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17 **ABSTRACT**
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19 *In this chapter we study the peer comparable approach used for the valuation*
20 *of companies that went public on the Italian Nuovo Mercato. In Italy, IPO*
21 *prospectuses often report the valuation methods used by investment banks.*
22 *This allows us to analyze the accuracy of “real-world” valuation estimates.*
23 *We show that underwriters rely on price-to-book and price-earnings multi-*
24 *ples. The valuation estimates generated by these multiples are closest to offer*
25 *prices. Conversely, when using enterprise value ratios comparable firms’*
26 *multiples are typically higher than those of the firms going public. We argue*
27 *that underwriters have the possibility to select comparables that make their*
28 *valuations look conservative.*
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31 **1. INTRODUCTION**
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33 At the time of an Initial Public Offering (IPO), firms are faced with the difficult
34 decision of how to determine the offer price for their shares. Issuers therefore
35 delegate the pricing decision to an investment bank that underwrites the securities
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1 issue (Baron, 1982). Today, most IPOs are priced using the book building procedure
2 (Sherman, 2002). Under this framework, underwriters determine the final offer
3 price in two steps. First, they determine an initial price range for the shares using
4 traditional valuation techniques such as the discounted cash flow (DCF) method
5 or the comparable multiples method. Second, they collect indications of interest
6 from institutional investors. These investors indicate how many shares they would
7 like to buy and at what price within the price range. Investment banks use this
8 information about investor demand to set the final offer price within or outside the
9 initial price range.

10 Valuation is a key issue during the first step of the bookbuilding procedure.
11 However, we are aware of only two studies that examine the valuation of IPOs
12 using multiples. Kim and Ritter (1999) examine the use of multiples of comparable
13 firms to value U.S. IPOs. They consider both historical accounting numbers (i.e.
14 book value, earnings, cash flows, and sales) and forecasted earnings, and find that
15 price-earnings (*P/E*) multiples based on forecasted earnings dominate all other
16 multiples in terms of valuation accuracy. In their study, comparable firms are
17 selected from two sets: recent IPOs (comparable firms that went public no more
18 than 12 months prior to the IPO firm's offer date and that operate in the same
19 industry) and firms chosen by a research boutique (Renaissance Capital). In another
20 study, Purnanandam and Swaminathan (2004) investigate a sample of U.S. IPOs
21 from 1980 to 1997. They find that the median IPO is overvalued at the offer by
22 about 50% to its industry comparables. They report similar results using alternative
23 sets of comparable firms selected on the basis of industry, industry and size and a
24 combination of industry, sales and ROA.

25 Kim and Ritter (1999) and Purnanandam and Swaminathan (2004) select
26 comparable firms on the basis of an "algorithmic" process. The reason is that
27 the prospectuses of U.S. IPOs do not report any information on the comparable
28 firms' multiples that underwriters used when setting the initial price range. It can
29 be argued that the accuracy of valuations by investment banks differs from that of
30 the valuations by researchers. Analysts have more information available than aca-
31 demics and may take into account firm-specific factors. Moreover, the selection of
32 the set of comparable firms is up to a certain extent arbitrary and underwriters may
33 be tempted to choose comparable firms that make the offer price look conservative
34 (Kim & Ritter, 1999). To the best of our knowledge, no study has previously investi-
35 gated the accuracy of the actual valuation process used by underwriting investment
36 banks. In this chapter we study the valuation of companies that went public on the
37 Nuovo Mercato in Italy using comparable firms that are selected by underwriters in
38 the "real-world."

39 The peer comparables approach is the valuation methodology most frequently
40 adopted for the pricing of firms that recently (1999–2002) went public in Italy. In

1 this process, the choice of the multiples is critical as the median of the multiples of
2 comparable companies is used as a driver for pricing the companies going public.
3 We examine the multiples relied on most by underwriters when pricing IPOs. We
4 assess the valuation accuracy is by comparing the IPO prices with the valuation
5 estimates obtained for each multiple on the basis of information published in the
6 prospectuses. We find that the prices are mainly driven by traditional multiples,
7 such as price-earnings (P/E) and price-book value (P/BV) ratios. Multiples relative
8 to the enterprise value do not play a significant role in the pricing process, even
9 though these multiples are frequently cited. EV multiples for comparable firms
10 are often higher than those of IPO firms. Thus, comparable firms reported in the
11 prospectuses may be selected in order to make the IPO look conservative.

12 The valuation accuracy is also tested using a regression approach with compa-
13 rable firms' multiples as independent variables (Kim & Ritter, 1999). However,
14 the accuracy of valuations does not benefit substantially and the empirical relation
15 between the multiples of IPO firms and their comparables does not increase using
16 the regression approach. These results are consistent with the industry practice of
17 using the simple multiples approach rather than the regression.

18 This chapter continues as follows. The next section summarizes the char-
19 acteristics of the peer comparable approach to valuation. Section 3 examines
20 the valuation methods used for pricing the IPOs on the Nuovo Mercato, while
21 Section 4 reports the results of the valuation accuracy analysis. We present our
22 conclusions in Section 5.

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2. VALUATION USING MULTIPLES

27 Equity valuation using multiples is widely recommended by practitioner pub-
28 lications and valuation textbooks (e.g. Damodaran, 2002; Palepu et al., 2000).
29 Multiples valuation methods are based on the market valuations of companies that
30 are thought to be “comparable” to the firm that is to be priced. The basic hypothesis
31 is that the value of the indicator/multiple for firms in the same market can be
32 used as a driver for the valuation of a specific company, assuming that investors
33 evaluate the results of the company in the same way in which they evaluate those
34 of the comparable firms. For example, when using the price-earnings valuation
35 method, the value of a company is estimated based upon how the shares of similar
36 companies are currently priced in the market. The estimated value is found by
37 multiplying the firm's earnings to the average (or median) price-earnings ratio
38 for the set of comparable firms. Thereby, the comparable method yields the risk
39 of self-justifying an over or under valuation of the firm if the market evidences
40 cycles of relative over or under valuation of the firms in a certain industry.

