

BEFORE THE
SURFACE TRANSPORTATION BOARD
Docket No. EP 664 (Sub No. 2)

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PETITION OF THE WESTERN COAL TRAFFIC LEAGUE TO INSTITUTE A
RULEMAKING PROCEEDING TO ABOLISH THE USE OF THE MULTI-STAGE
DISCOUNTED CASH FLOW MODEL IN DETERMINING THE RAILROAD
INDUSTRY'S COST OF EQUITY CAPITAL

OPENING COMMENTS OF THE
ASSOCIATION OF AMERICAN RAILROADS

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Pursuant to the procedural schedule established by the Board in its decision served on June 16, 2014, the Association of American Railroads ("AAR") submits its opening comments in the above-referenced proceeding. For the reasons described below, and in the supporting statement of Dr. Bente Villadsen, the Board should deny the petition of the Western Coal Traffic League ("WCTL") to abolish the use of the multi-stage discounted cash flow model ("MSDCF") in the Board's annual determinations of the railroad industry's cost of capital.¹

¹ See Petition of the Western Coal Traffic League To Institute a Rulemaking Proceeding To Abolish the Use of the Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital, filed August 27, 2013, in Ex Parte No. 664 (Sub-No. 2) ("Petition").

INTRODUCTION

As there are many different ways to estimate the cost of equity, the Board must take great care not to swing back-and-forth between parties' preferred methodologies based on the results of the different approaches.

Surface Transportation Board²

Five years ago, the Board completed a long and exhaustive journey to find a suitable way to estimate the cost of equity for the railroad industry. Settling on a suitable approach was not easy. If anything was made crystal clear from those prior rulemakings, it was that there is no single "best" method. Experienced finance practitioners disagree on the best technique for a particular industry and will debate vigorously all the assumptions used by any given model. Since the cost of equity never reveals itself, even historically, there is no way to assemble all the leading contenders and test the predicted estimates to figure out which model is the most robust. The Board discovered that all financial techniques used to estimate the cost of equity are inherently imprecise; the results vary from year to year and are sensitive to assumptions that are just that, assumptions. "[I]f our exploration of this issue has revealed nothing else, it has shown that there is no single simple or correct way to estimate the cost of equity for the railroad industry, and countless reasonable options are available."³

One best practice did emerge: *use multiple models*. Every expert who testified before the STB in the prior rulemakings reaffirmed this fundamental point. Whether it was independent economists from the Federal Reserve, leading finance experts, or indeed even WCTL, the same point was echoed by all concerned. Every technique has different strengths and weaknesses. By using

² Ex Parte No. 558 (Sub-No. 9), *Cost of Capital – 2005*, Decision served February 9, 2007, at 4; *see also id.*, Decision served September 20, 2006, at 7.

³ *Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital*, Ex Parte No. 664 (Sub-No. 1), slip op. at 15 (released Jan. 28, 2009) ("*MSDCF Decision*").

multiple models, the STB can harness the strengths of each model while mitigating the known weaknesses, resulting in a more reliable estimate of an inherently undetectable figure. This best practice was artfully captured by Stewart Myers, Robert C. Morris Professor of Finance at MIT's Sloan School of Management, who long ago offered this sage advice: "Use more than one model when you can. Because estimating the opportunity cost of capital is difficult, only a fool throws away useful information."⁴

The STB was no fool. It wisely followed this best practice and settled on two models to estimate the cost of equity for the railroad industry. Specifically, the Board concluded that the cost-of-equity component should be calculated using a simple average of the estimates produced by the Capital Asset Pricing Model ("CAPM") and the Morningstar / Ibbotson MSDCF model. Based on the overwhelming evidence that the best practice is to use multiple models, the STB reasonably concluded that "a simple average of the two results will produce the best estimate of the rail industry's cost of equity that will aid us in performing a variety of regulatory responsibilities."⁵

A disgruntled WCTL launched a campaign to encourage the Board to ignore the valuable information provided by the forward-looking MSDCF model and instead rely just on the backward-looking CAPM. Its current petition is the latest foray. WCTL believes that the Board's methodology produces a cost of capital that is, from WCTL's standpoint, too high.

