

# EVOLUTION AND VOLATILITY OF ECONOMIC MULTIPLE VALUE 2005-2015: A COMPARATIVE ANALYSIS

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## Abstract

The paper analyzes economic multiple evolution and volatility over ten years. Specifically, the paper investigates the evolution of EV/EBITDA and EV/EBIT multiples value in the period 2005-2015 and demonstrates that: (a) EV/EBITDA and EV/EBIT multiples present an appreciable level of volatility from year to year; (b) EV/EBIT multiple presents a standard deviation higher than that of the EV/EBITDA and (c) EV/EBITDA multiple presents a linear correlation with the beta risk coefficient higher than that of the EV/EBIT. The analysis concerns multiples that refer to the North American market, as it constitutes a relatively homogeneous context from regulatory and GAAP-application points of view, and a reliable and comprehensive time series is available. Multiples do not refer to specific companies, but to average sector values, as identified by Bloomberg and Datastream.

**Keywords:** Corporate Valuation, Multiples, Volatility, EV/EBITDA, EV/EBIT

## 1. INTRODUCTION AND RESEARCH OBJECTIVES

Methods based on multiples are among the most widespread criteria used in corporate valuation. As they are based on stock-market values or on the outcome of comparable transactions, it is inevitable that such methodology, more so than others, be affected by contingent market conditions. In fact, it has been determined that in phases of "economic euphoria," multiples tend to be of higher value, while in phases of slowdown or recession, they pay the consequences of the inevitable contraction of prices.

For example, in the luxury sector - which ranges from clothing to jewelry, etc. - the EV/EBITDA multiple in 2009, the first year in which structural economic change came to be known, was on average 5.4x below the food and manufacturing industries (7.7x and 6.3x respectively). At the first signs of economic recovery in 2012, the same multiple settled at around 14.6x, over 100% higher than those of the two sectors cited above. Indeed, in examining the major *luxury* deals closed between 2012 and 2013, EBITDA multiples are, in some cases, almost double the average, as in the cases of the acquisitions of Valentino (25.4x), Pomellato (25.6x), and Loro Piana (21.8x). In 2011 Bulgari was traded at 28.7x.

It is evident, therefore, that multiples are not independent of market volatility, but conversely, as they are based on share prices and their exchange values, reflect the trends thereof, sometimes with an amplified effect.

In some cases performances are even detached from those of the sector. For example, in Ferrari's 2015 IPO, an EV/EBITDA multiple of 16x was determined - closer to the *luxury* multiple than the

*automotive* sector's. In fact the multiple was even higher than the average for luxury sector companies (11x), and only slightly lower than the *best-in-class* Hermes (17.5x).

This article aims to:

(1) ascertain the evolution of the average value of EV/EBITDA and EV/EBIT market multiples in the period 2005-2015 for a sample of industries;

(2) identify a less volatile economic multiple through the examination of its standard deviation;

(3) determine the correlation between economic multiples and the "beta" sector risk coefficient, commonly used in corporate valuation, in order to define the value-risk relationship.

The analysis will first provide an examination of the literature, then lay out both the context and investigative methodology. Next, the sample will be presented. It contains the EV/EBITDA and EV/EBIT multiples and sector beta coefficients for the period 2005-2015. In particular, both the evolution of the multiples over time and their relative volatility through standard deviation, and the correlation between multiple value and beta coefficient, are investigated.

## 2. BRIEF REVIEW OF THE LITERATURE

In corporate valuation, one of the most reliable criteria for two decades has been the multiple method (Guatri & Bini, 2002; Asquith et al. 2005; Zanda et al., 2013; Pozzoli, 2016; Plenborg and Pimentel, 2016). In particular, research focused on the modes of construction of the sample of comparable companies (Herrmann and Richter 2003), on the criterion of multiple selection (Kaplan and Ruback 1996; Lie and Lie 2002), on the correspondence between estimated value and the

value effectively derived from the market (Kim and Ritter 1999), and on the accuracy of results based on value drivers (Alford 1992; Liu et al. 2002 and 2007; Yoo 2006; Demirakos et al. 2009).

With regard to the *research questions* formulated beforehand, it is noted that:

(1) research aiming to examine time series of multiple values relating to specific sectors is encountered almost exclusively in analyst and merchant bank contributions (The Brandes Institute, 2001), most of which seeks to provide a comparison of trends, rather than performing an analysis of the evolution of value dynamics (Fang, et al., 2009);

(2) there are some contributions that aim to examine volatility in the application of valuation methods; however, these are based on data referring to periods prior to 2006, when the markets were characterized by greater stability (Damodaran, 2009; Kane et al. 1996) or in relation to corporate valuation in general (Almeida et al., 2004; Chi & Su, 2015; Marasca, 2015).

### 3. CONTEXT AND INVESTIGATIVE METHODOLOGY

The multiple method, as we know, is an empirical criterion for determining value based on the examination of entities with similar characteristics. In particular, there are two types of multiples: market multiples and multiples based on comparable transactions.

In the first, the numerator is the stock prices for a sample of similar companies (*comparable companies*); in the second multiple type, the numerator is represented by the prices recorded in similar transactions (*comparable transactions*).

This analysis considers only multiples that refer to comparable companies, because "they are much more reliable, arising from official data. They also refer to similar operations: stock market contracts. The prices that arise from comparable negotiations are often heterogeneous in their nature, conditions, and valuation times. They also raise the issue of the transition from the price of the negotiated capital share to the expected price of the entire company. In terms of information content, we also recall the different tendency of the two sources to capture liquidity premiums (in the first case) and control premiums (in the second)" (Organismo Italiano di Valutazione, PIV, § III.1.38). This approach derives from the International Valuation Standards (IVS) (Amaduzzi et al., 2016).

