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Calibration of DCF Valuation in Litigation: The Case of HQ

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ABSTRACT HQ was a medium-sized Swedish banking group whose banking and fund management licenses were revoked in 2010, after losses in trading in equity derivatives for its own account. The parent company of the HQ group sued the board members and the audit firm and the responsible auditor for damages. NN was an expert witness for plaintiff and submitted a DCF valuation of HQ in a but-for scenario, where the banking group would have survived. This valuation is an interesting example of choice of valuation model assumptions to obtain a specific result, i. e., calibration. The nature of the calibration depends on the purpose of the model. Two possible purposes of a DCF model used by an expert for plaintiff are mentioned, maximizing the but-for value, and legitimizing a value that has been set in advance based on other considerations. From an analysis of unusual evidence that is contained in the DCF valuation model for HQ, it appears that the purpose of that model was to legitimize a value that had been set in advance. The author served as expert witness to defendant, with the task of rebutting NN. This paper is based on expert reports by NN and the author.

Keywords: Valuation, litigation, DCF model, calibration, maximizing but-for value, legitimation

JEL classification: M41, G21, G33

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1. Background and intent

HQ was a medium-sized Swedish banking group that was listed on the Stockholm Stock Exchange. It was organized into two business units: Investment

Banking and Private Banking. Following losses in Investment Banking due to trading in equity derivatives for its own account, HQ undertook a speedy close-down of the trading portfolio in the early summer of 2010. To cover costs associated with that close-down, HQ also sold its investment funds. On 27 August 2010, the Swedish Financial Supervisory Authority (Finansinspektionen) revoked HQ's license to conduct banking and securities business and its license as a fund manager. This decision by the Financial Supervisory Authority was motivated by the trading losses just mentioned. According to the Authority, HQ had overvalued the trading portfolio for a number of years. That overvaluation had not been evident from HQ's financial statements. Consequently, HQ had violated accounting as well as capital adequacy rules, according to the Authority. Also according to the Authority, risk control by the CEO and the Board of Directors had been insufficient and incompatible with legal requirements.

Immediately after the revocation of the licenses, HQ sold off its remaining, mainly private banking business to another bank. The parent company of the HQ group, HQ AB, carried on with the sole motive of suing to obtain damages from former board members and from HQ's audit firm.

Following an investigation by the Swedish Economic Crime Authority (Ekobrottsmyndigheten), four former members of the HQ Board of Directors and the responsible auditor were prosecuted for fraud in a criminal case before the Stockholm District Court. They were acquitted in 2016. That verdict was not appealed. The criminal HQ case is discussed in a recently published paper, Hartman et al. 2018.

In 2011, HQ AB sued nine former board members and the audit firm and the responsible auditor for damages. According to plaintiff, the board of directors had been negligent in its supervision of trading by Investment Banking for its own account. Also according to plaintiff, the audit firm and the responsible auditor had been negligent in approving the 2009 annual report. Plaintiff asserted that the Financial Supervisory Authority had decided to revoke HQ's licenses as a consequence of this neglect. Litigation proceedings before the Stockholm District Court started in 2016, after the termination of the criminal case. Damages sought amounted to approximately 3 200 million

SEK.[1]

The verdict in the litigation case was announced by the Stockholm District Court in December 2017. Plaintiff's assertion that the board of directors and the auditor had been negligent was sustained to some extent. However, the alleged link between that negligence and the decision by the Financial Supervisory Authority to revoke HQ's licenses was not credible, according to the Court. Consequently, the Court dismissed plaintiff's claim for damages.

After the district court verdict in the litigation case, HQ AB was declared bankrupt, and subsequently also in liquidation. The receiver made the following deal with the defendants: The district court verdict would not be appealed by the receiver. In return, defendants would give up their claims for reimbursement of legal expenses (262 million SEK). This deal was appealed by the liquidator (representing the owners of HQ AB in liquidation) to the Svea Court of Appeal in Stockholm. That appeal was dismissed by the latter court. The liquidator then appealed the dismissal to the Supreme Court of Sweden, resulting in one more dismissal in January 2019. The HQ litigation case hence came to an end with a legally binding verdict.

As evidence of damages in the HQ litigation case, plaintiff submitted several expert reports written by NN of C Consulting on the value of the HQ banking group that was lost as a consequence of the decision by the Financial Supervisory Authority to revoke HQ's licenses.[2] In particular, NN prepared a valuation of HQ in an alternative but-for scenario where HQ would have closed down the trading portfolio at a point in time earlier than the summer of 2010. In this but-for scenario, HQ would (by assumption) have survived. In rebuttal of the expert reports by NN containing valuations of HQ in the but-for scenario, the author of this paper authored or co-authored several expert reports on behalf of the defendant audit firm.

This paper is based on the following four expert reports by NN and by the author: (1) 'Expert report of NN', C Consulting, 20 October 2014, referred to below as C 1; (2) Peter Jennergren, 'En granskning av C 1-rapporten' (An

[1] 10.65 SEK can be considered as equivalent to 1 Euro (end of September 2019).

[2] The identities of the expert witness and the consulting firm are not important for this paper, so they will be referred to as NN and C throughout.

examination of the C 1 report, in Swedish), 24 February 2015, referred to below as Jennergren 2015; (3) 'Expert reply report of NN in response to the expert report of Peter Jennergren', C Consulting, 30 September 2015, referred to below as C 2; and (4) Peter Jennergren, 'Genmäle till NNs rapport C 2' (Reply to the report C 2 by NN, in Swedish), 7 March 2016, referred to below as Jennergren 2016. This paper also draws on NN's Excel spreadsheet file for DCF valuation, Appendix 3 - DCF - HQ AB 2007_Updated.xlsx, that was submitted together with C 2.[3] In the end, these four reports and the spreadsheet file had no impact on the verdict by the Stockholm District Court, since the Court rejected plaintiff's asserted link between negligence by the directors and the auditor and decision by the Financial Supervisory Authority to revoke HQ's licenses. The author of this paper undertook no valuations of HQ of his own. His task was merely to rebut NN's valuations.