WCTL hopes its persistence will ultimately wear down the Board's resistance. By asking the Board to discard any MSDCF model, it is asking the

⁴ Stewart C. Myers, "On the Use of Modern Portfolio Theory in Public Utility Rate Cases," Comment, *Financial Management*, Autumn 1978, at 67.

⁵ *MSDCF Decision* at 15.

Board to forget all the lessons learned from its prior journey. Once a supporter of using the MSDCF and of averaging CAPM and MSDCF estimates, WCTL now advocates instead that the Board rely solely on the CAPM because it currently generates a lower estimate. WCTL's position is as fickle as the wind – the only certainty is that it will blow in the direction of the lowest plausible cost-of-equity result.

For three reasons, the Board should stand fast and resist WCTL's call to depart from the best practice of using multiple models to estimate the cost of equity. *First*, as explained by Dr. Villadsen, "best practices use multiple models so as to glean useful information from each one based on its relative strengths." Villadsen V.S. at 5. Dr. Villadsen reminds the Board that it is important to use more than one model, particularly models that use different kinds of information. As she explains, CAPM relies on historical information to determine the risk factor for the railroad industry, while a multi-stage DCF model uses forward-looking growth estimates and contemporaneous cash flow and stock price information. "Thus," Dr. Villadsen explains, "the two models attempt to estimate the same figure, but use different information to do so." *Id.* at 8.

Second, given the overwhelming support for the use of multiple models, WCTL bears a heavy burden to justify abandoning this practice. However, WCTL's various substantive criticisms of that model do not merit disregarding the useful information in the Morningstar / Ibbotson MSDCF, and certainly do not show that the model is so flawed as to warrant abandonment of *any* MSDCF model. As explained below:

- The key assumptions in the Morningstar / Ibbotson MSDCF are plainly reasonable, as the Board found five years ago. *MSDCF Decision* at 8-13.

- Although WCTL asserts that there has been a “substantial deviation” between the Morningstar / Ibbotson MSDCF estimates and CAPM estimates, the fact is that the estimates generated by the two models are converging. In the most recent year, 2013, the difference was only 0.88%.⁶
- WCTL’s core substantive criticisms of the Morningstar / Ibbotson MSDCF involve the model’s transition from the initial stage to the steady-state final stage and the influence of stock repurchases on forecast growth rates. However, when these two criticisms of the model are “corrected,” the cost of equity decreases, on average, by only 0.4%. Villadsen V.S. at 29. And Dr. Villadsen showed that this difference is smaller than the degree that CAPM understated the cost of equity (0.63%, *id.* at 25) due to the unusual monetary policies that temporarily suppressed the Federal Treasury rate.

Finally, if the Board were to replace the Morningstar / Ibbotson MSDCF with one of its own design, it would need to consider issues other than those cherry-picked by WCTL. The Board considered the broad applicability of the Morningstar / Ibbotson model a virtue. As the Board found, “it is prudent to use an approach that was not developed simply as a tool for litigation before the Board, but rather to use an approach that has been tested in the marketplace and is used to estimate the cost of equity for different industries, not just the rail industry.”⁷ If this virtue is now considered a vice, then the Board would need to address a range of complex issues in tailoring a model for the railroad industry.

The Board should not allow an elusive search for a “perfect” MSDCF model to be the enemy of a very good approach, tested in the marketplace and used to estimate the cost of equity for different industries. Indeed, WCTL offers no alternative MSDCF model. Long ago, Justice Brandeis observed that

⁶ Ex Parte No. 558 (Sub-No. 17), *Railroad Cost of Capital – 2013*, Decision served July 31, 2014, at 11.

⁷ Ex Parte No. 664 (Sub-No. 1), *Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry’s Cost of Capital*, Notice of Proposed Rulemaking served August 11, 2008, at 6 (“MSDCF NPRM”).