Starting from this premise, the analysis is limited to EV/EBITDA and EV/EBIT multiples, for the following reasons:

(a) valuations based on the use of multiples are mostly performed on an asset side perspective;

(b) economic values are frequently used in corporate valuation, because they represent a reliable performance indicator and are easy to be obtained;

(c) in economic measurement, EBITDA and EBIT multiples are to be judged more significant than those based on revenue, as they reflect the characteristics of the cost structure. It is possible that similar entities with similar turnover present different margins due to the specific ways in which the business is managed.

From a methodological point of view:

(a) the analysis concerns multiples that refer to the North American market, as it constitutes a relatively homogeneous context from regulatory and GAAP-application points of view, and a reliable and comprehensive time series is available;

(b) multiples do not refer to specific companies, but to average sector values, as identified by Bloomberg and Datastream;

(c) the sectors have been selected considering their relevance; however it is possible that a larger sample may lead to partially different results; Furthermore, it should be noted that the multiples refer to an extremely long period of time; during that period many changes took place (the economic crisis, the development and partial decline of BRIC, the so-called Arab Spring, etc.), which inevitably have an impact on the volatility of the markets and, therefore, on values.

### 4. THE SAMPLE

As stated, the sample is composed of sectors deemed to be representative with reference to the North American market. For each of these and for every year considered (2005-2015), the EV/EBITDA and EV/EBIT multiples and beta coefficient have been identified (Table 1).

### 5. EVOLUTION AND VOLATILITY IN MULTIPLES OVER TIME

The first objective of this analysis, as has been stated, is to ascertain the evolution of the average value of the EV/EBITDA and EV/EBIT market multiples in the period 2005-2015 (Tables 2 and 3). For each sector the following results have been calculated: average, median, minimum value, maximum value, and standard deviation. In both cases, multiple value changes from year to year, sometimes significantly, and especially in sectors which present a greater degree of volatility.

For example, with reference to the EV/EBITDA ratio, "Internet" and "Power" (Energy) sectors are more affected by market variability and present a rather significant span between minimum and maximum values. In fact, in the "Power" sector the maximum value (in 2006) is around 7 times the minimum value (in 2011).

EV/EBIT multiple is even affected by a greater volatility.

In order to focus on the extent of the changes in multiple value from one year to another, the year-on-year variations expressed in terms of percentage are reported below (Tables. 4 and 5).

Table 1. The sample used (sources: Bloomberg and Datastream)