1 The methods of relative valuation have the advantage of being intuitive and simple to apply. However, they are accompanied by several problems. The first problem is that it is difficult to find two identical companies. If the established selection criteria are too strict, few comparable firms can be identified. If the selection criteria are not very strict, the risk is to obtain a sample of firms non-comparable with the one to be evaluated. The correct selection of the peer group therefore requires the solution of the trade-off between more or less strict selection criteria. Furthermore, it is probable that given a certain peer group, different valuations result depending on the type of indicator used (e.g. earnings, book value of equity). The choice of the multiples constitutes a critical decision in the valuation process. The more a performance measure refers to the “upper” part of the profit and loss account, the less it is affected by the accounting policies used in drafting the balance sheet. On the other side, the more the performance measure approaches the net profit, the better it reflects the diversity in firms’ operating efficiency. For example, the use of sales multiples does not yield any information about production, marketing and administration efficiency and interest and taxes; whereas net profit incorporates the effect of all these elements. The most popular multiple used in practice is the price-earnings (*P/E*) multiple. The *P/E* multiple is obtained dividing the market value of the comparable firm by its net profit. The latter can be this year’s profit, the previous year’s profit or next year’s expected profit. One potential problem of the *P/E* multiple is that it cannot be used for valuation purposes when the firm does not expect earnings in the short term.

23 There are several studies dealing with the valuation accuracy of the multiples approach. [Boatsman and Baskin \(1981\)](#) study the peer comparables approach and show that the valuation process leads to better results when comparable firms are chosen in the same industry and with similar historical earnings growth, relative to when they are chosen randomly. [Alford \(1992\)](#) examines the valuation accuracy of earnings per share (EPS) multiples when comparable firms are selected on the basis of industry, size, earnings growth, and leverage. He finds that valuation errors decrease when the industry definition used to select comparable firms is narrowed from classification based on a single digit SIC code to two and three digits. [Kaplan and Ruback \(1995\)](#) compare the performance of DCF estimates to the estimates obtained from comparable firms (and comparable transactions) based valuations. With reference to a sample of 51 highly leveraged transactions, they find that estimates based on the comparable firm method underestimate the transaction value. [Beatty et al. \(1999\)](#) evaluate the predictive ability of a range of models and find that those based on weighted earnings and book value provided the best price estimates. [Baker and Ruback \(1999\)](#) use the harmonic mean estimator to calculate multiples based on EBITDA, EBIT, and sales, and report that industry-adjusted EBITDA performs better than EBIT and sales. [Bhojraj and Lee \(2002\)](#)

1 focus on the selection of comparable firms and use of a linear regression approach
 2 that predicts a “warranted multiple” for each target company. They identify peer
 3 firms as those having the closest warranted valuation multiple.¹ Liu et al. (2002)
 4 show that (forward and historical) earnings multiples provide the best estimates,
 5 followed by multiples based on cash flow measures and book value of equity.
 6 Liu et al. (2004) provide international evidence that multiples based on earnings
 7 perform best. They also show that the valuation accuracy decreased temporarily
 8 during the “bubble” of the late 1990s: it began to decline in 1997, reached a low
 9 in 2000, and improves thereafter.

12 3. VALUATION METHODS FOR THE IPOS 13 ON THE NUOVO MERCATO

15 The approach of comparable firms is the most frequently adopted valuation
 16 methodology for the pricing of 83 firms that recently (1999–2002) went public
 17 in Italy. Table 1 shows that 86.7 and 79.5% of companies use the multiples method
 18 and the DCF method, respectively. The multiples method was used more frequently
 19 in the IPOs of the Nuovo Mercato (37 IPOs out of 39). Moreover, 11 companies re-
 20 port to have exclusively used the multiples method for the setting of the offer price,
 21 while only 3 companies exclusively adopted the DCF technique (not reported in
 22 the table). The majority of firms (46 of which 27 on the Nuovo Mercato) choose
 23 the multiples method as principal valuation method and used the DCF method
 24 as control method; on the other hand, only 5 Nuovo Mercato companies chose
 25

27 **Table 1.** The Use of Valuation Methods.

Year	Multiples Method		DCF Method		IPO Sample	
	Main Market MTA	Nuovo Mercato	Main Market MTA	Nuovo Mercato	Main Market MTA	Nuovo Mercato
1999	14 (82%)	6 (100%)	11 (65%)	6 (100%)	17 (100%)	6 (100%)
2000	10 (100%)	27 (93%)	8 (80%)	23 (79%)	10 (100%)	29 (100%)
2001	9 (69%)	4 (100%)	10 (77%)	4 (100%)	13 (100%)	4 (100%)
2002	2 (50%)	–	4 (100%)	–	4 (100%)	–
Total	35 (80%)	37 (95%)	33 (75%)	33 (85%)	44 (100%)	39 (100%)
Sample	72 (86.7%)		66 (79.5%)		83 (100%)	

38 *Note:* This table shows the number of firms that adopted the multiples method and/or the DCF method.
 39 Data are taken from the prospectuses of 83 non-financial companies that went public on the Main
 40 Market (MTA) or Nuovo Mercato of the Italian Exchange during 1999–2002.

