Fundamental Analytics

Bloomberg's beta: Question it - analyse it and get behind it

Equities

Global

Fundamental Analytics

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Bloomberg beta, lift the lid and get behind it...

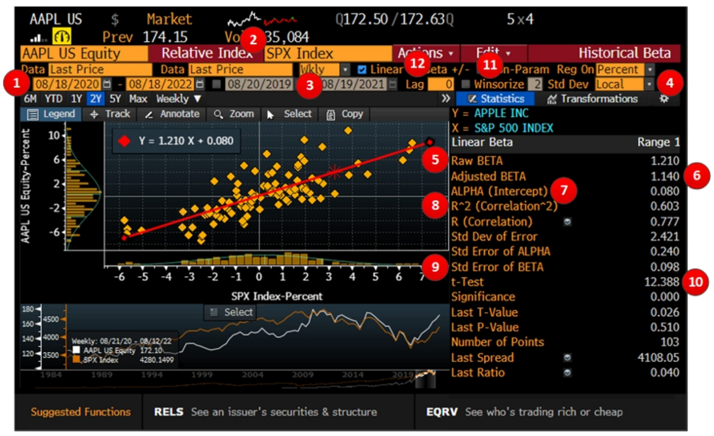
Bloomberg tends to be the source of choice for beta. Before relying on Bloomberg betas, there are certain questions we suggest you should ask.

- Should we use a raw beta or an adjusted beta?
- Do we know what the difference is and is the adjustment valid?
- Are these betas levered?
- Is the leverage a fair and consistent reflection of what we have in the valuation?
- What does the R^2 tell us – is a low R^2 a problem?
- What does the standard error of the beta tell us?
- What does the intercept indicate?
- What is the analytical significance of the t-test statistic?
- Why would you winsorise a beta?

Bloomberg allows users to build a regression analysis for the derivation of beta. Users can also specify the time period and frequency of observation as well as which market the stock returns are regressed against. Poor beta choices can have a material impact on valuation.

Make use of and analyse the Bloomberg screen data

A Bloomberg beta screen offers a wealth of information to help assess the appropriateness of beta. However, there is a tendency to focus on the beta only, often at the expense of the additional information disclosed on the screen. Most of the additional information is statistical output – this can be an off-putting feature for many. We explain the contents of this screen. Source: Bloomberg Finance L.P., UBS highlights (Used with permission of Bloomberg Finance L.P.)



Bloomberg's beta, question it - analyse it and get behind it

Beta measures the sensitivity of a stock in relation to market movements. Beta has been long a pivotal component of equity valuation as an input to the capital asset pricing model (CAPM). CAPM estimates a stock's cost of equity by adding an equity market risk premium (factored by a beta) to a benchmark risk free rate. Beta estimates the relationship between the equity market risk premium and an individual stock's equity risk.

Cost of equity = Risk free rate + beta x equity market risk premium

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Why our Country Risk Premiums tend to be higher than "the norm"?

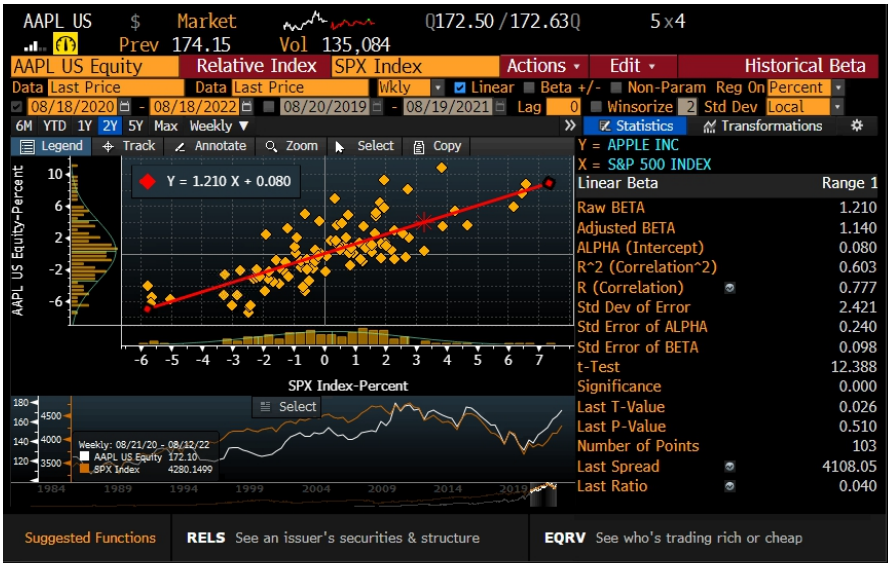
A beta greater than one suggests the stock price will move more than the market; a beta less than one implies a movement less than the market.

