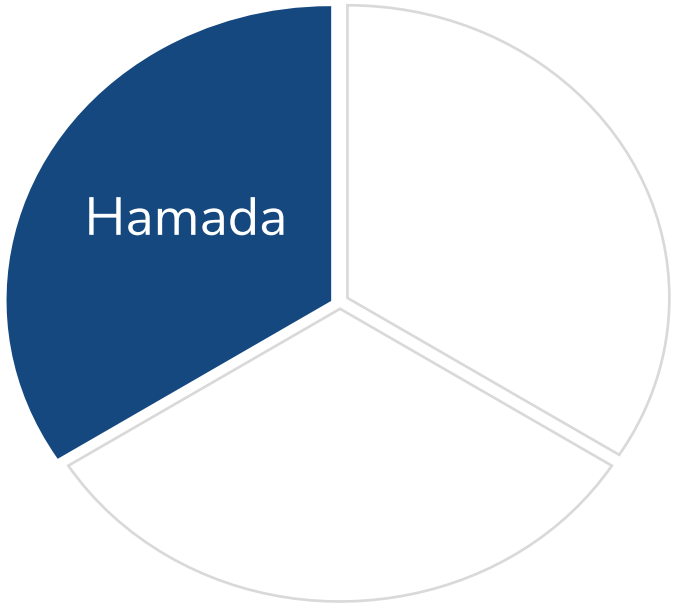
IMPORTANT!

Because of interest deductibility limitations introduced by the 2017 U.S. Tax Reform, you may need to adjust your tax rate assumptions in your unlevering/levering calculations.



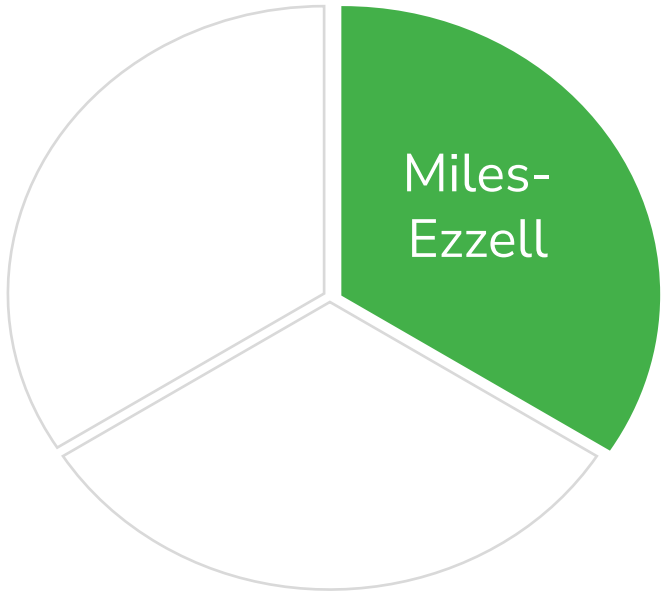
Hamada Beta Unlevering/ Relevering Formulas

- Is the most commonly used formula.
- Is applicable in situations where the **absolute amount of debt is fixed**.
- Consistent with theory that there is **no risk** surrounding the ability to get full tax deductions



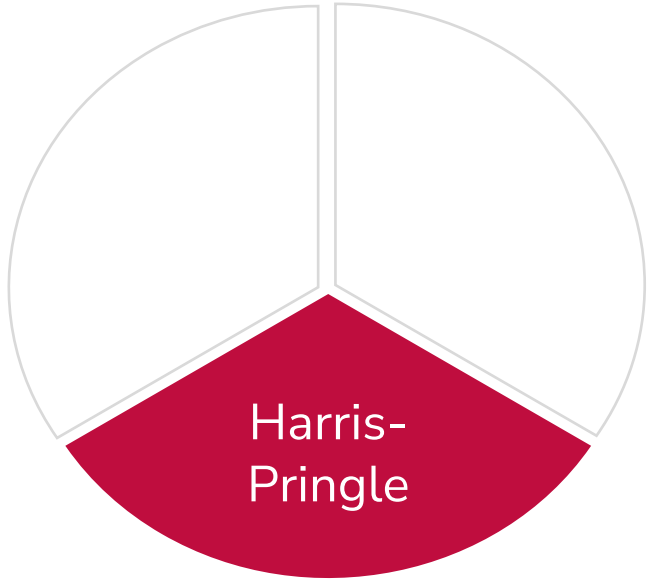
Miles Ezzell Beta Unlevering/Relevering Formulas

- Assumes that the risk of realizing the tax deductions is greater than is assumed in the Hamada formulas.
  - **Year 1:** The discount rate used to calculate the value of the tax shield equals the cost of debt capital during the first year (i.e., the tax shield has the same risk as debt).
  - **Years 2 and beyond:** The discount rate used to calculate the value of the tax shield in years 2 and beyond equals the cost of equity calculated using the asset beta of the firm (i.e., the risk of the tax shield after the first year is comparable to the risk of the operating cash flows).
- Market value of debt capital remains at a **constant percentage** of equity capital, which is equivalent to saying that debt increases in proportion to increases in the net cash flow of the firm (net cash flow to invested capital) in every period.