1 the DCF method as their principal method and multiples for confirmation.² This
2 may be due to the difficulties in using the DCF technique to value Nuovo Mercato
3 companies. At the time of the IPO, many of these firms did not report profits and
4 had a short operating history.

5 These findings show a significant change when compared with the procedure
6 followed by firms that listed on the Italian main market from 1995 to 1997, where
7 less attention was given to the multiples method (Giorgino et al., 2001). When using
8 multiples to value firms, analysts obtain a convenient valuation without incurring
9 extensive time and effort costs, yet lose some of the benefits of a direct valuation.
10 Although the comparable method can reduce the probability of misvaluing a firm
11 relative to others, it provides no safeguard against an entire sector being under- or
12 over-valued. The peer comparables approach may therefore cause overoptimistic
13 valuations to be self-justified.

14 Prior studies that examine comparable firms often focus solely on *P/E* ratios (e.g.
15 Alford, 1992; Boatsman & Baskin, 1981), and therefore do not consider firms with
16 losses. This limitation is important for our sample since many high-tech firms report
17 negative earnings. Along with the traditional ratios *P/BV*, *P/E* and *P/CF*, companies
18 in our sample also used Enterprise Value multiples (i.e. *EV/Sales*, *EV/EBIT*, and
19 *EV/EBITDA*). In particular, Table 2 shows that companies listed on the Nuovo
20 Mercato often adopt Enterprise Value multiples (especially *EV/Sales*, 32 IPOs),
21 while the ones listed on the MTA preferred to adopt the *P/E* and the *P/CF* multiples
22 (30 and 28 IPOs respectively). The *P/BV* ratio is widely used on both the markets
23 (30 IPOs on MTA and 35 on the Nuovo Mercato). Finally, the adoption of sales
24 multiples (*EV/Sales* and *P/Sales*) is more common on the Nuovo Mercato.

25 Sometimes firms are valued using non-financial multiples. For instance, valuation
26 of the Internet-based firms referred to web traffic measures as number of users,
27 time on the website, type of service offered and percentage of a web site's visitors
28 relative to the total web-surfing population (Demers & Lev, 2001; Hand, 2001;
29 Trueman et al., 2000). Bartov et al. (2002) compared the valuation of Internet and
30 non-Internet IPO-firms, and found that the valuation of the former group departs
31 from conventional wisdom with earnings not being priced, and negative cash flows
32 being viewed as investments.

33 The analysis of the IPOs on the Italian Exchange from 1999 to 2002 points out
34 that the number of comparable firms mentioned in the prospectus seems to be on
35 average greater for IPO firms on the Nuovo Mercato than for IPO firms on the main
36 market. For Nuovo Mercato firms that report the names of the peer comparables
37 in the prospectus, there are on average 9.3 comparable companies. For the main
38 market the average number of peer comparable firms is 5. Nevertheless, when
39 taking into consideration only Italian comparable firms, the proportion reverses:
40 the firms listed on the MTA on average mention 2.2 Italian comparables while

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40**Table 2.** What Type of Multiples are Used to Value IPOs?

Year	EV/Sales	EV/EBITDA	EV/EBIT	P/BV	P/E	P/CF	P/Sales	P/EBIT	P/EBITDA	Total
Main Market MTA										
1999	5	6	7	12	11	11	0	1	0	14
2000	7	8	6	10	7	9	2	0	1	10
2001	6	9	5	8	9	8	0	0	0	9
2002	0	1	2	0	2	0	0	0	0	2
Total	18 (51%)	24 (69%)	20 (57%)	30 (86%)	30 (86%)	28 (80%)	2 (6%)	1 (3%)	1 (3%)	35 (100%)
Nuovo Mercato										
1999	2	3	3	6	4	4	0	0	0	6
2000	26	21	13	25	20	22	4	2	2	27
2001	4	4	4	4	4	4	0	0	0	4
Total	32 (86%)	28 (76%)	20 (54%)	35 (95%)	28 (76%)	30 (81%)	4 (11%)	2 (5%)	2 (5%)	37 (100%)
Sample	50 (69%)	52 (72%)	40 (56%)	65 (90%)	58 (81%)	58 (81%)	6 (8%)	3 (4%)	3 (4%)	72 (100%)

Note: This table shows the number of firms that adopt a particular multiple for the pricing of shares. The sample consists of companies that went public on the Main Market (MTA) and the Nuovo Mercato in the period 1999–2002.

Table 3. Valuation Using Multiples.

	EV/Sales	EV/EBITDA	EV/EBIT	P/BV	P/E	P/CF
MTA	4.63 (2.66)	11.87 (8.42)	16.62 (13.64)	6.53 (4.60)	36.55 (19.25)	14.87 (12.70)
Nuovo Mercato	18.49 (4.10)	56.79 (26.48)	39.31 (26.13)	46.90 (19.65)	268.32 (57.33)	72.52 (41.56)
Sample	13.50 (3.59)	36.06 (13.14)	27.97 (18.06)	28.26 (10.84)	141.90 (33.57)	43.69 (17.57)
Test on the difference	0.021**	0.013**	0.038**	0.001***	0.050**	0.005***

Note: Table shows the mean (median) values of the multiples most commonly adopted for the pricing of IPOs on the Main Market (MTA) and the Nuovo Mercato in the period 1999–2002. The multiples are calculated at the offering price. The number of observations for each multiple is reported in Table 2. The last row reports *p*-values of a *t*-test on the difference between markets.

