INDUSTRY BETAS

LEVERED AND UNLEVERED

65 INDUSTRIES
144 SUB-INDUSTRIES
10 GEOGRAPHICAL AREAS

IV QUARTER 2021

salvidio & partners

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- 144 SUB INDUSTRIES

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This quarterly research on industry and sub-industry betas
has been prepared by

salvidio & partners

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I – DESCRIPTION OF METHOD USED

1. About industry and sub-industry betas reported in this publication

Tables in Sections III and IV of this research list, *levered* and *unlevered industry* and *sub-industry* betas[1], are estimated on the basis of individual betas of shares issued by thousands of companies quoted on stock exchanges worldwide[2]. Industry betas have been calculated as arithmetic averages of individual betas. They have been aggregated by industry or by sub-industry, as well as by different geographical areas[3].

Industry betas can be useful when estimating the cost of capital because they tend to be less sensitive to errors that may affect the calculation of individual betas:

- as a consequence of special market situations or of other extraordinary events involving underlying companies, the results of individual beta calculation may be sometimes over- or underestimated;

- since industry betas are determined as averages of individual stock betas, over- and underestimations tend to compensate each other.

An average (industry or sub-industry) beta can, therefore, be generally considered to be more meaningful for the purpose of cost of capital calculation than its underlying single stock betas, considered individually.

2. Selection of individual betas

In order to estimate industry betas, we have averaged individual betas of listed companies:

- having a minimum market capitalization of 50 million Euros in the last five years;

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[1] **For a more plain reading on this note, we will, hereinafter recall both industry and sub-industry betas collectively as "industry betas", unless a distinct reference to sub-industry betas is required for a better understanding of methodology and content of this research.**
[2] Our estimates are based on industry, stock market and financial data provided by Standard & Poor's Capital IQ
[3] We have calculated an average "global" value of each industry and each sub-industry of the individual betas. In addition, the tables in Sections III and IV feature also specific "regional" average values for the following areas: a) International edition of this booklet: *European Union and Western Europe, Russia and Eastern Europe, Southern and Eastern Mediterranean Countries, States of the Persian Gulf, Sub-Saharan Africa, Central and South Asia, East Asia, Pacific States, South America, North America*; b) USA edition of this booklet: *United States of America, Canada, Central and South America, European Union and other Western European countries, Russia and other Eastern European countries, Southern and Eastern Mediterranean and Gulf countries, Sub-Saharan Africa Central and South Asia,East Asia. Oceania and Pacific*.

- whose shares daily traded value was never less than one hundredth of their average market capitalization in the last five years.

In our opinion, the requirements above constitute a reasonable compromise between:

- the need to collect a vast number of individual betas to be able to calculate as many industry and sub-industry betas as possible;

- the necessity to avoid companies that are too small and/or whose shares may be thinly traded, since their individual betas may be not meaningful.

3. Estimating individual *levered* betas

For each company selected we have estimated a set of two *levered* betas:

- *calculation technique*: regression of return of company shares to market return, applied over two distinctive periods of five and of two years considering, respectively, monthly and weekly returns;

- *market return*: we have assumed as a proxy the return of the local stock market index of reference for the underlying company.

Individual *levered* betas calculated over a regression period of five years appear, generally, to be less dispersed around the market beta than those of a regression period of two years. The latter, due to the shorter regression period, may show results that are more affected by the volatility of the underlying shares return against the index return, but also better reflect the underlying company's recent operating financial risk profiles.

4. Estimating individual *unlevered* betas

Based on their *levered* betas, we have calculated *unlevered* betas of all companies different than those belonging to financial industries (banks and insurances).

We have estimated *unlevered* betas using two different techniques, depending on whether the underlying company's gross debt less "cash[4] and equivalents" is greater than (net debt) or lower than (net liquidity) zero.

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[4] Amount of liquidity has been adjusted to properly reflect s.c. "working cash". See T. Coller, M. Goedhart, D.Wessels *Valuation*, Wiley, 2010, pag. 143

4.1. Unlevered Beta – Net debt

In the case of existing net debt (gross debt being higher than cash and equivalents), we have used a simplified version[5] of Hamada's formula to extract *unlevered* beta from one stock's *levered* five years and two years regression betas:

$$\beta_{unlevered} = \frac{\beta_{levered}}{1 + (1 - t) \times \dfrac{D}{E}}$$

where:

- "D": gross debt (adjusted for pension liabilities and similar provisions) less cash and equivalents;

- "E": market capitalization adjusted for minority interests;

- "t": effective tax rate.