Most analysts tend to source their betas from Bloomberg. The Bloomberg beta can be accessed by:

- typing in the company's ticker followed by <GO>
- once on the company's equity screen, type <BETA> followed by <GO>, or
- <ticker symbol> <EQUITY> <BETA> <GO>

Bloomberg will then generate a beta screen output as illustrated in Figure 1.

Figure 1: Bloomberg beta screen
(Used with permission of Bloomberg Finance L.P.)



Source: Bloomberg Finance L.P.

For many analysts this is where the analysis stops. The output is taken from the Bloomberg screen and used as an input in a valuation model. More questions can be asked before using the data. However, this is a perilous situation for market participants to find themselves in. A poor choice of beta (and a lack of understanding of its weaknesses) can materially mis-state a price target and lead to poor allocation of capital.

We think analysts must consider this input in more depth. Beta is a key and sensitive input in the valuation process. However beta is fundamentally at odds with the concept of a forward-looking valuation process as it is based on an analysis of historic market movements. This analysis can be noisy and distorted by the choices analysts make when shaping the regression analysis on Bloomberg.

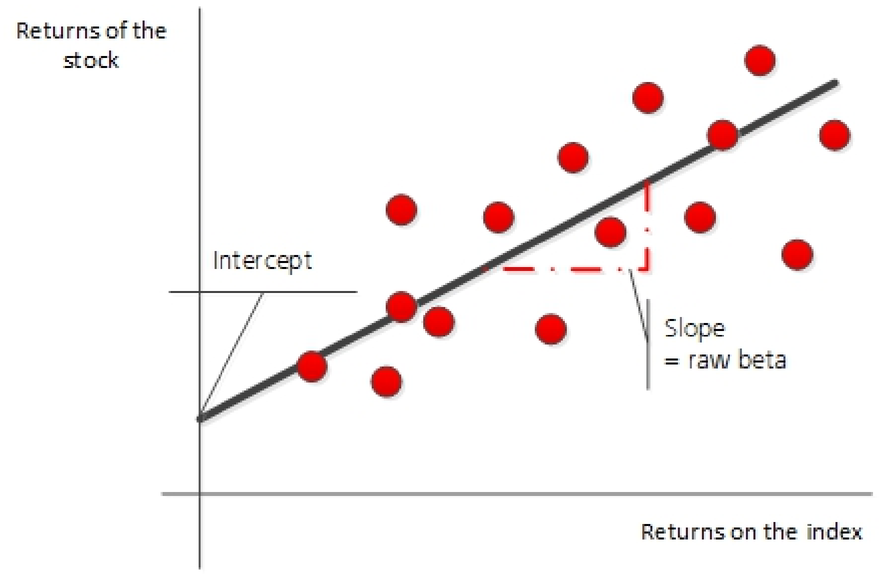
How does Bloomberg derive its beta?

A Bloomberg beta is a simple least-squares regression analysis, plotting a line of best fit against historical observations of a stock's return in relation to a specified market return. The regression analysis requires three inputs:

1. The time period over which observations are taken
2. The frequency of observation (daily, weekly, monthly, quarterly)
3. The market proxy

The slope of the regression line is the estimated raw beta.

Figure 2: Regression Line



Source: UBS

The slope of the line is equal to the covariance between the stock and market returns divided by the variance of the market returns, or alternatively the correlation between the stock and the market multiplied by the ratio of their volatilities.

$$\beta = \frac{Cov(Mkt,Stk)}{\sigma^2_{Mkt}} = \rho_{Stk,Mkt}\frac{\sigma_{Stk}}{\sigma_{Mkt}}$$

This equation suggests, all other things being equal, the closer a stock correlates with the market, the lower beta should be. The more variable a stock is relative to the market, the higher the beta should be.

How do the beta screen choices affect the beta?

Each of the three inputs required to calculate beta (time period and frequency of observations as well as the market proxy) require judgement and can introduce errors in the estimation of beta and hence errors to valuations. The default Bloomberg beta is calculated using two years of weekly observations where the weekly return is measured from one Friday to the next. In regression analysis, generally the larger the data the set, the better the output, as the impact of error is diluted. This is, however, only true if the relationship being captured by the regression is unchanging – a statement which might not be true for the relationship between the market's returns and the stock's returns.

The frequency of observations

One way to enlarge the data set for regression purposes is to increase the frequency of the observations (i.e. moving from monthly to weekly to daily data). Although this is appealing for liquid stocks, less liquid stocks may suffer from a thin-trading bias (or asynchronicity). This bias occurs when the returns on an individual stock are not synchronised with the market. For instance, a thinly-traded stock may have its last trade of the day much earlier than the market's close: as a result the market return and the stock return can become dislocated and the estimated beta is distorted.

The time period of observation

Another way of providing a sufficiently large data set is to go further back in time. There is a risk that the true relationship between the stock returns and the market returns may have changed over the period.