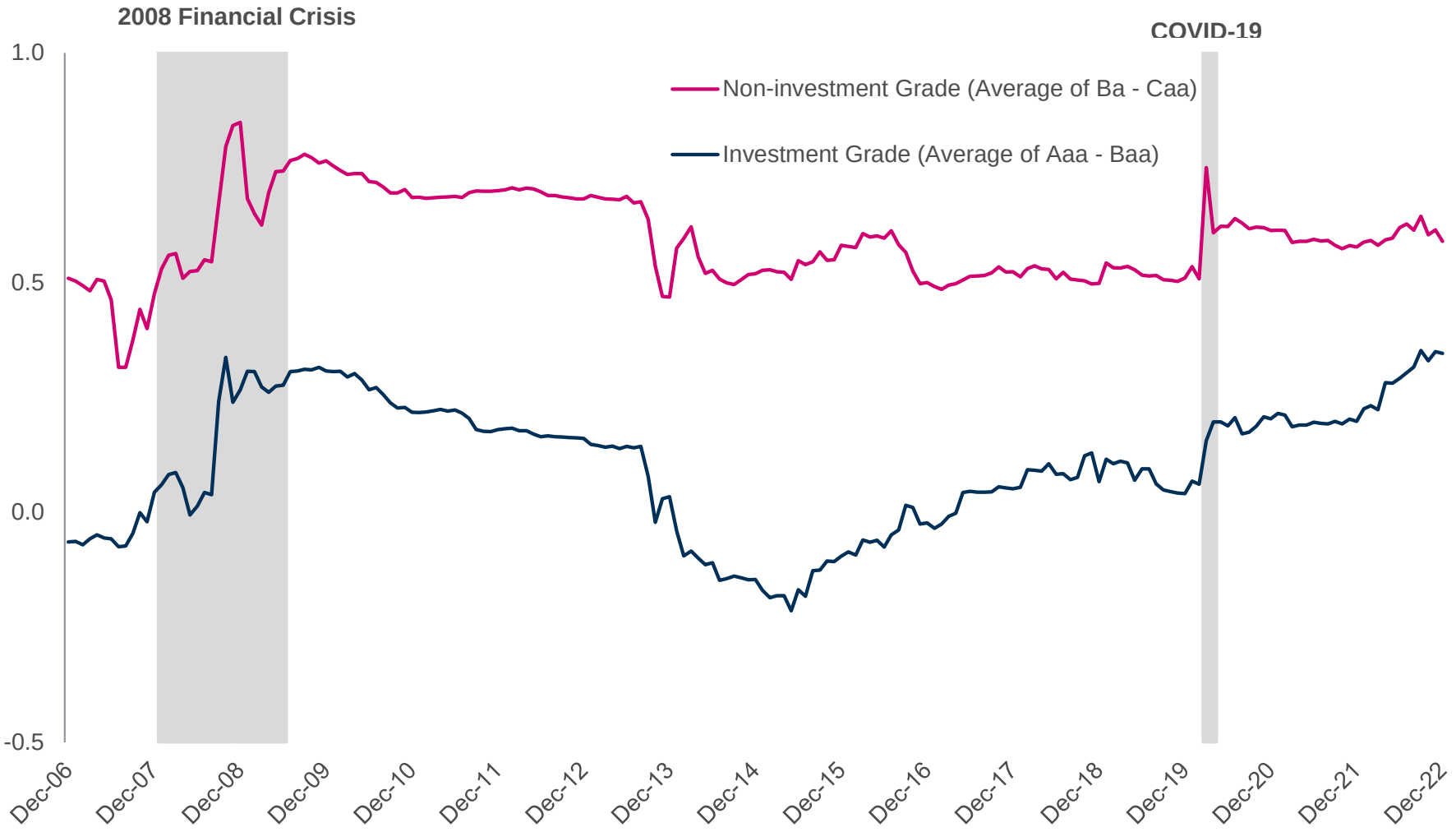
Harris Pringle Beta Unlevering/ Relevering Formulas

- Assumes the tax shield is even riskier.
- Consistent with theory that tax deductions are as risky as operating cash flows and the discount rate on those deductions equals cost of equity
- Assumes the market value of debt capital remains at a **constant percentage** of equity capital, which is equivalent to saying that debt increases in proportion to the net cash flow of the firm (net cash flow to invested capital) in every period.



U.S. Debt Betas (by credit grade) Over Time

December 2006 – December 2022



Source: Cost of Capital Navigator

Practical Issues

- The beta of a portfolio is always the market-value weighted average of the betas of the individual investments in that portfolio. For example, the beta of a mutual fund is the weighted average of the betas of the stocks and other investments in that portfolio.

- The beta of a company after a merger is the market-value weighted average of the betas of the companies involved in the merger.

- The beta of an overall company is the market-value weighted average of the businesses (i.e., divisions and/or projects) comprising the overall company.

Recommendations

- Use public comparable (or guideline) companies as proxies when valuing a private company. Even for companies that are traded, it's better to also look at comparable companies.
- Consider differences between subject company and public comparables.
- Use betas from consistent source.
- Be cautious of data from small firms without an active market: true betas tend to be underestimated. Therefore, consider avoiding betas from thinly-traded companies or use Sum Betas.
- Be careful with betas of highly levered companies: Harris-Pringle unlevering methodologies should be used in such cases.
- Consider avoiding unlevered (asset) beta that is 0.10 or lower. Such estimate is likely not statistically different from zero.
- Consider impact of unusual effective tax rates on unlevering Beta (e.g., negative tax rate).
- May want to adjust betas of companies with large cash balances (objective is to estimate underlying (asset) beta of operations).

Case Study

Calculating and Selecting Betas for Valuation Date = 31 December 2022

Our Example Subject Company

“Kroll’s Clothing Store” is a company that operates in the U.S. and sells branded apparel. The company operates out of approximately 1,000 stores, based entirely in the United States. The company generates ~$5 billion a year in sales.

Our industry is **GICS 25504010 – Apparel Retail.**

Our valuation date is **31 December 2022.**

What steps do we follow to estimate beta for our subject company?

Decisions to Estimate Beta

1. What is the currency of your WACC and where is your subject company located?

2. The length of the time period over which the historical returns are measured (i.e., the length of the look-back period)

3. The periodicity (frequency) of return measurement within that time period (e.g., weekly, monthly, etc.)

4. The choice of which index to use as a market proxy

Decisions to Estimate Beta

1. What is the currency of your WACC and where is your subject company located?

   USD, located in the United States

2. The length of the time period over which the historical returns are measured (i.e., the length of the look-back period)

3. The periodicity (frequency) of return measurement within that time period (e.g., weekly, monthly, etc.)

4. The choice of which index to use as a market proxy

Decisions to Estimate Beta

1. What is the currency of your WACC and where is your subject company located?

   USD, located in the United States

2. The length of the time period over which the historical returns are measured (i.e., the length of the look-back period)

   5 years

3. The periodicity (frequency) of return measurement within that time period (e.g., weekly, monthly, etc.)

4. The choice of which index to use as a market proxy

Decisions to Estimate Beta

1. What is the currency of your WACC and where is your subject company located?

   USD, located in the United States

2. The length of the time period over which the historical returns are measured (i.e., the length of the look-back period)