Business sector	2005			2006			2007			2008			2009			2010		
	EV/ EBITD A	EV/ EBIT	Beta	EV/ EBITDA	EV/ EBIT	Beta	EV/ EBITDA	EV/ EBIT	Beta	EV/ EBITDA	EV/ EBIT	Beta	EV/ EBITDA	EV/ EBIT	Beta	EV/ EBITDA	EV/ EBIT	Beta
Air Transport	11,09	22,44	1,03	8,57	14,06	1,03	6,45	9,50	1,01	4,82	7,22	0,72	7,92	14,48	0,67	10,23	20,76	0,85
Apparel	8,84	11,24	0,77	10,90	13,49	0,84	8,97	11,05	0,76	4,91	6,20	0,83	8,08	10,41	1,09	9,89	12,95	1,20
Auto & Truck	7,91	14,04	0,50	10,05	21,49	0,64	6,56	12,24	0,87	3,82	6,14	0,56	10,75	91,28	0,74	11,20	112,61	0,83
Bank	NA	NA	0,39	6,09	6,09	0,43	4,92	4,92	0,39	3,87	3,87	0,30	5,63	5,63	0,28	4,86	4,86	0,30
Beverage (Alcoholic)	11,01	13,70	0,46	12,21	16,30	0,55	16,01	21,50	0,77	8,76	11,78	0,78	11,01	14,42	0,84	11,89	14,80	0,74
Beverage (Soft Drink)	12,50	15,94	0,54	13,27	16,96	0,63	16,94	22,30	0,85	9,95	12,52	0,83	11,97	15,06	0,90	12,68	15,42	0,83
Biotechnology	43,82	61,25	1,58	29,48	38,61	1,50	20,30	25,81	1,39	20,64	27,14	1,15	21,84	32,36	0,96	15,91	20,98	1,01
Broadcasting	11,33	34,94	1,20	12,82	31,14	1,31	9,15	18,51	1,08	6,37	13,49	0,94	6,24	12,42	1,02	6,64	12,74	0,95
Building Materials	8,16	10,50	0,79	7,62	9,82	0,78	7,70	10,07	0,83	6,02	9,05	0,75	8,33	14,12	0,84	11,79	29,33	0,83
Chemical (Specialty)	10,04	14,78	0,76	10,03	14,40	0,84	10,52	14,94	0,93	6,41	9,12	0,92	8,35	12,81	1,03	11,81	19,20	1,15
Coal	16,70	30,47	0,82	10,26	16,09	1,53	13,71	21,47	1,52	6,98	13,04	1,39	8,61	12,33	1,39	11,22	17,51	1,39
Computer services	13,99	17,38	2,00	14,67	18,16	1,79	15,45	19,04	1,51	7,42	8,80	1,14	11,35	13,65	0,97	11,84	13,97	1,01
Drug	13,29	16,74	1,47	13,60	18,28	1,46	11,80	15,90	1,67	8,65	11,56	1,03	9,32	12,04	0,99	9,06	11,78	0,97
Electronics	11,82	19,68	1,48	11,65	20,03	1,33	11,64	18,29	1,17	4,15	6,15	0,93	7,62	11,47	0,94	10,14	16,16	0,98
Entertainment	9,78	14,84	1,17	11,40	15,22	1,07	9,96	13,81	1,17	5,34	7,08	1,01	7,00	9,43	1,21	10,19	13,18	1,36
Environmental	8,73	14,58	0,51	10,12	17,09	0,60	9,31	14,76	0,71	7,86	11,98	0,78	8,59	12,84	0,68	9,54	14,53	0,62
Food Processing	10,34	14,44	0,50	11,00	14,10	0,61	12,33	15,68	0,66	8,40	10,46	0,63	9,10	11,03	0,69	10,03	12,65	0,72
Furn/Home Furnishings	8,92	12,21	0,82	9,02	12,04	0,71	7,36	9,91	0,88	4,24	5,84	0,86	8,71	14,65	1,16	11,96	22,28	1,37
Hotel/Gaming	14,50	21,46	0,63	18,17	26,52	0,60	15,02	20,92	0,96	6,48	9,08	0,78	10,47	17,11	1,00	20,39	48,72	1,24
Internet	48,02	75,86	2,73	29,36	40,24	2,25	30,67	41,07	1,94	11,51	15,92	1,36	20,22	27,82	1,02	19,87	26,76	1,09
Machinery	10,36	14,57	0,65	10,22	13,75	0,81	11,04	14,26	1,00	5,10	6,54	0,97	7,56	10,03	0,96	14,07	22,26	0,99
Maritime	6,34	8,54	0,44	8,05	11,65	0,55	12,05	17,51	0,59	7,25	10,93	0,48	7,02	10,22	0,57	10,37	20,12	0,59
Packaging & Container	8,31	14,24	0,53	9,14	15,26	0,61	8,03	12,30	0,80	5,41	8,12	0,77	7,15	11,24	0,80	8,15	12,58	0,78
Paper/Forest Products	6,96	11,55	0,53	8,32	15,71	0,57	7,74	12,81	0,68	6,01	13,18	0,60	10,14	28,90	0,91	7,24	13,99	0,96
Power	26,73	43,51	1,78	45,58	85,09	2,05	43,67	66,10	1,71	7,82	11,95	0,77	8,57	12,63	0,63	8,30	12,66	0,65
Publishing	8,69	13,47	0,57	10,14	15,08	0,70	10,75	14,00	1,05	5,09	6,58	0,58	7,15	9,06	0,90	6,29	8,31	0,94
Shoe	10,52	12,35	0,98	10,32	11,92	1,05	11,06	12,68	1,48	6,46	7,47	1,22	10,31	12,40	1,30	13,29	15,82	1,30
Steel (General)	5,48	6,50	0,85	6,40	7,63	1,05	6,42	7,46	1,57	4,46	5,29	1,39	5,23	6,32	1,30	8,98	10,20	1,32
Telecom. Equipment	16,45	21,22	2,52	14,78	18,37	2,24	15,15	18,71	1,88	6,46	8,81	1,34	11,07	17,12	1,05	10,48	14,50	0,94
Mean	13,59	20,80	1,00	13,22	19,81	1,04	12,78	17,85	1,10	6,92	9,84	0,89	9,49	16,67	0,92	10,97	20,40	0,96
Median	10,44	14,68	0,79	10,32	15,71	0,84	11,04	14,94	1,00	6,41	9,05	0,83	8,59	12,63	0,96	10,37	14,80	0,96
Min	5,48	6,50	0,39	6,09	6,09	0,43	4,92	4,92	0,39	3,82	3,87	0,30	5,23	5,63	0,28	4,86	4,86	0,30
Max	48,02	75,86	2,73	45,58	85,09	2,25	43,67	66,10	1,94	20,64	27,14	1,39	21,84	91,28	1,39	20,39	112,61	1,39
Standard deviation	10,02731	15,75149	0,622202	8,280601	14,8034	0,529222	7,854184	11,4789	0,410639	3,227745	4,459427	0,280166	3,635378	15,57758	0,237574	3,461255	19,46008	0,263193