There are three key reasons why a business may change over time:

1. a change in business mix due to M&A and asset divestures;
2. a shift in leverage as debt is issued and redeemed. The capital structure can also evolve due to corporate actions such as special dividend programmes and stock buybacks; and
3. As companies grow, the impact of economies of scale can alter the operating cost structure and the balance of a company's operating leverage.

In extreme cases it is unlikely that the results of historic regression analysis will give the best estimate of beta and hence many not be the most appropriate for valuation work.

Figure 3 shows how much beta can change based on period and frequency of the observations used.

Figure 3: Impact of different time periods on beta

	Adjusted beta		
Period / Frequency	Weekly	Monthly	Quarterly
1yr	1.268	1.298	1.742
2yr	1.210	1.227	1.320
5yr	1.077	1.235	1.566
10yr	1.083	1.242	1.512

Source: Bloomberg Finance L.P.

Performing the regression over a longer period will bring more observations into the analysis. There is a trade-off between the time period and frequencies choices when running a regression beta on Bloomberg. A longer time period may provide more observations, but the observations are older and may be less representative of the future.

Most analysts default to either a:

- two-year weekly beta estimate or
- five-year monthly beta estimate

The Market

Beta expresses the stocks' return in relation to the market's return. For the purposes of estimating beta using regression we need a market. The Bloomberg beta (as with most beta estimates) will use an index as an approximation for the market. The S&P 500 is the most commonly used index for US stocks when performing a beta regression. The index captures only 500 of the 3,700 listed stocks. However, the S&P 500 does capture about 80% of US market capitalisation.

Users have the option to change the index the beta is regressed against. A local index may not be the best choice for international or cross-border stocks. In these cases, analysts might be better served using an international index such as the Morgan Stanley Capital World Index ("MSCI"). Bloomberg allows currency adjustments on the beta screen. Note that as well as using a global beta, one should also use a global equity risk premium when estimating cost of equity.

In an emerging market context, indices can be less liquid and dominated by a small number of local companies. This can make the estimate of beta look very good for the larger companies within the market.

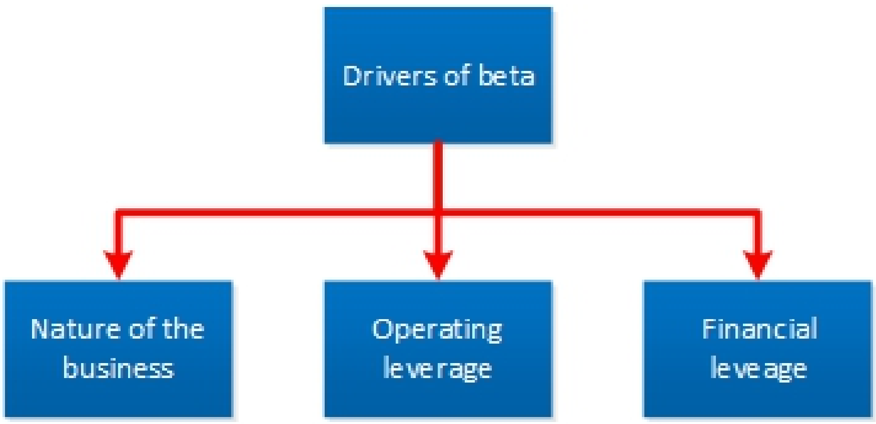
What are the fundamental drivers of beta?

We have seen above that companies with a high variability to market performance should have a higher beta. Their variability directly exposes to risk and investors need to be compensated accordingly.

An understanding of the drivers of beta allows analysts to sanity check beta against the fundamentals of the company, namely.

- nature of the business;
- operating leverage and
- financial leverage

Figure 4: The fundamental drivers of beta



Source: UBS

Nature of the business

The more sensitive the business is to macroeconomic conditions, the higher the expected beta. We would expect cyclical (versus defensive) companies to have higher betas. In terms of product portfolio, companies producing items for discretionary purchase should trade on higher betas than those concerned with the production of essential items.

Operating leverage

Operating leverage is a function of the cost structure of the company. It is normally defined in terms of the ratio of fixed cost to variable cost. A company with a high ratio of fixed costs to variable cost would be described as having high operating leverage, which can be a double-edged sword. Once the company's fixed costs are covered, incremental revenue translates directly to earnings. However, if the company is unable to cover its fixed costs, losses are realised quickly. The high fixed cost structure brings higher variability to the earnings profile, and this should be reflected in the beta.

However, operating leverage is hard to measure from the outside looking in, as the income statement does not disclose such information well. Analysts can approximate the impact by analysing the degrees of operating leverage:

Degrees of operating leverage = % Δ in EBIT / % Δ in revenue

Higher operating leverage should translate into higher betas.