**5% significance level.

***1% significance level.

those on the Nuovo Mercato mention only 1.1 Italian comparables. Table 3 reports the mean and median values of the most used multiples using the offer prices. Multiples are higher on the Nuovo Mercato than on MTA. This is not surprising since firms going public on this market are typically younger and riskier.

Previous studies of the IPO pricing (Kim & Ritter, 1999; Purnanandam & Swaminathan, 2004) use three separate prices to compute the market value of equity in order to evaluate the accuracy of alternative valuation methods and to examine the role of accounting information in valuation. Similarly, our study considers the following values: the preliminary offer price (POP), defined as the midpoint of the range of the offer price disclosed in the prospectuses; the final offer price (OP); and the market price (MP) at the close of the first trading day. Between the filing of the prospectus and the offer date there is a so-called “waiting period,” during which the underwriter gathers information about the market demand for the issue. This additional information affects the final offer price, which may or may not be within the preliminary offer price range.

Most firms of the sample (61 out of 83) are sold at a price within in the price range. In no case the offer price is higher than the range disclosed in the prospectus. On the other hand, 26.5% of the sample IPOs (10 cases on the MTA and 12 on the Nuovo Mercato) went public at a price lower than the minimum value of the range. The firms that went public during the 2000–2002 period are most likely to have an offer price below the lower bound of the price range. This roughly corresponds to the findings of Ritter and Welch (2002). They report that, 25.0% of U.S. IPOs between 1995 and 1998 had a final offer price below the minimum threshold of the range, while 25.9% of the offerings had a price higher than the maximum. The percentages became respectively 18.1 and 45.1% in 1999–2000, then 25.0 and 15.0% in the year 2001. Table 4 compares the preliminary offer price, the offer price, and the market price in terms of percentage price changes. It is worthwhile to note that the average offer price is set at a lower value compared to the midpoint

Table 4. Price Updates and Underpricing.

	Number of IPOs	$\frac{OP - POP}{IPOs}$ (%)	$\frac{MP - POP}{POP}$ (%)	Underpricing $\frac{MP - OP}{OP}$ (%)
MTA	44	-6.5 (-4.1)	11.7 (-4.4)	17.2 (0.1)
MTA (*)	43	-6.9 (-4.1)	-1.7 (-5.0)	5.3 (-0.1)
Nuovo Mercato	39	6.4 (-3.4)	33.7 (3.5)	22.7 (7.1)
Sample	83	-0.5 (-4.0)	22.0 (-3.0)	19.8 (0.9)
Sample (*)	82	-0.6 (-4.1)	15.1 (-3.3)	13.6 (0.8)
Test on the difference between markets	<i>p</i> -Value	0.394	0.393	0.695
	<i>p</i> -Value (*)	0.381	0.113	0.018**
Test on the difference from zero	<i>p</i> -Value	0.947	0.081*	0.007***
	<i>p</i> -Value (*)	0.935	0.155	<0.001***

Note: Mean (and median) values of the percentage price change: (i) from the preliminary offer price (POP) to the final offer price (OP); (ii) from the POP to the market price (MP); and (iii) from the OP to the MP. POP is defined as the midpoint of the offer price range disclosed in the prospectus, while MP is the closing price at the first trading day. The sample consists of non-financial on the Main Market (MTA) and the Nuovo Mercato in the period 1999–2002. Rows marked by (*) exclude data of Finmatica that listed in 1999 on MTA. Finmatica is a high technology company that experienced excessive underpricing (+532%). The last two rows report *p*-values of a *t*-test on the difference between markets and a *t*-test that tests whether the average is different from zero.

*10% significance level.

**5% significance level.

***1% significance level.

of the offering range (POP). However, the only significant observable change is from the offer price to the market price. Underpricing is statistically positive due to the high values of underpricing on the Nuovo Mercato.

4. ANALYSIS OF THE VALUATION ACCURACY

The focus of the literature on the valuation accuracy has typically focussed on U.S. IPOs. These usually do not report information on the multiples of comparable firms adopted for the valuation process. These firms were selected as comparable on the basis of a mechanical algorithm, typically referring to industry classifications such as that proposed by Fama and French (1997) or more simply using the SIC industry codes. However, underwriters choose the comparables on the basis of a situation-specific analysis, and may be tempted to justify a high multiple. Because of this lack of information on the comparables selected by

1 underwriters, previous studies did not investigate the effective multiples used for
 2 IPO pricing. In contrast, we have access to detailed information on the valuation
 3 method used in the pricing of Nuovo Mercato IPOs.

4 In this section we examine the valuation accuracy of multiples valuation.
 5 Following previous studies such as Kim and Ritter (1999) and Purnanandam and
 6 Swaminathan (2004), we examine how close value estimates are to IPO prices:

$$7 \text{ price (IPO)}_i = \gamma_i x_{i,\text{comp}} + \varepsilon_i \quad (1)$$

9 where γ_i is the value driver (such as earnings) for IPO firm i , $x_{i,\text{comp}}$ is the median
 10 multiple on the driver for peer comparables of IPO firm i (such as the median
 11 price-to-earnings), and ε_i is the pricing error.