Three different valuation methods are used by NN in C 1 and C 2: Discounted cash flow (DCF), comparable publicly traded companies, and comparable transactions (see Table 1). This paper is only concerned with NN's DCF model. More precisely, the intent is to examine that model as an interesting example of *calibration*, that is, of setting assumptions to obtain a desired result. The extent and nature of model calibration depends on the purpose of the model. In a litigation setting, one can think of (at least) two different purposes for a DCF model that is used by an expert for plaintiff. In the first place, the purpose can be to maximize the but-for value (of course, subject to credibility restrictions). This is relevant in a 'dueling experts' situation, where plaintiff submits an expert report that calculates a high but-for value, and defendant an expert report with a low such value. Calibration can then be expected, since the court often decides on a value somewhere in between the two experts. In fact, quoting from one authoritative handbook: 'One school

[3]The four reports and the Excel spreadsheet file are official documents and can be obtained from the archive of the Stockholm District Court. The case number is T 9311-11. The record sheet numbers are as follows. C 1: Included in 724 (binder). C 2: Included in 936 (binder). Jennergren 2015: 804 - Bilaga S1. Jennergren 2016: 1190. Excel spreadsheet file: Included in a USB memory stick that is included in 936 (binder). (Translations into Swedish: Record sheet: 'dagbok'; record sheet number: 'aktbilaga'.)

of thought holds that, since courts in some situations tend to split the difference between opposing positions, an analyst must take an extreme position, because that is the only strategy that will lead to a fair court result' (Pratt & Nikula 2008, p. 1032). In the HQ case, defendant did not submit an expert report containing a calculated value, so there was no opposite side expert to duel with. But even without a value calculated by an expert for defendant, the purpose of a DCF model used by an expert for plaintiff can obviously be to maximize the but-for value. Calibration then means searching for maximizing assumptions.

The second possible purpose of a DCF model in litigation is reminiscent of capital budgeting in firms, that is, project appraisal by discounting forecasted cash flow. Some authors, for instance Burchell et al. 1980, p. 18; Carpenter & Feroz 1992, p. 618; and Fernandez-Revuelta Perez & Robson 1990, p. 387, mention discounted cash flow as a tool for *legitimation*, or justification, of capital budgeting decisions that have already been made. Carpenter and Feroz summarize Bower 1970, a landmark study of investment planning in firms, as follows: 'Similarly, Bower's study (1970) of capital budgeting decisions provides evidence that capital budgeting procedures are used to justify investment decisions already made rather than as bases for decisions to be made.' Translated to a litigation setting, the second possible purpose of a DCF model is thus to legitimize some desired but-for value that has already been selected for other reasons, for instance intuitive or tactical. Calibration then aims at finding a set of credible DCF model assumptions that lead to that preset value.[4]

The next section is an overview of damages calculations in C 1 and C

[4]This purpose of legitimizing a value that has already been selected for other reasons is known from investment analysis, as is evident from the following quote from Imam et al. 2008, p. 526: 'This evidence is broadly consistent with valuation models (and in particular the DCF model) being used opportunistically, with the data therein being made to fit the analyst's prior, subjective judgement about the market's view of a stock.' Cf. also Demirakos et al. 2010. In this study of how the choice of valuation model, PE (price-to-earnings) or DCF, affects the accuracy of target prices in equity research reports, the authors '... assume analysts use the models ... to generate their investment recommendations, rather than as a way of rationalizing ... recommendations previously reached' (p. 37).

2. Sections 3 and 4 are about forecasted operating expenses for employees, in particular forecasted number of employees. This is that part of the DCF model where one detects evidence of calibration. The discussion in Sections 3 and 4 is largely taken from Jennergren 2016, but it also includes an excerpt in Table 2 below from an exact reverse engineering that the author prepared in 2018 of the Excel file Appendix 3 - DCF - HQ AB 2007_Updated.xlsx. In the final Section 5, it is argued that the evidence of calibration that is presented in this paper leads to the conclusion that the purpose of NN's DCF model was not to maximize the but-for value. Instead, the purpose appears to be legitimation of a but-for value that had already been decided on in advance.

The author is certainly not the first one to discover that DCF models can be calibrated. In fact, for that reason, and also for other reasons such as complexity and cost, there seems to be a tendency among US courts to dismiss DCF valuations (see, e. g., Ayotte & Morrisson 2018, pp. 1840-1841; Schwartz & Bryan 2012; Simkovic & Kaminetzky 2011, pp. 157-163).[5]

2. Overview of DCF calculations in the reports C 1 and C 2

Table 1 contains summaries of damages according to C 1 and C 2. It is assumed in the but-for scenario that the trading portfolio was closed down at the end of 2007. Damages are seen to be the difference between value in the but-for scenario and value in the actual scenario. The date of valuation is 28 August 2010. In the actual scenario, total value consists of two components: Dividends pertaining to the historical actual years 2007, 2008, and 2009 accumulated (discounted) forward to the date of valuation; and liquidation value early September 2010. The latter value is apparently 60, implying that HQ was close to worthless after losing its licenses. In the but-for scenario, total

[5]Incidentally, the same holds true for valuations by comparable publicly traded companies and by comparable transactions. The latter two categories of valuations are less complex than DCF valuations, which is an advantage in litigation, but no less susceptible to calibration (by suitable selection of comparable companies and transactions).

value also consists of two components: Dividends pertaining to the historical but-for years 2007, 2008, and 2009, accumulated forward to the date of valuation; and weighted average ongoing business value of HQ as of 28 August 2010. That weighted average uses three different ongoing business values: Based on DCF, on comparable publicly traded companies, and on comparable transactions, with weights 40%, 40%, and 20%. It is seen that calculated damages are 3 147 in C 1 and 3 167 in C 2. These amounts are both close to the amount 3 200 mentioned in the previous section that HQ AB sued for.