Financial leverage

Bloomberg betas are often referred as being levered. That is, they capture the financial leverage of company.

A company with increasing amounts of debt and associated fixed interest payments could be described as having high financial leverage. This has a similar impact on the earnings profile to operating leverage – it adds variability, thus making any equity investment increasingly risky.

A top-down view

An alternative top-down interpretation of beta is used as a proxy for a stock's sensitivity to what was driving the market over the estimation period. This is an observation which was made by Barr Rosenberg and James Guy back in 1976[1] . As they say:

"from an economic viewpoint, the market return does not cause the security return. Instead, both are caused by economic events."

This point has created some confusion among analysts who interpret beta […] as necessarily stating the causal relationship of market returns upon the security returns: That is, if beta is two, a market return of 10 percent causes a security return of 20 percent. The correct wording of this statement is that, as a consequence of the dependence of both market return and security return upon economic events, if a market return of 10 percent is observed, then the most likely value for the associated security return is 20 percent."

As an example, suppose that stock prices, and hence the market, are driven by two factors – the oil price and interest rates. We can write the stock's sensitivity to these factors as shown below.

$$r_{stk} = \alpha + \beta_{oil} r_{oil} + \beta_{rates} r_{rates} + \epsilon_{stk}$$

With a similar equation for the market's return. Over one period let us assume that rates don't change but oil prices increase. Then the return to oil sensitive stocks will be large and they will appear to have a high beta. Over the next period the drivers of the market change: oil prices are static and rates increase. Then the companies that move the most (and hence have the highest beta during that period) will be those with a high beta to rates.

In practice we don't know what factors are actually driving prices, and these factors change over time, so the stock's beta turns into a complex "average" of its various macroeconomic sensitivities.

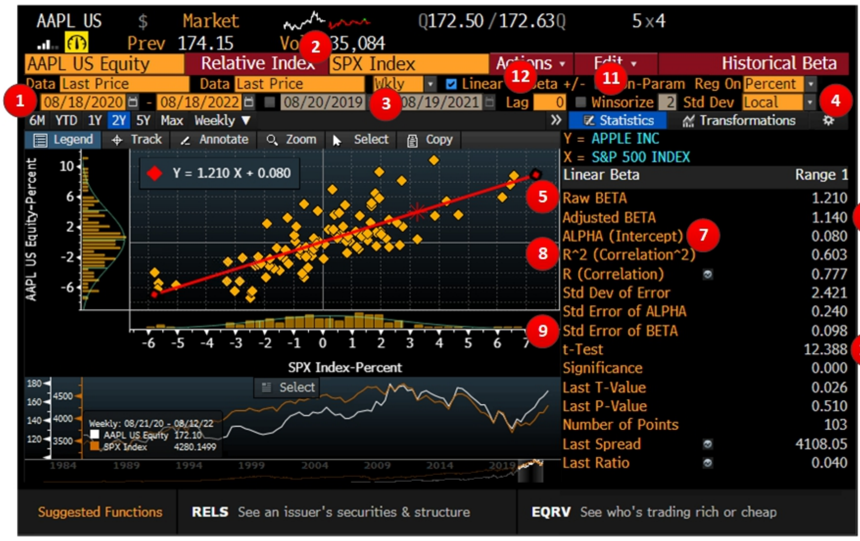
Analysing the Bloomberg beta screen

1. See Rosenberg, B. & J. Guy (1976) Prediction of Beta from Investment Fundamentals, Financial Analysts Journal May-June, 60-72.

A Bloomberg beta screen generates some very useful, but often ignored statistics. Whilst the output generates what looks like robust and reliable information, it is vital that analysts appreciate the associated statistics in order to understand the potential weaknesses in the regression analysis.

We have highlighted the key outputs from a standard Bloomberg screen and explain their relevance in Figure 5 below.

Figure 5: Annotated Bloomberg beta screen
(Used with permission of Bloomberg Finance L.P.)



Source: Bloomberg Finance L.P., UBS highlights

1. The date range

The date range specifies the date range over which market and stock return observations are sourced. As mentioned previously, there is a trade-off between the length of the date range (and the associated number of observations) and the structural relevance of the observations in a forward-looking valuation.

Bloomberg defaults to a two-year observation period.

2. The market

Bloomberg defaults to regressing the stock returns against the local market. Stock returns can be regressed against a market of the user's choice. International businesses can be regressed against an international index such as the MSCI.

3. Frequency of observation

Users can select daily, weekly, monthly, quarterly and annual observations. Shorter frequencies can suffer from non-trading bias with more thinly traded stocks.

Bloomberg defaults to a weekly frequency.