"D", "E" and "t" used in the above formula are, respectively, 5 year or 2 year average values, depending on regression period of *levered* betas.

4.2. Unlevered Beta – Net liquidity

In case of existing net liquidity (gross debt lower than cash and equivalents), a company's market capitalization "E" can be assumed to be the sum of two components, the first consisting in the market value of its business "E_b" and the second being its net liquidity "E_{liq}":

$$E = E_b + E_{liq}$$

The equation above can also be rewritten as follows:

$$E = (E - E_{liq}) + E_{liq}$$

The company's *levered* beta should be equal to the weighted average of the beta of its net liquidity and beta of its business. The latter should therefore correspond to the "true" *unlevered* beta:

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[5] The implied assumption is that the debt beta may not be meaningful. To be consistent with this assumption, we have discarded the betas of companies with an excessive level of indebtedness (see below)

$$\beta_{levered} = \beta_{Eb} \frac{(E - E_{liq})}{E} + \beta_{E_{liq}} \frac{E_{liq}}{E}$$

Assuming that net liquidity's beta is equal to zero, β_{Eb} can be calculated as follows[6]:

$$\beta_{Eb} = \frac{\beta_{levered}}{\frac{(E - E_{liq})}{E}}$$

In the end, for D equal to E_{liq}, the formula can be rewritten as:

$$\beta_{unlevered} = \frac{\beta_{levered}}{\frac{(E - D)}{E}}$$

5. From individual betas to industry betas

5.1. Filtering out outliers and meaningless values

Before calculating industry *levered* and *unlevered* betas as averages of individual *levered* and *unlevered* betas respectively, we have screened out outliers and/or otherwise, at least in our opinion, meaningless or possibly distorted individual beta values:

- we have filtered out individual betas when the five years average debt to equity ratio ($\frac{D}{E}$) of the underlying company exceeds a threshold of 1.5[7]. We believe that if the value of debt is too high with respect to that of equity, then one cannot assume that the debt beta is irrelevant[8]. As a consequence, it is not possible to use the simplified Hamada-formula to extract unlevered betas from levered ones;

- we also have filtered out individual betas in case the five-year average effective tax rate of the underlying company is negative or exceeds 70%. If the effective tax rate is negative, the company may be benefiting from some peculiar tax exemptions or from a huge tax loss carry-forward. On the other side, an effective taxation in excess of 70% is also quite unusual and may be related to other exceptional events in a company's life. In both cases, we feel that it is better not to include companies with such taxation profiles in our industry beta calculation,

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[6] M. Massari, G. Gianfrate, L. Zanetti *Corporate Valuation*, Wiley, 2016, pag. 216-218
[7] I.e. when value of D is 1.5 times the value of E or higher. Where: a) "D" is calculated as gross debt (adjusted for pension liabilities and similar provisions) less cash and equivalents, b) "E" as the market capitalization adjusted for minority interests
[8] Please see footnote 5 above.

since the result may be distorted by situations that are not common among businesses;

- finally, we have filtered out individual betas that are lower than 0.25 or higher than 2.5. We have set these thresholds on the basis of our behaviour as valuers: when we select comparable companies to estimate which beta value to apply in estimating the cost of capital to be used in the valuation of an unquoted business, we tend to eliminate betas that are either too low or too high. Values below 0.25 or higher than 2.5 we would always discard, because we feel they may be the consequence of events or errors that distort underlying company or stock trading data.

5.2. More about the unlevering of individual betas

The *unlevering* techniques illustrated in paragraph 4 imply that the risk of the operating activity of a company is not influenced by net liquidity and that, therefore, one can calculate the *unlevered* beta as shown before. In our opinion, however, this assumption may not correspond to reality, since decisions taken by management, all other circumstances being equal, may be different in case the company's gross debt is being higher or lower than cash and equivalents. We therefore have computed industry and sub-industry betas (both for five and for two year individual betas regression periods) from two different perspectives, as outlined below.

5.2.1. Industry betas "net liquidity included"

We have calculated industry and sub-industry betas, both *levered* and *unlevered*, by averaging individual *levered* and *unlevered* betas, considering companies having net liquidity.

5.2.2. Industry betas "net liquidity excluded"

We have calculated industry and sub-industry betas, both *levered* and *unlevered*, by averaging individual *levered* and *unlevered* betas, screening out companies having net liquidity.

