Table I-13

Relevering Volatility

Volatility Analysis

(US$ in millions, except per share amounts)

Company	Market Capitalization	Total Debt	Total Invested Capital	5.0 Year Annualized Daily Historical Equity Volatility	Book Value Implied Asset Volatility	Equity Implied Asset Volatility d1	d2	Asset Value (a)	Asset Volatility
Guideline company 1	$1,234	$310	$1,544	26.8%	21.4%	3.87	3.37	$1,475	22.4%
Guideline company 2	693	415	1,108	46.8%	29.2%	1.90	1.16	1,005	33.2%
Guideline company 3	1,151	187	1,338	31.9%	27.4%	3.77	3.14	1,296	28.3%
Guideline company 4	1,264	411	1,675	27.1%	20.5%	3.55	3.06	1,583	21.6%
Guideline company 5	811	799	1,610	27.6%	13.9%	2.55	2.19	1,431	15.8%
Guideline company 6	1,000	222	1,222	38.7%	31.7%	2.96	2.22	1,172	33.1%
Guideline company 7	1,200	325	1,525	50.0%	39.3%	2.33	1.39	1,446	41.9%
Guideline company 8	300	994	1,294	38.3%	8.9%	1.31	1.04	1,058	12.0%
			Mean	**35.9%**	**24.0%**			**Mean**	**26.0%**
			Median	**35.1%**	**24.4%**			**Median**	**25.4%**
								Selected Asset Volatility	**25.0%**

Company	Equity Value	Total Debt	Total Invested Capital		Selected Asset Volatility	d1	d2	Asset Value (a)	Relevered Equity Volatility
Doggo Corp.	$240	$960	$1,200		25.0%	0.54	−0.02	861	63.1%
								Calculated Equity Volatility	**63.0%**

Notes:

(a) The low asset value is an artifact of the iterative approach for relevering, where the book value of debt is treated as a strike price.

I.54 Given this volatility, table I-14, "OPM Assumptions and Allocation of Total Equity Values," summarizes the OPM allocation as of June 30, 2X09. Note that the total equity value consistent with the investment is approximately $254 million, higher than the aggregate $240 million paid for the Class A units in the transaction. Because the private equity investor paid $1,000 per unit with full knowledge that the profits interests would be issued, the value of these profits interests should be treated as incremental to the $1,000 per unit price rather than dilutive. It is not reasonable to assume that the investors took a day one loss due to the issuance of the management interests.

6.35 In general, because the OPM considers the evolution of the equity value without allowing for proceeds raised in additional financings, the allocation does not include the dilution impacts of any additional financings, nor the dilution impacts of any options and warrants that may be issued as the company progresses toward a future liquidity event. That is, even if the company has reserved a pool of options that may be issued to new and existing employees as the company progresses toward a successful liquidity event, only outstanding options and options that will be issued in the short term, irrespective of any changes in the company's value, are included in the allocation.[12]

6.36 The primary limitation of the OPM is that it assumes that future outcomes can be modeled using a lognormal distribution and that it is sensitive to certain key assumptions, such as the volatility assumption (one of the required inputs under the Black-Scholes model), that are not readily subject to contemporaneous or subsequent validation. Additionally, the lack of trading history for a privately held enterprise makes the subjectivity of the volatility assumption a potential limitation on the effectiveness of the method to estimate fair value. Key issues to consider in estimating the volatility are as follows:

a. For early-stage companies, it is likely that the public guideline companies will be larger, more profitable, and more diversified; thus, the appropriate volatility may be best represented by the higher end of the range of comparables, especially for shorter time frames, migrating toward the median of small public companies over the longer term. If no direct competitors are small, high-growth companies, consider using a set of smaller companies from the broader industry to estimate the volatility.