4. Currency

Bloomberg defaults to a local currency, i.e. the currency, returns are calculated in. If the stock returns are regressed against a local market, analysts should leave the currency as the local currency. If the local stock returns (non-US$) are being regressed against say, the S&P500 then the currency should be switched to US dollar. This will ensure that the inflationary expectations embedded in the currency are consistent throughout the estimate.

5. Raw beta

The raw beta is simply the slope of the regression line and expresses the relationship between the stock's return against the market. The raw beta reflects the regressed historic relationship between the stock and the market. Note that this may not be reflective of the company's future risk profile.

6. Adjusted beta

The raw regressed beta is derived from historical information. The Bloomberg adjusted beta is an attempt to take the raw beta and make it forward-looking by reverting the beta to mean. The rationale for the beta reversion to mean argument is driven by survivorship. Companies that survive tend to grow, become more diversified and dominate the movement of an index. These factors tend to push the beta towards one.

Bloomberg makes this adjustment in its adjusted beta estimate, which is calculated using the equation below:

Adjusted beta = raw beta x 0.67 + 0.33

The adjustment is often referred to as the Blume adjustment from Michael Blume's 1971 work that demonstrated that, over time, betas revert towards the mean value of one.

We outline below the derivation of the Apple two-year weekly adjusted beta below given a raw beta of 1.21.

Adjusted beta = 1.21 x 0.67 + 0.33 = 1.14

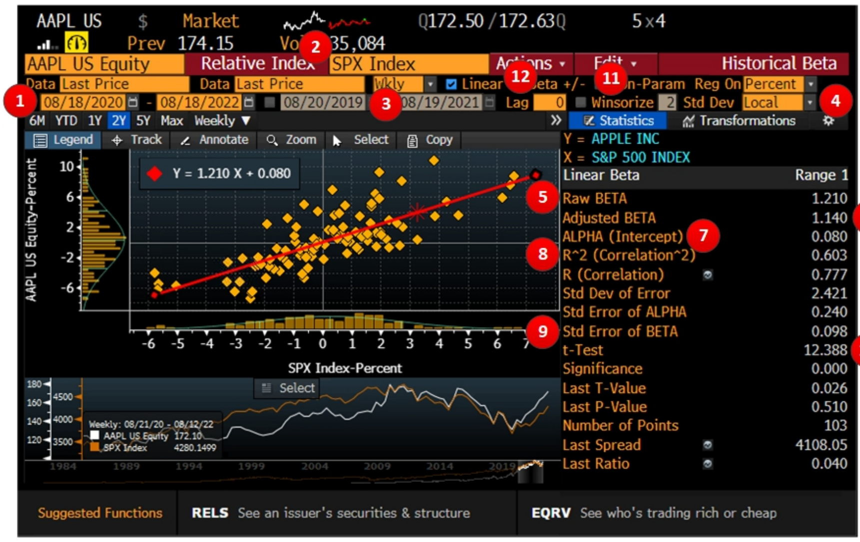
The Blume adjustment is a one-size-fits-all adjustment. Any beta higher than one will be adjusted downwards towards one. Likewise, any beta below one will be adjusted upwards towards one.

These weights do not vary across sectors. This makes the adjustment somewhat arbitrary. Some companies may diversify quicker than others, and as a result may revert to mean at a faster pace. Some companies will not necessarily revert to one.

Should adjusted betas be brought into a valuation today in any case? Companies grow and diversify over time, however a valuation takes place in today's terms, reflecting today's company setup and structure.

7. Alpha (the intercept)

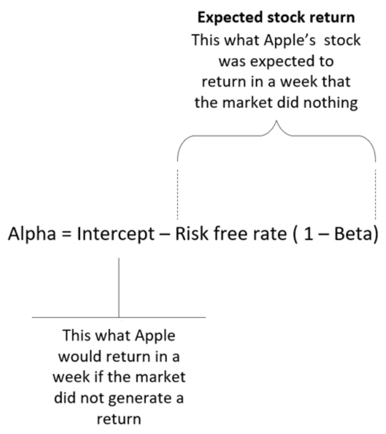
Figure 6: Alpha (the intercept) : bullet point 7
(Used with permission of Bloomberg Finance L.P.)



Source: Bloomberg Finance L.P. , UBS highlights

The Alpha in the Bloomberg screen represents the intercept with the y-axis (bullet point 7 in the figure above and as part of the regression line equation y = 1.210x + 0.080). The intercept can be used to derive alpha. Alpha is a metric used by the market to isolate a stock's excess return. The higher the alpha, the greater the excess return.

Figure 7: How can we derive alpha?