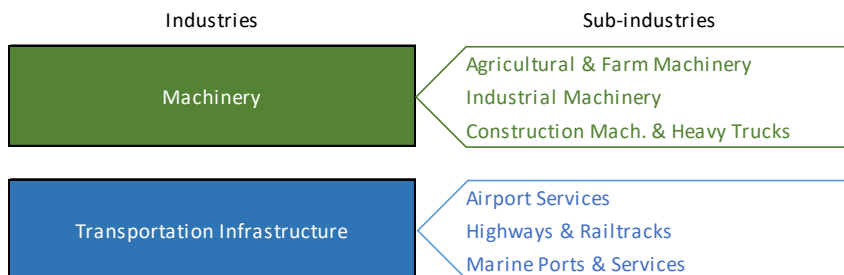## 6. Definitions and data tables

6.1. Differences between editions of this research

The first edition of our quarterly beta book started in the spring of 2017 and featured one-hundred and thirty-four sub-industries. Issues of the first edition covered all quarters of 2017 and the first three quarters of 2018.

The second edition has started with a 4th Quarter 2018 issue. Research has been extended:

- we have added ten more sub-industries. The total number of sub-industries now covered are one-hundred and forty-four;

- "on top" of the sub-industries we have added the average beta calculation for sixty-five industries. One industry includes one or more sub-industries, as suggested by the following visual sample scheme:

Industries	Sub-industries
Machinery	Agricultural & Farm Machinery Industrial Machinery Construction Mach. & Heavy Trucks
Transportation Infrastructure	Airport Services Highways & Railtracks Marine Ports & Services

While sub-industry betas, being more "granular", allow us to make a more targeted selection when estimating the cost of capital for valuing unquoted businesses, they may sometimes be based on too limited a set of underlying individual company betas. In such cases, industry betas, although less granular and therefore also less specific-to-target, may offer a better alternative to sub-industry ones.

6.2. Content of Sections II, III and IV

In estimating individual company betas and for their subsequent aggregation by industry and by sub-industry, as well as by geographical zone, we rely mainly on individual company financials and on market and industry classification data provided by Standard & Poor's[9] Capital IQ® database.

Such classification data is quite similar to sub-industry structure and definitions of the Global Industry Classification Standard (GICS®)[10] which are disclosed online by MSCI and by Standard & Poor's. We therefore "associate" the

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[9] Standard & Poor's Capital IQ is a financial data online distribution database and platform that is owned by S&P Global Inc.. S&P Global Inc. is an American publicly traded corporation headquartered in Manhattan, New York City. Its primary areas of business are financial information and analytics.

[10] The Global Industry Classification Standard (GICS) was developed by and is the exclusive property of Standard & Poor's Financial Services LLC (S&P) and MSCI. "GICS" is the trademark of Standard & Poor's Financial Services LLC (S&P) and MSCI. "Global Industry Classification Standard (GICS)" and "GICS Direct" are service marks of Standard & Poor's Financial Services LLC (S&P) and MSCI. GICS Direct is a joint product of Standard & Poor's Financial Services LLC (S&P) and MSCI, which provides the current, company-level GICS classification codes for over 40,000 companies.

publicly available GICS®[11] industry and sub-industry definitions to the average industry and sub-industry betas estimated on the basis of data obtained from Standard & Poor's Capital IQ® database.

In order to avoid dissemination of underlying data, our research features our calculation results only (average betas). We do not disclose individual company financial and stock prices data. We will, however, disclose, upon request and subject to certain limits and conditions, the names of companies that are constituents of our industry and sub-industry average beta values[12].

Section II (see below) lists industry and sub-industry definitions and indicates the reference number of tables that report average beta values.

Tables with sixty-five industry betas are displayed in Section III, while those with one-hundred and forty-four sub-industry betas are in Section IV.

The following is a brief explanation of the content of the tables.

6.3. Summary table

The first table in Section III and in Section IV, shows a summary of *levered* and *unlevered* industry betas or sub-industry betas respectively.

The first table reports their lowest, their highest and their average values, rounded to the second decimal place.

Industry betas are grouped by length of regression time period (2Y or 5Y), and sorted also by said inclusion or exclusion of net liquidity companies.