b. For later-stage privately held companies, consideration should be given to the effect of the company's leverage. Although many early-stage firms have limited, if any, debt, later-stage firms or those acquired in a leveraged buy-out may have significant debt financing, the effect of which can be to significantly increase the volatility of the firm's equity. For example, in a company with 75 percent debt, if the value of the company doubles, the value of equity increases by a factor of 5. The general relationship between equity value and asset value can be expressed as follows:

> Equity Value = Total Asset Value × N(d1) – Book Value of Debt × exp(–rT) × N(d2)

In this equation, r is the risk-free rate, T is the time to liquidity, and $d1$ and $d2$ have their standard Black-Scholes definitions based on the asset's volatility. In addition, the relationship between equity volatility and asset volatility can be written as follows:

> Equity Volatility = (Total Asset Value × N(d1) × Asset Volatility)/Total Equity Value

In a highly levered company, it is possible to solve for an asset volatility and equity volatility that satisfy both equations by treating the total asset value as the implied value of assets, given the

[12] More sophisticated lattice or simulation models that consider future financings and option issuances as a function of the change in value of the company over time are also feasible; however, the assumptions regarding the terms and conditions of future financing rounds may be speculative and difficult to estimate.

company's leverage. This approach results in estimates of asset volatility that are internally consistent and better match market data.[13]

c. An alternative approach is to use the firm's enterprise value as the underlying asset. Under this approach, the zero coupon bond equivalent of the debt[14] is modeled as the first breakpoint, modeling the total equity as a call option on the enterprise value. In this approach, the volatility used should be the asset volatility, which would not be affected by the financial leverage. In theory, these two approaches should result in equivalent values. In some cases, however, the allocation of enterprise value instead of equity value may have the effect of shifting value from the senior equity securities to the junior equity securities because the liquidation preference for the senior equity securities is "sandwiched" between the debt and junior securities. (See paragraph I.64 for further discussion.) In practice, rather than allowing the debt holders to claim the full enterprise value as is assumed when allocating enterprise value using the OPM, the controlling investors typically will begin a negotiation process with the debt holders prior to liquidation. Therefore, the task force believes that using the equity value as the underlying asset, considering the fair value of debt, as discussed in paragraphs 5.10–.21, provides a better indication of the relative value of the senior and junior equity securities.

6.37 It may also be difficult under the OPM to take into account the right and ability of preferred shareholders to early exercise (that is, to liquidate the firm earlier than anticipated), which can limit the potential upside to the common shares. The potential for early exercise is most appropriately modeled using a lattice or simulation model. Additionally, for early-stage firms, the next round of financing may be highly uncertain. Using a term in the OPM based on the expected time to exit, including the likelihood of dissolution in the short term, while still estimating the *discount for lack of marketability* based on the expected time to a successful exit may provide a more representative value for common stock in situations in which the company's ability to raise the next round of funding is highly uncertain.

6.38 In some cases, it may be appropriate to consider more than one scenario and run the option pricing model within each. For example, if the preferred stock has the right to both its liquidation preference and upside participation in a sale but is forced to convert upon a *qualified IPO*, it might be necessary to model the sale scenario (with unlimited participation) separately from the IPO scenario (with forced conversion at the qualifying IPO threshold).[15] Another example in which this approach can be helpful is when a

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[13] Stanislava M. Nikolova, "The Informational Content and Accuracy of Implied Asset Volatility as a Measure of Total Firm Risk" (research paper, 2003).

[14] The zero coupon bond equivalent of the debt is the future payoff amount for the debt such that the modeled value of the debt (the value allocated to the first breakpoint) equals its fair value. See paragraph 5.19.

[15] Note that the IPO scenario in this example should be thought of as "aim-for IPO" rather than describing an IPO at a specific value. In this scenario, if the fair value of the company increases enough to reach the qualifying IPO threshold, then the preferred stock is forced to convert. If the fair value of the company declines or increases to less than the required threshold, then the model assumes that the company will accept a lower value exit (via a sale or sale of assets rather than an IPO), and the preferred stock will not be forced to convert.