Business Valuation is a Question of Trust

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2

Page 1 – 55
Volume 1
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Articles

Data

News

Interview

Editors:

Sponsors:

In this issue

Dr. Johan Van den Cruijce
managing director at Atlas Services Belgium (Orange group) and postdoctoral research fellow at Vlerick Business School

Determinants of the Discount for Lack of Marketability

A private company has no established trading forum. As a result, the sale of an interest in a private company is oftentimes difficult, costly, and time-consuming. The Discount for Lack of Marketability (DLOM) compensates for these elements. This article shows that the industry practice of applying average DLOMs to any private company valuation leads to flawed conclusions and present evidence of determinants that lead to a more accurate approach.

Option Pricing Models for the DLOM

One of the main identified differences between shares traded in the public markets and shares in private companies is liquidity. The discount for lack of liquidity, more commonly called the Discount for Lack of Marketability or DLOM, has been a focus of business valuation for many years. This article looks at various methods for considering the DLOM, with a focus on mathe-matical models. The article argues that the more common mathematical models have flaws and that the preferred model is undeservedly the least well known.

Andrew Strickland
formerly a partner, and now a consultant to Scrutton Bland and a Valuation Committee member of the ICAEW

Yann Magnan
Chief Executive Officer of 73 Strings

Sambeet Parija
Chief Product Officer of 73 Strings

How Will Technology Change the Way Business Valuations Are Performed?

Business valuation analysis require a substantial volume of data as well as, still, numerous manual processes. As technology is developing faster and faster, huge changes are underway in the valuation industry through semi-automated processes that will leverage AI and machine learning to execute some of the analysis tasks.

Marketing as a Key Task for Valuation Professionals

Key tasks are critical success factors that are essential and crucial to the professional success of valuation professionals. Most of them focus on their professional qualifications which are the prerequisite for a professional to be successful in the long term. However, how good are professional qualifications if a professional fails to acquire clients and sustainably gain trust for a long-term client relationship? The following article shows why marketing is a key task for valuation professionals.

Andreas Creutzmann
Chairmann of the board of EACVA, a valuation expert, entrepreneur and speaker

From the Editors

Fallacies and Accuracy Challenges in the Application and Estimation of DLOMs

In front of you is the second issue of the EBVM, the recently launched journal for the European business valuation profession by the EACVA and the IVSC. Although it is a scientific-based journal, it's irrevocably practice-oriented and intended for both valuation experts and users of business valuations. In each issue, the editorial committee aims to find the best and most inspiring practitioners and academics to share their views on relevant and even sometimes underexposed topics in the business valuation landscape, ranging from technical issues to the more peripheral dimensions of the fascinating field of business valuation. However, always with the aim of providing new or more in-depth insights into the challenges the business valuation profession faces.

This time too, we believe we succeeded, although we are happy to leave that judgment to you as a reader. In this edition *Andreas Creutzmann* discusses the importance of having a clear and strong marketing strategy for business valuation professionals. He shows how valuation experts can successfully position themselves in competing markets and which strategies can be taken into account to succeed. In a similar vein, *Yann Magnan* and *Sambeet Parija* provide us with insights into how semi-automated processes by means of artificial intelligence and machine learning will change and enhance the business valuation landscape.

Of a very different nature is the use and application of the widespread and highly debated Discount for Lack of Marketability (DLOM), a complex but often ill-understood concept to adjust valuation outcomes of minority stakes of closely held and restricted shares. *Andrew Strickland* highlights in his article 'Option Pricing Models for the DLOM' issues and challenges on how to estimate DLOMs and advocates for the use of option-based models such as the Chaffe and Ghaidarov model when there is a lack of market evidence available.

Finally, to provide you with the most recent insights on the bigger DLOM debate, we are pleased to have found *Dr. Johan van den Cruijce* willing to give a primer on industry practices of applying average DLOMs to private company valuation resulting in flawed conclusions. His well-received research relates DLOM percentages to the specifics of a company and a valuation subject, and enables valuation professionals to estimate more precise DLOM percentages in any private company valuation. Next to new data on multiples and betas from KPMG, *Stefan Grbenic* shares DLOMs based on option pricing models. With that, he contributes to one of the major themes of this edition. We hope to have provided you again with a variety of actual and relevant articles that enhance the European business valuation practice and with that your work.

Enjoy reading it and we look forward to your feedback.

Dr. Marc Broekema
member of EBVM's
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Imprint

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Determinants of the Discount for Lack of Marketability

A private company has no established trading forum. As a result, the sale of an interest in a private company is oftentimes difficult, costly, and time-consuming. The Discount for Lack of Marketability (DLOM) compensates for these elements. We show that the industry practice of applying average DLOMs to any private company valuation leads to flawed conclusions and present evidence of determinants that lead to a more accurate approach.

I. Introduction

The valuation of private companies is a matter of interest for many stakeholders, including valuation professionals, auditors, courts and tax authorities. The matter is deceptively complex, notably because there is no consensus on the nature, size, and determinants of the so-called discount for lack of marketability (DLOM).

The DLOM has been defined as an amount or percentage deducted from the value of an ownership interest to reflect the relative absence of marketability.[1] Indeed, most valuation methods lead to value indications for a marketable interest,[2] and it is generally accepted that investors attach a lower price to assets that are not readily marketable.[3]

The DLOM is oftentimes oversimplified as the difference in value between an illiquid (unlisted) stock and an all-else-equal liquid (listed) security. This value gap is important but ill understood. Leading scholars have noted time and time again that fair market value calculations often boil down to taking a marketable value estimate and reducing that amount by a contrived percentage.[4] In practice, DLOMs of 20% to 40% are routinely used for valuing private businesses (see figure 1).[5]

Figure 1: Private – Public Value Gap

The extant literature has proposed various DLOM estimation methods that fall into two broad categories: financial (quantitative) and empirical models (see table 1). All of these models have been challenged, either because they require the input of information that cannot be objectively determined for private companies (financial models), or because estimates based on the comparisons between liquid and illiquid valuation subjects are by nature always imperfect and thus prone to discussion (empirical models).

Table 1: Extant DLOM Studies

Model	Method	Measurement rationale	DLOM[6]
Financial	1. Put option methods	A put option represents the value of a right to sell a stock. This type of model measures the DLOM by dividing the put option value by the market value of the stock.	25-50%
	2. DCF based models	The illiquidity discount is included in the DCF model and the implied DLOM is calculated based on the resulting value.	20-50%
Empirical	3. Pre-IPO stock studies	The IPO stock price is compared with the stock price in a private transaction prior to the IPO.	40-50%
	4. Restricted stock studies	A publicly traded entity can issue non-trading stocks in a private placement. Prices of the liquid and restricted stocks are compared.	10-20%[7]
	5. Valuation multipliers	Private acquisitions are matched with public peers and valuation multiples are used to compute the valuation discount.	15-30%

Nevertheless, and in the absence of better information, the empirical models, especially, have received lots of attention and the averages presented in these studies are often used in practice without much formal reasoning or economic justification.

1 Marketability has been defined as the ability to quickly or readily convert an asset, business, or investment to cash at minimal cost that reflects the capability and ease of transfer or salability of that property. For both definitions, see International Glossary of Business Valuation Terms – IGBVT, 2001; see also International Valuation Glossary – Business Valuation 2022 www.rics.org/globalassets/rics-website/media/upholding-professional-standards/sector-standards/valuation/international-business-valuation-glossary---feb-24-2022-revision_english.pdf.

2 This is because the input for the valuation models is mostly based on public company information, whether made explicit or not. See de Fontenay, The Deregulation of Private Capital and the Decline of the Public Company. Hastings Law Journal, vol 68, no. 4 (2017): 445-502 (at 492).

3 See, e.g., Chen/Dyl/Jiang/Juneja, Risk, illiquidity or marketability: What matters for the discounts on private equity placements? Journal of Banking & Finance,vol. 57 (2015): 41-50.

4 Chipalkatti/Luft/Levine/Mondal, Estimating the Marketability Discounts: A Comparison Between Bid-Ask Spreads, and Longstaff's Upper Bound, Journal of Applied Finance, no. 1 (2013): 57-70 (at 57).

5 Garg/Kumar, Option Pricing Models of Private Equity Valuation: A Comparative Analysis, The IUP Journal of Applied Finance, vol. 20 (2014): 28-40.

6 Indicative figures.

7 Early restricted stock studies conducted in the 1970s found discounts between 30% and 40%, but in later studies the value declined to 25% and below. The declining size of the liquidity discount found in successive private placement studies can be explained primarily by changes in Rule 144. The original rule was basically in place in unamended form until 1990 when it was changed to allow qualified institutional investors to trade unregistered securities among themselves without filing registration statements. This made the restricted stock more liquid and reduced the liquidity discount. The U.S. Securities and Exchange Commission (SEC) reduced the mandatory holding period for restricted stock from two years to one-year effective 29 April 1997, and further to six months from 15 February 2008.

The indiscriminate application of these averages to private company valuations, we coin here a "switch approach", misappropriates the findings of empirical model studies in various respects. First, most methods that have been employed to estimate the DLOM have, over time, been questioned and abandoned by the academic community. Second, these studies – most of which are based on large datasets using financial and transactional data – present a wide range of observations (where deep discounts to premiums have been applied). Applying average or mean values derived in these studies takes the results out of context. Third, the extant studies point to certain determinants, arguably limited in number because of the nature of the data they are based on, and confined to broad industry classes and financial parameters such as company size and measures for risk and profitability. However, even these limited determinants are oftentimes overlooked by valuation professionals who apply average DLOMs without regard to the specifics of the valuation subject.

In order to shed more light on the determinants of the DLOM we have turned to an alternative source of information that can bring additional insights. Specifically, we have turned to court decisions that decide on private company valuations, including the DLOM to be applied. The court typically justifies its decision by referring to how the specific company is situated, and the rights and obligations attached to the valuation subject. This contextual information provides more background than the pure financial information that can be found in traditional data sources.

Our study is based on U.S. tax cases (estate and gift tax cases) because this selection criterion has led to a sufficient number of observations (137), leaves no doubt on the applicable valuation standard (fair market value) and avoids the methodological and legal complexity of dealing with multiple jurisdictions. Indeed, on the basis of these considerations, we abandoned earlier ideas to work on a European dataset (too few cases, multiple jurisdictions and generally a limited focus on contextual elements) along with the alternative option of developing a dataset based on U.S. appraisal cases (applying state law and too ambiguous as far as the valuation standard is concerned).

The court cases we used are not standardized and the judicial opinions themselves require analysis and sometimes interpretation. For this reason, all cases have been independently reviewed by at least two qualified reviewers and our coding used their concurring conclusions. This method, which combines elements of qualitative and quantitative analysis, has resulted in a robust database that allows us to test the impact of multiples variables on the DLOM (as decided by courts of law).

We proceed by first presenting key DLOM determinants identified in our research (section II). Afterwards, we show statistical evidence that these remain relevant, even if they are applied in a cumulative manner (section III). We end the article with our summary conclusions (section IV).[8]

II. Determinants

1. Ownership Structure

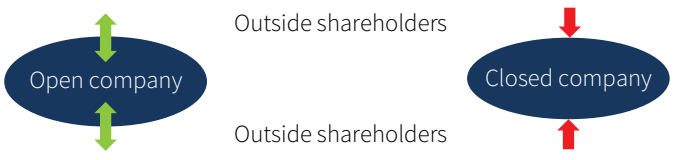
The indiscriminate application of average DLOMs on private companies misses an important dividing line that is intuitive to practitioners. Indeed, certain private companies are set up for a specific purpose and for a select shareholding circle while other companies are in principle open to any party that can provide financing and contribute to a venture's commercial success.

It is counterintuitive to apply the same DLOM on the two subsets of private companies. The discount supposedly compensates for the difference in marketability (liquidity) between private and public companies. This difference is, however, not a binary condition but rather exists on a continuum.

In the case of an ***intuitu personae*** entity (i.e., a company in which the identity and personal qualities of the shareholders are of primary importance), the sale to outside shareholders is in principle not allowed (or at least not intended to happen). This restriction does not apply to ***intuitu pecuniae*** companies (companies that are set purely with a view to realizing financial gains and that would welcome in principle any shareholder or partner that can contribute to the venture's success).

The marketability or liquidity available to the shareholders of these two subsets of private companies (that we refer to as "closed" and "open" companies) is not the same. These considerations have led us to theorize that different DLOMs should apply on "open" and on "closed" companies (see figure 2). We expect open companies to have a lower DLOM because their shares are more "sellable" than those of closed companies.

Figure 2: Open and Closed Companies



8 The article is a high-level summary of a PhD thesis that was defended on 12 October 2022. See Van den Cruijce, Value and Marketability: Determinants of the Discount for Lack of Marketability. Catholic University Leuven; Ghent University. Faculty of Economics and Business Administration (2022), XIV, 164 pages.

Our research has uncovered that courts do indeed apply a very different DLOM in the two situations. On average, the DLOM for closed companies is 6.5% higher than the DLOM for open companies.[9]

Aside from immediate practical implications in the context of specific valuations exercises and tax and litigation strategies, these conclusions might lead owners of companies to consider or reconsider opening up their share capital to third parties.

2. Operations

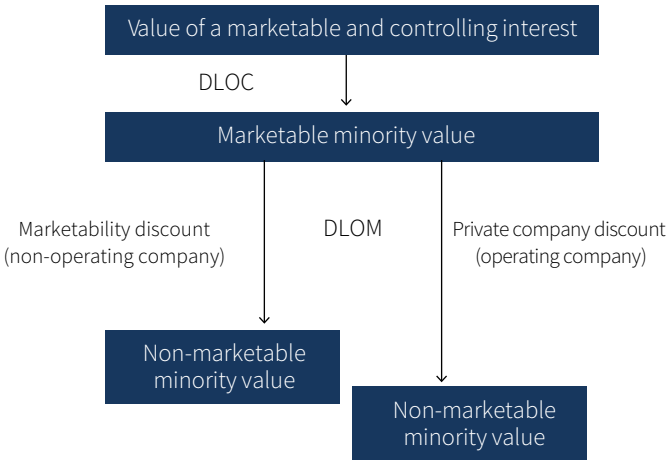
The DLOM was traditionally explained as equilibrium compensation (in the form of a discount) to investors for bearing additional risks in the form of opportunity costs.[10] An alternative and more recent view is that private companies are different from their public counterparts and that the valuation discount can be explained by a variety of factors of which marketability is only one.[11]

The differences between private and public companies include the difference in liquidity but also elements such as the difference in size (private companies are generally much smaller than public companies),[12] the availability of information (private companies are typically reluctant to disclose information whereas public companies are required to do so by law),[13] and the differences in diversification.[14]

Certain studies have endeavored to single out which portion of the DLOM represents the effect of liquidity and which portion accounts for other factors and effects.[15] They have thus showcased how the DLOM has become an ambiguous term that can either refer to a pure marketability discount (that accounts only for the difference in liquidity between public and private companies) or to a private company discount that reflects all differences between private and public companies (including but not limited to the difference in liquidity).

We have examined the difference by distinguishing between ***holding companies*** (whose assets are valued separately) and ***operating companies*** (that are typically valued based on their cash flows). In the case of holding companies, the DLOM ought to compensate only for the difference in marketability as all other differences are taken into account in the valuation of the assets whereas for operating companies, the DLOM supposedly compensates for all other differences between private and public companies as well (see figure 3).

Figure 3: Marketability Discount and Private Company Discount



Our research has uncovered that courts do indeed apply very different DLOMs to the two subsets of companies (with DLOMs lower by 7% applied on holding companies).[16] We thus show that there is a terminological, economic, and financial difference between a private company discount and a liquidity discount that is often overlooked by valuation practitioners.

3. Transfer Restrictions and Exit Possibilities

We know from extant studies and our own research that the DLOM is not a one-size-fits-all discount but depends on the characteristics of the company and the valuation subject. This understanding has naturally led us to consider the possibility that the shareholders or managers of a company can take actions that have an impact on the DLOM (see figure 4).

Specifically, they can try to make a private company a bit more like a public company by cancelling transfer restric-

9 Van den Cruijce/Baffert II/Janssens de Bisthoven/Tistaert, The Effect of Ownership Structure on the Value of a Private Company. Review of Law & Economics (2022), https://doi.org/10.1515/rle-2022-0030.

10 The inability to convert an asset to cash can cause investors to miss out on opportunities to allocate capital to assets with higher returns. See Bajaj/Denis/Ferris/Sarin, Firm Value and Marketability Discounts. The Journal of Corporation Law, vol. 27, no. 1 (2001): 89-115 (at 93).

11 Fishman, Advanced Concepts of Discounts for Marketability: New Studies, (May 2019): 1-31 (at 7), "A more recent view indicates that marketability is one of several factors affecting the observed discount.", https://www.familylawtrialinstitute.org/wp-content/uploads/2019/05/5.-Advanced-Concepts-of-DLOM.New-Studies.pdf.

12 See Comment, Business Valuation, DLOM and Daubert: The Issue of Redundancy, Bussines Valuation Review, vol. 29 (2010): 83-96.

13 De Fontenay, The Deregulation of Private Capital and the Decline of the Public Company, Hastings Law Journal, vol. 68 (2017): 445, 492.

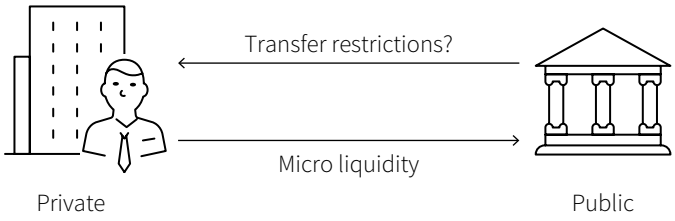
14 Matthews, Private Company Discounts Are Not Caused by Lack of Marketability. Business Valuation Update, vol. 22, no. 6 (2016), 1-11.

15 For example, a study by Bajaj et al. (2001) concluded that the discount associated with marketability was only 7.23%. A study by Comment (2012) estimated the effect at 5.2%. See Bajaj/Denis/Ferris/Sarin, Firm Value and Marketability Discounts. The Journal of Corporation Law, vol. 27, no. 1 (2001): 89-115; Comment, Revisiting the Illiquidity Discount for Private Companies: A New (and Skeptical) Restricted-Stock Study. Journal of Applied Corporate Finance, vol 24, winter (2012): 80-92.

16 Van den Cruijce/Janssens de Bisthoven/Tistaert, Do courts apply a private company discount or a marketability discount? Business and Finance Law Review, vol. 5, no. 2 (2022): 63-101.

tions on shares and/or by organizing an exit possibility for shareholders (referred to as micro-liquidity in our research).

Figure 4: Impact of Transfer Restrictions and Micro Liquidity



Certain arrangements can be qualified as both transfer restriction and a source of liquidity. For example, an approval clause can be designed in such a way that its exercise leads to the activation of a put option for the shareholder. As such, this combination of effects must be considered and tested in parallel.[17]

Our research has uncovered that transfer restrictions and micro-liquidity are not binary elements. Rather than their presence or lack thereof, it is their intensity that impacts a company's value. We have placed transfer restrictions (which we found most often under the form of right of first refusal arrangements) and the liquidity available to shareholders (typically under the form of redemption, i.e., the possibility to sell the shares back to the company) into three categories shown in table 2.

Table 2: Categories of transfer restriction and liquidity

Classification	Transfer Restrictions	Micro liquidity
Category A	No restrictions	No liquidity
Category B	Soft restrictions	Occasional redemption
Category C	Hard restrictions	Systematic redemption

The statistical evidence shows that only hard transfer restrictions or a systematic redemption policy have a demonstratable impact on the DLOM. For purposes of this classification, we have defined hard transfer restrictions as situations in which a proposed share transfer can be blocked, put on hold for more than 60 days, or lead to a situation where another party can acquire the shares at a price that is not necessarily equal to the third party offered price. In our taxonomy, a systematic redemption policy is a formal or tacit policy that guarantees an exit possibility for shareholders (i.e., the company will redeem shares whenever asked by a shareholder).

The impact of these actions is sizeable; hard transfer restrictions can decrease a company's value by about 5% whereas an organized redemption leads to an increase in value of more than 10%.[18]

These findings have an important managerial relevance as they show that the DLOM is not simply a devaluation that private companies undergo based on their nature but a discount that depends on the specifics of the valuation subject including matters and actions that are under the control of a company and its shareholders.

4. Control

Conventional wisdom states that the discount for lack of control (DLOC) and the discount for lack of marketability (DLOM) are two separate discounts. The view expressed by the most influential economic textbooks, and followed by the courts, is that in the valuation of a minority stake in a private company, first the DLOC must be applied and then (on the remaining value) the DLOM.[19]

A closer reading of academic papers and of important court decisions instills doubts on the impact of control on the DLOM. Certain researchers have opined that it makes no sense to study marketability without regards to control rights.[20] By the same token, landmark court decisions present the DLOC and DLOM as two separate discounts, yet they list "control" among the factors that ought to be used to decide on the percentage DLOM to be applied.[21] This conflicts with the premise that control only impacts the DLOC.

The database we developed for purposes of our research enables us to identify both the control rights and the cash flow rights attached to the valuation subjects. The percentages control rights and cash flow rights are indeed

17 In the landmark Mandelbaum case, the court not only mentions transfer restrictions as a possible determinant of the DLOM, but also the corporation's redemption policy. See Mandelbaum v. Comm'r, 69 T.C.M. (CCH) 2852, (1995) at p. 36-37.

18 Van den Cruijce/Endres, The impact of contractual transfer restrictions and micro liquidity on the discount for lack of marketability, Delaware Journal of Corporate Law, (2022) forthcoming.

19 See Pratt, Valuing a Business: The Analysis and Appraisal of Closely Held Companies, l5th ed. (2008) at p. 384 (insisting that "the appropriate level of value, i.e. either control or minority marketable should be established before applying a discount, if any, for lack of marketability"). This assertion clarifies that the discount for lack of control (DLOC) – if warranted – must be applied before a discount for lack of marketability (DLOM). This order is also applied by the courts. See, e.g., Est. of Magnin v. Comm'r, 81 T.C.M. (CCH) 1126 (2001) (holding "[i]n order to ensure accuracy, the minority interest discount should be applied first and then the marketability and liquidity discount should be applied to this figure").

20 Bruner/Palacios, Valuing Control and Marketability, Batten Institute Working Paper (2004) SSRN ID 553562.

21 In Mandelbaum v. Commissioner (69 T.C.M. (CCH) 2852 (1995)), the Court cites ten potential determinants of the DLOM, including "the degree of control transferred with the block of stock to be valued."

not necessarily the same: in the context of private companies, we have encountered an impressive creativity to dissociate the two sets of rights. Such instances are those where voting and non-voting stock are created or partnership structures where a general partner can control the venture with a limited investment (often as low as 1%).

There is surprisingly little agreement as to what constitutes a control block. This is because most studies are based on public companies that typically have a dispersed ownership. In such a context, it is possible to control a company with a block that constitutes less than 50% of the shares in the company (some studies are even based on blocks of 5%). In the context of private companies, which typically have a concentrated ownership, the matter is more straightforward and, for purposes of our study, we have defined control as 50% or more of the voting rights.[22]

Our regression results show that the DLOM is lower by one third (or 8%) in cases where a controlling stake in the company is valued.[23] This is a very high number which only further illustrates that the DLOM determinants are ill understood and that the discount – despite its name – does not only account for the difference in liquidity between listed and unlisted valuation subjects.

III. Statistical Analysis

1. Approach

In order to show the cumulative impact of the above variables on the DLOM, we use a linear regression approach.[24] This is a statistical method to predict the value of a variable based on the value of other variables. The variable that we want to predict is called the dependent variable. The variables used to predict the dependent's variable value are called the independent or explanatory variables.

Our regression is represented by the equation $Y = \alpha + \beta 1X1 + \beta 2X2 + \ldots + \beta nXn + \varepsilon$. In this formula, the Y is the dependent variable (i.e., the DLOM decision) and each X is an explanatory variable. The α in the equation is the intercept (the value of Y when X = 0) and β is the slope of the line. The deviations from the above equation are called the errors (ε).