12 For the six most frequently used multiples, we compare the value of the multiple
 13 for each firm to that of its comparable. We argue that a specific multiple is more
 14 relevant, the more the value of the multiple for the IPO firms reflects the value of
 15 the multiple for comparable firms. For each multiple we define a multiple rele-
 16 vance index, expressed as the ratio between the median value of the comparables'
 17 multiples and the value of the firm's multiple:

$$19 \text{ multiple relevance } (x_i) = \frac{x_{i,\text{comp}}}{x_i} \quad (2)$$

21 where $x_{i,\text{comp}}$ is the median value of the multiple x for peer comparables of IPO firm
 22 i , x_i is the value of multiple x for IPO firm i . For instance, if the multiple relevance of
 23 P/E is equal to 1, the P/E of the firm going public is exactly equal to the median value
 24 of the P/E ratios of the comparable firms selected by the underwriter. If the multiple
 25 relevance is higher than 1, the multiple is higher for the median comparable firm
 26 than for the company going public. Table 5 reports selected statistics of the multiple
 27 relevance indices. P/BV and P/E are the only multiples that are not statistically
 28 different from 1. In other words, the offer price of the average IPO is in line with the
 29 median values of these multiples for the firms chosen as comparables. We conclude
 30 that underwriters rely mostly on P/BV and P/E multiples in IPO valuation. These
 31 results are robust with respect to the different stages of the IPO pricing: P/BV and
 32 P/E are the "dominant" multiples either on the basis of preliminary offer price,
 33 offer price, or market price. As expected, the multiple relevance indices calculated
 34 on the basis of the preliminary offer price are predictably closer to 1 than those
 35 of the offer price or market price. This suggests that the additional information
 36 about investor demand collected during the "waiting period" gets incorporated
 37 into the offer price. It is unlikely that the historical accounting data of the IPO firm
 38 or its comparable firms' market multiples subsumes this incremental information
 39 (Kim & Ritter, 1999). If we consider all six multiples at once, we conclude that
 40 the mean multiple relevance index is statistically higher than 1 regardless of which

Table 5. Multiple Relevance Indices.

	EV/Sales	EV/EBITDA	EV/EBIT	P/BV	P/E	P/CF	6 Multiples
Number of cases	34	28	15	23	22	22	144
Preliminary offer price (POP)	3.48 (1.67)	1.53 (1.38)	2.08 (1.72)	1.40 (0.61)	1.44 (0.91)	1.38 (1.37)	1.99 (1.36)
Test on the difference from one	0.051*	<0.001***	0.024**	0.365	0.346	0.026**	0.002***
Offering price (OP)	3.68 (1.82)	1.85 (1.57)	2.55 (1.70)	1.71 (0.95)	1.78 (1.04)	1.78 (1.51)	2.31 (1.48)
Test on the difference from one	0.031**	<0.001***	0.011**	0.149	0.270	0.008***	<0.001***
Market price (MP)	3.29 (1.66)	1.73 (1.40)	2.34 (1.47)	1.64 (0.90)	1.73 (0.97)	1.71 (1.53)	2.15 (1.37)
Test on the difference from one	0.065*	0.001***	0.028**	0.158	0.300	0.016**	<0.001***

Note: Table shows the mean (median) values of the multiple relevance indices. This index is defined as the ratio between the median of the multiples for the comparable firms and the value of the multiple for the IPO firm. The sample consists of 39 Italian IPOs on the Nuovo Mercato during the period 1999–2002. We refer to Table 4 for the definition of POP, OP, and MP. We report *p*-values for a *t*-test that tests whether the average differs from one.

* 10% significance level.

** 5% significance level.

*** 1% significance level.

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1 of the three prices is used (1.99 for POP, 2.31 for OP, and 2.15 for MP). We argue
 2 that the selection of comparables is done in a way that makes the underwriters'
 3 valuations look conservative.

4 We now determine the valuation accuracy by examining the distribution of
 5 valuation errors, expressed as the natural logarithm of the estimated value relative
 6 to the transaction value (Finnerty & Emery, 2004; Kaplan & Ruback, 1995;
 7 Kim & Ritter, 1999):

$$8 \qquad \text{valuation error } (x_i) = \ln(x_{i,\text{comp}}) - \ln(x_i) \qquad (3)$$

10 where $x_{i,\text{comp}}$ is the median value of the multiple x for peer comparables of IPO
 11 firm i , x_i is the value of multiple x for IPO firm i . We find that valuation errors
 12 are smaller for the multiples based on preliminary offer prices than those on offer
 13 prices or market prices. At the level of the single multiple, we show that P/BV
 14 and P/E are the most accurate: the mean of their valuation errors is not statistically
 15 different from zero. This finding is consistent with the multiple relevance analysis
 16 (see Table 5), and it is to some extent consistent with the widespread rate of
 17 adoption of these multiples (see Table 2).³ However, as also reported by Kim and
 18 Ritter (1999), there is a significant variation in the values of multiples, especially
 19 in the case of P/E multiples. When looking at the other multiples we find that the
 20 POP valuation error of P/CF multiples is on average not different from zero, but
 21 this finding is not robust for OP and MP valuation errors. Enterprise Value (EV)
 22 multiples are on average statistically positive, and their mean and median values
 23 of valuation errors are higher than 30% regardless of the price used (POP, OP or
 24 MP). We argue that either these ratios are not really taken into account during the
 25 IPO pricing process or that the analysts select comparables that will not make the
 26 IPO look overpriced.