Two items in Table 1 are noted, the but-for scenario ongoing business values based on expected dividends after 28 August 2010, i. e., the DCF values 3 507 in C 1 and 3 543 in C 2. Since HQ is a bank, DCF means discounted dividends (cf. Koller et al. 2015, pp. 760-761). DCF value is calculated with an explicit forecast period that comprises the years 2010 - 2019 and a post-horizon period that starts in 2020 and extends into infinity. Value at the start of the post-horizon period, i. e., at the end of 2019, is calculated by the Gordon formula, since the company is by assumption in a steady state in the post-horizon period.

When the report C 1 was submitted to the court, the DCF model was documented only through printed tables. The Excel file was not included. The author reverse engineered that DCF model from those printed tables. The resulting approximate reconstruction, documented in Jennergren 2015, was fairly close to the original, but not exactly so. Using that reconstruction, the author found that the DCF valuation of HQ in the but-for scenario in C 1 violated the assumption of steady state from 2020. In fact, a simple extension of the explicit forecast period to 2029 provided a DCF value of 2 688, that is, much lower than NN's DCF value of 3 507. Application of the Gordon formula in a situation where the company is not in a steady state is an error that one frequently warns against in corporate valuation courses (cf. Green et al. 2016, pp. 606, 614; Lundholm & O'Keefe 2001, pp. 328-330). This error was pointed out in Jennergren 2015.

In his subsequent report C 2, NN made two important interrelated changes that reduced (but did not eliminate) the violation of steady state from 2020. In C 1 and in C 2, forecasted annual operating expenses for employees are modelled as forecasted number of employees times forecasted annual expense per employee. Annual expense per employee increases from year to year by assumed inflation. In C 1, number of employees increases from year to year by an assumed *nominal* growth rate. The assumption of a nominal growth rate for number of employees is another error, mix-up of nominal and real. This mix-up (that was discovered by NN himself, i. e., not pointed out by the author) was actually the principal error and the main cause of the violated assumption of steady state from 2020. The growth rate of number of employees was changed in C 2 to real. At the same time, the 2010 forecasted number of employees increased from 239 in C 1 to 270 in C 2. These two interrelated changes will be discussed at length in the following two sections. NN also made three additional smaller changes in the DCF model between C 1 and C 2. These smaller changes are unimportant and will not be discussed further. Together, these five changes have a very small effect on the calculated DCF value in the but-for scenario, the increase from 3 507 to 3 543 that is seen in Table 1. What is hidden in this small increase is that the first two changes affect the valuation in opposite directions.

The DCF model version in C 2, including the Excel spreadsheet that was submitted together with C 2, is more general than the one in C 1. More precisely, the C 2 version allows for changing between C 1 and C 2 assumptions. Hence, the C 2 DCF model spreadsheet Appendix 3 - DCF - HQ AB 2007_Updated.xlsx can be used to obtain results that were reported in C 2 as well as in C 1.

3. Forecasting of number of employees

As already mentioned in the previous section, annual operating expenses for employees in 2010 and later years are modelled as annual expense per employee times number of employees. Forecasts of these two quantities are found in Table 2. As seen in row 283, annual expense per employee starts from an average of 2006 - 2009 in the historical actual scenario and then increases with inflation, starting in 2010. Inflation is measured by average consumer prices in row 280.

A couple of remarks regarding number of employees and assets under management (AUM) are called for at this point. Only employees in Private Banking and in administration are relevant in the DCF model, since by NN's assumption not only the trading portfolio but actually the entire Investment Banking unit is closed down at the end of 2007 in the but-for scenario. Number of employees in these two categories in the historical actual years 2005 - 2009 are seen in rows 285 and 286. Row 287 sums up rows 285 and 286. Similarly, only AUM in Private Banking is relevant. Historical and forecasted AUM in Private Banking is seen in row 82. Starting from 2010, AUM increases at the nominal annual rate 3.5%. There is no difference in employees or in AUM between the historical actual and the historical but-for years 2007 - 2009.

Consider now the forecasted number of employees in 2010 and later years. Number of employees in a given year is equal to a *fictitious initial number of employees* that is associated with 2009 and increases in subsequent years by assumed growth rates.[6] At this point, some notation is needed:

AUM[t]	assets under management end of year t
PB[t]	number of employees in Private Banking end of year t
adm[t]	number of employees in administration end of year t
total[t]	total number of employees end of year t (total[t] = PB[t] + adm[t])
C1F[x]	fictitious initial number of employees in C 1
x	= 3 or 4; number of terms in non-trivial average in C1F[x]
C2F[y, z]	fictitious initial number of employees in C 2
y	= 1, 3 or 4; number of terms in first non-trivial average in C2F[y, z]
z	= 3 or 4; number of terms in second non-trivial average in C2F[y, z]

Years within brackets are specified by the last two digits. For instance, AUM[08] means the same as AUM[t] when t = 2008. Since AUM and num-

[6]The designation 'fictitious initial number of employees' is not used by NN, only by the author. (The fictitious initial number of employees is not the same as the actual number of employees in 2009 in the historical actual scenario, 243.)