In addition to the parameters α and β, the regression results provide us with two important indicators that indicate, respectively, the significance of the parameters and the goodness-of-fit of the model:

- The p-value tests the null hypothesis (H0) that the independent variables have no correlation with the dependent variable (DLOM).[25] Conventionally, the significance level at which we can reject the H0 is 5%. In other words, if we find a p-value below 0.05 (5%) we can validly assume that the explanatory variables have a statistically significant effect on the DLOM.
- The coefficient of determination (R-squared) is a goodness-of-fit measure for linear regression models. The coefficient of determination is the proportion of the variance in the dependent variable (measured on a 0-100% scale) that can be explained by the independent variable(s). There are no conventional standards for R-squared. Any field that attempts to predict human behavior typically has modest R-squared values.[26]

5. Variable construction

The dependent variable in our analysis is the DLOM. This is the final DLOM expressed as a percentage decided by the court. The dependent variables are first and foremost the five determinants that we have discussed in the previous section. In addition, we introduce the explanatory variables that have identified in the extant literature as control variables. We present these control variables (including the rationale for their selection) below:

- The size of the company can be seen as a measure for risk because larger firms are generally more stable than smaller firms.[27] In our dataset, we measure the size of the company by reference to the total undiscounted equity value[28] on the valuation date (expressed in million USD).[29] Conventional wisdom suggests that larger companies should have a smaller DLOM (as they are supposedly less risky).[30]
- The size of the interest has been identified as a potential determinant of the DLOM in the context of restricted

22 Admittedly, in certain circumstances, a private company can be controlled with less than 50% of the voting rights (e.g. in the case of several important blockholders with "swing vote" positions).

23 Van den Cruijce, The impact of control on the discount for lack of marketability, Tax Notes International, vol. 106 (2022): 517-529.

24 In principle, because the DLOM is a percentage and lies in the [0,1] interval, the correct statistical method to be applied is a fractional regression. See Clark, Fractional Regression (19.08.2019), https://m-clark.github.io/posts/2019-08-20-fractional-regression/. In our case, because the DLOM observations steer away from the interval boundaries, the linear and fractional regressions results will be practically the same. We have opted to present linear regression results because they are easier to interpret.

25 This is a bit counterintuitive, but the testing seeks to confirm the null hypothesis that posits that the explanatory variable has no effect on the dependent variable.

26 Note that an increased R-squared means that the error term has become less important.

27 See Chen/Dyl/ Jiang/Juneja, Risk, illiquidity or marketability: What matters for the discounts on private equity placements? Journal of Banking & Finance, vol. 57 (2015), 41–50 (at 44).

28 The undiscounted equity value refers to the marketable value (i.e., the value before application of a DLOC and/or a DLOM.

29 Our dataset contains valuation years that span several decades. In order to ensure consistency, we have adjusted the values in our dataset on the basis of the consumer price index published by the World Bank. We use the natural logarithm of the company size in the regression. A log transformation is recommended for skewed data and ensures that the resulting values are normally distributed.

30 See, e.g., Comment, Business Valuation, DLOM and Daubert: The Issue of Redundancy, Business Valuation Review, vol. 29 (2010): 83.

stock studies. Specifically, it has been suggested that the percentage equity (cash flow rights) has a positive impact on the DLOM as important shareholders seek a remuneration for their (future) monitoring and expert advice.[31]

- Uncertainty and volatility (measured often as the standard deviation of a stock's daily returns) are directly and positively correlated to the discount.[32] We use the percentage difference between the parties' final valuations presented to the court as a proxy for uncertainty.[33]
- Profitability is associated with lower risk. Also, a profitable company can pay out dividends. This is a corporate action that can be seen as a fractional liquidation of the stock (or a partial liquidity event). For these reasons, profitable (and a fortiori dividend-paying stocks) are expected to have lower DLOMs.[34] We introduce a dummy variable that indicates whether the company was profitable in the year before the valuation date.
- Availability and quality of financial reporting has been identified as a determinant of the discount.[35] Information quality is difficult to measure and compare, especially for private companies. In order to make the measure as objective as possible, we employ a dummy variable that denotes the availability of audited annual accounts.

6. Regression results

We perform a multiple linear regression of the DLOM on our five hypothesized determinants of the DLOM. At the same time, we include our control variables in the regression and present the results below (including p-values and the R-squared of the model).

We note that the coefficients of the determinants are (slightly) different from those that are presented in Section II. This is because we present their standalone impact in section II whereas the above regression results show their combined impact after inclusion of control variables. Nevertheless, the regression results show that the variables that we have introduced in this article can be applied cumulatively (i.e., they all remain relevant at the 5% level).

Table 3 shows how the application of these variables to a given valuation subject increases the explanatory value in an important manner. For example, the open character of a company, can – in combination with the control variables – explain 16.50% of the DLOM decision. When we then add the operating status as an explanatory variable, the explanatory value goes up to 25.80% etc. Together, the five determinants presented in this article lead to an adjusted R-squared of more than 40% which is highly significant for an exercise that aims at explaining human behavior (in our case a legal decision about an appropriate DLOM for a given valuation subject).

Table 3 can readily illustrate how a "formula approach" is superior to the "switch approach," routinely followed by valuation professionals.

IV. Conclusion

The so-called discount for lack of marketability (DLOM) is a valuation adjustment that is ill-understood and not necessarily explained solely by the differences in marketability between private and public companies. The extant studies, which are predominantly based on data derived from financial and transactional databases, have only been able to identify a limited number of determinants (essentially confined to broad industry classes and financial parameters). Because of the limited number of determinants (and the fact that certain studies remain inconclusive as to their impact or come to conflicting conclusions), valuation practitioners tend to focus on the averages presented in these studies (an approach that we have coined a "switch approach" in the introduction).

This article presents results based on a on a novel and underutilized data source (published court cases) that can provide rich contextual information. Our method and conclusions are relevant in several ways:

- First, we add the court cases method (including our approach of combining elements of qualitative and quantitative analysis) to the arsenal of empirical methods to estimate the DLOM;
- Second, we have identified and tested determinants of the DLOM that have been overlooked in extant studies that typically rely on financial and transactional databases (and from which these determinants cannot be distilled);
- Third, we show that the determinants we identified can be used in a cumulative manner in order to derive a more reasoned DLOM percentage for a given valuation subject. This is what we have dubbed a "formula approach".

31 See, e.g., Wruck, Equity ownership concentration and firm value: Evidence from private equity financings. Journal of Financial Economics, vol. 23, issue 1 (1989): 3-28; Bajaj/Denis/Ferris/Sarin, Firm Value and Marketability Discounts. The Journal of Corporation Law, vol. 27, no. 1 (2001): 89-115; Wruck/Wu, Relationships, corporate governance, and performance: Evidence from private placements of common stock. Journal of Corporate Finance, vol 15 (2009), 30-47.

32 See Garg/Kumar, Option Pricing Models of Private Equity Valuation: A Comparative Analysis, The IUP Journal of Applied Finance, vol. 20, no. 3 (2014): 28-40 (at 39).

33 We measure this by the relative difference between the two parties' final valuations in court. The variable is the result of the formula whereby hi denotes the highest valuation and lo the lowest valuation presented.

34 See Pratt, Valuing a Business: The Analysis and Appraisal of Closely Held Companies, 5th ed. (2008) at 446; see also Paglia/Harjoto, The Discount for Lack of Marketability in Privately Owned Companies: A Multiples Approach, Journal of Business Valuation & Economic Loss Analysis (2010): 1-25.

35 See Matthews, Private Company Discounts Are Not Caused by Lack of Marketability. Business Valuation Update, vol. 22, no. 6 (2016): 1-11.

Table 3: Regression results

	Variable	Est.(β)	St. Error	Beta	t	p-value.	Adj. R^2 (%)
	Intercept (α)	18.116	3.231		5.606	0.000	(cumulative)
Determinant 1	Open company	-3.447	1.474	-0.203	-2.338	0.021	16.50
Determinant 2	Operating company	7.627	1.365	0.451	5.587	0.000	25.80
Determinant 3	Transfer restrictions (hard)	2.895	1.439	0.164	2.012	0.047	30.80
Determinant 4	Structured redemption policy	-6.918	2.723	-0.211	-2.540	0.013	35.30
Determinant 5	Controlling stake	-5.870	1.946	-0.282	-3.017	0.003	40.10
Control variable 1	Logsize (company-USDm)	0.463	0.383	0.104	1.208	0.230	
Control variable 2	Cash flow rights (%)	0.022	0.027	0.076	0.802	0.425	
Control variable 3	Spread	-0.020	0.021	-0.078	-0.930	0.354	
Control variable 4	Profitability	2.566	2.122	0.091	1.209	0.229	
Control variable 5	Audited accounts	0.031	1.847	0.001	0.017	0.986	

In short, we have been able to relate DLOM percentages to the specifics of the company and the valuation subject (allowing us to propose moving towards a "formula approach" i.e., the cumulative application of multiple variables to determine the correct DLOM in a specific case).

Our conclusions thus complement the determinants set forth in extant studies by introducing additional determinants based on information that remains otherwise shielded from the public. The determinants uncovered by our research will allow valuation professionals to determine more precise DLOM percentages in any private company valuation.

Exhibit: Definition of Key Variables

- An open company is a company that is able and willing to allow third parties to become a shareholder or partner in the venture.
- An operating company has been defined for our purposes as a company that has confirmed operating revenues (i.e., revenues other than exceptional or pure financial revenues such as dividends or interest income).
- Hard transfer restrictions include right of first refusal rights at a formula price and arrangements that can delay the transfer or payment for more than sixty days. These restrictions also include approval rights which give the board, shareholder, or a third party the right to simply block a proposed transfer.
- Structured redemption (policy) refers to the existence of a systematic and organized redemption policy or of equivalent contractual rights (e.g., a put option) that provide an exit solution for shareholders that want to sell their stake.
- Control or Controlling stake refers to a situation in which 50% or more of the voting rights of the company being valued are vested in the valuation subject.
- The size of the company is measured as the total undiscounted equity value on the valuation date (expressed in million USD). The values in our dataset have been adjusted for inflation and log (ln) transformed to ensure that the resulting values are normally distributed
- The size of the interest is a continuous variable that expresses the percentage cash flow rights attached to the valuation subject.
- The spread is the percentage difference between the parties' final valuations presented to the court. The variable is the result of the formula whereby hi denotes the highest valuation and lo the lowest valuation presented.
- Profitability is a dummy variable that indicates whether the company was profitable in the year before the valuation date.
- Audit or audited accounts is a dummy variable that denotes whether audited annual accounts are made available to shareholders of the subject company. ◆

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Option Pricing Models for the DLOM

One of the main identified differences between shares traded in the public markets and shares in private companies is liquidity. The discount for lack of liquidity, more commonly called the Discount for Lack of Marketability or DLOM, has been a focus of business valuation for many years. This article looks at various methods for considering the DLOM, with a focus on mathematical models. The article argues that the more common mathematical models have flaws and that the preferred model is undeservedly the least well known.

I. Introduction

1. Discount for Lack of Marketability or DLOM

In business valuation nearly all evidence that we obtain from the markets is supportive or persuasive rather than compelling. This is certainly the case with the discount for lack of liquidity. This is more commonly known as the DLOM – the Discount for Lack of Marketability. This is one of the many acronyms that are sprinkled throughout discussions of business valuation that we can all recognise.

There have been two major sources of market evidence for the DLOM: these are restricted stocks data and pre-initial public offering (pre-IPO) studies. Restricted stocks are also known as unregistered stocks or letter stocks.[1]

It is my view that the DLOM is better thought of as the discount for lack of liquidity. This focuses on the simple truth that both control holdings and non-control holdings in private companies suffer from a lack of liquidity. There should always be a liquidity discount when comparing private company shareholdings with holdings of shares in liquid public companies. Non-control holdings suffer from greater illiquidity than control holdings.

2. Restricted Stocks and the DLOM

The difficulty for business valuers is that the empirical data sources are being increasingly challenged. As a result of those challenges all their vulnerabilities have been laid bare.

The studies of restricted stocks are the background to the development of option pricing models for the DLOM. These models seek to replicate how securities with impaired liquidity should be priced in an efficient market.

This article looks at some of the regulatory background relating to letter stocks, the changes to those regulations and the challenges with the data. We then look at the evolution of some models: they seek to resolve the frailties with much of the market evidence.

3. The Present Position for many Valuers

There were various studies into the pricing of restricted stocks in the late 1960's and early 1970's. These gave the valuation community an apparent fixed point of certainty regarding the DLOM. A discount of 35% appeared to be well supported.[2]

These studies are no longer current, relating to transactions 50 and more years ago. In addition to this, some of these studies have been increasingly questioned. Despite this, the echoes of this past wisdom still resonate with many people. A discount of 35% appears to appeal to the intuitive senses.

A study by Business Valuation Resources (Business Valuation Update, September 2021)[3] found that 90% of respondents used restricted stock studies. 48% used option pricing models, and 45% used pre-IPO studies.

II. Letter Stocks or Restricted Stocks

1. What are they?

Restricted stocks, unregistered stocks, or letter stocks are a feature of the US market in securities. They are shares in public companies that are identical in every way to the shares that are traded on the markets, except that they cannot be freely transferred.

The idea of having two securities that are identical, except that one of them cannot be freely traded, is potentially a wonderful source of data: we should be able to isolate and measure the impact of a lack of marketability by the simple act of comparing two prices.

I need to explain some terminology that I use below: the primary market in shares is the issue of shares to the market by a public company. The secondary market comprises the vast majority of stock market activity: it is the buying and selling of these shares on the main markets once they have been issued.

There is a tertiary market in restricted or letter stocks. In this tertiary market qualified institutional buyers can buy the shares in certain circumstances. This feature allows an institution that may have underwritten a share issue to sell some of these shares to other institutions. They cannot otherwise be freely traded in the markets.

It is the pricing of the transactions in the primary market and the tertiary market that gives the evidence regarding the value of restricted shares.

2. The USA Legislation

The relevant rules regarding restricted securities were set out in the Securities Act of 1933. The Securities and Exchange Commission describes such stocks:[4]

"Restricted securities are securities acquired in unregistered, private sales from the issuing company or from an affiliate of the issuer. Investors typically receive restricted

1 The term "letter stocks" refers to the requirement to send a letter to the USA Securities and Exchange Commission on their issue.

2 Respected texts such as Shannon Pratt on Business Valuation and Eastaway Practical Share Valuation both focussed on the support for the DLOM at 35%.

3 Available as a free download: bvresources.com/pdfs/BVR-2021-DLOM-Survey-Results.pdf.

4 www.sec.gov/reportspubs/investor-publications/investorpubsrule144htm.html. A Regulation D offering is the issue of shares with a value up to $5,000,000.

securities through private placement offerings, Regulation D offerings, employee stock benefit plans, as compensation for professional services, or in exchange for providing "seed money" or start-up capital to the company. Rule 144(a)(3) identifies what sales produce restricted securities."

The pricing of restricted stocks has long been seen as a very promising source of information relating to a lack of marketability.

3. The Early Studies

Various studies were undertaken into transactions covering the late 1960's and early 1970's. The dates covered and the discounts are summarised in table 1.

Table 1: Early restricted stock studies

	Number of transactions	Dates Covered	Mean
SEC Institutional Investor[5]	398	1966-1969	26%
Gelman[6]	89	1968-1970	33%
Maher[7]	34	1969-1973	35%
Moroney[8]	148	1968-1972	35%
Trout[9]	60	1968-1972	34%

These studies provided a comforting certainty. A valuation profession that is always seeking some fixed points of reference gratefully accepted the evidence provided: the discount for lack of marketability was 35%. In both the USA and the UK the concept of a marketability discount of 35% has become almost an article of faith.

It now appears that the pleasing uniformity of results was partly due to various studies being based on the same modest sample of transactions, involving sales between a small number of mutual funds. The number of transactions in each study is given above.

The companies involved in the issue of restricted stocks were generally smaller public companies seeking to raise additional funds. Conventional sources of funding such as bank and other borrowings were not available: an issue of restricted stock was the source of funding with the lowest cost. When considering the data, it is important to recognise this aspect of most of the issuing companies. We can expect these companies to be at the higher risk and more volatile end of the public markets.

The obvious response to the weaknesses in these early studies is to repeat them using larger datasets and to review transactions covering all periods to the present day. This is no longer possible. We therefore need to examine why this is so.

4. The Changes to the Rules – closing the Door

There was a rule change in January 1972: in order to give some greater certainty to holders of restricted securities, a two-year limit was introduced from that date. After a holding period of two years it was possible for restricted securities to be traded, within defined limits. It is not surprising that the average discounts reduced in consequence of this liberalisation.

In 1997 the two-year minimum holding period was reduced to one year; in 2008 it was reduced again to a minimum period of six months. The door has therefore been closed on the prospect of new studies to provide current evidence for the DLOM apart from short periods of illiquidity.

Transactions in restricted securities continue to be tracked and measured. It Is no surprise that each stage of the relaxation of the rules has resulted in lower discounts being reported.

5. Challenges Within the Data

There are other challenges with the data. I will address three variables which impact on the datasets. These are:

- Registration Rights
- The Relative Sizes of holdings
- The underlying volatility.

a) Registration Rights

Registration rights are rights that the holder of restricted securities may have to require the issuer to register the shares. Once registered, the shares can be traded in the secondary public markets. The terms of such registration rights, if they exist, will impact on the level of discount applicable to the restricted securities. There are three different types of registration rights.

- On demand registration rights mean that the holders of the restricted securities can at any time require the issuer to seek registration of the securities;
- Piggy back registration rights mean that if there is any later issue of registered stock by the company, the holders of the restricted stock can require the issuer also to register the restricted stock that has been issued to them.

5 Discounts Involved in Purchases of Common Stock (1966-1969) Institutional Study Report of the Securities and Exchange Commission.
6 Gelman, An Economic Financial Analyst's Approach to Valuing Stock of a Closely Held Company, Journal of Taxation, June 1972.
7 Maher, Discounts for Lack of Marketability for Closely Held Business Interests, Taxes, September 1976
8 Moroney, Most Courts Overvalue Closely Held Stock, Taxes March 1973.
9 Trout, Estimation of the Discount Associated with Restricted Securities, Taxes, June 1977.

- Mandatory registration rights are a requirement for the issuer to register the securities by a stated date some time after issue.

b) Relative Sizes of Holdings

After the minimum holding period of 6 months, the restricted securities cannot all be freely traded in the secondary markets. In order to minimise disruption such stocks can only be released into the market in a controlled way in what are known as "dribble out rights". These apply to affiliates of the issuing company. The dribble out rights are based on two measures:

- 1% of the stock of the company every three months;
- The average reported weekly trading in the previous four weeks.

It is possible for restricted stock to be traded in the secondary markets up to the higher of the above two measures. This means that larger blocks of restricted stocks will normally have a larger discount as it takes a longer period for them to be dribbled out into the markets.

For very small holdings, the rules relating to dribble out rights mean that they can be entered onto the markets and realised in one transaction following the minimum holding period of 6 months; for larger blocks of say 5% of the issued capital, it would take 15 months for the shares to be entered onto the markets. Trading may then be extended in order not to impact the share price by the act of selling.

c) Volatility

The holder of restricted securities is entitled to the same cash flows from the company as the holder of unrestricted securities. In theory, a market participant with a longer term investment horizon should not be troubled by a lack of marketability.

Volatility is a factor in considering the absence of marketability: stocks with lower volatility are normally considered to demand a lower cost of capital. With such stocks there is a reduced risk of the entry price being at a price peak and the exit price being at a low point. Volatility in the context of marketability is the loss of the opportunity to trade: the holder of restricted stocks does not have the ability to take advantage of a pricing peak or to stop losses if the stocks are reducing in value. The expectation is therefore that restricted stocks in a company with higher volatility will trade at a greater discount than restricted stocks in a low volatility company.

There is no method of calculating volatility for a private company that cannot be challenged. Chaffe considered that the volatility of private companies should be considered to be at least 50%. The underlying volatility of the smaller companies on the public markets is very often a false reading due to a thin market for the shares. IFRS 2 suggests means of calculating volatility for private companies.

This point leads us on elegantly to consider the concepts behind the use of mathematical models for the calculation of a discount for lack of marketability.

III. The Option Pricing Models

1. Overview

Various option pricing models have been designed in order to remove the large amount of "noise" in the restricted stock data and to provide a framework which can be extended over longer than 6 months to two years. They are based on the volatility of the underlying liquid stock and the time period to the liquidity event – these are the two inputs into nearly all of the models.

This involves the creation of an abstraction: there are matching pairs of shares: one share is on the markets and is fully liquid – it can be sold for a known price very quickly. The other share is restricted from being traded and is fully illiquid but is otherwise identical. That then allows the illiquidity discount to be distilled.

The measurement of the illiquidity is the loss of the freedom to trade the illiquid share at will: that is to lock in a gain, to cut losses, or whatever other decision is made with liquid shares.

The basis for most of the mathematical models can be simply explained:

- If the illiquid stock in a public company is bundled with a put option, requiring a third party to purchase the stock, then it has the benefits of liquidity.
- This means that the price of the liquid stock, less the cost of the put option, should equal the value of the illiquid stock. The cost of the put option should therefore equate to the discount for lack of marketability.

We need to be very precise with the assumptions which underpin the put option models. They assume that the investor owns two assets at the start of a period of illiquidity: an illiquid share in a public company and a put option. The put option pays out at a precise date in the future. That date is when the period of illiquidity is deemed to come to an end.

2. Expected Qualities of Models

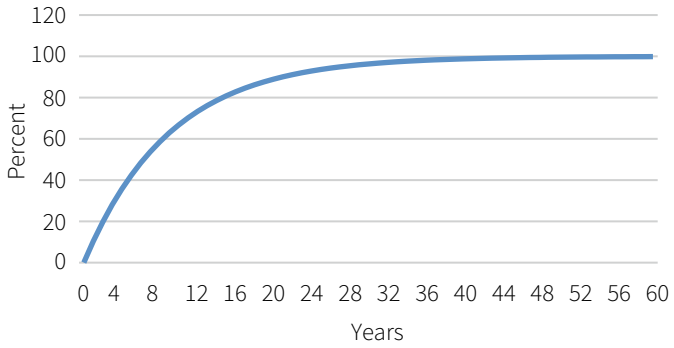
If the models are expressed in graphical form, we would expect a model to have the following characteristics:[10]

10 I am indebted to Stillian Ghaidarov for this analysis

- **Time:** We anticipate that the graph will be a function of time: a longer period of illiquidity should result in an increase in the DLOM.
- **Volatility:** We would expect volatility to be a variable: shares with higher volatility are more likely to have higher peaks and troughs in value. The opportunity cost of not being able to trade is therefore higher with higher volatility shares.
- **Discount Increasing at a reducing rate:** We would not expect the discount for illiquidity to be a straight line: this is because the impact of illiquidity for years 1 to 10 should be greater than for years 50 to 60. We therefore expect the model to be in the form of a curve, with the gradient of the curve gradually reducing over time.
- **Lower and Upper Bounds:** We expect the line to be one which begins at 0%: if a stock is illiquid for one day, the discount for illiquidity would be miniscule. We expect the line to approach but never reach 100%: if there are no cash flows the relevant security has no value
- **Impact of Dividends:** Lastly, we would expect dividends to reduce the discount for illiquidity, as dividend income is a form of liquidity. We would therefore expect the line for a stock that was paying dividends to be of a similar shape to the stock not paying dividends but to be at a slightly lower level. We would not expect the DLOM for stock that was paying dividends to decline for longer holding periods.

We will therefore test the various models against the above expectations. If dividends are ignored, figure 1 is an illustration of the expected shape:

Figure 1: Option Pricing Models – Expected Shape



3. The Models

The models that we are looking at are:

- Chaffe Model
- Longstaff Lookback Put Option
- Finnerty Average Strike 2012 Model
- Ghaidarov Average Strike
- Ghaidarov Forward Starting Model

The difference between most[11] of the models is in setting the price at which the put option can be exercised. That is the fundamental challenge faced by the developers.

The order in which these models are listed reflects an intellectual journey – with various attempts to resolve criticisms of previous models. We will follow that journey so as to understand the challenges faced and the solutions proposed.

In all of the models I am using a relatively high volatility of 50% in order to demonstrate the relative values produced. I also extend the time periods to 60 years so that the models can be fully tested.

IV. The Chaffe Protective Put Model[12]

1. Background and Inputs

The *Chaffe* Model was the first of the various models. It has since been overtaken by other models. However, we should recognise that it broke new ground at the time for proposing the put option as a measure of illiquidity. It deserves full credit for that. With the *Chaffe* protective put model, the strike price of the put option is set as the current share price at the beginning of the period of illiquidity. The option period is for the expected period of illiquidity.