27 We also report the percentage of predicted valuations within 15% of the
 28 actual multiple. These percentages are generally between 10 and 25%, and are
 29 sensitive to the price used in the calculation. If we refer to POP, EV multiples
 30 show the highest percentage within 15% (26.7% of valuation errors are less
 31 than 15% for EV/EBIT). On the other hand, when referring to the offer price,
 32 P/E and P/BV multiples are the most accurate. Finally, EV/EBIT and P/E show
 33 the highest percentage of valuation errors within 15% for market price-based
 34 multiples. This evidence is broadly consistent with Kim and Ritter (1999)
 35 although their results are insensitive to the price used.⁴ Finally, we investigate
 36 absolute valuation errors, measured as the predicted price⁵ minus the actual price,
 37 divided by the actual price (Alford, 1992):⁶

$$38 \qquad \text{absolute valuation error } (x_i) = \left| \frac{x_{i,\text{comp}} - x_i}{x_i} \right| \qquad (4)$$

1 where $x_{i,comp}$ is the median value of the multiple x for peer comparables of IPO
 2 firm i , x_i is the value of multiple x for IPO firm i . The absolute error analysis
 3 confirms the accuracy of P/BV and P/E ; only the absolute errors of these multiples
 4 are on average not statistically different from zero.

5 The analysis of the valuation relevance and of the valuation errors leads to
 6 the conclusion that P/BV and P/E multiples are the most relevant multiples for
 7 the pricing of Italian IPOs in the period 1999–2002. These tests of the accuracy
 8 of multiple-based valuations compare the IPO-firms’ multiples to the multiples
 9 of their peer comparables. The implied assumption is that the price of a firm is
 10 directly proportional to the observed value driver. As an alternative to this “simple
 11 multiple approach,” a more general regression approach may be used:

$$x_i = \alpha + \beta x_{i,comp} + \varepsilon_i \tag{5}$$

14 where x_i is the value of multiple x for IPO firm i , α and β are the regressions
 15 coefficients (intercept and slope coefficient), $x_{i,comp}$ is the median multiple for peer
 16 comparables of IPO firm i , and ε_i is the pricing error. The regression approach
 17 expressed in Eq. (5) is a generalization of the simple approach of Eq. (1) where we
 18 forced the intercept and slope coefficients in Eq. (5) to be zero and one, respectively.

22 **Table 6.** Regression Results.

	$x_i = \alpha + \beta x_{i,comp} + \varepsilon_i$				R^2_{ADJ} (%)	Valuation Error				
	α		β			Mean	Median	Percentage Within 15%		
	Coeff.	t-Stat.	Coeff.	t-Stat.				KR 1999	Pure	Simple
P/BV										
POP	3.38	3.21	0.581	3.02	43.0	8.3	-8.5	56.5	13.0	13.0
OP	2.74	2.43	0.631	2.49	43.7	10.4	-10.0	47.8	17.4	17.4
MP	3.15	2.79	0.593	2.73	40.4	10.3	-9.6	43.5	17.4	8.7
P/E										
POP	32.25	3.15	0.428	3.45	21.3	37.0	25.4	18.2	13.6	13.6
OP	20.65	2.46	0.532	3.45	40.7	22.8	0.5	22.7	22.7	18.2
MP	24.00	2.74	0.485	3.63	33.7	23.1	5.3	27.3	9.1	22.7

33 *Note:* Table shows the results of OLS regressions with IPO multiples as the dependent variables and using comparable
 34 firm multiples as explanatory variables. The sample consists of companies that are valued using the P/BV ratio
 35 (23 firms) and the P/E ratio (22). Valuation errors are defined as the natural logarithm of the ratio of the
 36 median comparable firms’ multiple divided by the IPO multiple. The percentage of predicted valuations within
 37 15% is the proportion of IPOs in which the valuation error is less than or equal to 15%. The column “pure”
 38 refers to the regression approach without constraints: $x_i = \alpha + \beta x_{i,comp} + \varepsilon_i$. The column “KR 1999” refers
 39 to regressions on data with all IPOs and comparable firms median P/BV constrained to be no greater than 10
 40 and P/E no greater than 100 (as in Kim & Ritter, 1999). The column “simple” reports previous results without
 using regression predictions (see Table 6). We refer to Table 4 for the definition of POP, OP, and MP. *t-Stat.*
 for alpha (beta) refers to test of hypothesis that alpha (beta) equals zero (one).

1 The null hypothesis is that β equals one (a firm going public with comparables
2 showing high multiples should also be capitalized at high multiples).

3 **Table 6** reports the results from the regressions using the most relevant multiples
4 (i.e. P/BV and P/E) as the dependent variables. For both multiples, the slope
5 coefficients are less than one; they range from 0.428 for P/E at preliminary offer
6 prices to 0.631 for P/BV at offer prices (Kim and Ritter's coefficients are between
7 0.126 and 0.275). Further, as in Kim and Ritter (1999), the highest values of β are
8

9 **Table 7.** Valuation Errors.

Valuation error (%)	EV/Sales	EV/EBITDA	EV/EBIT	P/BV	P/E	P/CF	6 Multiples
Number of IPOs	34	28	15	23	22	22	144
POP							
Mean	42.5*	33.3***	53.9***	-16.9	-36.0	16.8	16.5*
Median	51.1	32.4	54.2	-48.9	-9.6	31.3	30.5
Standard deviation	136.9	44.4	59.5	93.1	130.0	60.5	101.8
Interquartile range	95.2	47.4	80.7	101.4	150.7	72.4	84.8
Percentage within 15%	14.7	17.9	26.7	13.0	13.6	9.1	15.3
Percentage positive	79.4	89.3	73.3	43.5	50.0	68.2	68.8
Mean absolute error	247.9*	52.6***	107.7**	39.6	43.6	38.4**	98.8***
OP							
Mean	54.6**	50.2***	70.5***	6.4	-15.8	37.5**	34.3***
Median	59.6	45.0	52.9	-5.1	3.5	41.1	38.9
Standard deviation	132.2	47.9	67.5	92.0	124.1	65.7	99.5
Interquartile range	96.0	35.4	84.7	100.7	115.6	57.5	86.1
Percentage within 15%	8.8	0.0	13.3	17.4	18.2	4.5	9.7
Percentage positive	79.4	92.9	86.7	47.8	54.5	77.3	73.6
Mean absolute error	268.1**	84.7***	155.0**	71.0	77.8	77.9**	131.0***
MP							
Mean	43.7*	42.3***	57.8***	-0.3	-21.5	31.4**	26.0***
Median	50.8	34.0	38.2	-10.3	-3.0	42.3	31.5
Standard deviation	126.8	48.8	71.0	99.6	125.4	67.9	99.3
Interquartile range	114.9	28.8	75.4	103.2	133.9	58.7	83.6
Percentage within 15%	17.6	10.7	26.7	8.7	22.7	18.2	16.7
Percentage positive	73.5	89.3	86.7	47.8	45.5	77.3	70.1
Mean absolute error	229.1*	73.1***	134.0**	64.1	73.5	70.7**	114.5***