Table 1. Continued

Business sector	2011			2012			2013			2014			2015		
	EV/ EBITDA	EV/ EBIT	Beta	EV/ EBITDA	EV/ EBIT	Beta	EV/ EBITDA	EV/ EBIT	Beta	EV/ EBITDA	EV/ EBIT	Beta	EV/ EBITDA	EV/ EBIT	Beta
Air Transport	12,91	20,22	1,02	6,00	9,32	0,70	9,64	14,68	0,48	8,09	22,22	0,59	5,80	9,71	0,81
Apparel	8,65	10,83	1,13	11,73	14,68	1,23	14,12	16,03	0,96	12,39	18,49	0,84	10,84	16,39	0,85
Auto & Truck	5,81	10,40	0,79	7,46	13,95	0,93	11,72	24,07	0,66	14,53	41,13	0,54	10,03	20,93	0,44
Bank	4,37	4,37	0,33	4,87	4,87	0,37	NA	NA	0,43	NA	NA	0,31	NA	NA	0,43
Beverage (Alcoholic)	11,21	13,97	0,65	11,89	14,67	0,72	18,78	22,75	0,91	17,32	21,29	0,88	19,93	24,13	0,81
Beverage (Soft Drink)	12,04	14,80	0,73	12,74	15,58	0,80	13,95	16,89	1,17	14,26	17,63	0,93	15,82	19,66	0,95
Biotechnology	NA	NA	0,91	22,46	30,77	1,07	22,87	49,96	1,02	19,06	36,39	1,02	13,60	21,02	1,12
Broadcasting	6,25	11,27	0,92	7,08	12,35	0,92	13,55	15,53	1,08	9,20	14,82	0,67	9,32	15,16	0,87
Building Materials	10,99	29,23	0,82	14,45	35,82	0,99	14,47	19,68	1,02	11,81	17,60	0,88	11,42	16,09	0,94
Chemical (Specialty)	9,84	14,06	1,09	10,86	15,23	1,00	10,82	13,30	0,89	11,85	16,16	0,86	10,68	14,81	0,97
Coal	7,34	11,14	1,22	5,99	9,34	0,91	9,28	43,19	0,69	8,91	66,81	0,78	6,04	184,31	0,36
Computer services	8,64	9,81	0,98	9,70	11,11	0,92	9,51	11,06	0,78	8,39	10,79	0,93	8,27	10,89	0,94
Drug	9,35	13,02	0,98	8,93	12,10	0,94	11,54	15,60	0,97	13,58	18,79	0,91	13,63	19,35	0,90
Electronics	5,82	7,84	0,89	6,63	9,28	1,01	11,85	19,55	0,89	11,02	18,02	0,91	9,48	15,29	0,87
Entertainment	8,03	10,67	1,21	9,53	12,22	1,24	12,61	15,10	0,95	11,71	15,79	0,95	10,36	13,21	0,94
Environmental	8,77	13,58	0,58	8,44	12,78	0,48	10,79	17,17	0,80	9,97	17,17	0,93	10,13	18,59	0,81
Food Processing	9,54	11,93	0,74	10,10	12,53	0,74	12,26	14,63	0,69	11,91	15,08	0,80	14,93	19,16	0,72
Furn/Home Furnishings	9,68	14,31	1,52	8,34	11,22	1,37	11,25	14,87	0,99	10,36	15,42	0,89	9,97	15,03	0,98
Hotel/Gaming	12,46	20,51	1,20	10,68	15,66	1,21	14,18	22,08	0,87	12,97	22,56	0,80	11,89	20,05	0,65
Internet	17,06	21,41	1,06	23,16	31,64	1,15	22,80	33,63	1,01	21,10	33,76	1,22	23,81	39,05	1,28
Machinery	9,08	12,41	1,04	9,93	12,94	1,11	12,03	14,84	0,91	10,46	13,56	1,05	9,60	12,60	1,16
Maritime	9,63	18,14	0,53	10,36	21,66	0,57	13,04	21,01	0,92	9,44	19,50	0,91	6,40	13,51	0,83
Packaging & Container	7,18	10,51	0,83	7,57	11,20	0,84	9,12	12,86	0,71	9,09	13,78	0,68	9,45	14,29	0,88
Paper/Forest Products	5,46	8,83	0,89	7,22	11,38	0,99	9,70	15,67	0,90	9,05	14,93	0,58	9,08	15,41	0,87
Power	6,63	10,17	0,57	8,92	21,70	0,53	9,78	16,85	0,40	9,89	18,14	0,52	8,92	15,32	0,49
Publishing	6,44	9,47	0,82	8,76	13,14	0,92	10,18	16,34	0,82	9,57	17,17	0,82	8,85	16,44	1,01
Shoe	11,64	13,41	1,23	14,09	16,98	1,24	16,51	18,90	0,78	15,17	20,26	0,80	17,25	23,22	0,78
Steel (General)	7,08	13,30	1,23	5,63	8,89	1,16	10,32	18,06	0,85	8,63	16,14	0,85	7,40	NA	0,79
Telecom. Equipment	8,46	11,50	0,91	6,74	8,51	0,96	11,65	14,63	1,04	12,01	15,86	1,12	10,60	13,68	1,09
Mean	8,94	13,25	0,92	10,01	14,88	0,93	12,80	19,60	0,85	11,85	21,04	0,83	11,20	23,60	0,85
Median	8,71	12,17	0,91	8,93	12,78	0,94	11,79	16,59	0,89	11,36	17,61	0,86	10,08	16,09	0,87
Min	4,37	4,37	0,33	4,87	4,87	0,37	9,12	11,06	0,40	8,09	10,79	0,31	5,80	9,71	0,36
Max	17,06	29,23	1,52	23,16	35,82	1,37	22,87	49,96	1,17	21,10	66,81	1,22	23,81	184,31	1,28
Standard deviation	2,75	4,93	0,26	4,30	7,15	0,25	3,62	8,83	0,19	3,26	11,30	0,19	4,10	32,60	0,22

Data show that:

- for the same year, multiples have values that are somewhat different from sector to sector, an inevitable fact in itself because of the implicit differences in the competitive environment, business model, financial structure, etc.;
- the average/median beta coefficient settles around one, confirming the fact that the selected sample presents a "neutral" risk level; any volatility in the value of the multiples does not depend, therefore, on the preponderant presence of "high-risk" sectors, but on endogenous factors attributable to a broader context, which influence the dynamics of the value;
- the EV/EBIT multiple presents a standard deviation higher than that of the EV/EBITDA, presumably because of the different impact produced by the investment policies in the various sectors.