ber of employees in Private Banking and in administration are the same in the historical but-for and historical actual years 2007 - 2009, the meaning of (e. g.) AUM[08] is not ambiguous. There are apparently 2 different formula values of C1F[x] that are of interest and 6 = 3 × 2 different formula values of C2F[y, z], for a total of 8 different values. Writing out the formulas, these values of fictitious initial number of employees are as follows:

$$\mathrm{C1F[3]} = \left[0.5(\mathrm{AUM[08]} + \mathrm{AUM[09]})\right] \Big/ \left[\frac{1}{3}\left\{\frac{0.5(\mathrm{AUM[06]} + \mathrm{AUM[07]})}{0.5(\mathrm{total[06]} + \mathrm{total[07]})}\right.\right.$$

$$\left.\left. + \frac{0.5(\mathrm{AUM[07]} + \mathrm{AUM[08]})}{0.5(\mathrm{total[07]} + \mathrm{total[08]})} + \frac{0.5(\mathrm{AUM[08]} + \mathrm{AUM[09]})}{0.5(\mathrm{total[08]} + \mathrm{total[09]})}\right\}\right] = 206.1657$$

$$\mathrm{C1F[4]} = \left[0.5(\mathrm{AUM[08]} + \mathrm{AUM[09]})\right] \Big/ \left[\frac{1}{4}\left\{\frac{0.5(\mathrm{AUM[05]} + \mathrm{AUM[06]})}{0.5(\mathrm{total[05]} + \mathrm{total[06]})}\right.\right.$$

$$+ \frac{0.5(\mathrm{AUM[06]} + \mathrm{AUM[07]})}{0.5(\mathrm{total[06]} + \mathrm{total[07]})} + \frac{0.5(\mathrm{AUM[07]} + \mathrm{AUM[08]})}{0.5(\mathrm{total[07]} + \mathrm{total[08]})}$$

$$\left.\left. + \frac{0.5(\mathrm{AUM[08]} + \mathrm{AUM[09]})}{0.5(\mathrm{total[08]} + \mathrm{total[09]})}\right\}\right] = 195.5299$$

$$\mathrm{C2F[1,3]} = \left(\left[0.5(\mathrm{AUM[08]} + \mathrm{AUM[09]})\right] \Big/ \left[\frac{1}{1}\left\{\frac{0.5(\mathrm{AUM[08]} + \mathrm{AUM[09]})}{0.5(\mathrm{PB[08]} + \mathrm{PB[09]})}\right\}\right]\right)$$

$$\times \left(1 + \frac{1}{3}\left\{\frac{\mathrm{adm[07]}}{\mathrm{PB[07]}} + \frac{\mathrm{adm[08]}}{\mathrm{PB[08]}} + \frac{\mathrm{adm[09]}}{\mathrm{PB[09]}}\right\}\right) = 225.1404$$

$$\mathrm{C2F[1,4]} = \left(\left[0.5(\mathrm{AUM[08]} + \mathrm{AUM[09]})\right] \Big/ \left[\frac{1}{1}\left\{\frac{0.5(\mathrm{AUM[08]} + \mathrm{AUM[09]})}{0.5(\mathrm{PB[08]} + \mathrm{PB[09]})}\right\}\right]\right)$$

$$\times \left(1 + \frac{1}{4}\left\{\frac{\mathrm{adm[06]}}{\mathrm{PB[06]}} + \frac{\mathrm{adm[07]}}{\mathrm{PB[07]}} + \frac{\mathrm{adm[08]}}{\mathrm{PB[08]}} + \frac{\mathrm{adm[09]}}{\mathrm{PB[09]}}\right\}\right) = 218.3640$$

$$
\begin{aligned}
\text{C2F[3,3]} = {} & \left(\left[0.5(\text{AUM[08]} + \text{AUM[09]}) \right] \Big/ \left[\frac{1}{3} \left\{ \frac{0.5(\text{AUM[06]} + \text{AUM[07]})}{0.5(\text{PB[06]} + \text{PB[07]})} \right. \right. \right. \\
& \left. \left. \left. + \frac{0.5(\text{AUM[07]} + \text{AUM[08]})}{0.5(\text{PB[07]} + \text{PB[08]})} + \frac{0.5(\text{AUM[08]} + \text{AUM[09]})}{0.5(\text{PB[08]} + \text{PB[09]})} \right\} \right] \right) \\
& \times \left(1 + \frac{1}{3} \left\{ \frac{\text{adm[07]}}{\text{PB[07]}} + \frac{\text{adm[08]}}{\text{PB[08]}} + \frac{\text{adm[09]}}{\text{PB[09]}} \right\} \right) = 212.8527
\end{aligned}
$$

$$
\begin{aligned}
\text{C2F[3,4]} = {} & \left(\left[0.5(\text{AUM[08]} + \text{AUM[09]}) \right] \Big/ \left[\frac{1}{3} \left\{ \frac{0.5(\text{AUM[06]} + \text{AUM[07]})}{0.5(\text{PB[06]} + \text{PB[07]})} \right. \right. \right. \\
& \left. \left. \left. + \frac{0.5(\text{AUM[07]} + \text{AUM[08]})}{0.5(\text{PB[07]} + \text{PB[08]})} + \frac{0.5(\text{AUM[08]} + \text{AUM[09]})}{0.5(\text{PB[08]} + \text{PB[09]})} \right\} \right] \right) \\
& \times \left(1 + \frac{1}{4} \left\{ \frac{\text{adm[06]}}{\text{PB[06]}} + \frac{\text{adm[07]}}{\text{PB[07]}} + \frac{\text{adm[08]}}{\text{PB[08]}} + \frac{\text{adm[09]}}{\text{PB[09]}} \right\} \right) = 206.4462
\end{aligned}
$$