32 *Note:* Table shows statistics on valuation errors for the sample of 39 companies that went public on Nuovo Mercato
33 in the period 1999–2002. Valuation errors are defined as the natural logarithm of the ratio between the median
34 of comparable firms multiple and the IPO multiple (Finnerty & Emery, 2004; Kaplan & Ruback, 1995; Kim &
35 Ritter, 1999). The interquartile range is a measure of dispersion calculated as the difference between the 75th
36 percentile and the 25th percentile. The percentage of predicted valuations within 15% is the proportion of IPOs
37 where the valuation error is less than or equal to 15%. percentage positive is the proportion of valuation errors
38 that is positive. The absolute valuation error is measured as the ratio of predicted price less actual price over
39 actual price (Alford, 1992). For the definition of POP, OP, and MP refer to Table 4. A t -test on the difference
40 from zero is carried out both for valuation errors and for absolute valuation errors.

*10% significance level.

**5% significance level.

***1% significance level.

1 generally found for P/BV , and for offer prices. The empirical relationship between
2 IPO firm multiples and comparables' multiples is therefore tenuous; nevertheless
3 it is higher than in other studies where the comparable firms are selected in a
4 mechanical way (Kaplan & Ruback, 1995; Kim & Ritter, 1999). The accuracy of
5 valuations does not benefit substantially by using the regression approach instead
6 of the simple one. The percentage of valuations within 15% of the actual multiples
7 when a regression approach is used (Table 6), is of the same order of magnitude
8 of the percentages reported in Table 7, where the simple multiples approach is
9 used.⁷ We conclude that IPO prices are not set mechanically on the basis of their
10 comparables multiples (functional fixation hypothesis), but rather that analysts do
11 take into account firm-specific factors when pricing IPOs.

14 5. CONCLUSIONS

16 In this study we examine the valuation methods that underwriters use to value
17 firms that went public on the Nuovo Mercato during 1999–2002. We document
18 that the peer comparable approach is the most frequently used valuation method.
19 According to this method, IPOs are priced with reference to other companies
20 multiples. To be precise, the firm's value is estimated by multiplying a ratio
21 relative to a performance measure for comparable firms (e.g. comparables' median
22 price-to-earnings) times the firm's performance measure (e.g. firm's earnings).
23 Valuation by comparables therefore relies on the assumption that the performance
24 measure has the same "proportionality to value" for comparable firms as for the
25 company being valued. In this way, the methodology builds in errors that the
26 market might be making in valuing comparable firms. In the IPO market, it may
27 generate a "run-up effect": the rise in prices of a firm in a specific sector that listed
28 first makes it convenient for follower companies (who list subsequently) to use
29 comparables.

30 We show that underwriters rely on price-to-book (P/BV) multiples and price-
31 earnings (P/E) multiples when pricing Nuovo Mercato IPOs. These multiples gen-
32 erate valuation estimates that are closest to IPO prices. On the contrary, when using
33 Enterprise Value ratios (i.e. $EV/Sales$, $EV/EBIT$, and $EV/EBITDA$), comparable
34 firms multiples are typically higher than the multiples for the firms going public.
35 We argue that either these ratios are not really taken into account during the IPO
36 pricing, or that the analysts select comparables that will make their valuations look
37 conservative.

38 The arbitrariness of using comparable firm multiples for valuing IPOs gives
39 great responsibility to investment bankers in valuing IPOs. They have an incentive
40 to avoid IPO misvaluations and to build a reputation in valuing IPOs. If the firm

1 is undervalued, its existing shareholders do not appreciate giving up part of the
2 offer value (“money left on the table”); if the firm is overvalued, the risk is that of
3 compromising the success of the offer and of displeasing the investors that will be
4 cautious in subscribing to future IPOs underwritten by the same investment banks.
5 These reputation incentives apply as far as underwriters deal repeatedly in the IPO
6 market (i.e. act as “repeat players”). However, the effects of these reputation-based
7 incentives may be imperfect in markets where the number of firms going public
8 each year is small. In these markets the underwriter’s reputation incentive might
9 not be sufficient to reduce the information asymmetry between the firm going
10 public and the investors.

11 NOTES

12
13
14
15 1. Specifically, Bhojraj and Lee estimate a series of annual cross-sectional regressions
16 of a given valuation multiple on various explanatory variables that drive cross-sectional
17 differences in this ratio (e.g. expected profitability, growth, and cost-of-capital as explana-
18 tory variables for enterprise-value-to-sales ratio). The estimated coefficients from previous
19 year’s regressions are then used, in conjunction with each firm’s current year information,
20 to generate a prediction of the firm’s current and future ratio. This prediction is referred to
21 as a firm’s “warranted multiple” and becomes the basis for the identification of comparable
22 firms.