The *Chaffe* model is built on the surest of foundations, namely the Black Scholes option pricing model (BSOPM).[13] There are five inputs into BSOPM. These increase to six when it is extended to include dividends:

- S: Share price
- K: Strike price
- σ: Sigma – Volatility of share price
- t: Period to exercise in years
- r: Risk free Rate
- q: continuously compounding dividend rate.
- Other terms:
- N: Standard normal distribution function (=norm.s.dist (z, true) in Excel)
- ln: Natural log
- e: exponential number 2.71828….

2. The Formulas

The BSOPM put option formula, as extended by Merton to include dividends, is given below:

11 There is also the Meulbroek CAPM model. This is very different to the put option models and warrants an article of its own. https://www.researchgate.net/publication/269869733_A_test_of_DLOM_computational_models

12 Chaffe, Option Pricing as a Proxy for Discount for Lack of Marketability in Private Company Valuations, Business Valuation Review, vol. 12, 4:182-188, 1993.

13 I describe BSOPM as the surest of foundations as it has the status of a mathematical proof.

$$(Ke^{-rt}\ x\ N(-d_2)) - (Se^{-qt}\ x\ N(-d_1))$$

$$d_1 = \frac{\ln\left(\frac{s}{k}\right)+\left(\left[r-q+\frac{\sigma^2}{2}\right]x\ t\right)}{\sigma\sqrt{t}}$$

$$d_2 = \frac{\ln\left(\frac{s}{k}\right)+\left(\left[r-q-\frac{\sigma^2}{2}\right]x\ t\right)}{\sigma\sqrt{t}}$$

In fairness to *Chaffe* we need to recognise that his model was designed for companies that do not pay dividends. The "q" function in the above formulas therefore does not feature in his protective put option model.

For the *Chaffe* protective put model there is also an assumption that the opening share price is the same as the strike price on exercise of the option. This quality, and the absence of a dividend function, considerably simplifies the formula to the following:

$$N(d_1) - N(d_2)$$

$$d_1 = \frac{\left(r+\frac{\sigma^2}{2}\right)x\ t}{\sigma\sqrt{t}}$$

$$d_2 = \frac{\left(r-\frac{\sigma^2}{2}\right)x\ t}{\sigma\sqrt{t}}$$

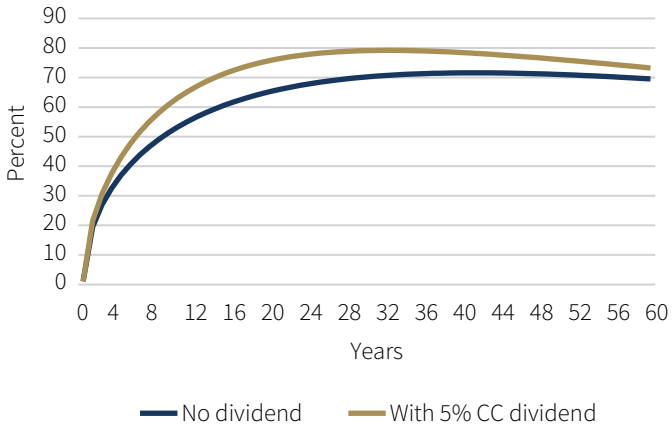
3. The Outputs

Here are some of the outputs, all based on volatility of 50%:

	No Dividend	5% Dividend
1 year	19.4%	21.5%
5 years	40.6%	47.7%
10 years	53.3%	63.1%
20 years	65.4%	76.0%

The outputs of the Chaffe model are given in figure 2.

Figure 2: Chaffe BS Put Option 50% Volatility, 0.5% RFR



4. The Challenges

It is described in the literature as the protective put option – this is because the Chaffe put option provides protection of the opening value: the concept is that the period of illiquidity commences and the holder buys a put option to protect that opening position.[14] The protective put option is therefore similar to an insurance policy to protect the price at the start of the period of illiquidity.

As an example, we will look at a fully liquid share in B Public Company with an opening value of €10. During the period of illiquidity it alternatively increases in value to €12 or reduces in value to €8. If it increases in value to €12 the option will not be exercised and the holder receives €12 on sale. If it reduces in value to €8, the holder exercises the put option and receives €10.

A conventional put option gives pricing certainty. A shareholder of a very liquid stock can buy a put option as a form of protection – not as a means of obtaining liquidity. We therefore have two things going on at the same time: we have pricing certainty (the main purpose of a put option) and we have that as a measure of illiquidity.

- We are not able to isolate the cost of pricing certainty in order to distil the cost of illiquidity with the Chaffe model – as the cost of that pricing certainty is the output from the Black Scholes model.
- The model does not include the value of being able to take advantage of a pricing spike during the period of illiquidity: continuing the above example of B Public Company, if the share price had peaked at €16 during the period of illiquidity, the Chaffe model does not include the cost of the lost opportunity to sell at or near to that price.
- The next point is that the shareholder does not receive any cash until the end of the period of illiquidity. The put option makes that share liquid in only one sense – the shareholder locks into the starting price. He is protected from downward movements in the price of the share. However he can take advantage of an increase in the share price at the end. He cannot take advantage of interim pricing spikes.
- We can see the next issue by looking at the figures above: dividends should reduce illiquidity discounts – funds flow to the shareholders rather than being retained in the business. So the inclusion of dividends is the next challenge to Chaffe.[15] Chaffe shows DLOMs that are higher with dividends. The other models show DLOMs that are lower – but that brings its own problems as we shall see later.

14 The 2021 UK case of McArthur and HMRC [UK FTT TC 08186] (Baa Bar Group plc) refers to "protective put option theory". We can therefore assume that the Chaffe model was the model used in that case to calculate the DLOM.

15 As previously noted, Chaffe did not include dividends in his version of the model.

- The next challenge is the inclusion of the risk free rate in the Chaffe model: this is because it is based on the BSOPM. There is no reason why there should be a link between the risk free rate and the DLOM. This has an unexpected consequence: it means that the discounts start to reduce for longer time periods in the model. This can be seen in the graph above.

The final point to make about the Chaffe model (and indeed all of the models) is that there is no variable for the size of holding. We would normally expect a higher DLOM for a 5% holding in a private company than for a 60% holding in that company. We therefore need to adjust the time periods in order to reflect this factor.

V. Longstaff Lookback Put Option[16]

1. Background and Inputs

I referred above to an intellectual journey. We can see that the *Longstaff* model was a response to some of the critiques of the *Chaffe* model. Much of the commentary on *Chaffe* was centred on the choice of the opening value as the exercise price of the option and the inability to take advantage of a pricing spike.

The response of *Longstaff* was to produce a model which addressed this issue: it was assumed that the market participant would have perfect market timing: if the shares were not illiquid, the investor would have realised the investment at the highest pricing spike during the period of illiquidity. The DLOM was therefore calculated as the value of that lost opportunity.

The *Longstaff* model therefore states the maximum value of the lost opportunity caused by illiquidity. As it is assumed that the investor has perfect market timing, this is an upper bound to the DLOM.

The *Longstaff* model is conceptually sound: the holder of an illiquid stock in a public company loses the ability to trade during the period of illiquidity. The cost of that illiquidity can be measured by reference to the highest price achieved by that stock during the period of illiquidity.

There are only two inputs required:

- σ sigma – the volatility of the liquid stock;
- t – time period of illiquidity in years

2. The Formula

The *Longstaff* formula is:

$$= V_0 \left[\left(2 + \frac{\sigma^2 t}{2}\right) N\left(\frac{\sqrt{\sigma^2 t}}{2}\right) + \sqrt{\frac{\sigma^2 t}{2\pi}}\, x\, e^{-\left(\frac{\sigma^2 t}{8}\right)} - 1 \right]$$

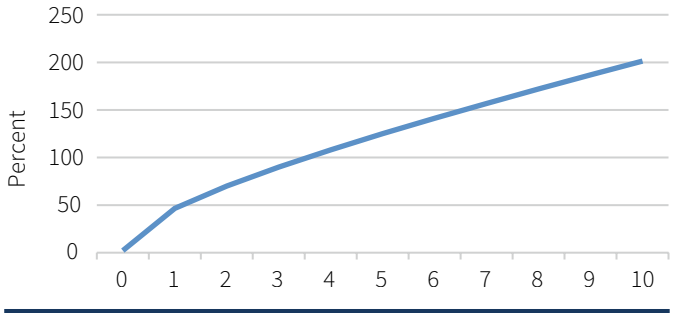
In the above formula V0 is the value of the liquid stock at the start of the period of illiquidity.

The perhaps surprising introduction of the π function is due to the formula deriving from a normal distribution.

3. The Outputs

The outputs are shown graphically in figure 3.

Figure 3: Longstaff Look-Back Put Option 50% Volatility



4. The Challenges

There is major problem with the *Longstaff* model: a DLOM must have a limit of 100%; as can be seen above, the *Longstaff* model can give discounts of greater than 100%. The outputs of more than 100% are understandable with an underlying liquid stock with a volatility of 50%. However it is then not possible to use the outputs in order to compute a DLOM: this must have an upper bound of 100%.

A simple solution has been proposed for this fatal weakness: if the output of the model is described as L, then the formula $\frac{L}{(1+L)}$ means that the model now has an upper bound of 100%. However, I am not aware of any justification, other than pragmatism, for this proposed solution.

It is my view that *Longstaff* is primarily of interest in understanding the evolutionary process in the development of these models to measure the DLOM.

VI. Finnerty Average Strike 2012 Model[17]

1. Background and Inputs

The *Finnerty* models were developed in an attempt to improve the *Chaffe* model and the Longstaff model. The *Chaffe* model assumes that the holder fixes the price on the first day of the illiquidity period for the price on that day – and gets paid on the last day of illiquidity.

16 Longstaff, How Much Can Marketability Affect Security Value, Journal of Finance, vol. 50, Dec. 1995: 1797.

17 Finnerty, An Average-Strike Put Option Model of Marketability Discount, The Journal of Derivatives, vol. 19, 4:53-69, 2012.

The average strike models assume that the shareholder is not protected at the opening value or the maximum value, but at the average value. The evolutionary development of the thinking is evident here. It is assumed that the holder would have the same probability of selling on any day during the period of illiquidity. Chaffe chose the opening value; Longstaff chose the highest value; it is my view that this provides relevant background in understanding the next two models.

There have been various iterations of the Finnerty model: the 2012 model appears to find favour with much of the business valuation community in the USA. In the BVR Survey on Methods Used for Estimating a Discount for Lack of Marketability (DLOM) of July 2021, it was the most commonly used of the option pricing models. Of the participants who used option pricing models, 57% used the Finnerty model.

The basis for the two average strike models is that, in the absence of resale restrictions, investors would be equally likely to sell the shares at any time during the restricted period.

The inputs are:

- σ sigma – the volatility of the liquid stock;
- t – time period of illiquidity in years
- q- continuously compounding dividend yield

2. The Formula

The Finnerty Average Strike model formula is:

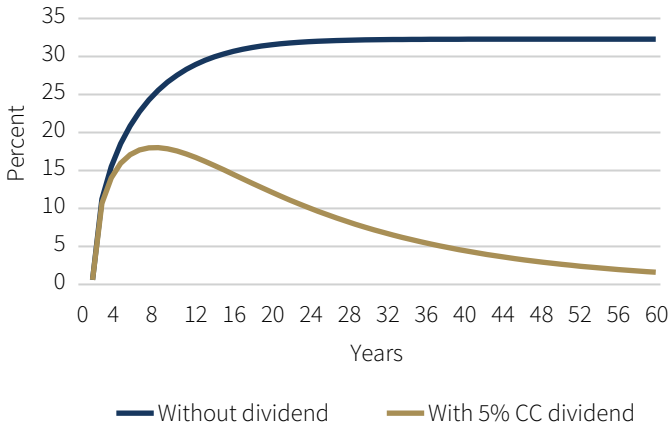
$$DLOM = V_0 \, x \, e^{-qt} \left(N\left(\frac{v\sqrt{t}}{2}\right) - N\left(-\frac{v\sqrt{t}}{2}\right)\right)$$

$$v^2t = \sigma^2t + ln\left[2\,x\left(e^{\sigma^2t} - \sigma^2t - 1\right)\right] - \left(2ln\left[e^{\sigma^2t} - 1\right]\right)$$

3, The Outputs

Here are the outputs in graph form in figure 4.

Figure 4: Finnerty Average Strike Model 2012



4. The Challenges

Two problems with the model are immediately evident:

- **Artificial Ceiling:** There is an artificial ceiling within the model: the precise ceiling is 32.28%;
- **Treatment of Dividend Income:** Dividends lead to a reducing DLOM for longer time periods. We can see that for a period of 7 years the discount for a stock paying a dividend is 18%. For later years the discount declines. We would expect the line to continue increasing over time but at a lower level than the stock not paying a dividend. We therefore have a situation in which a miniscule dividend reduces the DLOM to nil over perpetuity holding periods. A DLOM for 20 years should be more than a DLOM for ten years, whether or not dividends are being paid.

The ceiling in the model appears to be accidental – an unexpected function of the averaging formula that has been used.

In fairness to *Finnerty*, he has stated that the model is fine for one year or may be two years. However it should not be used for longer time periods or for stocks with high volatility.

In order to understand the formula we need to recognise that $v^2t = v\sqrt{t}$

The problem with the dividend is due to the function e^{-qt}. The way that this part of the formula works is that the dividend income is treated as an annuity. The annuity is discounted to net present value at the continuously compounding dividend yield. This part of the value is not subject to the DLOM discount.

We can put some flesh on the bones with an example: if there is a dividend with a 5% yield for a period of illiquidity of ten years, 39% of the value is carved out as the net present value of the dividend stream. The DLOM is then applied to the 61% that remains. The DLOM is applied to a reducing proportion of the value as the time period increases.

Even a very modest dividend results in the DLOM beginning to reduce as the value of the dividend annuity becomes a greater proportion of the total value. The problem with the dividend also applies to the next two models.

VII. Ghaidarov Average Strike Model[18]

1. Background and Inputs

Ghaidarov responded to earlier versions of the Finnerty Average Strike Model with his alternative average strike

18 Ghaidarov, 'The Use of Protective Put Options in Quantifying Marketability Discounts Applicable to Common and Preferred Interests, Business Valuation Review, vol. 28, 2:88-99, 2009; Ghaidarov, Analysis and Critique of the Average Strike Put Option Marketability Discount Model, 2009, ssrn ID 1478266.

model in 2009. He recognised that an earlier version of the Finnerty model overstated the DLOM due to a mathematical error. This fault was then remedied by *Finnerty* in his 2012 model.

Ghaidarov is very measured in his comments: he considers that there are very many different ways of estimating an average. He and *Finnerty* have used two different ways. One is not innately better than the other. Both of the average strike models suffer from weaknesses over longer time periods or high volatility.

2. The Formula

Ghaidarov and Finnerty use the same main formula structure. The difference is in the v^2t term. The main formula is:[19]

$$DLOM = V_0 \, x \, e^{-qt} \left(2 \, x \, N \left[\frac{v\sqrt{t}}{2} \right] - 1 \right)$$

The v^2t function with Ghaidarov is:

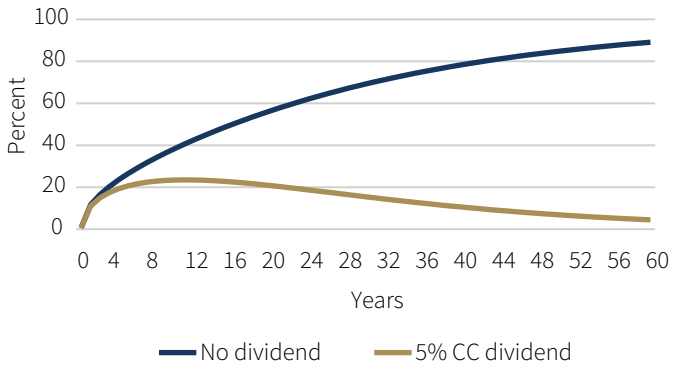
$$v^2t = ln\left[2 \, x \left(e^{\sigma^2 t} - \sigma^2 t - 1\right)\right] - (2 \, x \, ln[\sigma^2 t])$$

The v^2t function is a method of averaging when dealing with geometric rather than arithmetic progression. *Ghaidarov* has explained that there are many different ways of approximating the average, but that they are all only approximations.

3. The Outputs

The outputs from the *Ghaidarov* Average Strike Model are as shown in figure 5.

Figure 5: Ghaidarov Average Strike Model



We should pause at this point: this is the first model that complies with all of the expected rules relating to a DLOM Model if no dividends are assumed:

- it begins at nil% and extends to 100% over time but never exceeds 100%.
- It also increases throughout all time periods and volatilities, but at a reducing rate.

We can compare this with the behaviour of the other models that we have considered: Chaffe reduces over longer-time periods due to the presence of the risk free rate; Longstaff does not have an upper bound of 100%; Finnerty 2012 average strike has an artificial upper bound of 32.28%.

4. The Challenges

As previously noted, *Ghaidarov* does not consider that this model is well suited to longer time periods or higher volatility stocks. The problem with the declining DLOM for dividend paying stocks is evident, as with the *Finnerty* average strike model.

VIII. Ghaidarov Forward Starting Put Option Model[20]

1. Background and Inputs

Ghaidarov has built this model using an exotic option in the markets, namely a forward starting put option. Such an option can be priced at the beginning: the option holder is free to choose to select the date at which the strike price is fixed at any time during the period of illiquidity. The strike price of the option is equal to that day's market price of the share. *Ghaidarov* has stated that liquidity gives the investor the flexibility to respond to the market as it moves from day to day. A lack of liquidity is the absence of that flexibility.

This means that illiquidity as a lack of flexibility is fully recognised in the forward starting put option model. The strike price is not the starting price (*Chaffe*), the highest price (*Longstaff*) or the average price (*Finnerty* and *Ghaidarov* average strike). The option holder is free to choose the day on which the strike price is fixed.

2. The Formula

This is a model that has an elegant simplicity within the formula:

$$e^{-qt} x \left(2 \, x \, N \left[\frac{\sigma\sqrt{t}}{2} \right] - 1 \right)$$

We can recognise that the function e^{-qt} is the unsatisfactory part of the formula dealing with the dividend income. It is unsatisfactory as the DLOM will always be nil for perpetuity holding periods.

19 This appears, at first sight, to be different to the main Finnerty formula: this is solely due to Ghaidarov tidying the formula notation.

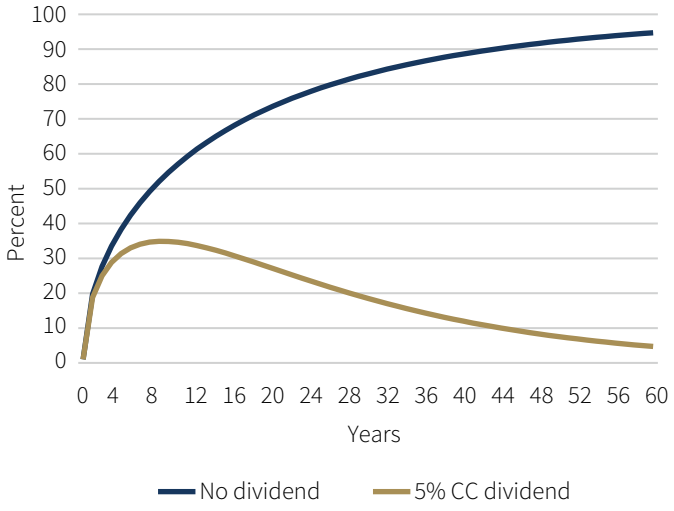
20 Ghaidarov, Analytical Bound on the Cost of Illiquidity For Equity Securities Subject to Sale Restrictions: The Journal of Derivatives, vol 21, Summer 2014: 31-48.

The part of the formula in brackets is identical to the Chaffe model if the risk free rate is set at nil in that model and if there are no dividends.

3. The Outputs

Figure 6 shows the outputs of the forward starting put option model in graph form.

Figure 6: Ghaidarov Forward Starting Model



4. The Challenges

It appears that this model has resolved the challenges that otherwise exist with the selection of the strike price. The problem of the DLOM for dividend paying stocks remains, due to the continuing difficulty of the e^{-qt} function. Ghaidarov has suggested an elegant means of dealing with this issue.

IX. Dividends and the Problem of e^{-qt}

1. Proposed Resolution

Ghaidarov has given an example of a share with a dividend yield of 5% which is illiquid for 24 months. It pays out a dividend at 6 months and 18 months. Ghaidarov's proposal is to treat 5% of the holding as having a period of illiquidity of 6 months; 4.75% (5% x 95%) of the holding has an illiquidity period of 18 months; 90.25% of the holding has an illiquidity period of 24 months. The equivalent period of illiquidity of the total investment is 1.9 years. This is a weighted average (5% for 0.5 years, 4.75% for 1.5 years and 90.25% for 2 years equals 1.90125 years). This appears to be an elegant means of dealing with the challenge of shares which pay dividends.

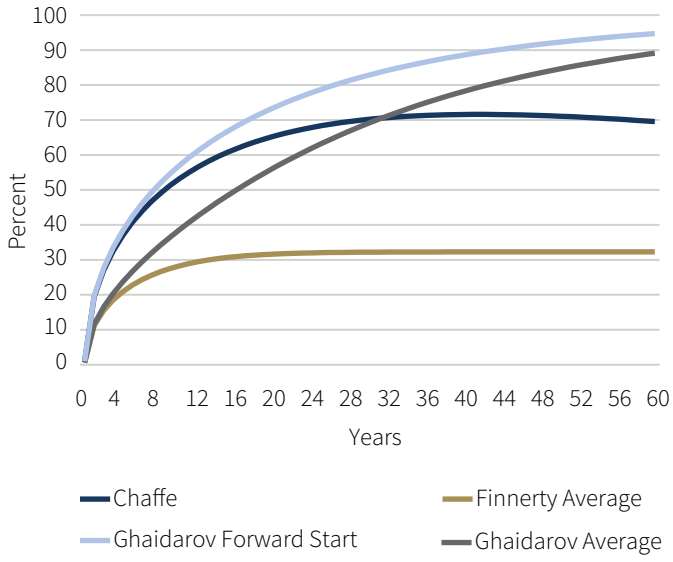
In this simple example there are three cash flows involved: the receipt of two dividends and the sale of the stock at the end of illiquidity period. The effect is to reduce a holding period of two years to a holding period of 1.9 years. The DLOM is calculated on the shortened holding period. The whole of the value is subject to the DLOM discount.

X. Some Conclusions

1. The comparisons

The various models have the shapes as shown in figure 7. I have not included the *Longstaff* lookback option model as this exceeds 100% after a relatively short period when the volatility is 50%.

Figure 7: Comparison of Models – no Dividends



The models have all addressed the question of the strike price within the put option differently. I hope that this article has given some insights into the order in which the thinking developed and why it has developed in the way that it has.

I find the *Ghaidarov* forward starting model to be the most theoretically compelling. It also has the virtue of simplicity, sitting on the most robust intellectual foundation. That foundation is BSOPM, with the strike price equal to the stock price and with the risk free rate set at nil. The setting of the risk free rate at nil is intuitively pleasing: movements in the risk free rate should not impact on the level of the DLOM. The model includes the prospect of the shareholder exercising the option at any time during the illiquidity period – not at the starting price, the highest price or the average price.

There is also some pleasing circularity here along the path of development: *Chaffe* produced the first model; this then led to the development of the others as a response to various criticisms. It now appears that *Chaffe* was within a hair's breadth of the right answer as the removal of the risk free rate equates to the *Ghaidarov* forward starting model.

Ghaidarov has suggested an elegant solution to the exclusion of the dividend annuity from the DLOM calculation.

XI. Overall Summary

In order to understand the DLOM, we need to consider the attributes of a lack of liquidity. A liquid stock has five qualities. It can be sold:

- Quickly;
- At a known price;
- Without the sale moving that price;
- With a modest bid-offer spread;
- With modest dealing costs.

The option pricing models give a price for the opportunity cost of not being able to deal during a period of illiquidity – to take advantage of a pricing spike, or to limit a loss. They therefore address only a part of the first two attributes above.

The idea of a put option combined with an illiquid stock is an elegant one: the models put a value on the volatility inherent in shares during a period of illiquidity. The shareholder is not able to take advantage of that volatility.