Table 2. Evolution of the EV/EBITDA multiple

Business sector	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Mean	Median	Min	Max	St Dev
	EV/ EBITDA	EV/ EBITDA	EV/ EBITDA	EV/ EBITDA	EV/ EBITDA	EV/ EBITDA	EV/ EBITDA	EV/ EBITDA	EV/ EBITDA	EV/ EBITDA	EV/ EBITDA					
Air Transport	11,09	8,57	6,45	4,82	7,92	10,23	12,91	6,00	9,64	8,09	5,80	8,32	8,09	4,82	12,91	2,49
Apparel	8,84	10,90	8,97	4,91	8,08	9,89	8,65	11,73	14,12	12,39	10,84	9,94	9,89	4,91	14,12	2,47
Auto & Truck	7,91	10,05	6,56	3,82	10,75	11,20	5,81	7,46	11,72	14,53	10,03	9,07	10,03	3,82	14,53	3,07
Bank	NA	6,09	4,92	3,87	5,63	4,86	4,37	4,87	NA	NA	NA	4,95	4,87	3,87	6,09	0,74
Beverage (Alcoholic)	11,01	12,21	16,01	8,76	11,01	11,89	11,21	11,89	18,78	17,32	19,93	13,64	11,89	8,76	19,93	3,70
Beverage (Soft Drink)	12,50	13,27	16,94	9,95	11,97	12,68	12,04	12,74	13,95	14,26	15,82	13,28	12,74	9,95	16,94	1,92
Biotechnology	43,82	29,48	20,30	20,64	21,84	15,91	NA	22,46	22,87	19,06	13,60	23,00	21,24	13,60	43,82	8,46
Broadcasting	11,33	12,82	9,15	6,37	6,24	6,64	6,25	7,08	13,55	9,20	9,32	8,91	9,15	6,24	13,55	2,69
Building Materials	8,16	7,62	7,70	6,02	8,33	11,79	10,99	14,45	14,47	11,81	11,42	10,25	10,99	6,02	14,47	2,86
Chemical (Specialty)	10,04	10,03	10,52	6,41	8,35	11,81	9,84	10,86	10,82	11,85	10,68	10,11	10,52	6,41	11,85	1,56
Coal	16,70	10,26	13,71	6,98	8,61	11,22	7,34	5,99	9,28	8,91	6,04	9,55	8,91	5,99	16,70	3,31
Computer services	13,99	14,67	15,45	7,42	11,35	11,84	8,64	9,70	9,51	8,39	8,27	10,84	9,70	7,42	15,45	2,82
Drug	13,29	13,60	11,80	8,65	9,32	9,06	9,35	8,93	11,54	13,58	13,63	11,16	11,54	8,65	13,63	2,13
Electronics	11,82	11,65	11,64	4,15	7,62	10,14	5,82	6,63	11,85	11,02	9,48	9,26	10,14	4,15	11,85	2,76
Entertainment	9,78	11,40	9,96	5,34	7,00	10,19	8,03	9,53	12,61	11,71	10,36	9,63	9,96	5,34	12,61	2,13
Environmental	8,73	10,12	9,31	7,86	8,59	9,54	8,77	8,44	10,79	9,97	10,13	9,29	9,31	7,86	10,79	0,89
Food Processing	10,34	11,00	12,33	8,40	9,10	10,03	9,54	10,10	12,26	11,91	14,93	10,90	10,34	8,40	14,93	1,85
Furn/Home Furnishings	8,92	9,02	7,36	4,24	8,71	11,96	9,68	8,34	11,25	10,36	9,97	9,07	9,02	4,24	11,96	2,07
Hotel/Gaming	14,50	18,17	15,02	6,48	10,47	20,39	12,46	10,68	14,18	12,97	11,89	13,38	12,97	6,48	20,39	3,79
Internet	48,02	29,36	30,67	11,51	20,22	19,87	17,06	23,16	22,80	21,10	23,81	24,32	22,80	11,51	48,02	9,46
Machinery	10,36	10,22	11,04	5,10	7,56	14,07	9,08	9,93	12,03	10,46	9,60	9,95	10,22	5,10	14,07	2,30
Maritime	6,34	8,05	12,05	7,25	7,02	10,37	9,63	10,36	13,04	9,44	6,40	9,09	9,44	6,34	13,04	2,27
Packaging & Container	8,31	9,14	8,03	5,41	7,15	8,15	7,18	7,57	9,12	9,09	9,45	8,05	8,15	5,41	9,45	1,19
Paper/Forest Products	6,96	8,32	7,74	6,01	10,14	7,24	5,46	7,22	9,70	9,05	9,08	7,90	7,74	5,46	10,14	1,50
Power	26,73	45,58	43,67	7,82	8,57	8,30	6,63	8,92	9,78	9,89	8,92	16,80	8,92	6,63	45,58	14,81
Publishing	8,69	10,14	10,75	5,09	7,15	6,29	6,44	8,76	10,18	9,57	8,85	8,35	8,76	5,09	10,75	1,85
Shoe	10,52	10,32	11,06	6,46	10,31	13,29	11,64	14,09	16,51	15,17	17,25	12,42	11,64	6,46	17,25	3,19
Steel (General)	5,48	6,40	6,42	4,46	5,23	8,98	7,08	5,63	10,32	8,63	7,40	6,91	6,42	4,46	10,32	1,79
Telecom. Equipment	16,45	14,78	15,15	6,46	11,07	10,48	8,46	6,74	11,65	12,01	10,60	11,26	11,07	6,46	16,45	3,28