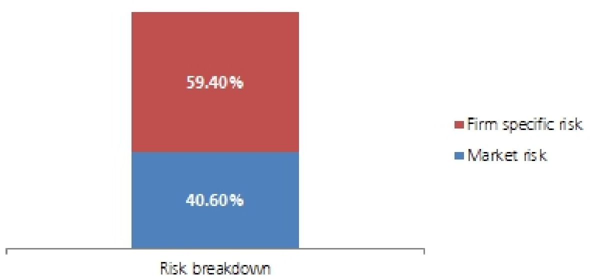
Source: UBS

The risk free rate and the intercept must be expressed in the same frequency terms. If the observations are monthly, the intercept is monthly, so therefore the risk free rate must be monthly.

8. R squared

The R squared of 60.3% suggests that 60.3% of Apple's stock price movement is explained by market factors. 39.7% of the stock price movement relates to firm-specific factors. The firm risk element should be able to be diversified and will not be rewarded with a higher return.

Figure 8: Risk distribution



Source: Bloomberg, UBS

9. Standard error

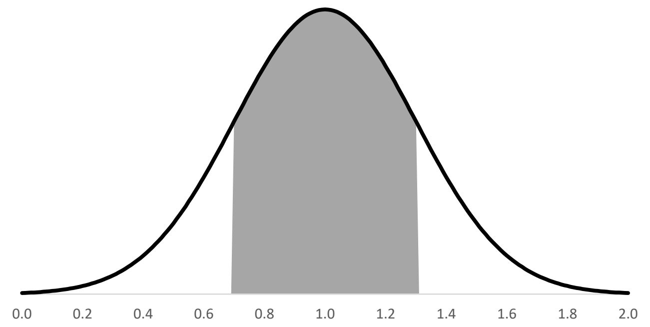
The standard error measures the "noise" in the regression line at a 67% confidence level[2] . The true beta for Apple Inc. could be within a range of 1.112 to 1.308 at a 67% confidence. The bigger the standard error, the more caution we should have with the regression line. The wider the beta range, the more caution should be exercised with the beta numbers.

For example, let's assume we have two companies, both with a beta of 1. However, the first company has a lower standard error of 0.3 while the second company has a higher standard error of 0.6. We will find that we have a smaller range of beta between 0.7 to

2. A 67% confidence interval suggests that 67% of the observations lie within a band around the mean of a normal distribution the width of one standard deviation.

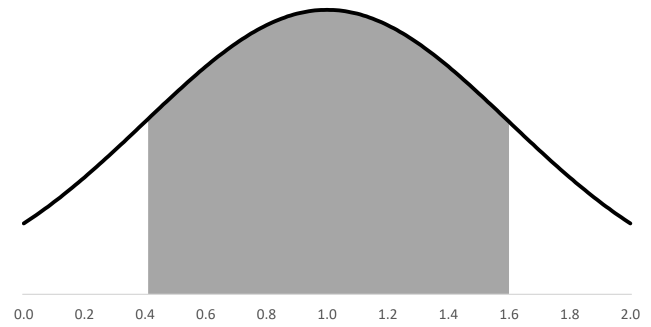
1.3 that falls within one standard deviation of the mean value of 1 for the first company (Figure 12) and a large range of betas between 0.4 and 1.6 that fall within one standard deviation of the mean value of 1 for the second company (Figure 10).

Figure 9: Lower standard error - smaller range of beta



Source: UBS

Figure 10: Higher standard error - larger range of beta



Source: UBS

10. What is the statistical and analytical relevance of the t-test statistic?

The t-test statistic (Bullet point 10 in Figure 11) is used to test linearity of relationship between the dependent and independent variables. Let us assume that we have two variables that are uncorrelated with each other, there is still a probability that we will calculate a non-zero beta when we run a regression simply due to randomness. The t-test statistic is then a measure to see what is the likelihood that we will obtain a non-zero beta if there true value of beta is zero.

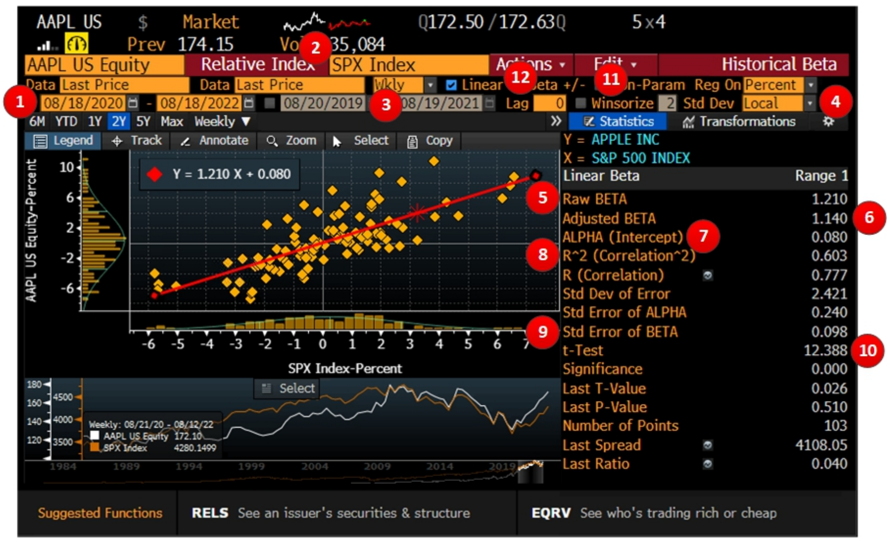
We can calculate the t-test statistic using the formula:

$$t = \frac{b}{SE_b}$$

Where,

b : Coefficient estimate (beta = 1.210)
SE : Standard error of coefficient estimate (Standard error of beta = 0.098)