“experience teaches that it is much easier to reject formulas presented as being misleading than to find one apparently adequate.” *Groesbeck v. Duluth, S.S. & A. R. Co.*, 250 U.S. 607, 614-615 (1919). Instead, WCTL raises concerns about the simplifying assumption of the model (many of which it raised in the prior rulemaking) and then asks the Board to abandon entirely the practice of using multiple models. However, cherry-picking particular assumptions used by a market-tested technique – without considering the totality of the model or offering an alternative – does not support WCTL’s quest for the lowest possible cost-of-equity estimate.

AAR therefore respectfully urges the Board to deny this Petition to abolish the use of a multi-stage DCF model to estimate the cost of equity for the railroad industry.

BACKGROUND

A. History of the Cost of Capital Methodology Adopted by the ICC and the Board

Section 10704 of the ICC Termination Act (“ICCTA”) requires the Board to “make an adequate and continuing effort to assist [rail] carriers in attaining” revenue levels that are adequate, *inter alia*, to “assure the repayment of a reasonable level of debt,” “permit the raising of needed equity capital,” and “attract and retain capital in amounts adequate to provide a sound transportation system in the United States.” 49 U.S.C. § 10704(a)(2). After this provision was originally enacted in 1976,⁸ the Interstate Commerce Commission (ICC) relied upon discounted cash flow (“DCF”)-based studies to make its annual revenue adequacy determinations.

⁸ See Railroad Revitalization and Regulatory Reform Act of 1976, Pub. L. No. 94-210, § 205, 90 Stat. 31, 41 (1976).

For example, in Ex Parte No. 353, *Adequacy of Railroad Revenue (1978 Determination)*, 361 I.C.C. 79 (1978), the ICC based its revenue adequacy findings primarily on two DCF-based analyses, as well as one study using the CAPM methodology. *Id.* at 94. While the ICC found that the CAPM study presented in that case “merit[ed] consideration,” it expressed concern regarding certain “weakness[es]” in CAPM, such as the sensitivity of the data in the model to the choice of dates for study periods and the failure of the calculated betas to fully explain changes in railroad returns compared to changes in market returns. *Id.* at 92.

In Ex Parte No. 393, *Standards for Railroad Revenue Adequacy*, 364 I.C.C. 803 (1981) (“*Ex Parte No. 393*”), the ICC acknowledged the Staggers Act’s mandate under Section 10704(a)(2) and concluded that “revenue adequacy standards must be based on a rate of return equal to the current cost of capital.” *Id.* at 807. In two subsequent proceedings, the ICC adopted the single-stage DCF model to compute the cost of equity. In Ex Parte No. 415, *Railroad Cost of Capital – 1981*, 365 I.C.C. 734 (1982), the ICC concluded that the “DCF approach is a commonly employed market valuation methodology used to estimate the cost of equity,” and the DCF studies offered in evidence “appear[ed] to constitute the most reliable evidence of record of the cost of equity.” *Id.* at 741. The ICC declined to use CAPM, agreeing with WCTL and other participating shippers that CAPM “requires the use of many assumptions,” each of which involved subjective judgments and could significantly affect the results. *Id.* at 741.

Similarly, in Ex Parte No. 436, *Railroad Cost of Capital – 1982*, 367 I.C.C. 662 (1983), the ICC used the DCF methodology, which “was supported by all parties” – including WCTL. *Id.* at 670. Although the railroads had developed a CAPM, the shippers attacked it as “conceptually and technically flawed,” and

the ICC concluded that it “should [not] be used as the primary means of determining the cost of equity in this proceeding.” *Id.* at 670, 680.