We must remember that the option pricing models do not breathe liquidity into an illiquid stock: the assumption is that the stock remains illiquid for the relevant period; the shareholder still has to wait patiently until the stock can be traded. However, she is compensated for the lost opportunity of trading in the illiquidity period.

Control holdings of shares in private companies are illiquid as they have none of the five above qualities. However, non-control holdings in private companies are far more illiquid. The only means within the models to recognise this difference is in the length of the holding period.

There are other aspects of illiquidity that are not within the models:

- The pricing uncertainty of private company shares;
- The desperate need for cash to meet urgent commitments;
- The costs of transacting in the shares of private companies;
- The time period between a decision to sell the entire equity and the eventual realisation of proceeds.

Of the models I consider that the *Ghaidarov* Forward Starting model is theoretically sound and it is also the simplest. Its technical underpinnings are unimpeachable. *Ghaidarov* has also suggested a means of addressing the challenge of applying the models to shares that pay dividends. This is most definitely my model of choice.

In considering the DLOM, judgement is still needed. If calculating a DLOM for a control holding in a private company, valuers may wish to assume a period of illiquidity of one or more years in which to achieve a sale. They can use an option pricing model as a guide to the discount for that period. There is then a need to make a further adjustment in order to reflect the greater costs of transacting a sale of shares in a private company. Finally valuers need to recognise that we humans have a primeval fear of being trapped: investors are happy to hold onto liquid stocks until market conditions result in trading being frozen; the stocks are no longer liquid; there is pricing uncertainty; any trading of the stocks in a secondary market would doubtless be at a discount to reflect all of those additional concerns unrelated to normal volatility. ◆

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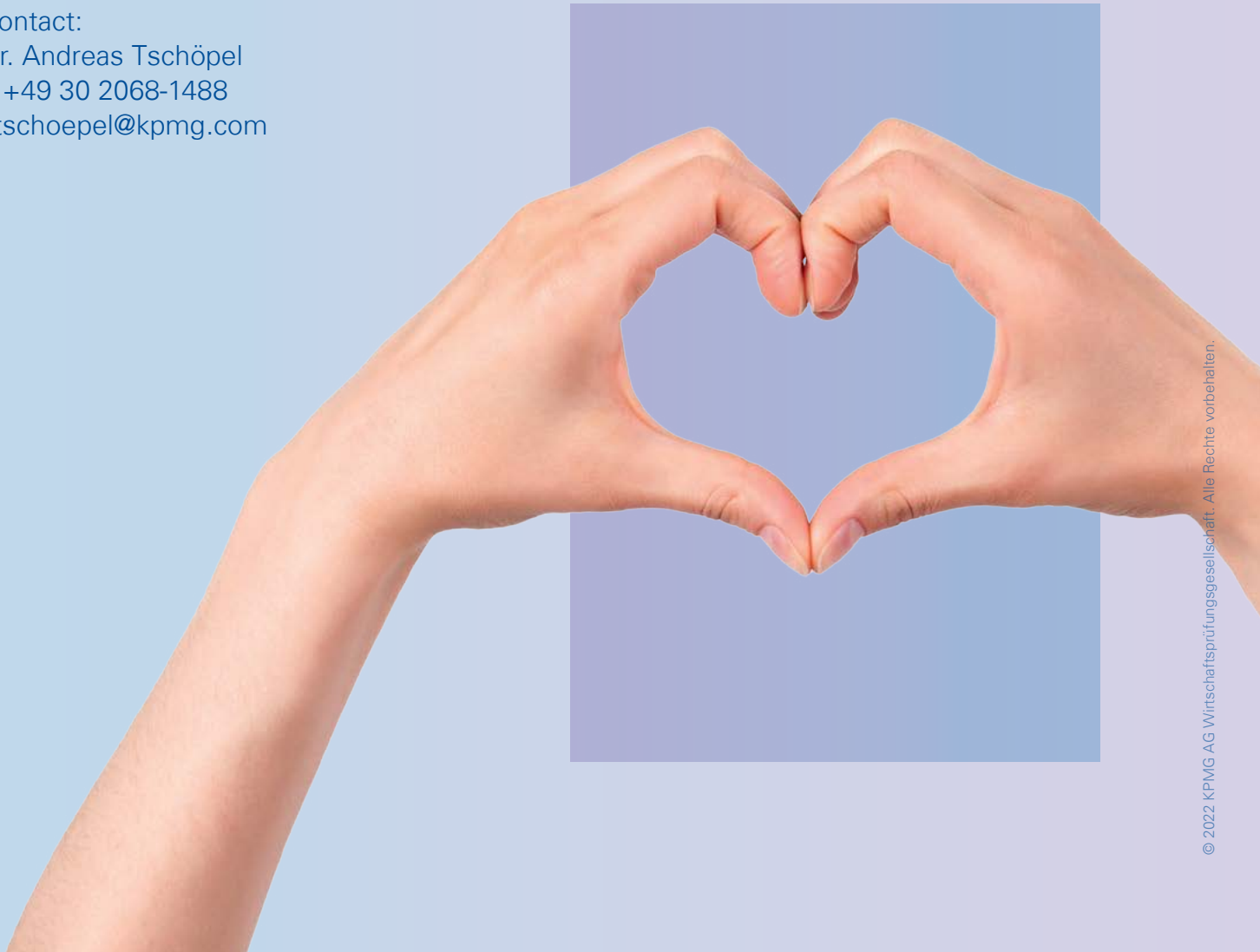

How Will Technology Change the Way Business Valuations Are Performed?

Business valuation analysis require a substantial volume of data as well as, still, numerous manual processes. As technology is developing faster and faster, huge changes are underway in the valuation industry through semi-automated processes that will leverage Artificial Intelligence ("AI") and machine learning to execute some of the tasks required to perform these analyses. These algorithms will be changing the industry by allowing a more thorough exploitation of data, lowering time spent by the analyst addressing mundane tasks, and ultimately providing the analyst with more time to focus on higher value-added and judgmental tasks, and better-informed analysis.

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I. Introduction

Business valuation industry is growing at a very rapid pace as investors are looking to deploy more capital and regulators demanding more transparency including on investor reporting. This will foster the use of technology for faster, better, and easier analysis and reporting. The industry is still largely using Excel as THE tool to perform the analysis. Excel has its own advantages and disadvantages when it comes to doing highly complicated and high-stake analysis. While it provides a very flexible and easy to use system (with shortcuts), it comes with issues like being prone to errors, requiring a rigorous quality check on every iteration, having limited automation capabilities, and issues when handling huge volumes of data.

Business valuation is an area in finance where technology has a huge potential of having a big impact. Algorithms are changing the industry in two ways:

- First, processes, meaning repetitive tasks prior to any decision making or human judgement, are being automatized thanks to technology and algorithms. One of the huge pain points of the industry is data collection and exploitation. The human process used to accomplish these tasks can be eased with process automation techniques, such as Robotic Process Automation ("RPA").
- Second, machine learning technologies such as Natural Language Processing ("NLP") and other statistical analyses can guide analysts when making decisions. Indeed, with a structured database and a robust analysis engine, the valuation professional can get a faster understanding of the key drivers of a valuation opinion. Having said that, we don't think that technology shall be construed as potentially on its way to replace human judgement. Quite the opposite, we believe technology will help and augment human judgment by bringing efficiencies and further analysis depth.

The use of technology is a source of value creation for the valuation professionals as it allows better management of time and better use and leverage of information, the two major aspects of a high-quality valuation. Thus, one can expect a shift from Excel towards semi-automated platforms.

Technology is evolving very fast and is able to automate some of the process driven tasks, thereby reducing the cost base. That itself is a factor that will drive more and faster innovation for valuation professionals. We're hoping to cover most here. But given how fast this is going, we may be missing a few.

II. Why is Excel still largely utilized for Business Valuations?

Traditionally virtually all valuation analyses of modern times have been realized on Excel. Because it is the most flexible tool available. However, it also comes with its own challenges.

1. Advantages of continuing to use Excel

Many companies choose to stick to Excel models even when there are several solutions available that could reduce the manual process inherent to these models. This probably comes from the sense of autonomy and the flexibility one has from working on Excel. The valuation professional is indeed the owner of the model and can model virtually any type of complexity. This flexibility is of high value because the application of a valuation methodology varies from company to company, and because of the broad diversity of assets that have to be valued. Furthermore, the perk of having everything done by hand is that the valuer has first-hand understanding of the data flow. The valuer has developed the model, selected the inputs, and at the time one does the analysis, the person knows what figures are used to provide results. When you have a new company, financial instrument, tangible or intangible asset to value, the flexibility that Excel brings in being able to model this new analysis is phenomenal.

These benefits however come with costs:

- time spent modelling,
- reviewing models,
- doing quality controls on the data,
- trying to document for future potential audits.

It's hard to change the tool that professionals are used to work with. Excel is well understood, accepted, and used by all in the financial industry. Using another solution would mean potentially losing that. And of course, while valuers learn how to get familiar with a new solution, the company pays the price for the loss of efficiency.

2. Limitations of Excel

However, autonomy and full flexibility also means that the error-rate and lag time of Excel models are higher. Historically, typos ("fat fingers") in spreadsheets have led to some of the largest financial errors. In 2008, a hide/delete error led Barclay into accidentally buying 179 more contracts than they intended in their purchase of Lehman Brothers assets.[1]

Basic Excel flaws and incorrect testing led to JP Morgan Chase losing more than $6 billion in their London Whale disaster. The banking and financial services holding company suffered due to having to use copy and paste for a new Value at Risk model, the process of which was

1 Havenstein, Excel error leaves Barclays with more Lehman assets than it bargained for, 14.10.2008, www.computerworld.com/article/2533631/excel-error-leaves-barclays-with-more-lehman-assets-than-it-bargained-for, last access 29.11.2022

strained due to increasing pressure from the trader to meet deadlines.[2]

Working with Excel brings autonomy and flexibility, but spreadsheets are also particularly susceptible to human errors and consequences can be severe. Platforms may have less flexibility (although the advancement of technology means that this statement gets less true every day), but they are less prone to errors as well. If anything, because a platform code is usually only accessible to its developer. Edits can be tracked. Hence auditing calculations is easier and doesn't need to be done as often as with an Excel model.

Updating a past valuation analysis on an Excel model is an arduous, fastidious and error-prone process. How many times have you said, or heard your colleagues say, "I am so tired of updating this model"? What if the machine could do that? Well, in most cases, it can.

Last, certain valuation analyses must abide to certain rules, norms, standards or guidelines (e.g., IPEV based valuations, IFRS Fair Values, US GAAP, IDW in Germany, and more generally IVS). As it is not efficient to insert in each new model certain industry-specific checks and balances, valuers can privilege templates that will not allow some thresholds to be exceeded, or that will maintain certain defined rules, or define mandatory analysis, benchmarks, or sections in a report thus assisting in guaranteeing the compliance of the valuation to these rules, norms, standards, or guidelines. As models become more and more similar across different industries, a platform type of solution automating various aspects of different types of valuation analysis can be designed.

III. Need of the hour: A robust semi-automated data collection, valuation and reporting system

Automation is the process whereby a technology will take up tasks that until now have required a human-led process to be performed. Automation of various processes can create efficiencies and publish a more reliable output. A robust system can allow the professionals to bring in data from various sources, perform reconciliations and run validation checks automatically. It can help in enhancing the quality of the audit that can be performed on the raw data.

1. Tackling the volume and variety of the incoming data

The quality of every analysis performed by the valuation professional depends heavily on the quality of the data ingested. From the valuer's perspective, information arrives from clients in a non-homogeneous way (PDFs, PowerPoint documents, unstructured Excel files, board decks, annual reports, emails, etc.) and in a significant volume. Reporting formats and keywords differ from document to document, which complicates storing information in a structured and logical way. Once the source files are stored, information from these files has to be manually extracted and formatted, making analysis and conclusions more time-consuming. Apart from the above issues, the data has a dimension of confidentiality and access.

A smart system can be designed around this process to automate data collection and couple it with the smartness of artificial intelligence. This system can collect files from various sources via a secured channel and keep the documents structured in a repository. A curated artificial intelligence powered algorithm can be trained to extract relevant information from the source files and structure it in a very analytics-friendly manner as shown in figure 1.

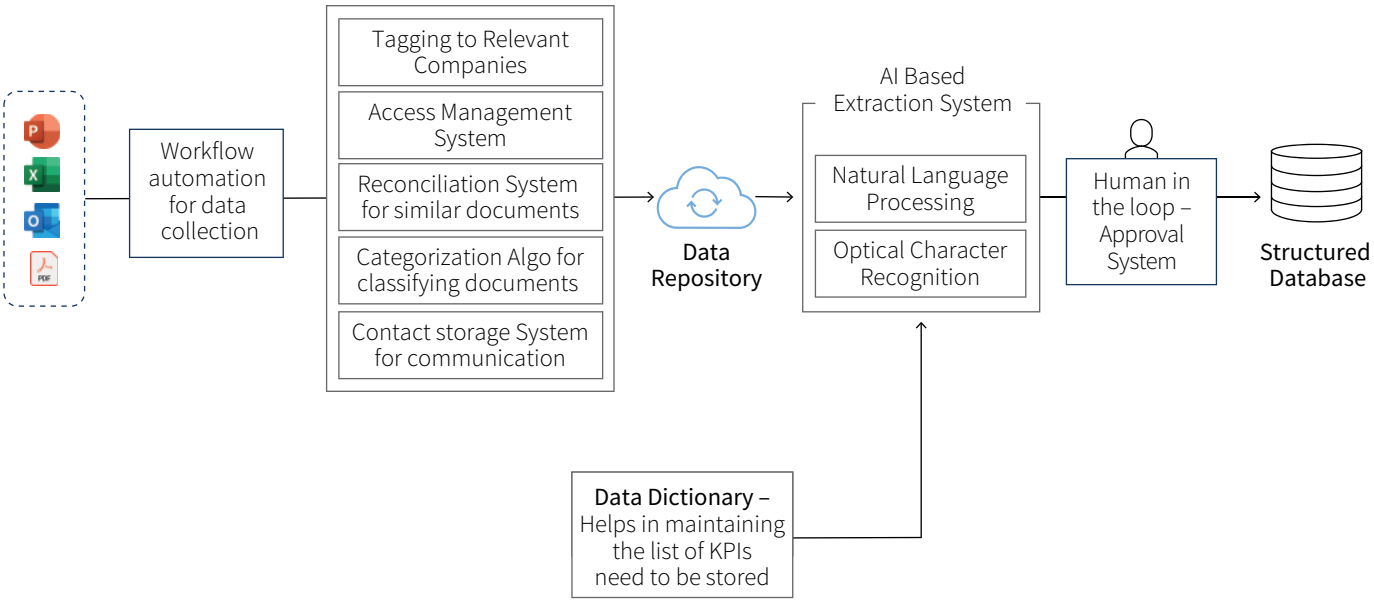
Technology is able to digest information from various formats (PowerPoint, Excel, Email, PDF) automatically from different sources. Once the files come in, technology can make sure that they are categorized and stored in a structured manner (based on document type, company, etc.). A Data Dictionary can be maintained to capture a list of KPIs that need to be extracted from the documents. This information around relevant KPIs can be fed into an AI based extraction system to get clean output. The output from the AI algorithms can be verified by a human and then clean information can be stored in the database in a structured manner.

The advantages of a robust database powering a valuation engine are substantial. First, information is secure, protecting the company's competitive advantages. The platform can be easily set up for access to chunks of information to be granted to a limited number of people. The only remaining flaw is the platform administrator, but again information could be encrypted or anonymized. This clear organization of the database is powerful when only bits of information need to be used, shown or sold. For example, segregating data sector-wise can give strong leverage when running a valuation.

Second, a robust database is a huge pain reliever when it comes to auditing processes. Changes are kept count of, and original documents can be retrieved easily. A trustworthy platform improves efficiency and transparency in a tangible way as the model does not have to circulate through several auditors. Automating a series of tasks therefore improves the error-rate, lag times and transparency, which results in the overall quality being superior. This is even more valuable that legal obligations are inflating everywhere in terms of reporting and auditing.

2 Lopez, How The London Whale Debacle Is Partly The Result Of An Error Using Excel, 13.02.2013, www.businessinsider.in/finance/how-the-london-whale-debacle-is-partly-the-result-of-an-error-using-excel/articleshow/21358120.cms, last access 29.11.2022

Figure 1: Architecture of a robust data gathering system



2. Comprehensive computation engine for Business Valuation embarking AI and algorithms

Business valuation is a very complicated exercise which involves a lot of judgement and rigorous analysis. From a fundamental aspect, business valuation generally focuses on Income Approach, Market Approach and Cost Approach. Process automation, algorithms and AI can help build a system to capture the basic essence of these approaches, while understanding the nuances involved in different methods.

Process automation systems can be put into place to capture the market data from sources like S&P Capital IQ, Bloomberg, FactSet, Refinitiv etc. Underlying company financials can come from the secured database and flow into the computation engine.

Powerful cloud-based calculation capabilities can help develop very flexible valuation platforms to accommodate the modelling requirements involved in various methods.

AI based classification system can be put into place to help identify a peer sample, potentially with more accuracy than a human based Global Industry Classification Standards ("GICS") code approach. A peer selection algorithm can be made very efficient by ingesting the subject company financials into the analysis. This will help the professionals cut down lots of research hours for finding trading and transaction peers.

Once the analysis is concluded on a platform, other professionals can join in to collaborate effectively. Review process can then only be limited to understanding the impact of the assumptions, rather than spending time on quality checks. The system can maintain proper change log to track every single change, which can bring more transparency. Such a robust system can then identify certain valuation policy changes and flag that to the professionals. It can also assist in the audit process as all information is present in a single place and tracing of information is very easy.

Combination of these various algorithms can bring a lot of efficiency, trust and transparency into the valuation process and automate various aspects of the analysis.

3. A faster world will require more efficient processes

In a time of economic and financial downturn, investors are gaining more and more interest for the private market. A February 2022 article by The Economist[3] reminds that private markets have grown exponentially, 5.5 times faster than public markets since the year 2000. This trend is expected to accelerate, but access to the private market was once reserved to large investors. However, better technology allows asset managers to offer new opportunities to small investors in the private sector. Competition will become fiercer in private asset management as final investors work to seize the growing number of opportunities, this market being almost thrice as big as the public market. It highlights the importance of modern processes that combine speed and precision to transform the valuation industry to the benefit of private markets.

3 Valencia, Fired up, The Economist (24.02.2022): Special report section

IV. If technology takes a larger role in a Business Valuation process, is the role of the valuation professional becoming obsolete?

The consultant or analyst will focus on the high value-added part of his or her job, which is exploiting all information available to render the best judgement possible. This can be accomplished by working hand-in-hand with AI and algorithms that pick data from the structured database.

Companies can leverage AI in their valuations and their decision-making processes in order to gain insights that their competitors lack. The use of an automated process makes searching for insights and patterns hidden in large volumes of data easier. As AI technologies can collect, process, and disseminate data within and between organizations, they can bring additional information to the valuation professional. Every firm that utilizes software for valuation can create a huge amount of propriety data, with historical information and past analyses, which they cannot get with Excel and that can later be utilized in valuation. Technology is not only about gaining more flexibility and creating new models. Its power relies on the help it provides the valuer in intelligently storing information and leveraging it in new models.

A platform will allow the analyst to fast track the creation process of a model, by replicating some of the analyst's tasks. It can also automate research based on specific criteria using NLP to find similarities. With the extracted comparisons and past concepts, the platform can help elaborate suggestions on the best possible solutions for the model.

Can business valuation be fully automated one day? Some hedge funds may indeed develop algorithms that can issue a recommendation of investment based on fully automated valuation analyses and complex AI algorithms. That being said, for business valuations that are requested to provide confidence, trust, and transparency, like fair value analysis, opinions, litigation analysis, i.e. any valuation that needs to be auditable and explained, we believe that full automation is unlikely any time soon: the human judgement part will remain, so that a human can explain (and abide to) the work that has been done. Human judgment will remain critical. However, technology can do a lot to facilitate the process prior to human judgment. Information will then arrive at a faster pace and in a cleaner manner to the valuation team. Human judgment inherent to any valuation process will still be there, and valuers will be core to it. But their work to get there will be made easier, and the capacity to draw richer analysis will be enhanced as well. AI experts refer for these type of models to the "human-in-the-loop" concept.

V. Conclusion

Automation of processes thanks to technology is just at its starting point. It will enable the business valuation industry to focus on higher value-added tasks. Process automation, AI and NLP will take the lead on arduous, little value-added tasks, while bringing more valuable information into the equation. Leaving more time to the valuation professional to focus on critical thinking. ◆

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Marketing as a Key Task for Valuation Professionals

Key tasks are critical success factors that are essential and crucial to the professional success of valuation experts. Most of them focus on their professional qualification which is the prerequisite for a professional to be successful in the long term. However, what good are professional qualifications if an expert fails to acquire clients and sustainably gain trust for a long-term client relationship? The following article shows why marketing is a key task for valuation professionals and how they can position themselves successfully.

I. Marketing Levels

The most important task of a successful professional is marketing. This is even more true if they work in a solo practice because in this case, they are not only responsible for providing the services, but also for acquiring new potential clients as well as retaining existing ones. I consider it highly expedient in marketing to make a distinction on several levels. The marketing plan should contain a marketing strategy and marketing activities. Figure 1 distinguishes marketing at the level of the company and at the level of the professional on the one hand and in terms of strategy and activities on the other.

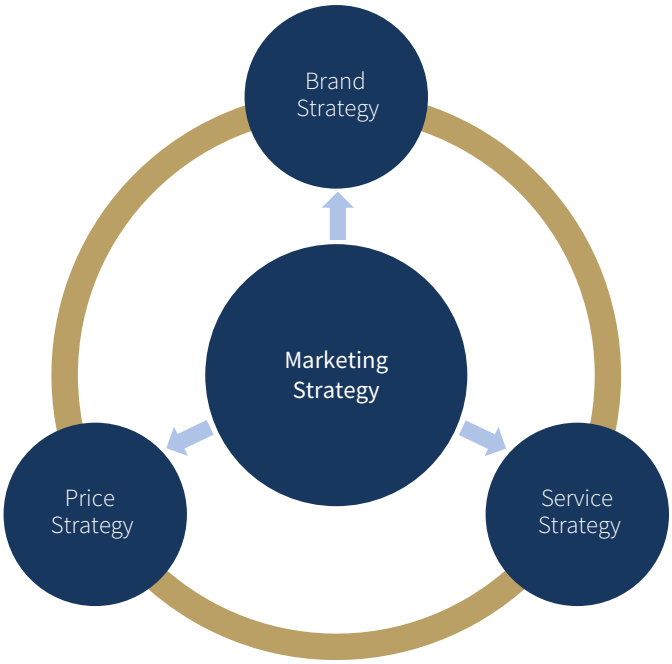
Figure 1: Marketing Levels

A distinction of marketing on the level of the company and on the level of the professional enables each professional in principle to create their own marketing plan. This goes hand in hand with the principle of self-responsibility. Each professional is responsible for their own marketing. It goes without saying that a valuation professional's marketing plan must not counteract the marketing plan of the company. In the case of a valuation professional in individual practice, the marketing plan of the company is identical with the marketing plan of the professional.

II. Marketing Strategy

A successful marketing strategy is based on the right positioning. Figure 2 shows the areas in which strategic decisions need to be made.

Figure 2: Marketing Strategy



The brand strategy, the service strategy and the price strategy are at the center of the marketing strategy. This applies both at the level of the professional as well as at the level of the company. The cycle is intended to express that the respective strategies influence each other. The marketing strategy will only be successful if the brand, service and price strategies are coordinated with each other. A strategic decision in one area influences the other two and vice versa. If you cannot sell yourself and your company convincingly, you will not be successful in the long run. It is important to consider the sequence: First, the professionals sell themselves and only in the second step do they sell their company. Those who believe that they can hide behind the brand of a large international auditing, law, or consulting firm show their lack of self-confidence as a manager. This will not really convince the clients, as the label of these "big" companies is interchangeable. The people behind the label, on the other hand, are unique and not interchangeable. At its core, brand strategy is about your own positioning as a professional and about the positioning of the company.