23 2. In 11 cases, companies did not explicitly mention in their prospectuses which of the
24 two methods was used as the principal method.

25 3. Table 2 shows that P/BV , P/E , and P/CF are the most cited multiples in the pricing
26 section of prospectuses. Thus, it is predictable that these multiples are somewhat
27 more significant than the others. However, the analysis of valuation errors is completely indepen-
28 dent from the rate of adoption. Further, the valuation errors analysis considers only those
29 IPOs that use the comparable company valuation method and that mention which firms are
30 assumed as peer comparables.

31 4. Kim and Ritter (1999) analyse three multiples (P/E , P/BV , and $P/Sales$) and find that
32 P/BV is the multiple with the highest number of valuation errors within 15%.

33 5. Note (see Eq. (1)) that the predicted price is estimated as the IPO firm’s value driver
34 multiplied by the median multiple on the driver for peer comparables.

35 6. Alford (1992) evaluates the accuracy of the P/E for a sample of about 1,500
36 firms listed on the U.S. markets in 1986 and reports that the median absolute valuation
37 error equals 24.5% when comparable firms are selected by three-digit SIC industry-
38 codes and 29.4% when all sample firms are used as comparables (ignoring industry
39 membership).

40 7. In Table 6, the percentage of valuation errors within 15% is nearly the same for
the simple approach and the “pure” regression approach (i.e. without any adjustment on
the multiples). On the contrary, the percentage does increase if the multiples are adjusted
like in Kim and Ritter (1999): all P/BV above 10 are set equal to 10 and all P/E above 100
are set equal to 100. However, this increase in percentage of valuation errors within 15% is
almost entirely due to the setting of a maximum value for the multiples.

REFERENCES

- 1
2
3 Alford, A. (1992). The effect of the set of comparable firms on the accuracy of the price-earnings
4 valuation method. *Journal of Accounting Research*, 30, 94–108.
- 5 Baker, M., & Ruback, R. (1999). Estimating industry multiples. Working Paper, Harvard University.
- 6 Baron, D. (1982). A model of the demand of investment banking advising and distribution services for
7 new issues. *Journal of Finance*, 37, 955–976.
- 8 Bartov, E., Mohanram, P., & Seethamraju, C. (2002). Valuation of internet stocks – An IPO perspective.
9 *Journal of Accounting Research*, 40, 321–346.
- 10 Beatty, R. P., Riffe, S. M., & Thompson, R. (1999). The method of comparables and tax court valuations
11 of private firms: An empirical investigation. *Accounting Horizons*, 13, 177–199.
- 12 Bhojraj, S., & Lee, C. M. C. (2002). Who is my peer? A valuation-based approach to the selection of
13 comparable firms. *Journal of Accounting Research*, 40, 407–439.
- 14 Boatsman, J., & Baskin, E. (1981). Asset valuation with incomplete markets. *Accounting Review*, 56,
15 38–53.
- 16 Damodaran, A. (2002). *Investment valuation: Tools and techniques for determining the value of any*
17 *asset*. New York: Wiley.
- 18 Demers, E., & Lev, B. (2001). A rude awakening: Internet shakeout in 2000. *Review of Accounting*
19 *Studies*, 6, 331–359.
- 20 Fama, E. F., & French, K. R. (1997). Industry costs of equity. *Journal of Financial Economics*, 43,
21 153–194.
- 22 Finnerty, J. D., & Emery, D. R. (2004). The value of corporate control and the comparable company
23 method of valuation. *Financial Management*, 33, 91–99.
- 24 Giorgino, M., Giudici, G., & Paleari, S. (2001). Nuove quotazioni e IPOs: l'esame alle matricole.
25 *Bancaria Editrice, Collana Banca e Mercati*, 29.
- 26 Hand, J. (2001). The role of economic fundamentals, web traffic, and supply and demand in the pricing
27 of U.S. Internet stocks. *European Financial Review*, 5, 295–317.
- 28 Kaplan, S. N., & Ruback, R. S. (1995). The valuation of cash flow forecasts: An empirical analysis.
29 *Journal of Finance*, 50, 1059–1093.
- 30 Kim, M., & Ritter, J. R. (1999). Valuing IPOs. *Journal of Financial Economics*, 53, 409–437.
- 31 Liu, J., Nissim, D., & Thomas, J. (2002). Equity valuation using multiples. *Journal of Accounting*
32 *Research*, 40, 135–172.
- 33 Liu, J., Nissim, D., & Thomas, J. (2004). Price multiples based on forecasts and reported values
34 of earnings, dividends, sales, and cash flows: An international analysis. Working Paper, Yale
35 University.
- 36 Palepu, K. G., Healy, P. M., & Bernard, V. L. (2000). *Business analysis and valuation*. Cincinnati:
37 South-Western College Publishing.
- 38 Purnanandam, A. K., & Swaminathan, B. (2004). Are IPOs really underpriced? *Review of Financial*
39 *Studies* (forthcoming).
- 40 Ritter, J. R., & Welch, I. (2002). A review of IPO activity, pricing, and allocation. *Journal of Finance*,
57, 1795–1828.
- Sherman, A. E. (2002). Global trends in IPO methods: Bookbuilding vs. auctions. Working Paper,
Notre Dame University.
- Trueman, B., Wong, F., & Zhang, X. J. (2000). The eyeballs have it: Searching for the value in Internet
stocks. *Journal of Accounting Research*, 38, 137–162.