$$
\begin{aligned}
\text{C2F[4,3]} = {} & \left(\left[0.5(\text{AUM[08]} + \text{AUM[09]}) \right] \Big/ \left[\frac{1}{4} \left\{ \frac{0.5(\text{AUM[05]} + \text{AUM[06]})}{0.5(\text{PB[05]} + \text{PB[06]})} \right. \right. \right. \\
& + \frac{0.5(\text{AUM[06]} + \text{AUM[07]})}{0.5(\text{PB[06]} + \text{PB[07]})} + \frac{0.5(\text{AUM[07]} + \text{AUM[08]})}{0.5(\text{PB[07]} + \text{PB[08]})} \\
& \left. \left. \left. + \frac{0.5(\text{AUM[08]} + \text{AUM[09]})}{0.5(\text{PB[08]} + \text{PB[09]})} \right\} \right] \right) \\
& \times \left(1 + \frac{1}{3} \left\{ \frac{\text{adm[07]}}{\text{PB[07]}} + \frac{\text{adm[08]}}{\text{PB[08]}} + \frac{\text{adm[09]}}{\text{PB[09]}} \right\} \right) = 206.8433
\end{aligned}
$$

$$
\begin{aligned}
\text{C2F[4,4]} = {} & \left(\left[0.5(\text{AUM[08]} + \text{AUM[09]}) \right] \Big/ \left[\frac{1}{4} \left\{ \frac{0.5(\text{AUM[05]} + \text{AUM[06]})}{0.5(\text{PB[05]} + \text{PB[06]})} \right. \right. \right. \\
& + \frac{0.5(\text{AUM[06]} + \text{AUM[07]})}{0.5(\text{PB[06]} + \text{PB[07]})} + \frac{0.5(\text{AUM[07]} + \text{AUM[08]})}{0.5(\text{PB[07]} + \text{PB[08]})} \\
& \left. \left. \left. + \frac{0.5(\text{AUM[08]} + \text{AUM[09]})}{0.5(\text{PB[08]} + \text{PB[09]})} \right\} \right] \right) \\
& \times \left(1 + \frac{1}{4} \left\{ \frac{\text{adm[06]}}{\text{PB[06]}} + \frac{\text{adm[07]}}{\text{PB[07]}} + \frac{\text{adm[08]}}{\text{PB[08]}} + \frac{\text{adm[09]}}{\text{PB[09]}} \right\} \right) = 200.6176
\end{aligned}
$$

The average AUM, 0.5(AUM[08] + AUM[09]), appears in both the C1F[x] and the C2F[y,z] formulas. Disregarding that trivial average, in the C1F[x] formulas there is one non-trivial average that expresses AUM per employee in Private Banking plus administration. Depending on the number of terms that are included in this non-trivial average, $x = 3$ or $x = 4$, one obtains two different estimates of AUM per employee. These two estimates are seen in cells C300 and C301. Dividing average AUM by AUM per employee gives the number of employees in Private Banking and administration. The resulting variant values C1F[3] and C1F[4] are shown in cells G300 and G301 of Table 2.

The C2F[y,z] formulas are products of two factors. Disregarding the trivial AUM average in the first factor, there are two non-trivial averages in the C2F[y,z] formulas. The first one, in the first factor, expresses AUM per employee in Private Banking only. The number of terms in this average is $y = 1$, $y = 3$, or $y = 4$. Resulting values of AUM per Private Banking employee are shown in cells C306, C307, and C308. The second non-trivial average, in the second factor, represents number of employees in administration in percent of number of employees in Private Banking. The number of terms in this average is $z = 3$ or $z = 4$. Resulting average values of administration employees in percent of Private Banking employees are shown in cells C313 and C314. The interpretation is that the first factor provides the number of employees in Private Banking, and the second factor augments that number by adding employees in administration. Resulting values of C2F[y,z] for all 6 variants, i. e., combinations of y and z, are shown in cells G307 - G312.

In cell H301, one of the variants for C1F[x] is selected, resulting in a specific fictitious initial number of employees in cell I301, also copied to cells I288 and I289. Similarly, one of the variants for C2F[y,z] is selected in cell H308, resulting in a specific fictitious initial number of employees in cell I308, also copied to cell I290. Table 2 apparently shows a situation where the second variant for C1F[x], with $x = 4$, has been selected, and the first variant for C2F[y,z], with $y = 1$ and $z = 3$. These are the choices that NN made in C 1 and C 2, that is, $x = 4$ in C 1, and $y = 1$ and $z = 3$ in C 2.

Number of employees in rows 288 - 290 are set by combining fictitious initial number of employees with nominal or real rates of increase. Row 288 forecasts number of employees as in C 1, that is, with the fictitious initial number of employees equal to C1F[4], and increasing by a nominal rate of growth. The latter is the same as the (nominal) rate of growth of forecasted AUM. For instance, for 2010 the number of employees becomes C1F[4] × {1 + rate of AUM growth} = 195.5299 × {1 + rate of AUM growth} = 195.5299 × {(0.5(AUM[09]+AUM[10]))/(0.5(AUM[08]+AUM[09]))} = 238.7420 = 239 rounded.[7] Row 290 forecasts number of employees as in C 2, that is, with the fictitious initial number of employees equal to C2F[1,3], and increasing by a real rate of growth. For 2010, the number of employees becomes C2F[1,3] × {[1 + rate of AUM growth] / [1 + accumulated inflation]} = 225.1404 × {[1 + rate of AUM growth] / 1.0184} = 269.9235 = 270 rounded. These two forecasted numbers of employees for 2010, 239 in C 1 and 270 in C 2, were mentioned in the previous section. Row 289 forecasts number of employees by combining C1F[4] with real growth.