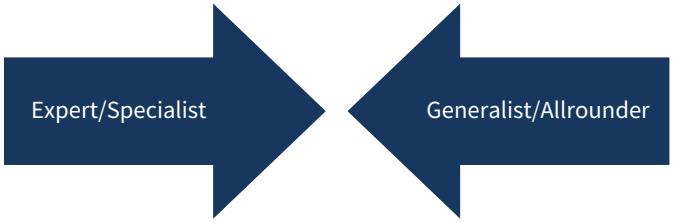
First of all, this requires a change in thinking. The brand strategy is largely focused on the corporate brand. However, since the profession of auditor and tax advisor depends much more on the bond between the professional and the client than on the bond between the company and the clients, it makes sense that the first step is to deal with the professional's branding and only the second step with the company's branding.

Branding therefore takes place at the level of the professional and at the level of the company as Figure 3 shows.

Figure 3: Brands

There are two basic positioning strategies for auditors and tax consultants in the services (cf. Figure 4). This positioning is accompanied by a change in the pricing strategy. An auditor and tax advisor who has expert status can charge significantly higher hourly rates than a generalist.

Figure 4: Positioning



First of all, the professional must make a fundamental decision whether they want to assume expert status. Once this fundamental decision has been made, two steps are required:

1. Determination of the Field of Activity as an Expert
2. Building up competence in the specific field of activity through professional practice, external training, and a great deal of self-study.

A professional will only be credibly perceived as an expert if they have an appropriate qualification as an expert. First of all, the professional acquires this qualification for themselves internally. Through the right marketing activities, these then become visible externally in the market to potential clients.

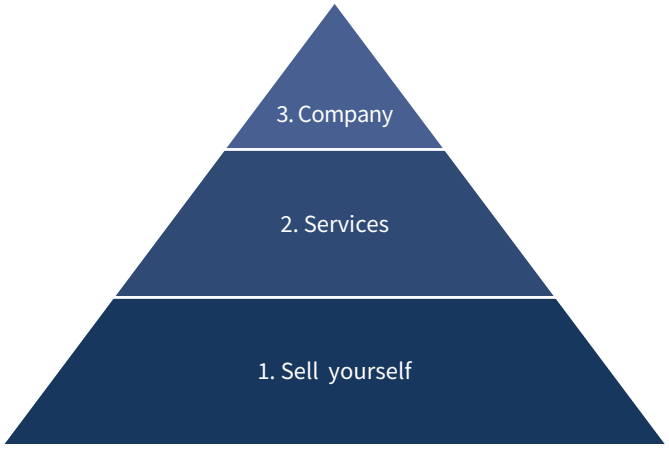
III. Marketing Activities

Marketing strategy is the part of the marketing plan that is used to achieve certain sales targets in the medium term through specific behaviour. Marketing activities, on the other hand, are the compass for day-to-day activities. I do not consider a distinction between online marketing and offline marketing activities to be purposeful for our profession. Certainly, individual marketing activities can be assigned quite clearly to online marketing and offline marketing. In a digitalized world, however, where online and offline are increasingly merging, marketing activities would be categorized in a way that no longer reflects the spirit of the times. Rather, two worlds would be created mentally that no longer coexist but have long since become one through the use of smartphones and virtual technologies. It is much more appropriate to divide marketing activities into those from the perspective of a professional and those of the company.

In the US, people who bring their companies new customers, engagements, and ultimately profits are called “Rainmakers”. “Rainmakers” have knowledge and skills that are distinctly different from other professionals. In essence, every time an engagement is placed, there is only one question at stake: Why should you receive the engagement and not your competitors? If you can answer this question clearly and unambiguously, you are one step ahead of your competitors. So, it’s all about the question of selling.

The following sales pyramid should be observed:

Figure 5: Sales Pyramid



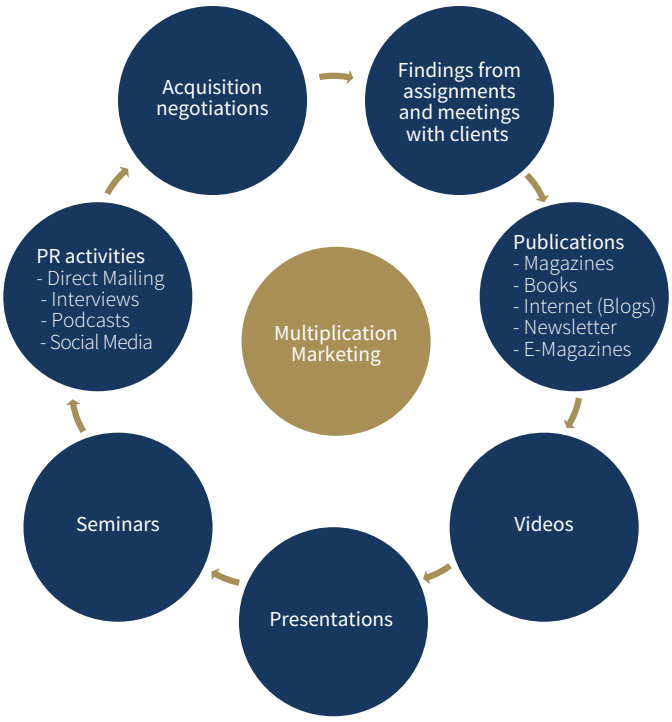
First, the professional always sells themselves first. Only then does a professional sell the services and the company. Many partners of large international companies or even second tier companies will vehemently disagree with this and propagate exactly the opposite order. With the shining logo and the international brand recognition, the professionals sell the services of the company. Undeniably, the brand recognition or the logo can be an important confidence-building measure. It follows that the basis of the sales pyramid is first of all the ability of the professional to sell themselves.

Since the acquisition of clients involves the sale of an order or the sale of a service, the first step is to gain the client’s trust for the services offered. This absolutely requires the involvement of the personality of the professional. It is not only a matter of being competent, but also of being likeable and convincing. It calls for skills

that professionals have neither been taught at traditional universities and that cannot be found in the relevant specialist literature. “Rainmakers” or good “salespersons” in the profession of auditors and tax consultants are rather rare. These are qualities that can be learned, and which I will show in other articles.

If a professional has recognized that a specialization strategy to become an expert gives them significant competitive advantages over colleagues, the first step is to credibly acquire this qualification. This requires a combination of several years of professional experience in a specific field of activity (e.g. business valuations), a great deal of self-study, continuing education, and other proof of qualification. However, having expert status is not automatically visible in the market. Professionals have only a limited choice of activities to make their expert status credibly visible in the market, as Figure 6 shows.

Figure 6: Multiplication Marketing



The multiplication marketing cycle illustrates the marketing activities of a professional within the framework of expert positioning. On the one hand, the cycle is intended to vividly illustrate that the individual marketing activities are interconnected and, on the other, that a professional can start any marketing activity at any time as part of their positioning strategy. The detailed description of Multiplication Marketing will be given later. In this context, I will then also describe that expert positioning can take place on two levels. Marketing activities of the companies will not be presented in detail here.

IV. Conclusion

Marketing is a key task for valuation professionals. Expertise is a commonly required prerequisite for professionals. The high requirements for passing the professional examinations document the formal qualification of a lawyer, Certified Public Accountant (CPA), or a Certified Valuation Analyst (CVA). Qualification and competence are important prerequisites for a successful professional life. This is true not only for auditors and valuation professionals, but also for lawyers, doctors, and others. “Soft Skills for the Professional Services Industry” presents the principles, tasks, and tools of professionals that are necessary to master the increasing complexity of everyday life and the VUCA world.[1] Effective self-management and the effective management of teams are more important today than ever before. ◆

1 Bibliography: Bly, Robert W. Become a Recognized Authority in Your Field, 2002 / Fox, Jeffrey J.: How to Become a Rainmaker: The Rules for Getting and Keeping Customers and Clients, 2000 / Harding, Ford: Rain Making: The Professional’s Guide to Attracting New Clients, 1997 / Heßler, Armin/Mosebach, Petra: Strategie und Marketing im Web 2.0: Handbuch für Wirtschaftsprüfer und Steuerberater, 2013 / Waugh, Tory: 101 Marketing Strategies for Accounting, Law, Consulting, and Professional Services Firms 2004.

Industry Betas and Multiples

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General

To derive the provided betas and multiples, only companies from the Eurozone have been considered. The included companies have been grouped on industry-level, as well as on sub-industry level based on the Global Industry Classification Standard (GICS). For each edition of the journal, aggregates for all eleven main industries and one individually selected sub-industry will be shown. Due to the special characteristics of companies operating in the financial industry (high leverage, leverage as part of the operating business, high dependency on the interest level, etc.) we only provide levered betas and equity-based multiples for that industry.

The underlying data has been obtained from S&P at the beginning of December 2022. All presented values are based on raw data and raw calculations. They have carefully been checked and evaluated but have not been audited nor have individual values been verified. Certain results may be misleading in your setup or specific context. All results should be critically evaluated and interpreted. The data and usage are on your own risk.

Eurozone Cost of Capital Parameters as at 30 November 2022

The typified, uniform risk-free rate based on AAA-rated government bonds currently lies at 2.25% for the Eurozone. It is derived from yield curves based on Svensson parameters and results published by the European Central Bank. The overall long-term market return for the Eurozone is estimated at around 9.5%, leading to a market risk premium of 7.25%. Estimations of the market return rely on historical returns as well as on forward-looking return estimates and risk premiums based on Eurozone companies with current market share prices and earnings forecasts from financial analysts.

Betas

Levered, debt and unlevered betas are calculated over an observation period of a single five-year period (monthly returns) as well as on five one-year periods (weekly returns). The provided unlevered betas rely on raw levered betas, uncertain tax shields, and including debt betas.

Raw levered betas are obtained from a standard OLS regression with stock returns being the dependent and stock market index returns (S&P Eurozone BMI Index) being the independent variable. Stock and index returns are total returns, thus including dividends, stock splits, rights-issues, etc. (if available). Levered betas below zero and above three are treated as outliers and are excluded.

Unlevered betas have been estimated based on Harris-Pringle, assuming uncertain tax shields and including debt beta:

$$\beta_u = \beta_L \frac{E}{E+D} + \beta_D \frac{D}{E+D},$$

where β_u = unlevered beta, β_d = debt beta, D = Net Debt, E = Market Value of Equity. Debt Betas rely on a company's individual rating on a given date. Annual rating-specific levels of debt betas are extracted from a broad market analysis. Net Debt includes *Total debt (incl. lease liabilities[1]) + net pensions + minority interest + total preferred equity - total cash - short term investments*. In accordance with the observation period, parameter averages of debt beta, net debt and market equity over the individual periods are applied when unlevering levered betas. Unlevered betas below zero and above two are treated as outliers and are excluded.

1 After the adoption of IFRS 16, reported total debt might now also include operating lease liabilities, which were not considered in prior years. For years before the adoption of IFRS 16, we include discounted estimates for operating lease liabilities based on reported operating lease liability payments in order to align the total debt estimations.

Table 1: Average Levered Industry Betas for five single 1y-periods and one 5y-period

30 November 2022	Average* Levered Betas								
Industries	1-Year, weekly returns							5-Year, monthly returns	
	Comps incl. (Average*)	12/2017 to 11/2018	12/2018 to 11/2019	12/2019 to 11/2020	12/2020 to 11/2021	12/2021 to 11/2022	Average*	Comps incl.	12/2017 to 11/2022
Industrials	*239*	1.04	1.11	1.03	1.00	0.90	1.01	*223*	1.17
Consumer Discretionary	*150*	0.92	1.04	1.04	1.04	1.07	1.02	*134*	1.25
Health Care	*120*	1.06	0.85	0.72	0.83	0.76	0.85	*111*	0.78
Financials	*137*	0.91	0.98	1.04	0.95	0.99	0.97	*125*	1.14
Utilities	*48*	0.75	0.34	0.81	0.75	0.69	0.67	*43*	0.72
Materials	*77*	1.12	1.29	1.03	0.97	0.89	1.06	*74*	1.22
Real Estate	*84*	0.60	0.44	0.82	0.47	0.70	0.60	*72*	0.80
Communication Services	*85*	1.03	0.72	0.82	0.74	0.72	0.81	*77*	0.86
Information Technology	*145*	1.19	0.98	0.85	1.01	0.94	0.99	*131*	1.10
Consumer Staples	*55*	0.67	0.61	0.62	0.56	0.73	0.64	*53*	0.67
Energy	*33*	1.04	1.11	1.06	0.88	0.56	0.93	*32*	1.13

Table 2: Average Industry Leverage for five single 1y-periods and one 5y-period

30 November 2022	Average* Debt-Equity-Ratios								
Industries	1-Year							5-Year	
	Comps incl. (Average*)	12/2017 to 11/2018	12/2018 to 11/2019	12/2019 to 11/2020	12/2020 to 11/2021	12/2021 to 11/2022	Average*	Comps incl.	12/2017 to 11/2022
Industrials	*121*	82.3%	74.1%	87.2%	52.7%	62.8%	71.8%	*161*	55.1%
Consumer Discretionary	*63*	118.7%	207.6%	121.1%	97.7%	90.6%	127.2%	*88*	82.4%
Health Care	*45*	29.3%	25.0%	20.4%	23.0%	334.0%	86.3%	*62*	22.8%
Utilities	*29*	117.0%	90.5%	76.2%	65.5%	109.3%	91.7%	*33*	80.1%
Materials	*47*	64.1%	64.9%	55.3%	42.7%	48.4%	55.1%	*56*	46.2%
Real Estate	*34*	100.9%	95.0%	132.1%	180.2%	212.1%	144.0%	*47*	109.5%
Communication Services	*37*	90.5%	96.5%	89.0%	66.8%	84.6%	85.5%	*47*	65.1%
Information Technology	*58*	29.1%	21.4%	15.9%	15.4%	35.0%	23.4%	*69*	13.8%
Consumer Staples	*34*	152.0%	195.0%	200.0%	211.0%	336.8%	219.0%	*40*	174.6%
Energy	*20*	113.8%	187.5%	577.7%	494.7%	62.7%	287.3%	*23*	111.5%

Table 3: Average Unlevered Industry Betas for five single 1y-periods and one 5y-period

30 November 2022	Average* Unlevered Betas								
Industries	1-Year, weekly returns							5-Year, monthly returns	
	Comps incl. (Average*)	12/2017 to 11/2018	12/2018 to 11/2019	12/2019 to 11/2020	12/2020 to 11/2021	12/2021 to 11/2022	Average*	Comps incl.	12/2017 to 11/2022
Industrials	*121*	0.84	0.90	0.92	0.86	0.78	0.86	*161*	0.99
Consumer Discretionary	*63*	0.80	0.89	0.93	0.87	0.91	0.88	*88*	1.00
Health Care	*45*	0.91	0.76	0.67	0.69	0.72	0.75	*62*	0.72
Utilities	*29*	0.63	0.31	0.66	0.62	0.50	0.54	*33*	0.55
Materials	*47*	0.87	0.95	0.84	0.73	0.74	0.82	*56*	0.91
Real Estate	*34*	0.53	0.43	0.69	0.35	0.54	0.51	*47*	0.64
Communication Services	*37*	0.82	0.66	0.71	0.53	0.63	0.67	*47*	0.69
Information Technology	*58*	1.11	1.14	0.97	0.95	0.98	1.03	*69*	1.10
Consumer Staples	*34*	0.59	0.57	0.59	0.52	0.62	0.58	*40*	0.57
Energy	*20*	0.86	0.90	1.07	0.81	0.61	0.85	*23*	0.98

*Average = Arithmetic Mean

Table 1: Average Levered Subindustry (Information Technology) Betas for five single 1y-periods and one 5y-period

30 November 2022	Average* Levered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Subindustry: Information Technology	Comps incl. (Average*)	12/2017 to 11/2018	12/2018 to 11/2019	12/2019 to 11/2020	12/2020 to 11/2021	12/2021 to 11/2022	Average*	Comps incl.	12/2017 to 11/2022
IT Services	*45*	1.12	0.94	0.86	0.93	0.95	0.96	*40*	1.08
Communications Equipment	*11*	1.29	1.02	0.87	0.81	0.62	0.92	*11*	0.98
Semiconductors & Semiconductor Equipment	*20*	1.51	1.50	1.09	1.51	1.24	1.37	*20*	1.31
Electronic Equipment, Instruments & Components	*27*	1.19	0.99	0.80	0.96	0.84	0.96	*24*	1.16
Software	*39*	1.06	0.71	0.75	0.96	0.92	0.88	*33*	1.01
Technology Hardware, Storage & Peripherals	*3*	1.23	1.00	1.01	0.89	0.90	1.01	*3*	1.03

Table 2: Average Subindustry (Information Technology) Leverage for five single 1y-periods and one 5y-period

30 November 2022	Average* Debt-Equity-Ratios								
	1-Year							5-Year	
Subindustry: Information Technology	Comps incl. (Average*)	12/2017 to 11/2018	12/2018 to 11/2019	12/2019 to 11/2020	12/2020 to 11/2021	12/2021 to 11/2022	Average*	Comps incl.	12/2017 to 11/2022
IT Services	*18*	20.4%	12.3%	9.2%	11.0%	25.6%	0.16	*24*	14.9%
Communications Equipment	*7*	111.6%	88.4%	69.2%	54.4%	245.1%	1.14	*9*	46.6%
Semiconductors & Semiconductor Equipment	*11*	18.2%	14.1%	5.1%	1.6%	2.5%	0.08	*13*	5.0%
Electronic Equipment, Instruments & Components	*7*	17.6%	29.3%	32.7%	38.1%	41.0%	0.32	*8*	17.4%
Software	*12*	28.1%	9.3%	1.7%	0.0%	2.3%	0.08	*13*	2.0%
Technology Hardware, Storage & Peripherals	*3*	34.5%	38.3%	37.8%	30.7%	71.6%	0.43	*2*	38.6%

Table 3: Average Unlevered Subindustry (Information Technology) Betas for five single 1y-periods and one 5y-period

30 November 2022	Average* Unlevered Betas								
	1-Year, weekly returns							5-Year, monthly returns	
Subindustry: Information Technology	Comps incl. (Average*)	12/2017 to 11/2018	12/2018 to 11/2019	12/2019 to 11/2020	12/2020 to 11/2021	12/2021 to 11/2022	Average*	Comps incl.	12/2017 to 11/2022
IT Services	*18*	1.10	0.96	0.93	0.90	0.97	0.97	*24*	1.10
Communications Equipment	*7*	1.11	1.06	1.03	0.86	0.79	0.97	*9*	0.97
Semiconductors & Semiconductor Equipment	*11*	1.15	1.53	1.18	1.36	1.17	1.28	*13*	1.20
Electronic Equipment, Instruments & Components	*7*	1.22	1.21	0.83	0.91	0.83	1.00	*8*	1.15
Software	*12*	1.00	1.09	0.84	0.85	1.02	0.96	*13*	1.07
Technology Hardware, Storage & Peripherals	*3*	1.09	0.96	0.89	0.76	0.75	0.89	*2*	1.01

*Average = Arithmetic Mean

Multiples

Multiples are computed based on actuals (based on the annual report) and forecasts (based on estimates by analyst) for the trailing year and the forward +1 year. Trading multiples for Sales, EBITDA and EBIT are each derived by dividing a companies' enterprise value (market capitalization plus net debt) by its sales, EBITDA or EBIT. Earnings multiples are derived by dividing a companies' market capitalization by earnings (net income). The market-to-book ratio is derived by dividing a companies' market value of equity by its book value of equity. Multiples below zero and above 500 are treated as outliers and are excluded. ◆

Table 1: Average Industry Multiples

30 November 2022	Sales			EBITDA			EBIT			Earnings			Market to Book-Ratio		
Industries	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.
Industrials	1.8	1.5	*220*	9.5	8.3	*198*	17.2	14.4	*209*	21.4	14.7	*202*	2.7	2.8	*203*
Consumer Discretionary	2.4	2.2	*132*	13.5	10.1	*110*	19.2	14.1	*121*	24.7	16.6	*121*	3.3	3.1	*125*
Health Care	7.2	6.1	*103*	12.1	14.0	*71*	21.6	25.2	*78*	22.7	27.9	*66*	3.1	2.9	*83*
Financials	n/m	n/m	*n/a*	n/m	n/m	*n/a*	n/m	n/m	*n/a*	14.8	10.6	*109*	1.1	1.0	*107*
Utilities	4.8	4.4	*43*	11.3	9.8	*42*	19.0	17.2	*43*	21.7	25.9	*43*	2.4	2.2	*42*
Materials	1.2	2.2	*72*	6.8	7.1	*64*	12.3	11.8	*70*	15.7	14.3	*69*	1.7	1.5	*63*
Real Estate	13.7	12.6	*66*	26.8	24.4	*60*	20.0	31.9	*65*	13.2	12.7	*61*	0.7	0.7	*57*
Communication Services	2.4	2.0	*72*	8.2	6.6	*64*	18.1	14.3	*68*	15.1	24.0	*64*	2.2	2.1	*66*
Information Technology	2.3	2.1	*128*	14.2	11.6	*104*	24.1	16.3	*110*	27.5	19.2	*104*	4.3	3.6	*107*
Consumer Staples	2.0	1.9	*54*	15.7	17.0	*39*	23.9	20.7	*53*	18.0	17.6	*53*	2.1	1.9	*49*
Energy	2.1	2.0	*31*	6.5	5.9	*28*	14.5	12.5	*30*	13.6	12.8	*29*	5.6	2.1	*26*

Table 2: Average Subindustry (Information Technology) Multiples

30 November 2022	Sales			EBITDA			EBIT			Earnings			Market to Book-Ratio		
Subindustry: Information Technology	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.	Trailing	Fwd. +1	Comps incl.
IT Services	2.4	2.1	*40*	12.0	9.8	*34*	15.9	13.3	*37*	20.5	16.3	*38*	3.0	2.6	*37*
Communications Equipment	1.0	1.0	*7*	10.0	7.3	*7*	23.9	17.7	*7*	23.8	15.1	*6*	1.9	1.8	*6*
Semiconductors & Semiconductor Equipment	3.3	3.0	*18*	14.9	12.3	*16*	47.8	16.6	*18*	29.6	19.9	*17*	5.2	4.6	*16*
Electronic Equipment, Instruments & Components	1.3	1.1	*23*	12.3	9.5	*19*	19.2	15.5	*20*	26.2	20.9	*18*	2.7	2.4	*16*
Software	2.8	2.4	*37*	20.2	16.7	*26*	23.4	21.3	*25*	39.7	25.2	*22*	6.7	5.3	*30*
Technology Hardware, Storage & Peripherals	1.6	1.3	*3*	12.2	5.6	*2*	22.7	9.9	*3*	25.2	7.3	*3*	0.7	0.7	*2*

*Average = Arithmetic Mean

Discounts for Lack of Marketability

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Over the years, a variety of Option Pricing Models (hereinafter OPM) have been introduced to estimate Discounts for Lack of Marketability (hereinafter DLOM), capturing the key value drivers stock price volatility, period of illiquidity, and dividend yield.[1] The DLOM are computed employing three OPM generally proved to generate DLOM estimates that comport with DLOM empirically observed on the European market[2] according to varying assumptions about the period of illiquidity, the size of the underlying DLOM benchmarks, the volatility of the underlying stock return and, the dividend yield (employing closed-form solution formulae):[3]

- Lookback Put OPM:[4]

$$DLOM_i = \frac{1}{P_i} P_i[\theta_i] \qquad \text{with } \theta_i = \left(2 + \frac{\sigma_i^2 T}{2}\right) N\left(\frac{\sqrt{\sigma_i^2 T}}{2}\right) + \sqrt{\frac{\sigma_i^2 T}{2\pi}} e^{-\frac{\sigma_i^2 T}{8}} - 1$$

- Adjusted Lookback Put OPM:[5]

$$DLOM_i = \frac{P_i[\theta_i]}{1 + P_i[\theta_i]}$$

- Perpetual Exchange Put OPM:[6]

$$DLOM_i = \frac{1}{P_i}\left(\frac{P_i}{-\psi_i - \frac{1}{2}}\right)\left(\frac{-\psi_i - \frac{1}{2}}{\frac{1}{2} - \psi_i}\right)^{\left(\frac{1}{2} - \psi_i\right)} \qquad \text{with } \psi_i = \sqrt{\frac{1}{4} + \frac{2q_i}{\sigma_i^2}}$$

where i is the index on the stocks related to DLOM estimates, P_i is the current price of the underlying stock as on end of computation period date, σ_i is the volatility of the underlying stock return, T is the period of illiquidity (holding period) indicating the period the stock is expected to remain non-marketable, q_i is the dividend yield of the underlying stock and, $N()$ is the cumulative normal distribution function.