Table 3. Evolution of the EV/EBIT multiple

Business sector	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	Mean	Median	Min	Max	St Dev
	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT					
Air Transport	22,44	14,06	9,50	7,22	14,48	20,76	20,22	9,32	14,68	22,22	9,71	14,96	14,48	7,22	22,44	5,66
Apparel	11,24	13,49	11,05	6,20	10,41	12,95	10,83	14,68	16,03	18,49	16,39	12,89	12,95	6,20	18,49	3,44
Auto & Truck	14,04	21,49	12,24	6,14	91,28	112,61	10,40	13,95	24,07	41,13	20,93	33,48	20,93	6,14	112,61	35,42
Bank	NA	6,09	4,92	3,87	5,63	4,86	4,37	4,87	NA	NA	NA	4,95	4,87	3,87	6,09	0,74
Beverage (Alcoholic)	13,70	16,30	21,50	11,78	14,42	14,80	13,97	14,67	22,75	21,29	24,13	17,21	14,80	11,78	24,13	4,32
Beverage (Soft Drink)	15,94	16,96	22,30	12,52	15,06	15,42	14,80	15,58	16,89	17,63	19,66	16,61	15,94	12,52	22,30	2,61
Biotechnology	61,25	38,61	25,81	27,14	32,36	20,98	NA	30,77	49,96	36,39	21,02	34,43	31,57	20,98	61,25	12,86
Broadcasting	34,94	31,14	18,51	13,49	12,42	12,74	11,27	12,35	15,53	14,82	15,16	17,49	14,82	11,27	34,94	7,99
Building Materials	10,50	9,82	10,07	9,05	14,12	29,33	29,23	35,82	19,68	17,60	16,09	18,30	16,09	9,05	35,82	9,27
Chemical (Specialty)	14,78	14,40	14,94	9,12	12,81	19,20	14,06	15,23	13,30	16,16	14,81	14,44	14,78	9,12	19,20	2,43
Coal	30,47	16,09	21,47	13,04	12,33	17,51	11,14	9,34	43,19	66,81	184,31	38,70	17,51	9,34	184,31	51,30
Computer services	17,38	18,16	19,04	8,80	13,65	13,97	9,81	11,11	11,06	10,79	10,89	13,15	11,11	8,80	19,04	3,58
Drug	16,74	18,28	15,90	11,56	12,04	11,78	13,02	12,10	15,60	18,79	19,35	15,01	15,60	11,56	19,35	3,03
Electronics	19,68	20,03	18,29	6,15	11,47	16,16	7,84	9,28	19,55	18,02	15,29	14,71	16,16	6,15	20,03	5,13
Entertainment	14,84	15,22	13,81	7,08	9,43	13,18	10,67	12,22	15,10	15,79	13,21	12,78	13,21	7,08	15,79	2,73
Environmental	14,58	17,09	14,76	11,98	12,84	14,53	13,58	12,78	17,17	17,17	18,59	15,01	14,58	11,98	18,59	2,19
Food Processing	14,44	14,10	15,68	10,46	11,03	12,65	11,93	12,53	14,63	15,08	19,16	13,79	14,10	10,46	19,16	2,46
Furn/Home Furnishings	12,21	12,04	9,91	5,84	14,65	22,28	14,31	11,22	14,87	15,42	15,03	13,43	14,31	5,84	22,28	4,09
Hotel/Gaming	21,46	26,52	20,92	9,08	17,11	48,72	20,51	15,66	22,08	22,56	20,05	22,24	20,92	9,08	48,72	9,86
Internet	75,86	40,24	41,07	15,92	27,82	26,76	21,41	31,64	33,63	33,76	39,05	35,20	33,63	15,92	75,86	15,60
Machinery	14,57	13,75	14,26	6,54	10,03	22,26	12,41	12,94	14,84	13,56	12,60	13,43	13,56	6,54	22,26	3,78
Maritime	8,54	11,65	17,51	10,93	10,22	20,12	18,14	21,66	21,01	19,50	13,51	15,71	17,51	8,54	21,66	4,82
Packaging & Container	14,24	15,26	12,30	8,12	11,24	12,58	10,51	11,20	12,86	13,78	14,29	12,40	12,58	8,12	15,26	2,05
Paper/Forest Products	11,55	15,71	12,81	13,18	28,90	13,99	8,83	11,38	15,67	14,93	15,41	14,76	13,99	8,83	28,90	5,16
Power	43,51	85,09	66,10	11,95	12,63	12,66	10,17	21,70	16,85	18,14	15,32	28,56	16,85	10,17	85,09	25,33
Publishing	13,47	15,08	14,00	6,58	9,06	8,31	9,47	13,14	16,34	17,17	16,44	12,64	13,47	6,58	17,17	3,68
Shoe	12,35	11,92	12,68	7,47	12,40	15,82	13,41	16,98	18,90	20,26	23,22	15,04	13,41	7,47	23,22	4,51
Steel (General)	6,50	7,63	7,46	5,29	6,32	10,20	13,30	8,89	18,06	16,14	NA	9,98	8,26	5,29	18,06	4,41
Telecom. Equipment	21,22	18,37	18,71	8,81	17,12	14,50	11,50	8,51	14,63	15,86	13,68	14,81	14,63	8,51	21,22	4,04