   5 years

3. The periodicity (frequency) of return measurement within that time period (e.g., weekly, monthly, etc.)

   Monthly (60 months)

4. The choice of which index to use as a market proxy

Decisions to Estimate Beta

1. What is the currency of your WACC and where is your subject company located?

   USD, located in the United States

2. The length of the time period over which the historical returns are measured (i.e., the length of the look-back period)

   5 years

3. The periodicity (frequency) of return measurement within that time period (e.g., weekly, monthly, etc.)

   Monthly (60 months)

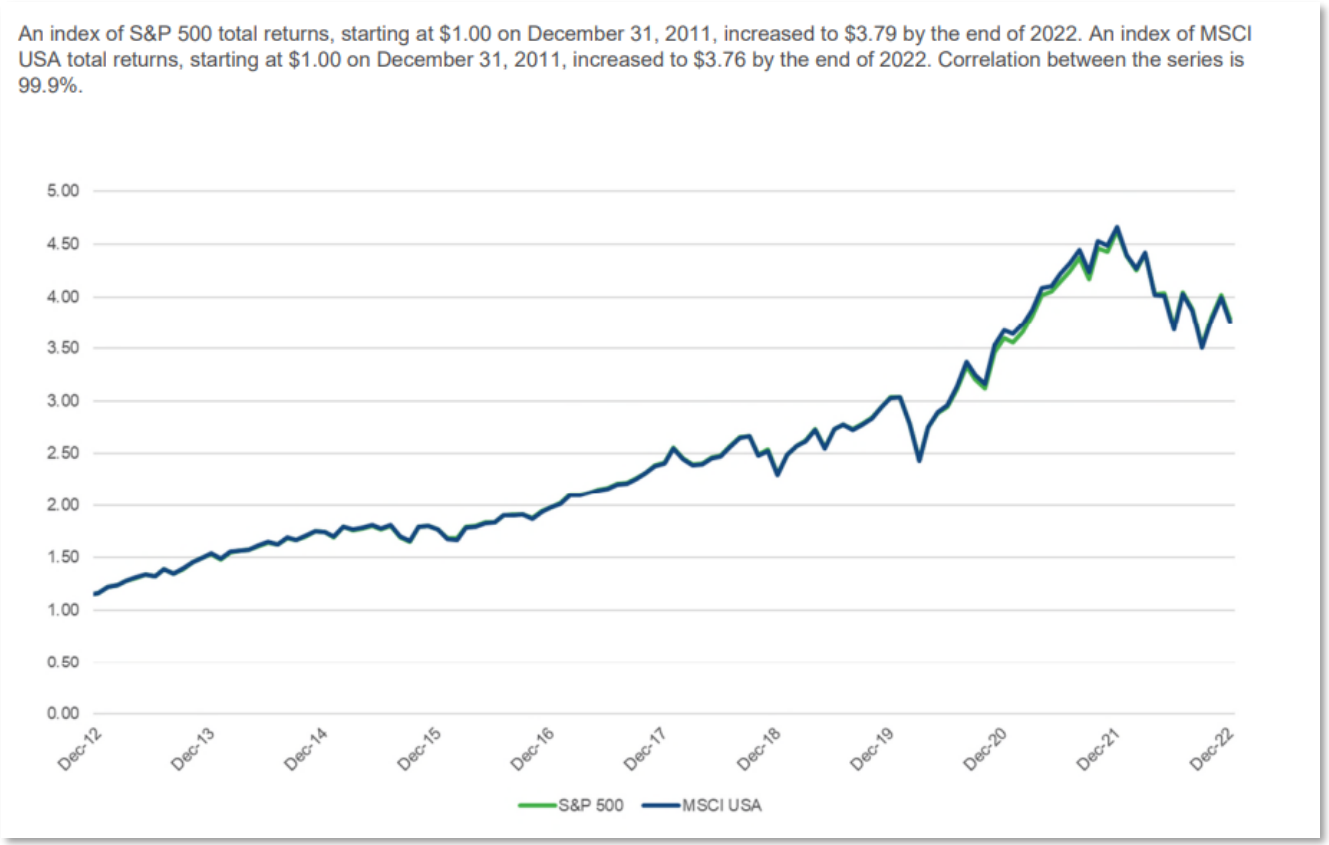
4. The choice of which index to use as a market proxy

   MSCI USA Index

Decisions to Estimate Beta

The choice of which index to use as a market proxy: **MSCI USA Index**

- MSCI country-level indices (e.g., MSCI USA, MSCI Brazil, MSCI China, etc.), are designed to measure the performance of the large and mid cap segments of that particular country and cover approximately 85% or more of the country's free float-adjusted market capitalization.
- As such, the MSCI country-level indices tend to be highly correlated with the major local stock market indices of a particular country. For example, the MSCI USA index has a **99.9%** correlation with the S&P 500.



Company-level Beta Module

KROLL

Hi Kevin, Welcome to the Cost of Capital Navigator

- Dashboard
- My Estimates
- Resources Library
- Product News

Company-level Betas

General Inputs

Valuation Date: December 31, 2022

Return Frequency: Monthly

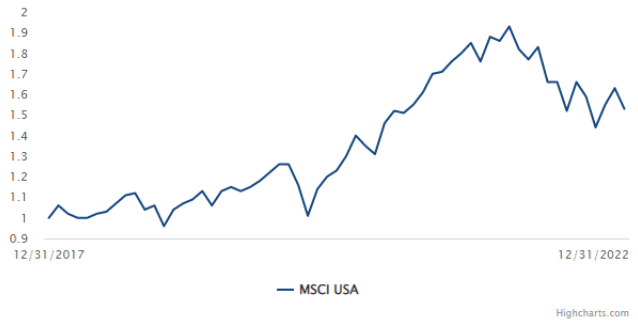
Currency of WACC: USD - US Dollar

Lookback Period: 5-Year

Subject Company Location: United States

Market Index: MSCI USA

Performance Indices



Note: All fields required. Click on the green "plus" icon below to select Comparable Companies once all general input fields are selected.