The indicated alternative choices of x (3 and 4) in C1F[x] and of y (1, 3, and 4) and z (3 and 4) in C2F[y,z] are programmed in NN's Excel file Appendix 3 - DCF - HQ AB 2007_Updated.xlsx. This is seen in Table 3 that is a printout of cells A1:M22 of the worksheet Assumptions of that file. The boxes and arrows have been added by the author. Also, the seven values of the non-trivial averages in C1F[x] and C2F[y,z] that are identified by the boxes and arrows have been formatted to four decimal places by the author. It is now recognized that these seven values are exactly the same as the corresponding values in rows 298 - 314 of Table 2. It is clear from the headings Assumption Used, 3 Year Average, and 4 Year Average in Table 3 that $x = 3$ and $x = 4$ were considered for C1F[x], and that $x = 4$ was chosen. Also, it is clear that $z = 3$ and $z = 4$ were considered for C2F[y,z], and that $z = 3$ was chosen. As for y, it is clear that $y = 3$ and $y = 4$ were considered for C2F[y,z], but in the end $y = 1$ was chosen.

To recapitulate, in C 1 number of employees increases at a nominal

[7] Since the rate of AUM growth is that of average AUM, the rate of growth of number of employees between 2009 and 2010 is not equal to 3.5%. In all later years, however, the rate of growth is 3.5%.

growth rate, starting from the fictitious initial number C1F[4]. In C 2, the growth rate of number of employees is real, starting from the fictitious initial number C2F[1,3]. These two changes, from nominal to real growth rate, and from C1F[4] to C2F[1,3], are the two important interrelated changes between C 1 and C 2 that were mentioned in the previous section.

4. Setting assumptions to obtain desired results

Table 4 contains DCF values as of 28 August 2010 obtained by discounting subsequent expected dividends under varying assumptions. Model runs (i), (ii), (iv), and (v) - (x) have been performed using of NN's file Appendix 3 - DCF - HQ AB 2007_Updated.xlsx as well as the author's reverse engineering of that file (the results agree exactly, to 12 digits). Model runs (iii) and (xi) have been performed only using the author's reverse engineering, since utilization of NN's file would require some reprogramming.

Model run (i) is the one that was presented in C 1, and run (v) the one presented in C 2. These two results are quite close, 3 507 and 3 543, as already indicated in Section 2. In Jennergren 2015 that discusses C 1, the author pointed out that setting the last year of the explicit forecast period to 2019 implies a violation of the assumption of steady state from 2020 (as also already mentioned in Section 2). Model run (iii) in Table 4 extends the explicit forecast period to 2029, while keeping all other C 1 assumptions. The DCF value then falls to 2 691 (this value is exact and can be compared to the value 2 688 mentioned in Section 2 that was obtained with the author's approximate reconstruction in Jennergren 2015 of the DCF model in C 1).

In reaction to Jennergren 2015, in C 2 NN made the two important interrelated changes that were mentioned earlier, real rather than nominal growth of number of employees, and fictitious initial number of employees equal to C2F[1,3] rather than C1F[4]. However, suppose one makes only the first one of these two changes. If so, the DCF value increases to 4 384, as seen in run (iv) in Table 4. This is a revised DCF value that could have been proposed by NN together with an admission that the previous assumption of a nominal growth rate for number of employees was an error. But 4 384 was not proposed in C 2. This can be interpreted to mean that 4 384 would have been too high, given the purpose of the DCF model, as will be suggested in the concluding next section.[8]

Incidentally, changing the growth rate of employees from nominal to real reduces (but does not eliminate) the error from violating the assumption of steady state from 2020, as also already mentioned in Section 2. If one extends the explicit forecast period in run (v) to 2029, the DCF value falls from 3 543 to 3 411 (see run (xi)).

It is clear from Table 3 and the discussion in the previous section that two alternatives for C1F[x], $x = 3$ and $x = 4$, were considered in C 1. Comparing runs (i) and (ii) in Table 4, it is seen that the rejected alternative $x = 3$ in run (ii) leads to a lower value than the selected alternative $x = 4$ in run (i). It is also clear from Table 3 and the previous discussion that six different combinations of y and z in C2F[y,z] were considered in C 2. These six combinations are featured in runs (v) - (x) in Table 4. It is seen that the chosen combination $y = 1$ and $z = 3$ in (v) gives a lower DCF value than each one of the other five combinations in runs (vi) - (x). There are no rejected DCF values between 3 507 in run (i) and 3 543 in run (v). All of the rejected runs (ii) and (vi) - (x) provide DCF values that are located either below 3 507 or above 3 543. That must be interpreted as evidence that assumptions in the calculations in C 1 and C 2 were chosen to provide DCF values slightly above 3 500, no more, no less. This evidence appears to be unusual. That is, it is not common in litigation valuations to find evidence suggesting alternative, rejected values.

The column headings 3 Year Average, 4 Year Average, and Assumption Used in Table 3 are clear hints that alternative assumptions had been considered. Despite these hints, reconstructing the formulas in cells J288 and J290 of Table 2 for number of employees in 2010 was not trivial, given the complexity of NN's Excel valuation model. Figure 1 gives some feeling for that complexity. This figure is a cell relationship diagram showing all predecessors (including one circular path) of cell T201 in the worksheet Appendix 3.A - DCF of the

[8]The combination of assumptions in run (iv) requires a small amount of reprogramming of the C 2 Excel model in Appendix 3 - DCF - HQ AB 2007_Updated.xlsx. The author supposes that NN did that reprogramming and hence noted the value 4 384.

file Appendix 3 - DCF - HQ AB 2007_Updated.xlsx. That cell corresponds to J291 in Table 2.

5. Conclusion

NN could have proposed a higher DCF value than 3 543 in his report C 2. For instance, he could have proposed slightly above 4 000, based on runs (viii) or (ix) in Table 4, or 4 239 based on run (x), or even 4 384 based on run (iv). But he refrained from doing so. The fact that he apparently rejected 4 384 is particularly interesting. An expert for plaintiff who has confidence in her/his valuation model but discovers that the resulting value *increases* after correction of an error would presumably propose a new and increased firm value in her/his subsequent report. But even disregarding run (iv), the evidence in Table 3 and Table 4 of rejected DCF values above 3 543 clearly indicates that NN did not maximize the but-for value. Consequently, the purpose of his DCF model was not maximization of that value.