Figure 11: What is the relevance of the t-Test statistic? (Used with permission of Bloomberg Finance L.P.)



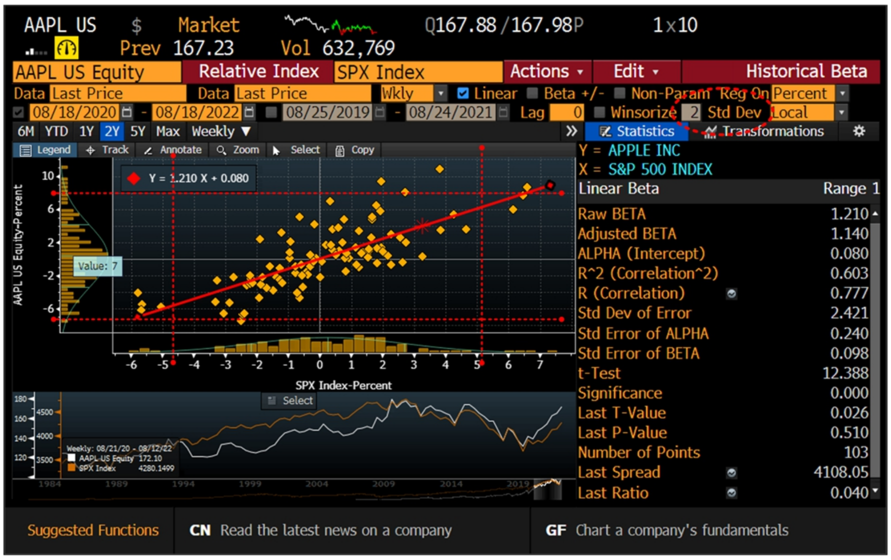
Source: Bloomberg Finance L.P. , UBS highlights

As discussed earlier, a lower standard error implies lower noise in coefficient estimate. It results in a high value of t-statistic (~12.38). A higher t-test statistic will indicate that there is a smaller probability that we will observe a non-zero beta if the true value of beta is zero, suggesting that there is indeed a relationship between the market returns and stock returns of Apple.

11. What does the winsorizing option do?

Winsorizing is a statistical method for eliminating the outliers. All the values that fall outside the standard deviation specified in "Std Dev" field are considered as outliers. As shown in Figure 12, the standard deviation value is 2. The red dotted lines in Figure 12 indicate the thresholds corresponding to two standard deviation for both variables. Any values outside these thresholds are considered outliers for two standard deviation.

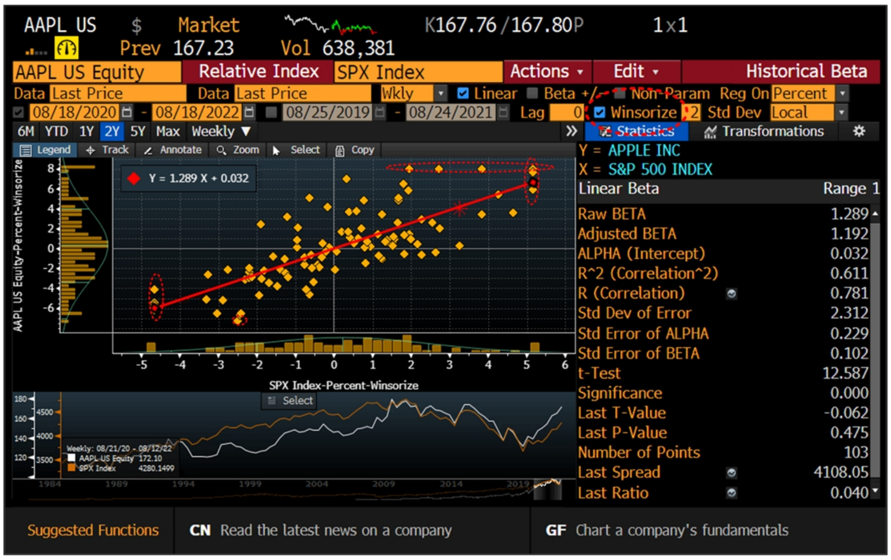
Figure 12: Before Winsorizing
(Used with permission of Bloomberg Finance L.P.)