Comparable Companies

Company

# of Observations:

Excel Add-in
Contact
Submit Feedback
Data Sources
Data Release Schedule
Support
Security
About Kroll
Legal | Privacy | Cookies
Disclosures | Terms & Conditions

Selecting Comparable Companies

GICS 25504010 – Retail Apparel

- When selecting comparable companies, it is useful begin by looking at companies that operate in the same industry as your subject company
  - The Company-level Beta module in the Kroll Cost of Capital Navigator provides lists of companies by industry.
  - A user can also search by financial statement metrics such as Market Cap, Total Assets, EBITDA, and Sales, as well as by Country of Headquarters and Country of Incorporation.
- There are various additional factors that that can be considered when narrowing down your list of comparable companies. For example:
  - Industry-specific measures
  - Geographic segments
  - Product sales mix
  - Company size

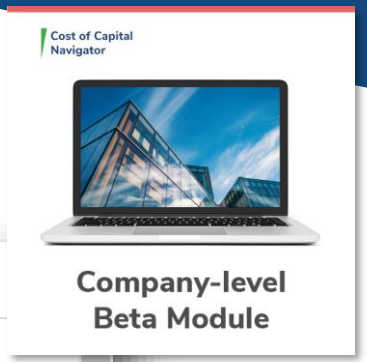
Company List - GICS 25504010 Data as of 12/31/2022

SIC/GICS Composite

Company Name	Sales ([USD] in millions)	Assets ([USD] in millions)
ABERCROMBIE & FITCH -CL A	3,713	2,939
AMERN EAGLE OUTFITTERS INC	5,011	3,787
BOOT BARN HOLDINGS INC	1,488	1,200
BUCKLE INC	1,295	781
BURLINGTON STORES INC	9,322	7,090
CATO CORP -CL A	769	634
CHILDRENS PLACE INC	1,915	1,037
CITI TRENDS INC	992	474
FOOT LOCKER INC	8,958	8,135
GAP INC	16,670	12,761
GENESCO INC	2,422	1,562
GUESS INC	2,495	2,556
ROSS STORES INC	18,916	13,640
SHOE CARNIVAL INC	1,330	812
TANDY LEATHER FACTORY INC	83	73
TILLY'S INC	776	505
TJX COS INC (THE)	48,550	28,461
URBAN OUTFITTERS INC	4,549	3,791
ZUMIEZ INC	1,184	862

Source: Kroll Cost of Capital Navigator (kroll.com/costofcapitalnavigator)

Company Search Tool in Company-level Beta Module



Add a Comparable Company

Type in filter criteria and use the magnifying glass to search for comparable companies. Use the green "plus" icon to add a company.

Selected Companies:

Add/Remove Columns

Company Name	# of Observations	Industry (GICS) Code – Description	Key Words
		25504010	

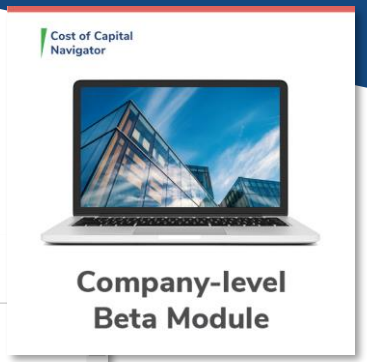
Clear Fields

Abc-Mart Inc	60	25504010 – Apparel Retail	ABC-Mart,Inc., engages retailing shoes, clothing, merchandise products women, kids develops manufactures shoes; licenses brands. involved sale owned purchased products stores. offers products VANS, HAWKINS, Saucony, NUOVO, gravis, DANNER, SPERRY, WHITE'S HOUSE brand names. operates 38 stores
Abercrombie & Fitch Co.	60	25504010 – Apparel Retail	operates specialty retailer Europe, Middle internationally. operates segments, Hollister
Accent Group Ltd	60	25504010 – Apparel Retail	engages retail, distribution, franchise lifestyle footwear, apparel accessories Zealand. brands banners include Athlete's Foot, Platypus Shoes, Hype DC, Skechers, Merrell, CAT, Vans, Dr. Martens, Saucony, Timberland, Hoka Superga, Kappa, Palladium, Supra, Subtype, Trybe, Stylerunner, Glue Store
Adastria Co Ltd	60	25504010 – Apparel Retail	plans, produces, retails clothes sundry offers women's, children's apparel; lifestyle items, including bags, shoes, kitchen interior furniture brands. changed headquartered
Al Arafa Investment & Consulting	60	25504010 – Apparel Retail	Consultancies (S.A.E.) manufactures, retails, distributes textile apparel offers luxury, formal, casual wear kids Concrete, Ted Baker, Ben Sherman, Alexander, Racing Green, Suit Direct, Gibson London, Pierre Cardin brands; hire services brand. operates network 40 retail stores Concrete brand; 50
American Eagle Outfitters Inc.	60	25504010 – Apparel Retail	Outfitters, operates specialty retailer clothing, accessories, personal care products Aerie brands Hong
Aoki Holdings Inc	60	25504010 – Apparel Retail	engages fashion, anniversary bridal, entertainment, real estate leasing businesses creates sells apparel women, business apparel casual clothing ORIHICA brand names; operates apparel store offers casual clothing sizes women Size MAX operates wedding halls guesthouse-style halls

1 - 100 of 115 Results

Submit

Company Search Tool in Company-level Beta Module



Add a Comparable Company

lus" icon to add a company.