Table 4. YoY EV/EBITDA multiple variation

Business sector	2005 EV/ EBITDA	2006 EV/ EBITDA	2007 EV/ EBITDA	2008 EV/ EBITDA	2009 EV/ EBITDA	2010 EV/ EBITDA	2011 EV/ EBITDA	2012 EV/ EBITDA	2013 EV/ EBITDA	2014 EV/ EBITDA	2015 EV/ EBITDA
Air Transport		-0,23	-0,25	-0,25	0,64	0,29	0,26	-0,53	0,60	-0,16	-0,28
Apparel		0,23	-0,18	-0,45	0,64	0,22	-0,12	0,36	0,20	-0,12	-0,13
Auto & Truck		0,27	-0,35	-0,42	1,82	0,04	-0,48	0,28	0,57	0,24	-0,31
Bank		-	-0,19	-0,21	0,45	-0,14	-0,10	0,12	-	-	-
Beverage (Alcoholic)		0,11	0,31	-0,45	0,26	0,08	-0,06	0,06	0,58	-0,08	0,15
Beverage (Soft Drink)		0,06	0,28	-0,41	0,20	0,06	-0,05	0,06	0,09	0,02	0,11
Biotechnology		-0,33	-0,31	0,02	0,06	-0,27	-	-	0,02	-0,17	-0,29
Broadcasting		0,13	-0,29	-0,30	-0,02	0,06	-0,06	0,13	0,91	-0,32	0,01
Building Materials		-0,07	0,01	-0,22	0,38	0,42	-0,07	0,32	0,00	-0,18	-0,03
Chemical (Specialty)		0,00	0,05	-0,39	0,30	0,41	-0,17	0,10	0,00	0,09	-0,10
Coal		-0,39	0,34	-0,49	0,23	0,30	-0,35	-0,18	0,55	-0,04	-0,32
Computer services		0,05	0,05	-0,52	0,53	0,04	-0,27	0,12	-0,02	-0,12	-0,01
Drug		0,02	-0,13	-0,27	0,08	-0,03	0,03	-0,04	0,29	0,18	0,00
Electronics		-0,01	0,00	-0,64	0,83	0,33	-0,43	0,14	0,79	-0,07	-0,14
Entertainment		0,16	-0,13	-0,46	0,31	0,46	-0,21	0,19	0,32	-0,07	-0,11
Environmental		0,16	-0,08	-0,15	0,09	0,11	-0,08	-0,04	0,28	-0,08	0,02
Food Processing		0,06	0,12	-0,32	0,08	0,10	-0,05	0,06	0,21	-0,03	0,25
Furn/Home Furnishings		0,01	-0,18	-0,42	1,06	0,37	-0,19	-0,14	0,35	-0,08	-0,04
Hotel/Gaming		0,25	-0,17	-0,57	0,61	0,95	-0,39	-0,14	0,33	-0,09	-0,08
Internet		-0,39	0,04	-0,62	0,76	-0,02	-0,14	0,36	-0,02	-0,07	0,13
Machinery		-0,01	0,08	-0,54	0,48	0,86	-0,35	0,09	0,21	-0,13	-0,08
Maritime		0,27	0,50	-0,40	-0,03	0,48	-0,07	0,08	0,26	-0,28	-0,32
Packaging & Container		0,10	-0,12	-0,33	0,32	0,14	-0,12	0,05	0,20	0,00	0,04
Paper/Forest Products		0,19	-0,07	-0,22	0,69	-0,29	-0,25	0,32	0,34	-0,07	0,00
Power		0,71	-0,04	-0,82	0,10	-0,03	-0,20	0,35	0,10	0,01	-0,10
Publishing		0,17	0,06	-0,53	0,41	-0,12	0,02	0,36	0,16	-0,06	-0,08
Shoe		-0,02	0,07	-0,42	0,60	0,29	-0,12	0,21	0,17	-0,08	0,14
Steel (General)		0,17	0,00	-0,31	0,17	0,72	-0,21	-0,20	0,83	-0,16	-0,14
Telecom. Equipment		-0,10	0,03	-0,57	0,71	-0,05	-0,19	-0,20	0,73	0,03	-0,12

Table 5. YoY EV/EBIT multiple variation

Business sector	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT	EV/ EBIT
Air Transport		-0,37	-0,32	-0,24	1,00	0,43	-0,03	-0,54	0,57	0,51	-0,56
Apparel		0,20	-0,18	-0,44	0,68	0,24	-0,16	0,36	0,09	0,15	-0,11
Auto & Truck		0,53	-0,43	-0,50	13,86	0,23	-0,91	0,34	0,73	0,71	-0,49
Bank		-	-0,19	-0,21	0,45	-0,14	-0,10	0,12	-	-	-
Beverage (Alcoholic)		0,19	0,32	-0,45	0,22	0,03	-0,06	0,05	0,55	-0,06	0,13
Beverage (Soft Drink)		0,06	0,32	-0,44	0,20	0,02	-0,04	0,05	0,08	0,04	0,12
Biotechnology		-0,37	-0,33	0,05	0,19	-0,35	-	-	0,62	-0,27	-0,42
Broadcasting		-0,11	-0,41	-0,27	-0,08	0,03	-0,12	0,10	0,26	-0,05	0,02
Building Materials		-0,07	0,03	-0,10	0,56	1,08	0,00	0,23	-0,45	-0,11	-0,09
Chemical (Specialty)		-0,03	0,04	-0,39	0,40	0,50	-0,27	0,08	-0,13	0,22	-0,08
Coal		-0,47	0,33	-0,39	-0,05	0,42	-0,36	-0,16	3,63	0,55	1,76
Computer services		0,04	0,05	-0,54	0,55	0,02	-0,30	0,13	0,00	-0,03	0,01
Drug		0,09	-0,13	-0,27	0,04	-0,02	0,10	-0,07	0,29	0,20	0,03
Electronics		0,02	-0,09	-0,66	0,87	0,41	-0,51	0,18	1,11	-0,08	-0,15
Entertainment		0,03	-0,09	-0,49	0,33	0,40	-0,19	0,14	0,24	0,05	-0,16
Environmental		0,17	-0,14	-0,19	0,07	0,13	-0,07	-0,06	0,34	0,00	0,08
Food Processing		-0,02	0,11	-0,33	0,05	0,15	-0,06	0,05	0,17	0,03	0,27
Furn/Home Furnishings		-0,01	-0,18	-0,41	1,51	0,52	-0,36	-0,22	0,32	0,04	-0,03
Hotel/Gaming		0,24	-0,21	-0,57	0,89	1,85	-0,58	-0,24	0,41	0,02	-0,11
Internet		-0,47	0,02	-0,61	0,75	-0,04	-0,20	0,48	0,06	0,00	0,16
Machinery		-0,06	0,04	-0,54	0,53	1,22	-0,44	0,04	0,15	-0,09	-0,07
Maritime		0,36	0,50	-0,38	-0,07	0,97	-0,10	0,19	-0,03	-0,07	-0,31
Packaging & Container		0,07	-0,19	-0,34	0,38	0,12	-0,16	0,07	0,15	0,07	0,04
Paper/Forest Products		0,36	-0,18	0,03	1,19	-0,52	-0,37	0,29	0,38	-0,05	0,03
Power		0,96	-0,22	-0,82	0,06	0,00	-0,20	1,13	-0,22	0,08	-0,16
Publishing		0,12	-0,07	-0,53	0,38	-0,08	0,14	0,39	0,24	0,05	-0,04
Shoe		-0,03	0,06	-0,41	0,66	0,28	-0,15	0,27	0,11	0,07	0,15
Steel (General)		0,18	-0,02	-0,29	0,19	0,61	0,30	-0,33	1,03	-0,11	-
Telecom. Equipment		-0,13	0,02	-0,53	0,94	-0,15	-0,21	-0,26	0,72	0,08	-0,14