Source: Bloomberg Finance L.P. , UBS highlights

Values at these thresholds act as floor (Apple stock price return: -7.26 and market return: -4.66) and ceiling (Apple stock price return: -8.31 and market return: 5.16) for outlier values. Upon selecting the winsorize option (Figure 13), outlier values are replaced by floor and ceiling values, thus capping their influence on beta estimate. We can see that the outlier values from Figure 15 are replaced by winsorized values in Figure 16.

Figure 13: After Winsorizing
(Used with permission of Bloomberg Finance L.P.)



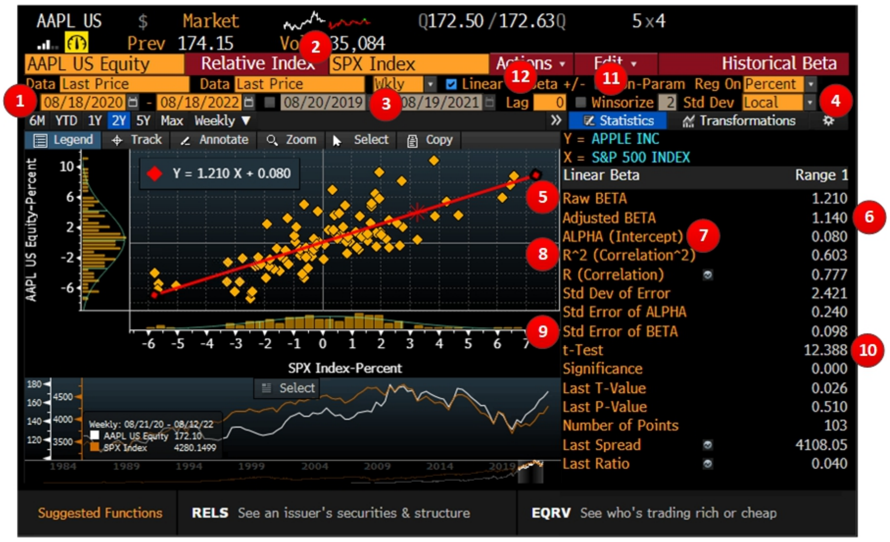
Source: Bloomberg Finance L.P., UBS highlights

12. Why would you lag the beta regression?

Lag (Bullet point 12 in Figure 14) allows us to specify a number of periods to lag the independent variable (weekly return on SPX index) in order to use past values for the calculation.

By default the lag value is 0. So with default setting, beta is estimated by running regression analysis on returns from same time periods.

Figure 14: Lag : Bullet point 12.
(Used with permission of Bloomberg Finance L.P.)



Source: Bloomberg Finance L.P., UBS highlights

If user assumes that a movement in the market only has an impact on the stock's returns after a delay, the user can set the lag period to a non-zero value. For example, if the lag can be set to 1, the new beta value is estimated by running regression of Apple stock price returns in week "t" on SPX index returns in week "t-1".

We would like to thank Vishal Kinage for his assistance in preparing this research report.

Valuation Method and Risk Statement

This research report represents UBS's interpretation of the accounting rules (IFRS, US GAAP and the US Tax code), accepted valuation convention and regulations as applied to the use and application of Bloomberg's beta in valuation. We have made reference to annual reports to illustrate the treatment of the various accounting issues within the financial statements. Such references do not necessarily represent agreement or disagreement with the disclosed treatments and are used for illustrative purposes only. The immediate risk in relation to the subject matter covered by the UBS Fundamental Analytics team arises from the existence of accounting standards, valuation and modelling techniques that are open to interpretation and differing methods of application. At the time of writing, we believe the issues raised in this research to be relevant to investors, but this may change. Additionally, this research should not be read as a complete or definitive account of all relevant issues. Although we attempt to address all significant or nascent issues, these may not always be apparent, and may change over time. Finally, this document should not be interpreted to mean that all the issues addressed in our research have a financial impact.

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12-Month Rating	Definition	Coverage[1]	IB Services[2]
Buy	FSR is > 6% above the MRA.	57%	32%
Neutral	FSR is between -6% and 6% of the MRA.	35%	26%
Sell	FSR is > 6% below the MRA.	9%	21%
Short-Term Rating	**Definition**	**Coverage[3]**	**IB Services[4]**
Buy	Stock price expected to rise within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%
Sell	Stock price expected to fall within three months from the time the rating was assigned because of a specific catalyst or event.	<1%	<1%

Source: UBS. Rating allocations are as of 30 June 2022.
1:Percentage of companies under coverage globally within the 12-month rating category.
2:Percentage of companies within the 12-month rating category for which investment banking (IB) services were provided within the past 12 months.
3:Percentage of companies under coverage globally within the Short-Term rating category.
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