Add/Remove Columns

Words	Sales *	EBITDA *	Assets *	Market Cap *	Incorporation Country *	Headquarter Country *
3C-Mart,Inc., engages tailing shoes, clothing, erchandise products women, ds develops manufactures ioes; licenses brands. volved sale owned purchased oducts stores. offers oducts VANS, HAWKINS, iucony, NUOVO, gravis, ANNER, SPERRY, WHITE'S OUSE brand names. operates stores	2,187.61	297.00	2,756.29	4,675.53	Japan	Japan
perates specialty retailer urope, Middle internationally. perates segments, Hollister	3,712.77	455.29	2,939.49	1,122.59	United States	United States
igages retail, distribution, anchise lifestyle footwear, pparel accessories Zealand. ands banners include hlete's Foot, Platypus Shoes, ype DC, Skechers, Merrell, AT, Vans, Dr. Martens, iucony, Timberland, Hoka iperga, Kappa, Palladium,	819.27	150.19	837.65	630.81	Australia	Australia

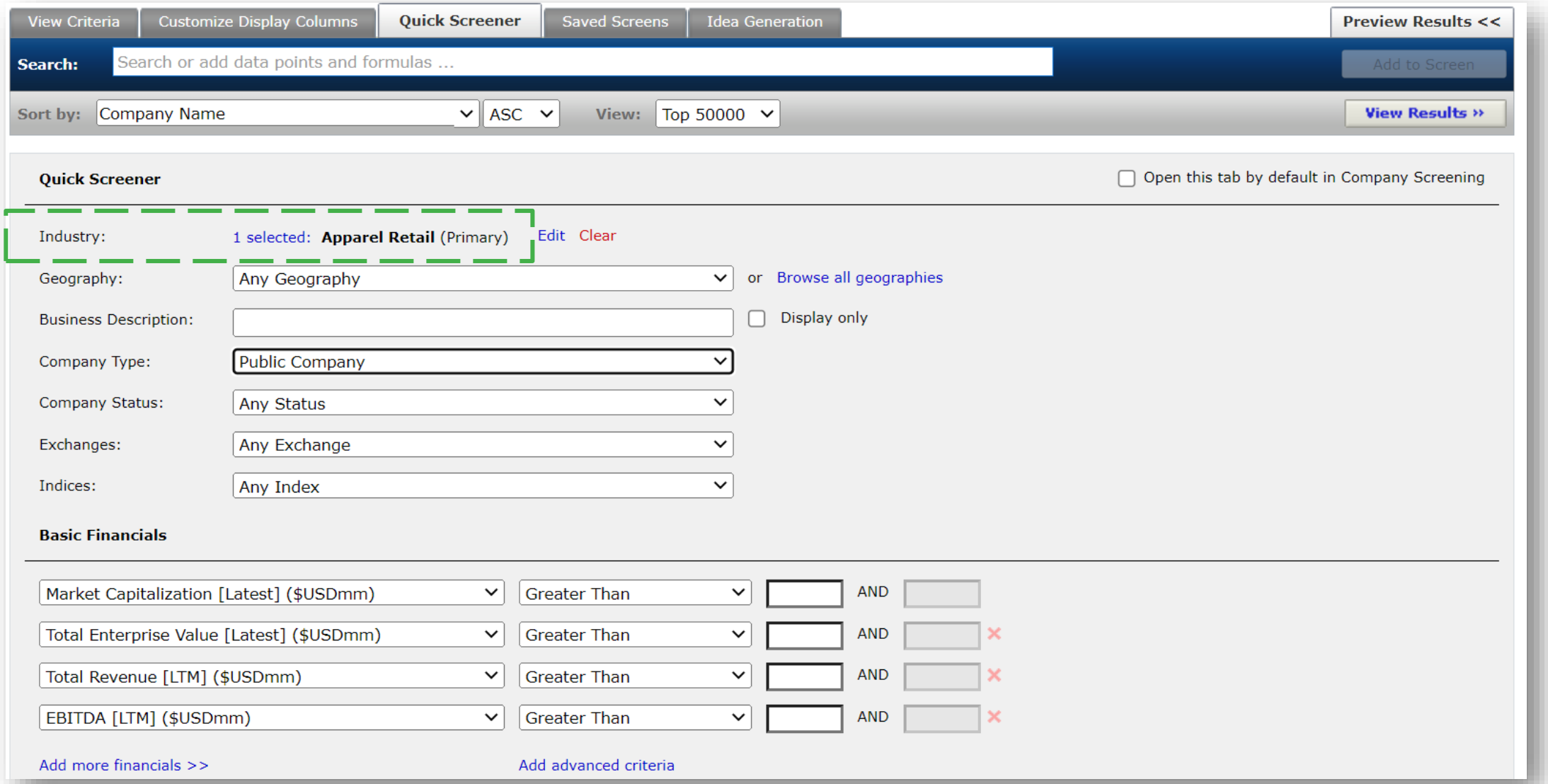
Clear Fields

*USD - US Dollar in millions

1 - 100 of 115 Results

Submit

Company Search Tool in Capital IQ



Urban Outfitters – Industry Specific Measures

For the Fiscal Period Ending	12 months Jan-31-2021	12 months Jan-31-2022	12 months Jan-31-2023
Currency	*USD*	*USD*	*USD*
Retail Specific Data			
Stores at Beginning	-	-	685
Stores Opened	-	-	38
Stores Closed	-	-	15
Total Stores	-	-	708

Source: Capital IQ

Urban Outfitters – Industry Specific Measures

For the Fiscal Period Ending	12 months Jan-31-2021	12 months Jan-31-2022	12 months Jan-31-2023
Currency	*USD*	*USD*	*USD*
Retail Specific Data			
Stores at Beginning	-	-	685
Stores Opened	-	-	38
Stores Closed	-	-	15
Total Stores	-	-	708

Source: Capital IQ

Not a very large footprint and not majorly distressed!

Urban Outfitters – Geographic Segments

For the Fiscal Period Ending	12 months Jan-31-2018	12 months Jan-31-2019	12 months Jan-31-2020	Reclassified 12 months Jan-31-2021	12 months Jan-31-2022	12 months Jan-31-2023
Currency	*USD*	*USD*	*USD*	*USD*	*USD*	*USD*
Revenues						
United States	3,163.1	3,449.9	3,485.4	3,040.8	3,950.4	4,158.8
Foreign	452.9	500.7	498.4	409.0	598.4	636.5
Total Revenues	**3,616.0**	**3,950.6**	**3,983.8**	**3,449.7**	**4,548.8**	**4,795.2**