The computations are based on stock and company data directly collected from the stock exchanges as well as from yahoo!finance.

When using the data, please consider the following:

- DLOM are computed employing (stock and company) data for the year 2021.
- DLOM reported in the tables for all three OPM are computed employing the arithmetic mean of all values available.
- The tables for all three OPM are separated for various periods of illiquidity (holding periods) 3 months, 6 months, 9 months, 1 year, 1,5 years and 2 years with the choice on the holding period depending on the specific valuation. The final table for the Perpetual Exchange Put OPM holds irrespective of choosing a specific holding period.
- Countries with less than 20 observations (10 observations for the Perpetual Exchange Put OPM) remain unreported, but are included in the regional breakdown.
- The various regions (see bottom of the tables) are compounded as follows:
  Central and Western Europe: Andorra, Austria, Belgium, France, Germany, Liechtenstein, Luxembourg, Monaco, The Netherlands, Switzerland
  Southern Europe: Croatia, Cyprus, Gibraltar, Greece, Italy, Malta, Portugal, San Marino, Slovenia, Spain, Turkey
  Scandinavia: Denmark, Finland, Iceland, Norway, Sweden
  Britain: Ireland, United Kingdom
  Eastern Europe: Albania, Armenia, Azerbaijan, Belarus, Bosnia and Herzegovina, Bulgaria, Czech Republic, Estonia, Georgia, Hungary, Kazakhstan, Kosovo, Latvia, Lithuania, Moldova, Montenegro, North Makedonia,

1 For a theoretical analysis see e. g. Hitchner/Aldering/Angell/Morris, Discount for Lack of Marketability, 2011, pp. 305-351.
2 See Grbenic/Baumüller, Zum Fungibilitätsabschlag am europäischen Markt, Wpg, 2022, vol. 75 iss. 22, pp. 1291-1301.
3 See Grbenic, The Performance of Option Pricing Models Estimating the Marketability Discount in a Pre-IPO Real-World Data Setting: Evidence from Europe, Journal of Business Valuation and Economic Loss Analysis, 2022, vol. 17 iss. 1, pp. 1-37.
4 See Longstaff, How Much Can Marketability Affect Security Values?, The Journal of Finance, 2005, vol. 50 iss. 5, pp. 1767-1774.
5 See Abbott, Discount for Lack of Liquidity: Understanding and Interpreting Option Models, Business Val-uation Review, 2009, vol. 28 iss. 3, pp. 114-148.
6 See Ghaidarov, The Cost of Illiquidity for Private Equity Investments, Working Paper, 2010, pp. 1-28.

Poland, Romania, Russia, Serbia, Slovakia, Ukraine

- The volatility σ_i of the underlying stock return is computed by the standard deviation of daily logarithmic stock returns (adjusted close prices) over the year 2021. To avoid distortions by thin trading, stocks with too many observations missing were either omitted or missing or invalid stock returns, respectively, were replaced employing the Uniform (Average) Returns Procedure

$$r_{i,t} = \sqrt[d+1]{\frac{p_{i,t+1+j}}{p_{i,t-d+j}}}$$

where *i* is the index on the stocks related to DLOM, $r_{i,t}$ is the return of stock *i* at day *t*, $p_{i,t}$ is the price of stock *i* at day *t*, *d* is the length (number of days) of the non-trading interval and, *j* is the number of remaining days without trading at day t in the non-trading interval.

- The dividend yield q_i of the underlying stock is computed in a sustainable shape[7]

$$q_i = ln\left[\left(1 + \frac{EPS_i}{PPS_i}\right) * \left(1 - \frac{g_i}{ROE_i}\right)\right]$$

where EPS_i are the earnings per share of stock *i*, PPS_i is the price of stock *i* as on end of computation period date, ROE_i is the return on equity of stock *i* and, g_i is the compound annual growth rate of operating sales over the preceding 5 years.

The data is evaluated carefully; however, the author denies liability for the accuracy of all computations.

Notes for application:

n indicates the number of DLOM (sample size) computed. $\bar{x}_a$ indicates the arithmetic mean, $\bar{x}_h$ indicates the harmonic mean

$$\bar{x}_h = \frac{n}{\sum_{i=1}^{n} \frac{n}{x_i}}$$

and $\bar{x}_t$ indicates the truncated mean (10% level = 10 % of the observations sorted in ascending order being eliminated up-side and down-side)

$$\bar{x}_t = \frac{\sum_{2}^{n-1} x_i}{n-2}$$

The first quartile Q_1 indicates the boundary of the lowest 25%, the third quartile Q_3 indicates the boundary of the highest 25% of the computed DLOM. Using this information, the effectively employed DLOM may be related to the group of the 25% lowest (highest) discounts computed. Q_2 indicates the median of the DLOM computed. The confidence interval reports the range (lower confidence limit to upper confidence limit) of the DLOM applying a 95% confidence level. Assuming the DLOM to be normally distributed, this indicates all DLOM lying within these limits. To evaluate the assumption of normally distributed DLOM computed, the results of the Jarque-Bera Test for Normality are reported in brackets

$$JB = n\left[\frac{(skewness)^2}{6} + \frac{(kurtosis-3)^2}{24}\right];$$

values above the reported 5% significance points reject the null hypothesis of normality, indicating the confidence interval to be less reliable:

n	5%	n	5%	n	5%	n	5%
100	4,29	200	4,43	400	4,74	800	5,46
150	4,39	300	4,6	500	4,82	∞	5,99

The skewness *sk* indicates the symmetry of the distribution of the computed DLOM. A negative skewness indicates the distribution to be skewed to the left, whereas a positive skewness indicates the distribution to be skewed to the right (a skewness of zero indicates the distribution to be symmetric). The kurtosis *kurt* indicates the weight in the tails of the distribution of the computed DLOM (for the normal distribution, the kurtosis is 3). The standard deviation *sd* indicates the dispersion of the comput-ed DLOM. Finally, the coefficient of variation cv indicates the dispersion of the computed DLOM adjust-ing for the scale of units in the DLOM, expressed by the standard deviation as a percentage of the mean. It allows for a comparison of the dispersion of the DLOM across countries/regions. A lower (higher) coefficient of variation indicates a lower (higher) dispersion of the computed DLOM and, simi-larly, a higher (lower) reliability. ◆

7 See Ghaidarov, Analysis and Critique of the Average Strike Put Option Marketability Discount Model, White Paper, 2009, pp. 1-15; Ghaidarov, The Cost of Illiquidity for Private Equity Investments, Working Paper, 2010, pp. 1-28.

Lookback Put OPM, Adjusted Lookback Put OPM and Perpetual Exchange Put OPM, 2021, Holding Period = 3 months

Country / Region	n	$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	kurt	sd	cv
Austria	127	19.10%	10.51%	17.78%	10.10%	13.62%	24.28%	[16,67% ; 21,53%] (59,2)	1.59	1.96	0.14	0.72
Belgium	272	19.20%	13.20%	17.50%	9.62%	13.74%	23.80%	[17,48% ; 20,91%] (> 100,0)	1.97	4.07	0.14	0.75
Bosnia and Herzegovina	42	12.59%	4.98%	12.06%	6.41%	11.12%	17.46%	[9,93% ; 15,26%] (17,3)	0.85	0.36	0.09	0.68
Bulgaria	38	12.50%	10.54%	12.52%	9.46%	13.01%	15.64%	[11,13% ; 13,88%] (19,4)	-0.28	-0.46	0.04	0.34
Croatia	42	14.46%	9.26%	12.95%	6.73%	9.28%	17.74%	[10,76% ; 18,16%] (35,4)	2.07	4.74	0.12	0.82
Cyprus	115	20.90%	11.85%	17.47%	10.01%	15.33%	21.48%	[16,63% ; 25,18%] (> 100,0)	3.95	18.40	0.23	1.11
Czech Republic	34	11.80%	2.36%	10.87%	6.34%	8.20%	15.89%	[8,03% ; 15,56%] (33,4)	2.09	5.46	0.11	0.91
Denmark	365	22.92%	16.07%	20.72%	11.94%	17.12%	27.01%	[21,13% ; 24,70%] (> 100,0)	2.59	9.70	0.17	0.76
Estonia	40	13.11%	9.50%	12.70%	8.18%	12.53%	16.75%	[10,88% ; 15,34%] (16,6)	0.80	0.28	0.07	0.53
Finland	381	19.57%	14.41%	17.89%	10.94%	14.44%	23.27%	[18,22% ; 20,93%] (> 100,0)	2.13	5.20	0.13	0.69
France	1,186	21.85%	15.38%	20.24%	11.69%	16.12%	27.75%	[20,99% ; 22,70%] (> 100,0)	1.74	3.16	0.15	0.69
Germany	1,328	25.04%	16.37%	22.72%	12.62%	17.65%	30.43%	[23,96% ; 26,12%] (> 100,0)	2.52	10.62	0.20	0.80
Greece	265	20.86%	15.02%	18.19%	12.09%	16.84%	23.23%	[17,37% ; 24,35%] (> 100,0)	12.87	190.42	0.29	1.38
Hungary	56	15.06%	11.71%	14.43%	9.80%	13.43%	17.78%	[12,90% ; 17,23%] (22,9)	1.57	2.99	0.08	0.54
Iceland	50	14.41%	10.07%	13.22%	8.46%	9.68%	12.41%	[11,08% ; 17,75%] (42,5)	2.19	4.08	0.12	0.81
Ireland	143	23.83%	15.72%	21.63%	10.46%	16.26%	32.21%	[20,70% ; 26,97%] (> 100,0)	2.60	11.42	0.19	0.80
Italy	670	16.58%	13.65%	15.16%	11.42%	14.03%	18.35%	[15,82% ; 17,35%] (> 100,0)	3.58	16.87	0.10	0.61
Lithuania	54	11.63%	9.35%	10.72%	7.80%	9.69%	12.43%	[9,57% ; 13,68%] (> 100,0)	3.65	17.76	0.08	0.65
Luxembourg	130	21.63%	14.92%	20.25%	12.58%	17.27%	24.35%	[19,18% ; 24,09%] (65,5)	1.74	2.80	0.14	0.65
Malta	22	22.75%	16.79%	22.01%	12.32%	19.31%	27.44%	[17,01% ; 28,49%] (10,3)	1.07	0.41	0.13	0.57
Netherlands	317	22.02%	13.70%	20.15%	11.62%	15.39%	28.18%	[20,13% ; 23,91%] (> 100,0)	3.15	18.59	0.17	0.78
North Macedonia	98	11.08%	2.01%	9.77%	4.07%	8.49%	12.41%	[8,83% ; 13,34%] (> 100,0)	2.47	7.42	0.11	1.02
Norway	428	23.65%	17.05%	21.49%	13.41%	19.81%	28.01%	[21,90% ; 25,41%] (> 100,0)	5.13	45.22	0.18	0.78
Poland	1,269	27.43%	20.85%	25.18%	16.64%	22.91%	32.65%	[25,80% ; 29,07%] (> 100,0)	22.01	645.67	0.30	1.08
Portugal	68	17.51%	14.12%	16.97%	11.27%	13.92%	21.61%	[15,36% ; 19,66%] (33,5)	1.21	0.55	0.09	0.51
Romania	105	16.92%	11.62%	14.63%	8.55%	12.01%	17.95%	[13,98% ; 19,86%] (> 100,0)	3.08	10.90	0.15	0.90
Russia	284	14.92%	12.50%	14.33%	9.93%	12.77%	18.48%	[14,12% ; 15,73%] (97,9)	1.35	2.02	0.07	0.46
Slovenia	44	18.64%	8.60%	15.64%	7.82%	10.84%	21.18%	[12,20% ; 25,08%] (> 100,0)	3.42	14.53	0.21	1.14
Spain	445	14.74%	3.42%	12.87%	5.27%	12.24%	17.98%	[13,39% ; 16,09%] (> 100,0)	2.28	6.63	0.15	0.98
Sweden	1,749	26.55%	19.64%	24.83%	15.61%	22.34%	32.24%	[25,78% ; 27,31%] (> 100,0)	1.84	4.48	0.16	0.62
Switzerland	59	19.55%	11.95%	17.67%	9.13%	12.74%	24.44%	[18,20% ; 20,90%] (> 100,0)	1.82	3.09	0.16	0.83
Turkey	702	24.62%	21.63%	23.13%	17.98%	21.99%	27.63%	[23,72% ; 25,52%] (> 100,0)	4.51	34.28	0.12	0.50
United Kingdom	3,481	20.92%	12.96%	19.33%	10.56%	16.00%	26.48%	[20,41% ; 21,42%] (> 100,0)	1.79	4.17	0.15	0.73
Central & Western Europe	**3,931**	**18.36%**	**14.53%**	**20.34%**	**11.26%**	**15.95%**	**27.63%**	**[21,78% ; 22,86%] (> 100,0)**	**2.37**	**9.82**	**0.17**	**0.77**
Southern Europe	**2,378**	**19.41%**	**9.33%**	**17.84%**	**11.95%**	**16.47%**	**23.05%**	**[18,76% ; 20,06%] (> 100,0)**	**10.04**	**225.84**	**0.16**	**0.83**
Scandinavia	**2,973**	**24.59%**	**17.67%**	**22.73%**	**13.50%**	**20.19%**	**29.84%**	**[23,99% ; 25,19%] (> 100,0)**	**2.59**	**13.94**	**0.17**	**0.68**
Britain	**3,624**	**21.03%**	**13.05%**	**19.43%**	**10.55%**	**16.03%**	**26.80%**	**[20,53% ; 21,53%] (> 100,0)**	**1.87**	**4.96**	**0.15**	**0.73**
Eastern Europe	**2,071**	**22.55%**	**11.09%**	**20.55%**	**12.23%**	**18.36%**	**27.55%**	**[21,45% ; 23,64%] (> 100,0)**	**22.26**	**756.92**	**0.25**	**1.13**
Total	**14,977**	**22.03%**	**12.93%**	**20.19%**	**11.73%**	**17.19%**	**26.98%**	**[21,74% ; 22,32%] (> 100,0)**	**11.07**	**444.16**	**0.18**	**0.82**

Lookback Put OPM, Adjusted Lookback Put OPM and Perpetual Exchange Put OPM, 2021, Holding Period = 6 months

Country / Region	n	$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	kurt	sd	cv
Austria	127	22.67%	14.22%	21.65%	14.25%	18.77%	26.92%	[20,46% ; 24,88%] (47,4)	1.42	2.04	0.13	0.56
Belgium	272	23.43%	17.85%	21.84%	13.46%	19.21%	28.29%	[21,71% ; 25,15%] (> 100,0)	1.85	3.72	0.14	0.62
Bosnia and Herzegovina	42	17.77%	7.03%	16.89%	9.12%	16.01%	24.02%	[13,94% ; 21,61%] (14,8)	0.99	0.86	0.12	0.69
Bulgaria	38	17.63%	14.82%	17.62%	13.06%	18.10%	21.37%	[15,64% ; 19,62%] (18,3)	-0.13	-0.39	0.06	0.34
Croatia	42	20.30%	12.69%	17.88%	9.42%	12.58%	25.60%	[14,84% ; 25,76%] (56,8)	2.33	6.29	0.18	0.86
Cyprus	115	28.88%	16.50%	23.58%	14.38%	21.36%	29.14%	[22,32% ; 35,45%] (> 100,0)	4.84	26.53	0.36	1.23
Czech Republic	34	16.68%	3.34%	15.20%	8.83%	11.35%	22.28%	[11,20% ; 22,16%] (55,1)	2.34	7.13	0.16	0.94
Denmark	365	29.37%	21.93%	27.06%	16.59%	23.86%	35.86%	[27,28% ; 31,46%] (> 100,0)	3.88	30.03	0.20	0.69
Estonia	40	18.50%	13.36%	17.81%	11.33%	17.22%	23.28%	[15,28% ; 21,72%] (14,1)	0.94	0.78	0.10	0.54
Finland	381	24.38%	19.43%	22.99%	15.21%	20.38%	29.44%	[23,05% ; 25,71%] (> 100,0)	1.75	3.65	0.13	0.54
France	1,186	27.80%	20.97%	26.09%	16.23%	22.33%	34.61%	[26,84% ; 28,75%] (> 100,0)	1.88	5.14	0.17	0.60
Germany	1,328	31.40%	22.28%	28.62%	17.84%	24.39%	36.70%	[30,09% ; 32,71%] (> 100,0)	4.66	41.10	0.24	0.78
Greece	265	28.95%	20.82%	24.88%	16.73%	23.72%	31.65%	[22,87% ; 35,04%] (> 100,0)	14.64	229.26	0.50	1.74
Hungary	56	21.27%	16.46%	20.23%	13.67%	19.26%	25.16%	[18,11% ; 24,43%] (32,0)	1.78	4.05	0.12	0.55
Iceland	50	18.26%	13.40%	17.30%	11.85%	13.87%	17.82%	[14,84% ; 21,67%] (30,8)	1.92	3.00	0.12	0.66
Ireland	143	31.06%	21.56%	27.98%	14.96%	21.99%	39.04%	[26,79% ; 35,34%] (> 100,0)	4.22	28.48	0.26	0.83
Italy	670	22.45%	19.03%	21.13%	15.95%	19.73%	25.58%	[21,61% ; 23,29%] (> 100,0)	2.67	10.57	0.11	0.49
Lithuania	54	15.85%	13.10%	14.92%	10.99%	13.63%	17.33%	[13,52% ; 18,18%] (> 100,0)	2.47	7.86	0.09	0.54
Luxembourg	130	27.49%	20.37%	26.33%	17.46%	23.59%	33.77%	[24,92% ; 30,05%] (48,7)	1.50	2.88	0.15	0.54
Malta	22	30.35%	23.22%	28.87%	17.44%	27.00%	40.39%	[23,21% ; 37,50%] (6,3)	1.27	2.32	0.16	0.53
Netherlands	317	27.91%	18.73%	25.84%	16.06%	22.04%	35.35%	[25,55% ; 30,26%] (> 100,0)	5.79	61.04	0.21	0.76
North Macedonia	98	15.53%	2.84%	13.46%	5.73%	11.80%	17.51%	[12,24% ; 18,81%] (> 100,0)	2.81	9.84	0.16	1.06
Norway	428	31.56%	23.14%	28.73%	17.96%	26.65%	36.85%	[28,99% ; 34,14%] (> 100,0)	7.65	88.14	0.27	0.86
Poland	1,269	39.19%	29.05%	35.22%	23.06%	31.58%	45.00%	[36,23% ; 42,16%] (> 100,0)	25.30	784.78	0.54	1.37
Portugal	68	22.81%	19.25%	22.17%	15.47%	20.07%	28.05%	[20,40% ; 25,21%] (25,8)	1.15	1.06	0.10	0.44
Romania	105	23.95%	16.29%	20.30%	12.05%	17.06%	24.22%	[19,50% ; 28,40%] (> 100,0)	3.49	13.92	0.23	0.96
Russia	284	21.06%	17.55%	20.13%	14.06%	17.96%	25.73%	[19,89% ; 22,23%] (> 100,0)	1.54	2.88	0.10	0.48
Slovenia	44	26.24%	12.02%	21.17%	10.83%	15.30%	28.03%	[16,24% ; 36,24%] (> 100,0)	3.96	18.87	0.33	1.25
Spain	445	18.97%	4.79%	17.42%	7.52%	17.07%	24.65%	[17,50% ; 20,44%] (> 100,0)	1.51	3.07	0.16	0.83
Sweden	1,749	35.08%	26.78%	32.97%	21.51%	30.16%	42.58%	[34,11% ; 36,06%] (> 100,0)	2.40	10.35	0.21	0.59
Switzerland	59	23.48%	16.16%	21.64%	12.73%	17.91%	29.31%	[22,06% ; 24,89%] (> 100,0)	2.32	8.66	0.17	0.72
Turkey	702	34.81%	30.15%	32.50%	24.88%	30.37%	38.57%	[33,40% ; 36,21%] (> 100,0)	5.17	45.00	0.19	0.54
United Kingdom	3,481	26.94%	17.65%	25.18%	14.58%	21.88%	34.55%	[26,33% ; 27,54%] (> 100,0)	2.06	8.26	0.18	0.67
Central & Western Europe	**3,931**	**22.25%**	**19.75%**	**25.78%**	**15.79%**	**22.11%**	**33.94%**	**[27,28% ; 28,53%] (> 100,0)**	**4.18**	**40.59**	**0.20**	**0.72**
Southern Europe	**2,378**	**26.64%**	**13.02%**	**24.67%**	**16.56%**	**23.02%**	**31.62%**	**[25,65% ; 27,63%] (> 100,0)**	**16.02**	**467.83**	**0.25**	**0.92**
Scandinavia	**2,973**	**32.22%**	**24.02%**	**30.01%**	**18.55%**	**27.35%**	**39.15%**	**[31,46% ; 32,98%] (> 100,0)**	**4.15**	**42.27**	**0.21**	**0.66**
Britain	**3,624**	**27.10%**	**17.78%**	**25.30%**	**14.58%**	**21.88%**	**34.76%**	**[26,50% ; 27,70%] (> 100,0)**	**2.33**	**11.88**	**0.19**	**0.68**
Eastern Europe	**2,071**	**32.12%**	**15.55%**	**28.66%**	**17.03%**	**25.48%**	**38.50%**	**[30,19% ; 34,06%] (> 100,0)**	**27.39**	**1,013.34**	**0.45**	**1.40**
Total	**14,977**	**28.95%**	**17.78%**	**26.71%**	**16.24%**	**23.61%**	**35.58%**	**[28,54% ; 29,36%] (> 100,0)**	**23.90**	**1,399.99**	**0.26**	**0.89**

Lookback Put OPM, Adjusted Lookback Put OPM and Perpetual Exchange Put OPM, 2021, Holding Period = 9 months