The alternative purpose of the DCF model, legitimation of a but-for value that had already been decided on for other reasons, is much more convincing. As already mentioned in the introduction, the task at hand would then be to select a set of defensible assumptions leading to approximately that value. If some assumption turned out not to be defensible and therefore had to be changed, then another assumption would also be changed so that the resulting DCF value remained roughly the same as before. The author imagines this is what happened in the HQ case. When NN realized that the assumption in C 1 of nominal growth of number of employees should be changed to real growth, in C 2 he also changed the assumption as regards fictitious initial number of employees in such a fashion that the new DCF value in C 2 was quite close to the previous one in C 1. It is a clear indication of legitimation of a preset value that the calculated value changed very little between C 1 and C 2, despite the fact that both of the two assumption changes affect the valuation significantly, when implemented one at a time. Making only the first one of the two assumption changes would have produced a value that was too high, so the second change was also made, to counter.

It was only by chance that the purpose of the DCF model, legitimation, could be discovered. More precisely, it was fortuitous that the two critical pieces of evidence were available, the mix-up of nominal and real growth in C 1 that led to two important changes in C 2 but without noticeable effect on the resulting DCF value, and the indication in the worksheet Assumptions of NN's Excel file of alternative, rejected assumptions for non-trivial averages in C1F[x] and C2F[y,z]. If there had been no mix-up of nominal and real in C 1, and if there had been no indication of alternative, rejected assumptions for non-trivial averages, then it would not have been possible to conclude that the DCF model was intended for legitimition of a but-for value that had already been selected in advance, and not intended for maximization of the but-for value.

To sum up, the author hence believes that the purpose of the calibrated DCF model in the reports C 1 and C 2 was to legitimize a but-for value of HQ that had already been decided on in advance, based on other considerations.

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Table 1. Summary of damages calculations in C 1 and C 2

	C 1	C 2
Actual scenario		
Value of actual scenario dividends 14 April 2008, 1 January 2009, and 1 January 2010, accumulated forward to 28 August 2010	677	677
Value according to balance sheet for liquidation purposes 8 September 2010	60	60
Total value in the actual scenario (= 677 + 60)	737	737
But-for scenario		
Value of but-for scenario dividends 14 April 2008, 1 January 2009, and 1 January 2010, accumulated forward to 28 August 2010	345	423
Ongoing business value: But-for scenario expected dividends after 28 August 2010, discounted to that date over an infinite horizon = DCF value	3 507	3 543
Ongoing business value according to comparable publicly traded companies (based on market capitalization / AUM)	3 787	3 659
Ongoing business value according to comparable transactions (based on transaction price / AUM)	3 107	3 002
Ongoing business value = weighted average of preceding three values with weights 40%, 40%, and 20%	3 539	3 481
Total value in the but-for scenario (= 345 + 3 539; = 423 + 3 481)	3 884	3 904
Damages		
(= 3884 - 737; = 3 904 - 737)	3 147	3 167

DCF valuation assumes that the trading portfolio was closed down at the end of 2007. Date of valuation: 28 August 2010. Amounts in million SEK

Table 2. Calculations related to employees in author's reverse engineering of Appendix 3 - DCF - HQ AB 2007_Updated.xlsx in C2