Source: Capital IQ

Urban Outfitters – Geographic Segments

For the Fiscal Period Ending	12 months Jan-31-2018	12 months Jan-31-2019	12 months Jan-31-2020	Reclassified 12 months Jan-31-2021	12 months Jan-31-2022	12 months Jan-31-2023
Currency	*USD*	*USD*	*USD*	*USD*	*USD*	*USD*
Revenues						
United States	3,163.1	3,449.9	3,485.4	3,040.8	3,950.4	4,158.8
Foreign	452.9	500.7	498.4	409.0	598.4	636.5
Total Revenues	**3,616.0**	**3,950.6**	**3,983.8**	**3,449.7**	**4,548.8**	**4,795.2**

Source: Capital IQ

Good proportion of sales in the United States
(% of Sales in U.S. in Jan 2023 - 86.7%)

Urban Outfitters – Business Segments (Product Mix)

For the Fiscal Period Ending	12 months Jan-31-2018	12 months Jan-31-2019	12 months Jan-31-2020	Reclassified 12 months Jan-31-2021	12 months Jan-31-2022	12 months Jan-31-2023
Currency	*USD*	*USD*	*USD*	*USD*	*USD*	*USD*
Revenues						
Retail Operations	3,299.7	3,604.2	3,648.9	3,228.2	4,248.7	4,415.4
Wholesale Operations	327.5	357.4	340.9	216.9	267.6	268.6
Nuuly Operations	-	-	8.0	24.3	47.7	129.6
Intersegment Elimination	(11.2)	(10.9)	(14.0)	(19.7)	(15.2)	(18.3)
Total Revenues	**3,616.0**	**3,950.6**	**3,983.8**	**3,449.7**	**4,548.8**	**4,795.2**

Source: Capital IQ

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Source: Capital IQ

Retail apparel is the focus of the business
(% of Retail Sales = 92%)

Comparable Subject Companies – Size Metrics

Companies	Market Cap ($)	Sales ($)	Total Assets ($)
Abercrombie & Fitch Co.	1,123	3,713	2,939
American Eagle Outfitters Inc.	2,616	5,011	3,787
Burlington Stores, Inc.	13,218	9,322	7,090
The Children's Place	**459**	**1,915**	**1,037**
The Gap, Inc.	4,117	16,670	12,761
Guess?, Inc.	1,126	2,495	2,556
Ross Stores, Inc.	40,022	18,916	13,640
The TJX Companies, Inc.	**92,039**	**48,550**	**28,461**
Urban Outfitters, Inc.	2,198	4,549	3,791

**Denominated in USD in millions. Sales and Total Assets as of the latest annual period.*

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**Denominated in USD in millions. Sales and Total Assets as of the latest annual period.*

Comparable Subject Companies – Statistical Quality

Companies	OLS Levered Beta	Standard Error of Estimate	T-stat	R^2	Is Beta significant? (95%)
Abercrombie & Fitch Co.	1.39	0.35	3.96	20%	Yes
American Eagle Outfitters Inc.	1.41	0.27	5.29	31%	Yes
Burlington Stores, Inc.	1.02	0.23	4.36	23%	Yes
The Children's Place	1.92	0.44	4.35	23%	Yes
The Gap, Inc.	1.85	0.30	6.23	39%	Yes
Guess?, Inc.	1.86	0.29	6.38	40%	Yes
Urban Outfitters, Inc.	1.39	0.25	5.66	34%	Yes

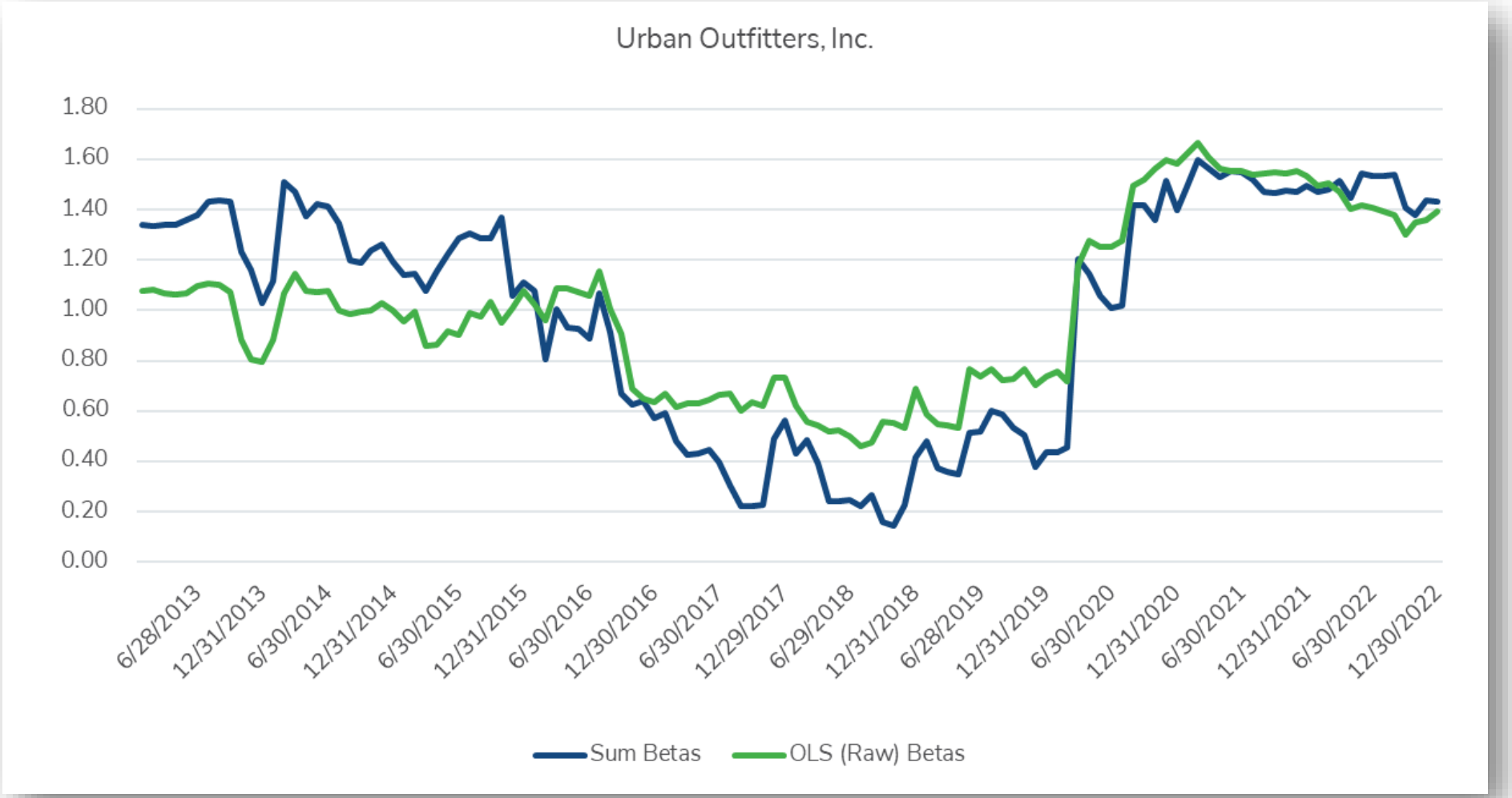
Comparable Subject Companies – Four Beta Types