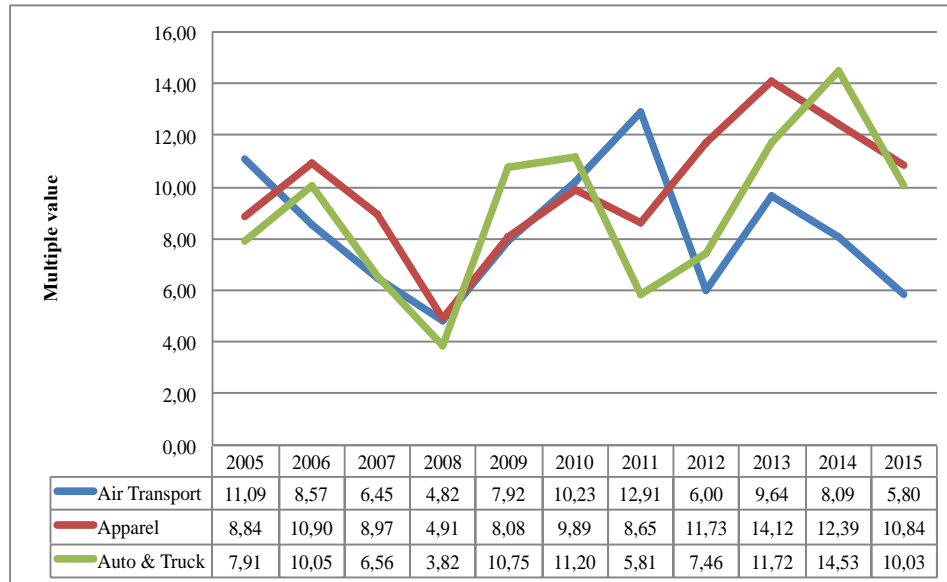


Almost all the variations are relevant.

Interestingly, the most significant reduction in multiple value (both EBITDA and EBIT) is recorded in 2008, coinciding with the beginning of the crisis, which manifested itself in the USA one year before

Europe. The exemplification in Fig. 1, although limited to three sectors for the sake of intelligibility, provides an exhaustive representation of the EV/EBITDA dynamics.

**Figure 1.** The effects of the 2008 crisis on the EV/EBIT multiple



In order to provide an answer to the second question (identifying a less volatile multiple), it is

interesting to compare the standard deviation of EV/EBITDA and EV/EBIT ratios (Table 6).

**Table 6.** Comparison of the standard deviation of multiple value (2005-2015)

Business sector	EV/ EBITDA Dev St	EV/ EBIT Dev St
Air Transport	2,49	5,66
Apparel	2,47	3,44
Auto & Truck	3,07	35,42
Bank	0,74	0,74
Beverage (Alcoholic)	3,70	4,32
Beverage (Soft Drink)	1,92	2,61
Biotechnology	8,46	12,86
Broadcasting	2,69	7,99
Building Materials	2,86	9,27
Chemical (Specialty)	1,56	2,43
Coal	3,31	51,30
Computer services	2,82	3,58
Drug	2,13	3,03
Electronics	2,76	5,13
Entertainment	2,13	2,73
Environmental	0,89	2,19
Food Processing	1,85	2,46
Furn/Home Furnishings	2,07	4,09
Hotel/Gaming	3,79	9,86
Internet	9,46	15,60
Machinery	2,30	3,78
Maritime	2,27	4,82
Packaging & Container	1,19	2,05
Paper/Forest Products	1,50	5,16
Power	14,81	25,33
Publishing	1,85	3,68
Shoe	3,19	4,51
Steel (General)	1,79	4,41
Telecom. Equipment	3,28	4,04

EV/EBIT multiple presents a standard deviation higher than that of the EV/EBITDA; the last column indicates the extent of this difference, which sometimes assumes significant values, as in the case of the "Coal" and "Paper/Forest Product" sectors, for which the EV/EBIT standard deviation is, respectively, 14.5x and 2.44x times that of the EV/EBITDA.

This suggests that the EV/EBIT ratio presents a higher level of volatility than that of the EV/EBITDA ratio and, consequently, less reliability in corporate valuation.

**Table 7.** Linear correlation between sectoral multiple value and relative beta coefficients

	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015
$\rho$ (EV/EBITDA; $\rho$ )	0,69	0,64	0,55	0,30	0,12	0,40	0,28	0,30	0,46	0,46	0,36
$\rho$ (EV/EBIT; $\rho$ )	0,67	0,57	0,51	0,27	-0,10	0,03	0,18	0,13	0,08	-0,05	-0,45

Surprisingly, the degree of correlation between the two value matrices is found to be quite low, and is even negative in the case of the EBIT for three years. Given the considered sample, the value expressed by the reports does not appear to have a significant link with sector risk, a fact which further proves the level of volatility inherent to such measures.

## 7. CONCLUSIONS

On the basis of the previous analysis it is possible to draw the following conclusions:

- EV/EBITDA and EV/EBIT multiples present an appreciable level of volatility from year to year;
- this is especially observable in the EV/EBIT multiple, which presents a standard deviation significantly higher than that of the EV/EBITDA over time;
- the EV/EBITDA multiple presents a linear correlation with the beta risk coefficient which is higher than that of the EV/EBIT (median of 0.40 against 0.13).

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## 6. THE CORRELATION BETWEEN MULTIPLES AND BETA COEFFICIENT

According to the fundamental theory of finance, there should be a significant link between value and risk, as the first one has to adequately compensate the second one. For this reason, through the Pearson coefficient ( $\rho$ ), it is verified the linear correlation between the average sector multiples and beta coefficients ( $\rho$ ) (Table 7).

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