	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S
80	**Other balance sheet disclosures: Assets under management**																		
81																			
82	Assets under management in Private Banking. Notation: AUM[*t*] (*t* = year) (from 2009 nominal growth rate	*54 000.000*	*64 000.000*	*67 000.000*	*45 800.000*	*68 700.000*	67 000.0000	45 800.0000	68 700.0000	71 104.5000	73 593.1575	76 168.9180	78 834.8301	81 594.0492	84 449.8409	87 405.5854	90 464.7808	93 631.0482	96 908.1349
83	taken from row 211)																		
84																			
211	Nominal growth of AUM (in row 82)		18.5185%	4.6875%	-31.6418%	50.0000%				*3.5000%*	3.5000%	3.5000%	3.5000%	3.5000%	3.5000%	3.5000%	3.5000%	3.5000%	3.5000%
277		**Historical actual scenario**					**Historical but-for scenario**			**Forecasted but-for scenario**									
278	**ANNUAL EXPENSE PER EMPLOYEE AND NUMBER OF EMPLOYEES**	**2005**	**2006**	**2007**	**2008**	**2009**	**2007**	**2008**	**2009**	**2010**	**2011**	**2012**	**2013**	**2014**	**2015**	**2016**	**2017**	**2018**	**2019**
279																			
280	Average consumer prices (increases by 2015 inflation rate 1.9996% from 2016) (data from IMF)	*99.9980*	*101.4960*	*103.1980*	*106.6010*	*108.7210*				*110.7240*	*112.8160*	*115.0720*	*117.3730*	*119.7210*	*122.1150*	124.5569	127.0476	129.5881	132.1794
281	Inflation, percent change in average consumer prices														1.9996%	1.9996%	1.9996%	1.9996%	1.9996%
282	One plus accumulated inflation, measured by average consumer prices from 2009 base									1.0184	1.0377	1.0584	1.0796	1.1012	1.1232	1.1457	1.1686	1.1919	1.2158
283	Annual expense per employee (= average of 2006 - 2009 × (1 plus accumulated inflation in row 282))		1.9828	1.9244	1.4688	1.3347	Average of 2006 - 2009		1.6777	1.7086	1.7409	1.7757	1.8112	1.8474	1.8844	1.9221	1.9605	1.9997	2.0397
284																			
285	Number of employees in Private Banking. Notation: PB[*t*] (*t* = year)	*91.0000*	*115.0000*	*120.0000*	*107.0000*	*129.0000*	120.0000	107.0000	129.0000										
286	Number of employees in administration. Notation: adm[*t*] (*t* = year)	*65.0000*	*78.0000*	*84.0000*	*122.0000*	*114.0000*	84.0000	122.0000	114.0000										
287	Number of employees in Private Banking plus in administration. Notation: total[*t*] (*t* = year)	156.0000	193.0000	204.0000	229.0000	243.0000	204.0000	229.0000	243.0000										
288	Number of employees, increasing with *nominal* assets under management (as in C 1)				Notation: C1F[x]	Fictitious initial number of employees			195.5299	238.7420	247.0979	255.7464	264.6975	273.9619	283.5506	293.4748	303.7465	314.3776	325.3808
289	Number of employees, increasing with *real* assets under management				Notation: C1F[x]	Fictitious initial number of employees			195.5299	234.4231	238.1288	241.6313	245.1857	248.7902	252.4498	256.1631	259.9311	263.7546	267.6342
290	Number of employees, increasing with *real* assets under management (as in C 2)				Notation: C2F[y,z]	Fictitious initial number of employees			225.1404	269.9235	274.1903	278.2233	282.3159	286.4663	290.6800	294.9558	299.2944	303.6968	308.1640
291	Number of employees in actual calculation (copied from row 288, 289, or 290)									269.9235	274.1903	278.2233	282.3159	286.4663	290.6800	294.9558	299.2944	303.6968	308.1640
292																			
293																			
294	**FORMULAS FOR FICTITIOUS INITIAL NUMBER OF EMPLOYEES AND SELECTED VARIANTS (ASSUMPTIONS)**																		
295																			
296	Average AUM = 0.5*(AUM[08]+AUM[09])	57 250.000	SEK millions																
297																			
298	Original model (in C 1)	SEK millions			Variant number			Selected	Resulting										
299		AUM/(total number of employees)			in C 1			variant	fictitious initial										
300		avg(*x* =3)	277.6892		1	C1F[3]	206.1657	number	number of employees										
301		avg(*x* =4)	292.7941		2	C1F[4]	195.5299	2	195.5299										
302																			
303	Updated model (in C 2)	SEK millions																	
304		AUM/(number of																	
305		Private Banking employees)			Variant number			Selected	Resulting										
306		avg(*y* =1)	485.1695		in C 2			variant	fictitious initial										
307		avg(*y* =3)	513.1775		1	C2F[1,3]	225.1404	number	number of employees										
308		avg(*y* =4)	528.0870		2	C2F[1,4]	218.3640	1	225.1404										
309					3	C2F[3,3]	212.8527												
310		Number of administration			4	C2F[3,4]	206.4462												
311		employees in % of number			5	C2F[4,3]	206.8433												
312		of Private Banking employees			6	C2F[4,4]	200.6176												
313		avg(*z* =3)	90.7969%																
314		avg(*z* =4)	85.0542%																

Table 3. Cells A1:M22 of the worksheet Assumptions of Appendix 3 - DCF - HQ AB 2007_Updated.xlsx

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Assumptions

Appendix 3

Original Model — C
Updated Model — Mr. Jennergren

I. Terminal Growth Rate	**2002**	**2003**	**2004**	**2005**	**2006**	**2007**	**2008**	**2009**	**Assumption Used**	**3 Year Average**	**4 Year Average**
	Historical										
Original Model											
Total Number of Employees	177	168	240	199	244	250	300	302		284	274
Mgmt. & Administration / Total Number of PB & Asset Mgmt. Employees											
AUM / PB Employee + SG&A Employee	134	153	160	240	338	330	261	243	292.7941	277.6892	292.7941
Updated Model											
Total Number of Employees	177	168	240	199	244	250	300	302		284	274
Mgmt. & Administration / Total Number of PB & Asset Mgmt. Employees	84%	95%	48%	71%	68%	70%	114%	88%	90.7969%	90.7969%	85.0542%
AUM / PB Employee	246	289	263	379	573	557	497	485.1695	485.1695	513.1775	528.0870

Non-trivial average in C1F[x] when x = 3
Non-trivial average in C1F[x] when x = 4
First non-trivial average in C2F[y,z] when y = 1
First non-trivial average in C2F[y,z] when y = 3
First non-trivial average in C2F[y,z] when y = 4
Second non-trivial average in C2F[y,z] when z = 3
Second non-trivial average in C2F[y,z] when z = 4

Table 4. DCF values under different assumptions

Model run no.	(i)	(ii)	(iii)	(iv)	(v)	(vi)	(vii)	(viii)	(ix)	(x)	(xi)
Three small changes from C 1 to C 2 - No: 0, Yes: 1	0	0	0	1	1	1	1	1	1	1	1
Alternatives for steady state: Formula for fictitious initial number of employees and growth rate of number of employees	0	0	0	1	2	2	2	2	2	2	2
x in C1F[x]	4	3	4	4							
y in C2F[y,z]					1	1	3	3	4	4	1
z in C2F[y,z]					3	4	3	4	3	4	3
Last year of explicit forecast period	2019	2019	2029	2019	2019	2019	2019	2019	2019	2019	2029
DCF value as of 28 August 2010 of subsequent expected dividends, million SEK	3 507	3 148	2 691	4 384	3 543	3 735	3 892	4 074	4 063	4 239	3 411

Alternatives for steady state:

0: Fictitious initial number of employees specified by C1F[x], nominal growth of number of employees

1: Fictitious initial number of employees specified by C1F[x], real growth of number of employees

2: Fictitious initial number of employees specified by C2F[y,z], real growth of number of employees

Figure 1. Cell relationship diagram, Appendix 3 - DCF - HQ AB 2007_Updated.xlsx, worksheet Appendix 3.A - DCF, cell T201