Companies	OLS Levered Beta	Sum Beta	Blume Adjusted Beta*	Vasicek Adjusted Beta
Abercrombie & Fitch Co.	1.39	1.95	1.25	1.47
American Eagle Outfitters Inc.	1.41	2.54	1.27	1.46
Burlington Stores, Inc.	1.02	1.71	1.02	1.20
The Children's Place	1.92	2.54	1.59	1.69
The Gap, Inc.	1.85	2.31	1.54	1.72
Guess?, Inc.	1.86	2.40	1.55	1.73
Urban Outfitters, Inc.	1.39	1.43	1.26	1.45

*Using the original version from Blume's 1971 paper

Comparable Subject Companies – Beta Stability over Time

10-year trailing 60-month OLS and Sum Betas regressed against MSCI USA



Comparable Subject Companies – Beta Stability over Time

10-year trailing 60-month OLS and Sum Betas regressed against MSCI USA

Comparing Navigator Results to Alternate Sources of Beta

Levered OLS Betas

Companies	Company-level Beta Module	CapIQ 5yr Beta	CapIQ Custom Beta 1	CapIQ Custom Beta 2
Abercrombie & Fitch Co.	1.39	1.39	1.39	1.38
American Eagle Outfitters Inc.	1.41	1.43	1.43	1.43
Burlington Stores, Inc.	1.02	1.05	1.05	1.04
The Children's Place	1.92	1.94	1.94	1.94
The Gap, Inc.	1.85	1.89	1.89	1.86
Guess?, Inc.	1.86	1.90	1.90	1.89
Urban Outfitters, Inc.	1.39	1.44	1.44	1.42
Index	**MSCI USA**	**S&P 500**	**S&P 500**	**MSCI USA**
Return Type	**Total**	**Price**	**Price**	**Price**
# of Returns	**60**	**59**	**59**	**59**

Unlevering Assumptions

Companies	D/TC Including Op. Leases [1]	D/TC Excluding Op. Leases [1]	Tax Rate [2]	Credit Rating [3]
Abercrombie & Fitch Co.	52%	21%	25.81%	BB
American Eagle Outfitters Inc.	41%	13%	25.81%	BBB
Burlington Stores, Inc.	25%	10%	25.81%	BB
The Children's Place	50%	38%	25.81%	BB
The Gap, Inc.	60%	31%	25.81%	BB
Guess?, Inc.	51%	30%	25.81%	BB
Urban Outfitters, Inc.	35%	0%	25.81%	BBB

D/TC = Debt / Total Capitalization

Median	**50%**	**21%**
Average	**45%**	**21%**

Concluded Market Participant Credit Rating: **BB**

[1] Debt/Total Capital and Leases as of the latest annual period.
[2] Tax rate of home (headquarter) country of each comparable company. Use of a U.S blended Federal and State corporate tax rate is a simplifying assumption. A different rate may be appropriate for companies with foreign operations.
[3] Source: S&P Credit Analytics Credit Model Score

Unlevering via Hamada

D/TC Including and Excluding Operating Leases

Companies	OLS Unlevered Beta Including Operating Leases	OLS Unlevered Beta Excluding Operating Leases
Abercrombie & Fitch Co.	0.77	1.16
American Eagle Outfitters Inc.	0.93	1.26
Burlington Stores, Inc.	0.82	0.95
The Children's Place	1.11	1.31
The Gap, Inc.	0.87	1.39
Guess?, Inc.	1.06	1.41
Urban Outfitters, Inc.	0.99	1.39
Median	**0.93**	**1.31**
Average	**0.94**	**1.27**

Unlevering via Hamada

D/TC Including Operating Leases

Companies	OLS Unlevered Beta	Blume Adjusted Beta*	Vasicek Adjusted Beta
Abercrombie & Fitch Co.	0.77	0.69	0.81
American Eagle Outfitters Inc.	0.93	0.84	0.97
Burlington Stores, Inc.	0.82	0.82	0.96
The Children's Place	1.11	0.92	0.98
The Gap, Inc.	0.87	0.72	0.81
Guess?, Inc.	1.06	0.88	0.98
Urban Outfitters, Inc.	0.99	0.90	1.04
Median	**0.93**	**0.84**	**0.97**
Average	**0.94**	**0.82**	**0.94**

*Using the original version from Blume's 1971 paper

Harris Pringle Beta Unlevering/Relevering Formulas

$$\beta_{unlevered} = \frac{\beta_{levered} + \beta_{debt} \times \frac{W_{debt}}{W_{equity}}}{1 + \frac{W_{debt}}{W_{Equity}}}$$

Step 1

Unlever Company's beta

$$\beta_{Levered} = \beta_{unlevered} + (\beta_{unlevered} - \beta_{debt}) \times \frac{W_{debt}}{W_{Equity}}$$

Step 2

Relever Company's beta

$\beta_{unlevered}$ = unlevered beta

$\beta_{levered}$ = levered beta

β_{debt} = beta of debt capital

W_{debt} = percent of debt in the company's capital structure

W_{equity} = percent of equity in the company's capital structure

Debt Betas Assumption

As of December 31, 2022

Credit Rating	Debt Beta
AAA	0.19
AA	0.19
A	0.21
BBB	0.30
BB	0.39
B	0.40
CCC	0.47
CC	0.65