Country / Region	n	$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	kurt	sd	cv
Austria	127	25.41%	16.86%	24.61%	17.66%	22.75%	30.30%	[23,30% ; 27,51%] (37,4)	1.18	1.77	0.12	0.47
Belgium	272	26.68%	21.14%	25.04%	16.27%	23.23%	30.66%	[24,87% ; 28,50%] (> 100,0)	2.01	5.18	0.15	0.57
Bosnia and Herzegovina	42	21.76%	8.59%	20.56%	11.20%	19.59%	28.51%	[16,97% ; 26,55%] (13,8)	1.11	1.29	0.15	0.71
Bulgaria	38	21.56%	18.06%	21.52%	15.70%	21.60%	25.91%	[19,06% ; 24,05%] (17,6)	-0.01	-0.34	0.08	0.35
Croatia	42	24.84%	15.17%	21.61%	11.45%	15.57%	31.27%	[17,88% ; 31,80%] (78,5)	2.51	7.43	0.22	0.90
Cyprus	115	35.31%	19.98%	28.10%	17.80%	25.54%	33.86%	[26,52% ; 44,10%] (> 100,0)	5.24	30.18	0.48	1.35
Czech Republic	34	20.47%	4.09%	18.48%	10.68%	13.80%	26.41%	[13,56% ; 27,38%] (78,7)	2.54	8.46	0.20	0.97
Denmark	365	34.39%	26.14%	31.80%	20.08%	27.90%	40.97%	[31,89% ; 36,89%] (> 100,0)	5.31	53.48	0.24	0.71
Estonia	40	22.64%	16.29%	21.69%	13.66%	20.57%	28.62%	[18,61% ; 26,67%] (13,0)	1.06	1.18	0.13	0.56
Finland	381	28.08%	22.98%	26.71%	18.36%	24.35%	33.75%	[26,69% ; 29,46%] (> 100,0)	1.58	2.82	0.14	0.49
France	1,186	32.41%	25.00%	30.33%	19.78%	26.79%	39.41%	[31,30% ; 33,51%] (> 100,0)	2.38	9.44	0.19	0.60
Germany	1,328	36.39%	26.51%	32.97%	21.56%	29.08%	41.92%	[34,77% ; 38,01%] (> 100,0)	6.43	69.62	0.30	0.83
Greece	265	35.49%	25.11%	29.88%	20.28%	28.34%	37.00%	[26,78% ; 44,20%] (> 100,0)	15.17	240.68	0.72	2.03
Hungary	56	26.05%	20.04%	24.64%	16.74%	23.47%	31.12%	[22,05% ; 30,04%] (43,1)	1.94	4.85	0.15	0.57
Iceland	50	21.21%	15.70%	20.19%	14.30%	16.98%	22.15%	[17,58% ; 24,84%] (36,1)	2.00	4.17	0.13	0.60
Ireland	143	36.77%	25.80%	32.64%	18.49%	26.60%	43.90%	[31,27% ; 42,27%] (> 100,0)	5.16	38.84	0.33	0.91
Italy	670	26.96%	23.05%	25.62%	19.32%	24.06%	30.79%	[26,01% ; 27,91%] (> 100,0)	2.49	10.67	0.13	0.46
Lithuania	54	19.08%	15.92%	18.13%	13.27%	16.84%	21.12%	[16,45% ; 21,72%] (52,8)	2.11	5.37	0.10	0.51
Luxembourg	130	32.00%	24.29%	30.85%	20.59%	28.32%	39.29%	[29,16% ; 34,85%] (> 100,0)	1.73	5.55	0.16	0.51
Malta	22	36.25%	27.95%	34.09%	21.38%	33.17%	45.93%	[27,48% ; 45,02%] (12,3)	1.68	4.44	0.20	0.55
Netherlands	317	32.50%	22.36%	29.87%	19.68%	26.38%	39.06%	[29,57% ; 35,44%] (> 100,0)	7.75	96.08	0.27	0.82
North Macedonia	98	18.98%	3.47%	16.22%	6.98%	14.30%	20.11%	[14,82% ; 23,14%] (> 100,0)	3.05	11.59	0.21	1.09
Norway	428	37.80%	27.48%	34.08%	22.06%	31.13%	44.63%	[34,37% ; 41,24%] (> 100,0)	8.88	110.08	0.36	0.96
Poland	1,269	48.59%	35.14%	42.90%	27.74%	38.30%	54.24%	[44,29% ; 52,89%] (> 100,0)	26.74	847.36	0.78	1.61
Portugal	68	26.88%	22.93%	25.90%	18.86%	24.21%	32.65%	[24,06% ; 29,69%] (25,9)	1.51	2.98	0.12	0.43
Romania	105	29.48%	19.81%	24.53%	14.76%	20.48%	29.99%	[23,68% ; 35,27%] (> 100,0)	3.74	15.81	0.30	1.02
Russia	284	25.78%	21.37%	24.52%	17.11%	22.00%	31.14%	[24,30% ; 27,26%] (> 100,0)	1.68	3.54	0.13	0.49
Slovenia	44	32.34%	14.59%	25.32%	13.27%	18.83%	31.04%	[19,07% ; 45,61%] (> 100,0)	4.26	21.32	0.44	1.35
Spain	445	22.22%	5.83%	20.71%	8.76%	20.53%	29.45%	[20,61% ; 23,84%] (> 100,0)	1.20	1.84	0.17	0.78
Sweden	1,749	41.76%	31.90%	38.91%	25.64%	35.76%	50.64%	[40,54% ; 42,97%] (> 100,0)	2.99	15.54	0.26	0.62
Switzerland	59	26.51%	19.14%	24.54%	15.62%	20.82%	31.89%	[24,97% ; 28,06%] (> 100,0)	3.24	19.71	0.19	0.70
Turkey	702	42.76%	36.50%	39.65%	29.80%	36.48%	47.52%	[40,89% ; 44,64%] (> 100,0)	5.59	51.58	0.25	0.59
United Kingdom	3,481	31.61%	21.02%	29.40%	17.49%	26.04%	39.73%	[30,89% ; 32,33%] (> 100,0)	2.61	14.07	0.22	0.68
Central & Western Europe	**3,931**	**25.23%**	**23.49%**	**29.73%**	**19.10%**	**26.19%**	**38.17%**	**[31,51% ; 33,00%] (> 100,0)**	**6.05**	**76.66**	**0.24**	**0.74**
Southern Europe	**2,378**	**32.29%**	**15.79%**	**29.75%**	**19.98%**	**27.81%**	**37.88%**	**[30,96% ; 33,62%] (> 100,0)**	**19.37**	**618.15**	**0.33**	**1.02**
Scandinavia	**2,973**	**38.18%**	**28.55%**	**35.34%**	**22.38%**	**32.25%**	**46.24%**	**[37,23% ; 39,14%] (> 100,0)**	**5.43**	**66.53**	**0.27**	**0.70**
Britain	**3,624**	**31.81%**	**21.17%**	**29.52%**	**17.51%**	**26.09%**	**39.95%**	**[31,09% ; 32,54%] (> 100,0)**	**3.02**	**20.26**	**0.22**	**0.70**
Eastern Europe	**2,071**	**39.73%**	**18.93%**	**34.84%**	**20.45%**	**30.74%**	**46.06%**	**[36,96% ; 42,50%] (> 100,0)**	**29.84**	**1,142.56**	**0.64**	**1.62**
Total	**14,977**	**34.37%**	**21.31%**	**31.45%**	**19.58%**	**28.15%**	**41.28%**	**[33,82% ; 34,91%] (> 100,0)**	**31.81**	**2,101.28**	**0.34**	**0.99**

Lookback Put OPM, Adjusted Lookback Put OPM and Perpetual Exchange Put OPM, 2021, Holding Period = 1 year

Country / Region	n	$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	kurt	sd	cv
Austria	127	27.72%	18.94%	27.10%	20.25%	25.26%	33.43%	[25,64% ; 29,79%] (32,9)	0.96	1.40	0.12	0.43
Belgium	272	29.44%	23.75%	27.63%	18.70%	25.47%	33.32%	[27,48% ; 31,40%] (> 100,0)	2.32	7.89	0.16	0.56
Bosnia and Herzegovina	42	25.14%	9.90%	23.63%	12.96%	22.53%	31.98%	[19,51% ; 30,78%] (13,6)	1.22	1.65	0.18	0.72
Bulgaria	38	24.87%	20.77%	24.80%	18.11%	24.41%	30.34%	[21,93% ; 27,82%] (17,3)	0.09	-0.30	0.09	0.36
Croatia	42	28.72%	17.17%	24.73%	12.57%	18.14%	36.29%	[20,39% ; 37,05%] (99,0)	2.66	8.32	0.27	0.93
Cyprus	115	40.97%	22.83%	31.86%	20.55%	29.46%	39.60%	[29,99% ; 51,95%] (> 100,0)	5.46	32.19	0.59	1.45
Czech Republic	34	23.69%	4.71%	21.24%	12.21%	15.88%	29.69%	[15,49% ; 31,90%] (> 100,0)	2.70	9.56	0.24	0.99
Denmark	365	38.69%	29.51%	35.70%	22.81%	31.74%	45.75%	[35,73% ; 41,64%] (> 100,0)	6.39	71.84	0.29	0.74
Estonia	40	26.14%	18.74%	24.95%	15.56%	23.27%	33.17%	[21,39% ; 30,89%] (12,7)	1.16	1.53	0.15	0.57
Finland	381	31.20%	25.77%	29.75%	21.28%	27.04%	35.92%	[29,72% ; 32,69%] (> 100,0)	1.60	3.04	0.15	0.47
France	1,186	36.34%	28.21%	33.78%	22.54%	30.14%	43.05%	[35,06% ; 37,61%] (> 100,0)	2.85	13.30	0.22	0.62
Germany	1,328	40.69%	29.88%	36.50%	24.49%	33.00%	46.13%	[38,75% ; 42,64%] (> 100,0)	7.57	89.47	0.36	0.89
Greece	265	41.23%	28.62%	34.11%	23.07%	31.32%	41.69%	[29,88% ; 52,58%] (> 100,0)	15.40	245.81	0.94	2.28
Hungary	56	30.10%	23.03%	28.35%	19.21%	26.47%	36.53%	[25,34% ; 34,86%] (54,3)	2.07	5.48	0.18	0.59
Iceland	50	23.70%	17.49%	22.60%	16.41%	19.46%	25.89%	[19,79% ; 27,62%] (67,7)	2.25	6.51	0.14	0.58
Ireland	143	41.72%	29.22%	36.35%	21.22%	30.13%	47.88%	[34,97% ; 48,47%] (> 100,0)	5.70	45.06	0.41	0.98
Italy	670	30.77%	26.36%	29.33%	22.04%	27.50%	35.31%	[29,70% ; 31,85%] (> 100,0)	2.59	12.84	0.14	0.46
Lithuania	54	21.81%	18.26%	20.82%	15.12%	19.28%	24.68%	[18,86% ; 24,76%] (49,1)	2.05	5.25	0.11	0.50
Luxembourg	130	35.84%	27.43%	34.52%	23.55%	32.18%	44.80%	[32,64% ; 39,04%] (> 100,0)	2.09	8.67	0.18	0.51
Malta	22	41.30%	31.81%	38.49%	24.73%	37.93%	50.22%	[30,86% ; 51,74%] (21,2)	1.97	5.74	0.24	0.57
Netherlands	317	36.45%	25.28%	33.14%	22.26%	29.78%	42.42%	[32,89% ; 40,00%] (> 100,0)	8.98	119.14	0.32	0.88
North Macedonia	98	21.93%	4.01%	18.52%	8.03%	16.59%	23.05%	[16,97% ; 26,88%] (> 100,0)	3.24	12.97	0.25	1.13
Norway	428	43.20%	30.92%	38.48%	24.17%	35.47%	49.52%	[38,90% ; 47,50%] (> 100,0)	9.58	122.75	0.45	1.05
Poland	1,269	56.82%	40.13%	49.41%	31.31%	43.43%	61.27%	[51,19% ; 62,45%] (> 100,0)	27.54	883.04	1.02	1.80
Portugal	68	30.33%	25.88%	29.05%	21.74%	27.66%	37.05%	[27,05% ; 33,60%] (42,6)	1.81	4.37	0.14	0.45
Romania	105	34.25%	22.73%	28.06%	16.90%	23.53%	34.96%	[27,17% ; 41,32%] (> 100,0)	3.92	17.12	0.37	1.07
Russia	284	29.77%	24.55%	28.20%	19.51%	25.27%	35.18%	[28,01% ; 31,54%] (> 100,0)	1.79	4.04	0.15	0.51
Slovenia	44	37.70%	16.71%	28.80%	15.37%	20.94%	34.72%	[21,28% ; 54,13%] (> 100,0)	4.45	22.93	0.54	1.43
Spain	445	24.98%	6.69%	23.40%	10.04%	23.36%	33.86%	[23,21% ; 26,75%] (> 100,0)	1.12	1.71	0.19	0.76
Sweden	1,749	47.50%	35.98%	43.79%	28.95%	39.81%	56.48%	[46,03% ; 48,97%] (> 100,0)	3.37	18.81	0.31	0.66
Switzerland	59	29.09%	21.51%	26.90%	17.77%	23.25%	34.07%	[27,38% ; 30,81%] (> 100,0)	4.19	32.20	0.21	0.71
Turkey	702	49.60%	41.70%	45.68%	33.86%	41.34%	56.09%	[47,27% ; 51,93%] (> 100,0)	5.86	56.02	0.31	0.63
United Kingdom	3,481	35.61%	23.71%	32.82%	19.83%	29.33%	43.87%	[34,76% ; 36,45%] (> 100,0)	3.07	18.93	0.25	0.71
Central & Western Europe	**3,931**	**27.75%**	**26.47%**	**32.93%**	**21.70%**	**29.56%**	**42.15%**	**[35,10% ; 36,86%] (> 100,0)**	**7.44**	**105.97**	**0.28**	**0.78**
Southern Europe	**2,378**	**37.14%**	**18.07%**	**33.98%**	**22.79%**	**31.47%**	**43.11%**	**[35,46% ; 38,82%] (> 100,0)**	**21.46**	**717.47**	**0.42**	**1.12**
Scandinavia	**2,973**	**43.31%**	**32.16%**	**39.70%**	**25.44%**	**36.11%**	**51.69%**	**[42,15% ; 44,47%] (> 100,0)**	**6.29**	**83.92**	**0.32**	**0.75**
Britain	**3,624**	**35.85%**	**23.89%**	**32.95%**	**19.88%**	**29.40%**	**43.99%**	**[35,00% ; 36,70%] (> 100,0)**	**3.57**	**27.14**	**0.26**	**0.73**
Eastern Europe	**2,071**	**46.36%**	**21.73%**	**40.03%**	**23.44%**	**34.94%**	**52.68%**	**[42,75% ; 49,96%] (> 100,0)**	**31.28**	**1,220.12**	**0.84**	**1.81**
Total	**14,977**	**39.02%**	**24.17%**	**35.33%**	**22.26%**	**31.79%**	**46.05%**	**[38,33% ; 39,71%] (> 100,0)**	**36.70**	**2,572.59**	**0.43**	**1.10**

Lookback Put OPM, Adjusted Lookback Put OPM and Perpetual Exchange Put OPM, 2021, Holding Period = 1.5 years

Country / Region	n	$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	kurt	sd	cv
Austria	127	31.59%	22.20%	31.09%	23.47%	29.01%	37.40%	[29,45% ; 33,74%] (30,6)	0.72	1.08	0.12	0.39
Belgium	272	34.11%	27.82%	31.89%	22.69%	28.48%	38.51%	[31,79% ; 36,43%] (> 100,0)	2.97	13.65	0.19	0.57
Bosnia and Herzegovina	42	30.87%	12.08%	28.77%	15.80%	26.70%	38.12%	[23,71% ; 38,04%] (14,5)	1.39	2.23	0.23	0.74
Bulgaria	38	30.45%	25.25%	30.31%	22.26%	29.16%	37.24%	[26,68% ; 34,21%] (17,1)	0.26	-0.25	0.11	0.38
Croatia	42	35.38%	20.34%	29.92%	15.44%	22.18%	43.90%	[24,49% ; 46,26%] (> 100,0)	2.87	9.63	0.35	0.99
Cyprus	115	51.02%	27.49%	38.00%	24.91%	33.81%	48.41%	[35,69% ; 66,34%] (> 100,0)	5.70	34.31	0.83	1.63
Czech Republic	34	29.20%	5.76%	25.84%	14.69%	19.37%	35.13%	[18,61% ; 39,79%] (> 100,0)	2.96	11.25	0.30	1.04
Denmark	365	46.06%	34.81%	42.06%	27.02%	38.00%	53.15%	[42,15% ; 49,97%] (> 100,0)	7.71	95.05	0.38	0.82
Estonia	40	32.06%	22.81%	30.40%	18.65%	27.63%	41.03%	[26,01% ; 38,11%] (13,3)	1.33	2.06	0.19	0.59
Finland	381	36.49%	30.11%	34.72%	25.03%	31.71%	42.74%	[34,74% ; 38,24%] (> 100,0)	1.86	4.73	0.17	0.48
France	1,186	43.05%	33.29%	39.41%	26.77%	35.15%	49.60%	[41,41% ; 44,68%] (> 100,0)	3.45	18.34	0.29	0.67
Germany	1,328	48.14%	35.17%	42.19%	28.95%	37.77%	53.34%	[45,50% ; 50,78%] (> 100,0)	8.81	112.50	0.49	1.02
Greece	265	51.40%	34.29%	41.20%	27.90%	36.70%	49.84%	[34,75% ; 68,04%] (> 100,0)	15.62	250.51	1.38	2.68
Hungary	56	36.98%	27.97%	34.57%	23.37%	31.18%	45.24%	[30,81% ; 43,16%] (74,3)	2.26	6.38	0.23	0.62
Iceland	50	27.91%	20.22%	26.42%	19.95%	23.84%	29.03%	[23,33% ; 32,49%] (> 100,0)	2.83	11.54	0.16	0.58
Ireland	143	50.34%	34.65%	42.60%	25.90%	36.28%	52.68%	[41,09% ; 59,59%] (> 100,0)	6.28	52.06	0.56	1.11
Italy	670	37.22%	31.77%	35.45%	26.30%	33.36%	42.98%	[35,89% ; 38,55%] (> 100,0)	2.92	17.34	0.18	0.47
Lithuania	54	26.40%	22.12%	25.25%	18.39%	23.38%	30.82%	[22,82% ; 29,98%] (70,3)	2.17	6.52	0.13	0.50
Luxembourg	130	42.36%	32.39%	40.37%	28.37%	37.31%	48.34%	[38,36% ; 46,36%] (> 100,0)	2.67	13.20	0.23	0.54
Malta	22	49.94%	38.00%	45.90%	30.38%	45.36%	59.29%	[36,16% ; 63,71%] (34,2)	2.30	7.03	0.31	0.62
Netherlands	317	43.24%	29.89%	38.50%	26.44%	34.90%	47.73%	[38,40% ; 48,07%] (> 100,0)	10.31	145.21	0.44	1.01
North Macedonia	98	26.97%	4.89%	22.33%	9.76%	19.63%	28.51%	[20,54% ; 33,40%] (> 100,0)	3.52	15.05	0.32	1.19
Norway	428	52.60%	36.30%	45.77%	28.25%	41.72%	56.87%	[46,56% ; 58,64%] (> 100,0)	10.33	137.06	0.64	1.21
Poland	1,269	71.31%	48.21%	60.51%	37.55%	51.80%	74.81%	[63,02% ; 79,61%] (> 100,0)	28.42	922.33	1.51	2.11
Portugal	68	36.16%	30.53%	34.33%	26.08%	32.65%	40.65%	[31,93% ; 40,38%] (73,1)	2.14	5.73	0.17	0.48
Romania	105	42.52%	27.55%	33.95%	20.41%	27.84%	43.73%	[33,01% ; 52,04%] (> 100,0)	4.15	18.81	0.49	1.16
Russia	284	36.54%	29.80%	34.37%	23.72%	30.70%	42.40%	[34,26% ; 38,82%] (> 100,0)	1.96	4.77	0.20	0.53
Slovenia	44	47.22%	20.19%	34.61%	18.54%	24.88%	42.66%	[24,64% ; 69,79%] (> 100,0)	4.69	24.96	0.74	1.57
Spain	445	29.64%	8.11%	27.77%	12.18%	27.65%	41.27%	[27,55% ; 31,72%] (> 100,0)	1.23	2.58	0.22	0.76
Sweden	1,749	57.43%	42.39%	51.98%	34.05%	46.02%	66.35%	[55,45% ; 59,42%] (> 100,0)	3.78	22.41	0.42	0.74
Switzerland	59	33.48%	25.19%	30.71%	20.53%	27.53%	38.99%	[31,38% ; 35,58%] (> 100,0)	5.69	53.17	0.25	0.76
Turkey	702	61.40%	50.14%	55.86%	40.06%	49.85%	70.19%	[58,17% ; 64,63%] (> 100,0)	6.19	61.89	0.44	0.71
United Kingdom	3,481	42.45%	27.95%	38.43%	23.41%	34.40%	50.33%	[41,36% ; 43,54%] (> 100,0)	3.70	25.74	0.33	0.77
Central & Western Europe	**3,931**	**32.01%**	**31.15%**	**38.11%**	**25.63%**	**34.42%**	**48.24%**	**[41,20% ; 43,53%] (> 100,0)**	**9.14**	**144.85**	**0.37**	**0.88**
Southern Europe	**2,378**	**45.50%**	**21.80%**	**40.95%**	**27.15%**	**37.57%**	**51.72%**	**[43,13% ; 47,87%] (> 100,0)**	**23.94**	**840.54**	**0.59**	**1.30**
Scandinavia	**2,973**	**52.16%**	**37.80%**	**46.91%**	**29.84%**	**41.95%**	**60.41%**	**[50,59% ; 53,73%] (> 100,0)**	**7.32**	**106.62**	**0.44**	**0.84**
Britain	**3,624**	**42.76%**	**28.16%**	**38.58%**	**23.53%**	**34.46%**	**50.54%**	**[41,65% ; 43,87%] (> 100,0)**	**4.31**	**36.84**	**0.34**	**0.80**
Eastern Europe	**2,071**	**57.97%**	**26.35%**	**48.81%**	**28.11%**	**41.84%**	**62.52%**	**[52,69% ; 63,24%] (> 100,0)**	**32.89**	**1,308.64**	**1.22**	**2.11**
Total	**14,977**	**47.06%**	**28.74%**	**41.70%**	**26.40%**	**37.27%**	**53.55%**	**[46,09% ; 48,03%] (> 100,0)**	**42.34**	**3,148.60**	**0.61**	**1.29**

Lookback Put OPM, Adjusted Lookback Put OPM and Perpetual Exchange Put OPM, 2021, Holding Period = 2 years

Country / Region	n	$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	kurt	sd	cv
Austria	127	34.88%	24.74%	34.31%	25.93%	32.09%	42.25%	[32,55% ; 37,21%] (25,4)	0.76	1.43	0.13	0.38
Belgium	272	38.09%	30.97%	35.41%	25.01%	31.47%	43.00%	[35,36% ; 40,82%] (> 100,0)	3.45	17.87	0.23	0.60
Bosnia and Herzegovina	42	35.77%	13.91%	33.09%	18.08%	30.35%	44.89%	[27,20% ; 44,34%] (16,5)	1.52	2.68	0.27	0.77
Bulgaria	38	35.17%	28.98%	34.96%	25.36%	33.41%	43.85%	[30,65% ; 39,69%] (17,3)	0.39	-0.22	0.14	0.39
Croatia	42	41.16%	22.85%	34.28%	17.74%	25.50%	48.34%	[27,85% ; 54,46%] (> 100,0)	3.03	10.54	0.43	1.04
Cyprus	115	60.09%	31.29%	43.16%	28.17%	39.40%	54.99%	[40,44% ; 79,73%] (> 100,0)	5.82	35.42	1.06	1.77
Czech Republic	34	33.95%	6.65%	29.73%	16.72%	22.29%	39.55%	[21,13% ; 46,77%] (> 100,0)	3.15	12.51	0.37	1.08
Denmark	365	52.47%	38.97%	47.25%	30.41%	41.93%	57.93%	[47,58% ; 57,36%] (> 100,0)	8.43	108.39	0.48	0.91
Estonia	40	37.10%	26.18%	34.98%	21.14%	31.66%	46.87%	[29,85% ; 44,35%] (14,6)	1.46	2.47	0.23	0.61
Finland	381	40.99%	33.46%	38.77%	27.67%	34.79%	47.51%	[38,94% ; 43,05%] (> 100,0)	2.11	6.25	0.20	0.50
France	1,186	48.85%	37.26%	44.09%	29.96%	39.33%	54.42%	[46,84% ; 50,85%] (> 100,0)	3.78	21.13	0.35	0.72
Germany	1,328	54.68%	39.30%	46.84%	32.29%	42.07%	59.94%	[51,33% ; 58,03%] (> 100,0)	9.43	124.94	0.62	1.14
Greece	265	60.50%	38.86%	47.03%	30.84%	41.45%	56.60%	[38,55% ; 82,46%] (> 100,0)	15.72	252.72	1.82	3.00
Hungary	56	42.88%	32.06%	39.82%	26.43%	35.59%	51.23%	[35,39% ; 50,38%] (90,6)	2.39	6.99	0.28	0.65
Iceland	50	31.48%	22.28%	29.55%	22.72%	27.33%	34.05%	[26,17% ; 36,79%] (> 100,0)	3.29	15.39	0.19	0.59
Ireland	143	57.97%	38.94%	47.91%	29.42%	39.36%	59.05%	[46,23% ; 69,72%] (> 100,0)	6.59	56.00	0.71	1.23
Italy	670	42.72%	36.17%	40.52%	29.87%	37.85%	49.12%	[41,12% ; 44,32%] (> 100,0)	3.20	20.47	0.21	0.49
Lithuania	54	30.29%	25.30%	28.83%	20.90%	26.56%	36.18%	[26,09% ; 34,49%] (> 100,0)	2.34	7.82	0.15	0.51
Luxembourg	130	47.96%	36.28%	45.26%	32.57%	41.74%	55.64%	[43,11% ; 52,82%] (> 100,0)	3.02	15.67	0.28	0.58
Malta	22	57.43%	42.95%	52.20%	35.20%	47.60%	65.14%	[40,37% ; 74,50%] (41,4)	2.45	7.60	0.38	0.67
Netherlands	317	49.16%	33.52%	42.94%	29.53%	38.13%	52.06%	[43,03% ; 55,29%] (> 100,0)	11.00	159.25	0.55	1.13
North Macedonia	98	31.34%	5.64%	25.51%	11.28%	22.44%	33.44%	[23,52% ; 39,16%] (> 100,0)	3.73	16.57	0.39	1.24
Norway	428	60.90%	40.48%	51.97%	31.63%	46.25%	64.98%	[53,11% ; 68,69%] (> 100,0)	10.75	145.23	0.82	1.35
Poland	1,269	84.30%	54.73%	70.11%	42.45%	57.36%	87.91%	[73,34% ; 95,25%] (> 100,0)	28.89	943.55	1.99	2.36
Portugal	68	41.14%	34.18%	38.77%	29.02%	36.23%	47.72%	[35,97% ; 46,31%] (88,9)	2.28	6.25	0.21	0.52
Romania	105	49.81%	31.52%	38.91%	23.17%	31.75%	50.22%	[37,92% ; 61,70%] (> 100,0)	4.29	19.86	0.61	1.23
Russia	284	42.32%	34.13%	39.57%	27.21%	35.50%	47.43%	[39,55% ; 45,09%] (> 100,0)	2.07	5.27	0.24	0.56
Slovenia	44	55.79%	23.04%	39.54%	20.42%	27.63%	47.36%	[27,16% ; 84,42%] (> 100,0)	4.84	26.21	0.94	1.69
Spain	445	33.61%	9.28%	31.36%	14.16%	31.35%	46.03%	[31,20% ; 36,02%] (> 100,0)	1.43	3.69	0.26	0.77
Sweden	1,749	66.14%	47.40%	59.00%	37.88%	51.52%	75.19%	[63,65% ; 68,64%] (> 100,0)	3.99	24.36	0.53	0.80
Switzerland	59	37.25%	28.05%	33.77%	22.82%	30.69%	42.37%	[34,73% ; 39,77%] (> 100,0)	6.64	67.24	0.30	0.81
Turkey	702	71.73%	56.95%	64.59%	44.59%	56.58%	82.42%	[67,61% ; 75,85%] (> 100,0)	6.40	65.78	0.56	0.77
United Kingdom	3,481	48.39%	31.27%	43.13%	26.15%	38.36%	55.63%	[47,04% ; 49,73%] (> 100,0)	4.09	30.23	0.40	0.84
Central & Western Europe	**3,931**	**35.64%**	**34.80%**	**42.34%**	**28.79%**	**38.06%**	**53.16%**	**[46,45% ; 49,36%] (> 100,0)**	**10.08**	**168.40**	**0.47**	**0.97**
Southern Europe	**2,378**	**52.79%**	**24.86%**	**46.79%**	**30.56%**	**42.55%**	**59.20%**	**[49,72% ; 55,87%] (> 100,0)**	**25.37**	**914.12**	**0.76**	**1.45**
Scandinavia	**2,973**	**59.90%**	**42.19%**	**53.04%**	**33.39%**	**46.91%**	**66.65%**	**[57,92% ; 61,89%] (> 100,0)**	**7.92**	**121.20**	**0.55**	**0.92**
Britain	**3,624**	**48.77%**	**31.52%**	**43.30%**	**26.25%**	**38.42%**	**55.74%**	**[47,39% ; 50,14%] (> 100,0)**	**4.76**	**43.38**	**0.42**	**0.86**
Eastern Europe	**2,071**	**68.30%**	**30.15%**	**56.33%**	**31.87%**	**47.41%**	**70.57%**	**[61,36% ; 75,24%] (> 100,0)**	**33.78**	**1,357.67**	**1.61**	**2.36**
Total	**14,977**	**54.09%**	**32.36%**	**47.07%**	**29.66%**	**41.70%**	**59.81%**	**[52,83% ; 55,35%] (> 100,0)**	**45.51**	**3,486.80**	**0.79**	**1.45**