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[11] We refer to the current GICS® structure and definitions that their sole legitimate owners, MSCI and S&P, periodically disclose through their websites. Such classification and definitions are disclosed in English together with official translations in many other languages. While classification structure and definitions are disclosed, access to GICS® classification codes for individual companies is offered by MSCI and by S&P or by distributors they authorize on a subscription basis.

[12] Restricted disclosure of company names aims to prevent the possibility to rely on our quarterly publications to attempt to build up a company classification database that is regularly updated. Even if it would still never reach the extent and completeness of the GICS® database, we believe such an attempt would be unfair vis-à-vis GISC® rightful owners and their authorized distributors. By preventing full and unrestricted disclosure of company names, we therefore avoid any possibility to exploit our publications in what we think may be unfair use. Business valuers and other financial experts interested in industry and sub-industry constituent company names may submit a request at www.salvidio.com/support and follow instructions to obtain information. Access to company names is limited per registered user and by quarterly issue to not more than twenty industries and/or sub-industries. Massive data downloads are not allowed and we retain the right to suspend at anytime the disclosure of company names in case of unusual high access requests coming from the same "unique visitors", same individual and/or firm, etc. or in case GICS® rightful owners asks to do so.

6.4. Industry and sub-industry betas tables

Single industry beta and sub-industry beta tables show *levered* and *unlevered* betas rounded to the second decimal place. They are aggregated:

- *by column*: on the basis of the length of regression period (5Y or 2Y) and by inclusion or exclusion of net liquidity companies;

- *by raw*: on geographical basis (ten different regional values and one global value).

Tables also show the number of individual betas underlying their average (industry and sub-industry) values, as shown by the following example, taken from the US edition of this research covering the fourth quarter of 2018

	β_L	n.	β_U	n.	β_L	n	β_U	n.
Oil & Gas Drilling								
31/12/2018		5Y net liq. incl.				5Y net liq. excl		
European Union and other Western European countries	1,48	3	1,26	3	1,27	2	0,93	2
Russia and other Eastern European countries	1,57	1	1,13	1	1,57	1	1,13	1
Southern and Eastern Mediterranean countries	-	-	-	-	-	-	-	-
Gulf countries	1,69	3	0,86	3	1,69	3	0,86	3
Sub-Saharan Africa	-	-	-	-	-	-	-	
Central and South Asia	-	-	-	-	-	-	-	-
East Asia	-	-	-	-	-	-	-	-
Pacific countries	-	-	-	-	-	-	-	-
Latin America	1,16	2	1,06	2	1,16	2	1,06	2
North America	-	-	-	-	-	-	-	-
Global	1,49	9	1,07	9	1,44	8	0,96	8

How to read the industry and sub industry beta tables[13]:

- A = reference date of the industry or sub-industry beta calculation;

- B = industry or sub-industry;

- C = rows of industry or sub-industry beta values aggregated by geographical area;

- D = columns displaying values of levered (β_L) and unlevered (β_U) industry or sub-industry betas;

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[13] The sample picture is taken from the international edition in English language of our industry and sub-industry beta research, issue covering the 4th Quarter of 2018. The table features the Oil & Gas Drilling sub-industry only. However, the content-structure of all other industry and sub-industry tables of all editions is the same.

- E = regression period, 5Y or 2Y: betas are aggregated in different columns depending on whether companies with net liquidity were or were not included in the industry and sub-industry betas calculation;

- F = columns displaying the number of individual betas underlying the values of industry and sub-industry betas;

- G = sample values of levered and unlevered industry and sub-industry betas;

- H = sample quantity of individual betas underlying corresponding industry and sub-industry betas values

When the number of individual betas for a specific geographical area is too small, it may be better to refer to the global value of industry beta or sub-industry beta. As an alternative, one could adjust average values resulting from a too limited underlying set of individual betas using the Blume's technique[14].

6.5. Beta distribution by geographical zone

The last table in Section III and in Section IV, shows how individual company betas are distributed among the different geographical zones.

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Disclaimer

We have estimated industry and sub-industry betas by relying upon third party industry, stock market, financial and classification data of thousands of listed companies. We have not verified such data.

All information contained in this publication is presented without any claim of accuracy, completeness and absence of errors. Computational mistakes can occur frequently when, like in this case, complex calculations are made by using a huge amount of information data.

We may, in future, modify at our discretion the criteria for calculating industry and sub-industry betas as well as change any content of this publication.

All information contained in this publication is provided *as is*. It is to be used at the user's own risk only.

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[14] Beta adjusted = Beta x 2/3 + 1/3