Source: Cost of Capital Navigator

Unlevering via Harris-Pringle

D/TC Including Operating Leases

Companies	OLS Unlevered Beta	Blume Adjusted Beta	Vasicek Adjusted Beta
Abercrombie & Fitch Co.	0.87	0.80	0.91
American Eagle Outfitters Inc.	0.96	0.87	0.99
Burlington Stores, Inc.	0.86	0.86	1.00
*The Children's Place	1.16	1.00	1.05
The Gap, Inc.	0.97	0.85	0.92
*Guess?, Inc.	1.12	0.96	1.05
Urban Outfitters, Inc.	1.01	0.92	1.05
Median	**0.97**	**0.87**	**1.00**
Average	**0.99**	**0.89**	**0.99**
***Average excl. Outliers**	**0.93**	**0.86**	**0.97**

*Companies excluded are The Children's Place, Inc. and Guess?, Inc.

Gap, Inc. Unlevered Betas

	OLS	Vasicek Adjusted
Hamada	0.87	0.81
Harris-Pringle	0.97	0.92

D/TC including Op. Leases = 60%

Comparable Companies – Selecting/Concluding on Unlevered Harris-Pringle Beta(s)

	OLS Unlevered Beta	Vasicek Adjusted Unlevered Beta
First Quartile	0.91	0.95
Median	0.97	1.00
Average	0.99	0.99
Average excl. outliers*	0.93	0.97
Third Quartile	1.06	1.05

*Companies excluded are The Children's Place, Inc. and Guess?, Inc.

Relevering Assumptions

We will assume a D/TC (including Op. Leases) ratio of **40%**

We will assume a credit rating of **BB**

We will assume a tax rate of **25.8%** **(U.S. 2022 Tax Rate)**

Relevering with Harris-Pringle

	OLS Unlevered Beta	Vasicek Adjusted Unlevered Beta
First Quartile	0.91	0.95
Median	0.97	1.00
Average	0.99	0.99
Average excl. outliers	0.93	0.97
Third Quartile	1.06	1.05

$\beta_{\text{Levered}} = 1.40$

$$\beta_{Levered} = \beta_{unlevered} + (\beta_{unlevered} - \beta_{debt}) \times \frac{W_{debt}}{W_{Equity}}$$

Relevering with Hamada

	OLS Unlevered Beta	Vasicek Adjusted Unlevered Beta
First Quartile	0.85	0.89
Median	0.93	0.97
Average	0.94	0.94
Average excl. outliers	0.88	0.92
Third Quartile	1.03	0.98

$\beta_{Levered} = 1.45$

$$\beta_{Levered} = \beta_{unlevered} \times \left(1 + (1 - t) \times \left(\frac{W_{debt}}{W_{equity}}\right)\right)$$

Key Takeaways

1. Start with comparable companies that closely reflect your subject company's underlying business risk

2. Use multiple methods to estimate your betas

3. Be critical about the methods you are using and the results you obtain

Cost of Capital Navigator

Company-Level Beta Module DEMO

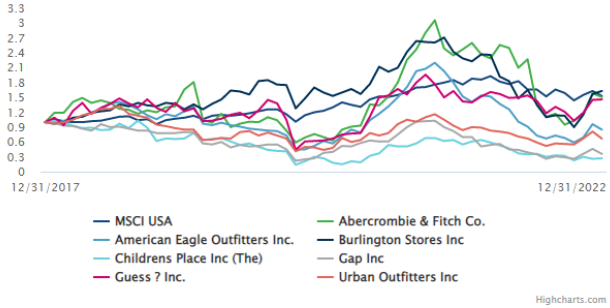
KROLL

- Dashboard
- My Estimates
- Resources Library
- Product News

General Inputs ⓘ Edit Inputs

Valuation Date: December 31, 2022	Return Frequency: Monthly
Currency of WACC: USD - US Dollar	Lookback Period: 5-Year
Subject Company Location: United States	Market Index: MSCI USA

Performance Indices ⓘ



Note: All fields required. Click on the green "plus" icon below to select Comparable Companies once all general input fields are selected.

Comparable Companies ⓘ

Company	Abercrombie & Fitch Co.	American Eagle Outfitters Inc.	Burlington Stores Inc	Childrens Place Inc (The)	Gap Inc	Guess ? Inc
# of Observations	60	60	60	60	60	6
▼ Levered Betas ⓘ						
Denominated in USD						
OLS Beta	1.39	1.41	1.02	1.92	1.85	
Sum Beta	1.95	2.54	1.71	2.54	2.31	
Vasicek Adj.	1.47	1.46	1.20	1.69	1.72	
Blume Adjusted	1.35	1.37	1.08	1.59	1.54	

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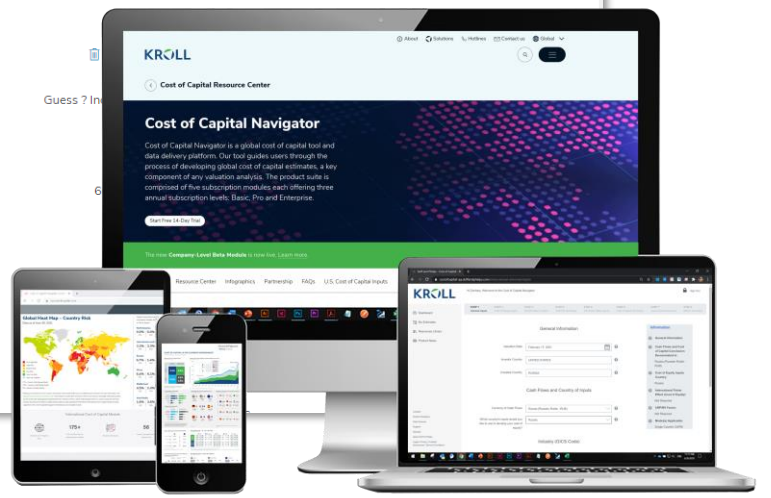

Questions?

If you need general assistance with the Cost of Capital Navigator, please contact the support team: CostofCapital.Support@kroll.com