Perpetual Exchange Put OPM, 2021

Country / Region	n	$\bar{x}_a$	$\bar{x}_h$	$\bar{x}_t$	Q_1	Q_2	Q_3	95% (JB)	sk	kurt	sd	cv
Austria	35	37.72%	29.13%	37.86%	29.00%	35.66%	45.45%	[33,18% ; 42,26%] (9,8)	0.25	0.46	0.13	0.35
Belgium	64	37.87%	31.99%	36.84%	26.26%	31.28%	49.59%	[33,82% ; 41,92%] (28,7)	1.01	0.41	0.16	0.43
Denmark	57	47.42%	36.57%	46.94%	31.74%	44.61%	60.94%	[41,70% ; 53,13%] (26,1)	0.59	-0.10	0.22	0.45
Finland	77	38.95%	28.74%	38.45%	26.96%	34.90%	48.44%	[35,15% ; 42,75%] (26,4)	0.71	0.51	0.17	0.43
France	204	43.41%	37.37%	42.71%	32.32%	40.80%	52.80%	[41,18% ; 45,63%] (76,2)	0.66	0.31	0.16	0.37
Germany	264	49.84%	42.95%	49.22%	34.72%	46.84%	62.96%	[47,59% ; 52,09%] (> 100,0)	0.51	-0.54	0.19	0.37
Greece	17	40.36%	34.87%	40.36%	28.77%	35.60%	41.06%	[30,42% ; 50,29%] (12,1)	2.04	3.60	0.19	0.48
Ireland	21	45.96%	42.09%	45.69%	37.14%	45.89%	51.18%	[39,98% ; 51,93%] (5,7)	0.57	0.72	0.13	0.29
Italy	32	48.24%	39.15%	47.89%	32.22%	47.12%	62.52%	[41,14% ; 55,33%] (17,5)	0.34	-0.56	0.20	0.41
Luxembourg	22	43.91%	36.49%	43.99%	34.38%	44.22%	54.06%	[36,68% ; 51,13%] (13,4)	-0.01	-0.83	0.16	0.37
Netherlands	59	42.72%	37.80%	41.64%	31.25%	38.80%	50.01%	[38,50% ; 46,94%] (19,4)	1.30	1.92	0.16	0.38
Norway	56	37.89%	28.24%	36.98%	23.06%	30.87%	52.97%	[32,51% ; 43,27%] (25,5)	0.87	0.19	0.20	0.53
Portugal	10	31.43%	28.31%	31.43%	27.08%	32.99%	38.27%	[25,44% ; 37,43%] (4,5)	-0.84	0.17	0.08	0.27
Spain	43	46.05%	17.28%	46.23%	28.85%	46.75%	59.88%	[39,40% ; 52,69%] (20,1)	-0.03	-0.35	0.22	0.47
Sweden	221	48.35%	39.17%	48.00%	35.30%	44.94%	62.00%	[45,83% ; 50,87%] (> 100,0)	0.33	-0.44	0.19	0.39
Switzerland	145	38.74%	31.35%	38.10%	24.98%	34.40%	48.42%	[35,94% ; 41,54%] (78,9)	0.63	-0.39	0.17	0.44
United Kingdom	575	38.75%	27.98%	37.98%	24.46%	36.69%	50.65%	[37,22% ; 40,29%] (> 100,0)	0.58	-0.06	0.19	0.48
Central & Western Europe	**797**	**43.92%**	**36.70%**	**43.15%**	**30.95%**	**40.41%**	**55.03%**	**[42,69% ; 45,15%] (> 100,0)**	**0.66**	**-0.05**	**0.18**	**0.40**
Southern Europe	**118**	**43.61%**	**24.36%**	**43.11%**	**28.37%**	**39.16%**	**54.56%**	**[39,83% ; 47,39%] (53,2)**	**0.53**	**-0.11**	**0.21**	**0.48**
Scandinavia	**419**	**44.78%**	**33.36%**	**44.22%**	**30.10%**	**41.85%**	**58.15%**	**[42,88% ; 46,68%] (> 100,0)**	**0.47**	**-0.24**	**0.20**	**0.44**
Britain	**596**	**39.01%**	**28.31%**	**38.27%**	**24.78%**	**36.98%**	**50.71%**	**[37,51% ; 40,51%] (> 100,0)**	**0.56**	**-0.06**	**0.19**	**0.48**
Eastern Europe	**13**	**35.61%**	**28.14%**	**35.61%**	**19.56%**	**29.90%**	**48.58%**	**[24,68% ; 46,54%] (4,9)**	**1.05**	**0.85**	**0.18**	**0.51**
Total	**1,943**	**42.52%**	**32.05%**	**41.85%**	**28.88%**	**39.34%**	**53.80%**	**[41,69% ; 43,36%] (> 100,0)**	**0.56**	**-0.09**	**0.19**	**0.44**

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News from IVSC

IVSC and IOSCO formalise cooperation

The International Organization of Securities Commissions ("IOSCO"), the global standard setter for securities regulation, and the IVSC, have entered into a Statement of Cooperation aimed at developing a better understanding of the quality and consistency of valuations and the professional standards employed by valuers internationally, with the objective of mitigating risks to the quality of financial information for the protection of investors and for the stability of the financial system. The Statement of Cooperation, signed by IOSCO Board Chair and CEO of Securities and Futures Commission of Hong Kong, Ashley Alder, and IVSC Chair, Alistair Darling, outlines steps both organisations will take to enhance their cooperation and build mutual understanding of the landscape surrounding the valuation profession and standard-setting process, including governance, due process and credentialing. It follows a roundtable meeting earlier this year, during which senior leaders of standard-setting, regulatory, audit, investor and valuation organisations encouraged IVSC and IOSCO to work together to improve the quality and consistency of valuations across international markets. You can read more about this development, here.

Latest IVSC Perspectives Papers

Automated Valuation Models & Residential Valuation

The latest IVSC Perspectives Paper, ‚Automated Valuation Models and Residential Valuation', looks at the rapid evolution in technology and data which is supporting the valuation process. In particular, the paper considers the growth in AVMs in residential valuation and asks "can an AVM ever produce an IVS-compliant valuation?" You can download the Perspectives Paper form the IVSC website, here.

Rethinking Brand Value

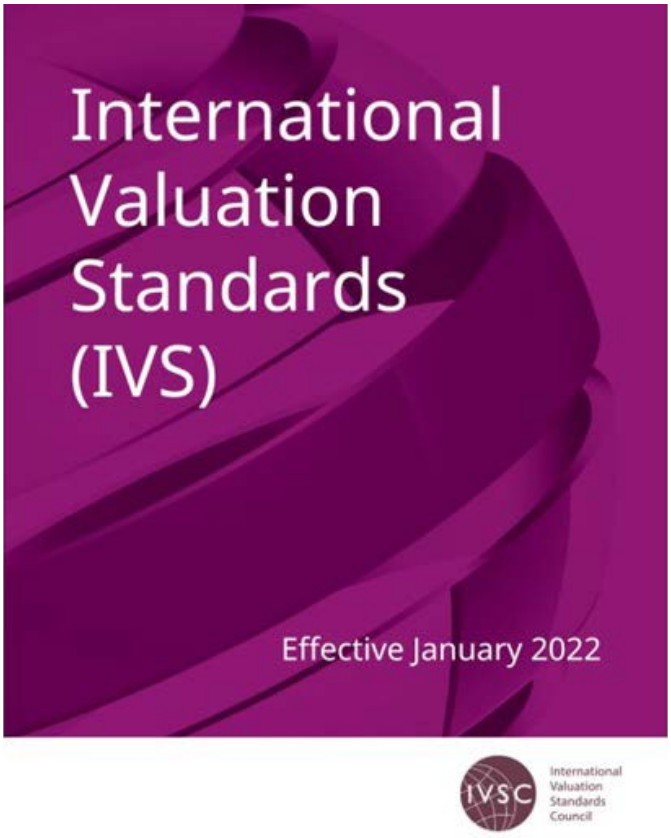
The third paper in the IVSC's Intangible Assets series looks at Brand Value and takes a deeper dive into brands and reputation value creation. The limitation of the current reporting frameworks to convey value creation and preservation activities is largely because the prevailing value creation strategies that existed when the standards were enacted decades ago, have evolved. As many current business models have evolved over decades, namely, to rely more heavily on intangible assets at the expense of tangible, the standards and the economics have become misaligned. This article series looks to contribute to realigning accounting and reporting standards with the value creation and preservation strategies utilised in modern business models. You can download the Perspectives Paper form the IVSC website, here.

IVSC announces new Trustees

IVSC is pleased to announce three new appointments to its Board of Trustees. New Trustees were confirmed by the IVSC's Nominations Committee during the 2022 AGM in Fort Lauderdale and will take up their roles from October 2022, on an initial three-year term.

- **Marcelo Barbosa** (Brazil) was President of the Brazilian Securities and Exchange Commission (CVM) from 2017-2022.
- **Japheth Katto** (Uganda), is a corporate governance and financial services regulation consultant and former CEO of Uganda's Capital Markets Authority (CMA) for 16 years.
- **Narayan K. Seshadri** (India), is a qualified Chartered Accountantand former Managing Partner of KPMG, India. He is also is non-executive Chairman of several listed Indian companies including PI Industries, AstraZeneca Pharma India.

IVS General Standards Update Project 2023



The International Valuation Standards (IVS) are updated on a two-yearly cycle, the last substantive update coming into effect earlier this year (January 2022). As part of this process, the IVSC's technical boards issue an Exposure Draft for consultation, which is open for comment for a twelve-week period. The next Exposure Draft will be issued in April 2023 and, subject to feedback, the IVSC expects to launch an update to IVS in January 2024 with an effective date of July 2024.

Next year's Exposure Draft will focus in particular on updates to the General Standards – the part of IVS that applies to all valuations, regardless of asset type or valuation purpose. These changes are being looked at as part of a 'General Standards Improvement Project'. Historically, the IVS have focused almost exclusively on the role of the 'valuer'. However, many other participants are involved in the valuation process, including specialists, service providers, data providers etc. The updated General Standards will focus on enhancing transparency in this process and setting out the minimum requirements of all parties involved in an IVS-compliant valuation. You can find out more about the General Standards Improvement Project and the IVS Exposure Draft in future editions of the IVSC's eNews.

News from EACVA

Thank You for Your Great Feedback on the Release of the EBVM!

We were very pleased with the positive feedback we received on our first issue of EBVM. Thousands of downloads give us an indication that there is a need for a professional publication in the middle between theory and practice. If you would like to publish an article or have a suggestions on how to develop the magazine further, please e-mail us at ebvm@eacva.de. Subject areas of your article could be e.g.: valuation methodology assessment, application of income-, market- and cost approach; normalizing adjustments; prospective financial information; stage models; terminal value; surplus assets; capital market related topics; discount rates; risk = danger + opportunity; valuation uncertainty related issues (how to handle and cope); controlling vs. minority interest; small and mid-sized privately held companies; valuation adjustments: discounts & premia; report writing skills; price vs. value; valuation related European legislation; empirical findings; application of International Valuation Standards; excel skills for valuation professionals; quality review skills e.g. usage of toolkits for financial modelling reviews; soft skills for valuation professionals; data sources; EU Law related to business and itangible asset valuation; international taxation and valuation (e.g. transfer pricing or country specific developments), etc. *We look forward to your ideas!*

More than 300 Attendees from 17 Countries at EACVA's Conference

EACVA hosted its 15th Annual International Business Valuation Conference on 3 and 4 November 2022 in Vienna – one of the most beautiful cities in Europe. The event brought together more than 300 business valuation professionals, corporate finance and tax consultants, analysts, controllers, lawyers and academics from 17 different countries and five continents. We all enjoyed the face-to-face contact with our speakers and participants and the opportunity to meet colleagues again and get to know new ones.

As a Valuation Professional Organisation (VPO) member of the IVSC, EACVA plays a hugely important role in bringing together business valuation practitioners to discuss and debate the major trends shaping the profession. This year's conference was no exception, with a packed programme of top speakers tackling an array of topical subjects, EACVA's conference provided an exciting learning opportunity for all attendees while connecting and networking with other valuation professionals. The full programme included two keynote sessions, a panel discussion and 21 parallel sessions over two days, with topics ranging from current trends in business valuation, to ESG and peer group selection using artificial intelligence technology. We will summarize some of the conference sessions in the next issue of the EBVM. One of the highlights of this year's conference was the the networking dinner at the magnificent Garden Palace of the princely family of Liechtenstein.

Save the date! EACVA's 16th International Annual Business Valuation Conference will be held on 30 November and 1 December 2023 in Berlin, Germany. More details can be found at www.ValuationConference.de.

EACVA Held its 100th CVA Training

In November EACVA reached a new milestone – we were happy to held our 100th CVA credentialing training and exam on 21 – 26 November 2022 in Munich, Germany.

Since 2005 EACVA has been supporting the globally recognized Certified Valuation Analyst (CVA) certification, having trained over 1,400 individuals in Europe. We are very proud to be a part of the Global Association of Certified Valuators and Analysts providing the CVA certification as the only premiere credential in the business valuation and industry in Europe.

Our next international CVA Training classes (in English language) 2023:

- **Live Online: 10 – 17 May 2023** (six-day training / 42 hours of continuing training credit)
- **In-Person: 4 – 8 December 2023** in Berlin (five-day training / 42 hours of continuing training credit)

CVA Training delivers the most comprehensive and complete foundational training teaching to the body of knowledge on how to value business enterprises, on business valuation methodologies, approaches, and case studies, professional standards and ethics, specialty areas of business valuation and valuation of intangible assets practice. *Learn more about the CVA program…*

Around the Valuation World (AVWi) International

To keep our members up to date on industry trends and updates for the business valuation profession on international valuation issues from leading business valuation experts, the Global Association of Certified Valuators and Analysts (GACVA) launched a new exclusive member benefit Around the Valuation World International. The live monthly webcast series is free to view for all members worldwide, so they can be confident that their knowledge is current and accurate at all times. AVWI is designed for business valuation and financial litigation practitioners who wish to advance their skill set and remain current with trends and activities in the financial consulting niches. The webcast is hosted by chapter leaders from Europe (Wolfgang Kniest, CVA I EACVA), Canada (Andrew Neuman, CPA, CA, CFE, CA.IFA, CFF, CVA) and India (Pratik Shah, CVA I ACVA). They interview and engage in technical dialogue with the experts during the live webcast and moderate attendees' questions.

Upcoming events:

- 30 January 2023: Global Economic Conditions Impacting Business Valuation and Appraisal – Simon Rubinsohn, *Chief Economist, Royal Institution of Chartered Surveyors (RICS)*
- 20 February 2023: Buying Performance? The Impact of Multiple Arbitrage in Buy-and-Build Strategies of Private Equity Firms – Prof. Dr. Bernhard Schwetzler, CVA, *Chair Financial Management, HHL Leipzig Graduate School of Management*

Learn more about AVWI and other benefits of EACVA membership...

Interview: Richard Stewart

Richard Stewart OAM (2015) is a Valuation partner at PwC. His experience spans 37 years in Australia, Asia, Europe and the USA across many industries. Richard writes and speaks regularly, having previously published his first book, Strategic Value, in 2012 and his second, Hitting Pay Dirt in 2017. He also blogs regularly. He holds holds a Bec, MBA, FCA (BV specialist), FCPA and SFFin. Richard is also an Adjunct Professor at the University of Technology Sydney and Chair of the BV Board and member of the Standards Review Board of the IVSC.

Wolfgang: Business valuation is not exactly a vocation. Please tell us about your background and how you got to where you are today.

Richard: I started 37 years ago as an auditor, while I was studying part-time. After completing my professional studies and an MBA, I went overseas with my firm. During the time away, I moved into value consulting starting in London and then New York. On my return to Australia, I transitioned to more traditional valuation work. I have been doing that even since, except for a four-year stint in our Federal Government practice.

Wolfgang: When did you start valuing companies and what was the first purpose of valuation?

Richard: The first valuation I worked on was in 1992, for the purpose of a selective share buy-back.

Wolfgang: Which valuation method do you use most often, and why?

Richard: DCF is the most common as it has the most flexibility to describe different businesses in a meaningful way. I also cross check with a variety of other methods (e.g. mutliples) as a preference.

Wolfgang: What do you see as the general importance of business valuations standards and the role of IVS?

Richard: Robust business valuation standards build confidence in business valuation practice around the world, by focusing on consistency and professionalism. The role of the IVS is to promote universal, principles-based standards to enable a common baseline for practice regardless of jurisdiction. In a world of rapid international movement of capital, this common baseline is essential.

Wolfgang: In your opinion, what are the biggest differences between existing business valuation standards worldwide?

Richard: Where they exist, at a level of general principles there is little variation. However, even when they exist the level of detail in guidance varies considerably across territories in ways that can have significant implications for practitioners. Where there are no local standards, there can be very wide disparities across the profession which can create difficulties for the users of valuation reports, who ultimately do not have the expertise to distinguish across this variation. On top of that the legislative and regulatory contexts differs widely across international boundaries. In this environment, the unifying voice of IVS helps to bring clarity and a focus on professionalism.

Wolfgang: How does European business valuation practice differ from the rest of the world?

Richard: The level of national variation in Europe is interesting as a practitioner from elsewhere in the world. Again, the principles don't vary much (in fact. levels of IVS adherence are high, and widely referenced in regulation such as the Mortgage Credit Directive and the Eupoean Banking Association in their paper on valuations for resolutions) but elements of practice that are set out in local valuation standards can and do vary.

Wolfgang: What are your goals as chairman of the Business Valuation Board?

Richard: There are three:

1. Making sure the valuation standards we have remain fit for current practice purposes
2. Reviewing the evolving issues in practice to future proof the standards

3. Contributing to community debates that are relevant to business valuation.

Wolfgang: In your opinion, what are the three biggest challenges in company valuations today, and why?

Richard: The first is clearly intangibles; they already make up more than 90% of the average company's value. They are also focuses for both accountants and tax practitioners and in these areas, valuation is a central question to be addressed by them. Valuers will have much to contribute to these developments.

The second is ESG. Communities' expectations of business have changed much in this area, and disclosures will rapidly change. Assessing how value responds to this increased disclosure will evolve for years to come.

A third is valuation uncertainty and value risk. There is more work for us to do to communicate the uncertainty of our point in time value estimates (eg a valuation range) and also how those values may change over time. In the areas of property and financial instruments, the topic of prudential value is probing this issue and reflections on these disuccions will no doubt impact our thinking on BV.

Wolfgang: How can "big data" and "artificial intelligence" effect business valution today and in the future?

Richard: This is changing all the time, as the boundaries in both these areas get pushed back. Access to the right data is critical, as not in all cricstances is that publically available, and just using what is available can lead to bias in your valuation inputs. Artificial intelligence could allow the codification of rules used by business valuers and expedite the ways in which judgments are formed. As they evolve, these two issues could radically transform valuation practice, as it has already done in algorithmic trading for example. The question will be how valuers use these tools in a way that maintains the confidence in valuation outcomes, which is where the principles-based valuation standards will help as a filter to these innovations.

Wolfgang: Which book(s) in the field of business valuation can you recommend?

Richard: For reasons of impartiality, leaving aside ones I have written, the first I read was the Copeland et al Valuation: Measuring and Managing the Value of Companies, and this remains one of the best introductions to the subject, and the wider commercial implications of it. I also read Damodaran's books and for reflections of current practice some of Shannon Pratt's books provide great examples, albeit with a North American flavour.

Wolfgang: What is your favorite professional and personal website?

Richard: Damodaran's website is one of the best public resources for valuers. Naturally PwC's website is excellent for the general business issues, and I find the IVSC website great for the Perspectives Papers. After that its mainly news and intranet sites.

Wolfgang: What apps, gadgets, or tools do you work with (besides your phone and computer), which you can recommend?

Richard: Capital IQ is fabulously helpful for our work and LinkedIn for professional networking. Choosing the best from the other 100 or so apps on my phone is tricky. Duolingo is excellent for language learning (important for international work and travel). Social media, email and calendar apps together with Kindle and Youtube are essential for keeping in contact and informed whether at home or on the road. I also have several apps that facilitate my personal interests in sports and fitness, food and wine, motorcycling, sailing and volunteer firefighting.

Wolfgang: What is the best work/life advice you have ever received?

Richard: Work out your priorities and fit them in first. You can achieve a lot of things with the focus that provides and still have plenty of room for other things. I got this advice 20 years ago and it has really paid off for me. ◆

Certified Valuation Analyst (CVA)

- Business Valuation is a Question of Trust -

Credentialing Training and Exam (in English) Dates 2023

Date	Delivery Method
10 – 17 May 2023	**Live Online** (six-day training: Wednesday to Friday and Monday to Wednesday)
4 – 8 December 2023	**In Person** in **Berlin** (five-day training: Monday to Friday)

For dates of CVA trainings and exams in German language please visit www.eacva.de.

Understanding and applying the generally accepted business valuation methodologies and approaches and adhering to professional standards that govern the business valuation profession, will put you in a stronger position to better serve your clients.

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