In Ex Parte No. 464, *Railroad Cost of Capital – 1985*, 3. I.C.C. 2d 625 (1987) (“*Ex Parte No.464*”), the ICC requested comments from interested parties on other approaches to the DCF methodology for determining the cost of equity (including CAPM, earnings/price ratio, risk premium methods other than CAPM, and the comparable earnings method). Shippers, however, submitted no evidence. AAR proposed a cost of equity based upon the DCF methodology and also proffered a CAPM-based study as “verification” of the cost of equity produced by the DCF model. *Id.* at 630, 636-637. However, the ICC again declined to adopt CAPM, noting that it “ha[d] not used the CAPM figure” in prior cost of capital determinations. The ICC noted that CAPM had certain weaknesses: the overall computation using CAPM was “complex,” CAPM was based on the use of “historical observations possibly over many years,” and the time frames used “can have a significant impact on the computed cost of equity.” *Id.* at 637. Rather, observing that the DCF methodology “is used by a majority of state regulatory agencies and has been used by the Commission for many years,” the ICC once again adopted the DCF methodology to determine the industry’s cost of equity capital for 1986. *Id.* at 631, 636. In its decision regarding the cost of capital for 1986, the ICC reached the same conclusions, adding only that “no party advocates [the] use” of alternatives to the single-stage DCF and that it would nonetheless continue to study alternatives “with the view there may be a more appropriate approach(es) to computing common equity costs.” Ex Parte No. 466, *Railroad Cost of Capital – 1986*, 3 I.C.C.2d 948, 957 (1987).

By 1987, the ICC had, as a practical matter, abandoned CAPM even as a verification tool in its determination of the railroad industry’s cost of equity

capital based upon the DCF methodology. For example, in its proceeding to determine the cost of capital for 1987, the ICC did not solicit comments on alternative methodologies (in contrast to prior decisions in other recent cost of capital proceedings), and the AAR based its estimates of the cost of equity only on the DCF methodology. Ex Parte No. 473, *Railroad Cost of Capital – 1987*, 4 I.C.C.2d 621, 625 (1988).

Until 2006, the ICC and the Board consistently used the DCF model to make the annual cost of capital determinations.⁹ Shipper interests largely concurred with the Board's approach until the Board's *Ex Parte 558 (Sub-No. 9)* proceeding, in which WCTL argued that the DCF methodology produced an "overstated" cost of equity, and recommended that the Board discard the established DCF model in favor of a form of CAPM. See Ex Parte No. 558 (Sub-No. 9), *Railroad Cost of Capital – 2005*, decision served September 20, 2006, at 6-8.¹⁰ In rejecting WCTL's argument, the Board (correctly) concluded that "there is not enough evidence that our longstanding DCF model must be replaced." *Id.* at 6.

Nonetheless, in September 2006, the Board instituted the Ex Parte No. 664 proceeding "to explore the most suitable methodology for calculating the cost of capital." Ex Parte No. 664, *Methodology To Be Employed in Determining the Railroad Industry's Cost of Capital*, Decision served January 17, 2008, at 4 ("CAPM Decision"). After receiving comments and evidence from interested parties, the

⁹ See, e.g., Ex Parte No. 558 (Sub-No. 9), *Railroad Cost of Capital – 2005*, Decision served Sept. 20, 2006, at 6-7; Ex Parte No. 558 (Sub-No. 8), *Railroad Cost of Capital – 2004*, Decision served June 21, 2005, at 5; Ex Parte No. 558 (Sub-No. 7), *Railroad Cost of Capital -- 2003*, Decision served June 28, 2004, at 5; Ex Parte No. 558 (Sub-No. 6), *Railroad Cost of Capital – 2002*, Decision served June 19, 2003 at 6; Ex Parte No. 558 (Sub-No. 5), *Railroad Cost of Capital – 2001*, Decision served June 20, 2002, at 5-6.

¹⁰ As discussed below, in early 1998 WCTL filed comments in Ex Parte No. 558 (Sub-No. 1) asserting that that the Board's procedures for calculating the cost of capital produces an excessively high figure. After that submission, however, WCTL did not again raise any challenge to the Board's DCF methodology until 2006.

Board issued a decision concluding that “the time has come to replace the single-stage Discounted Cash Flow (DCF) model we have used since 1981 to estimate the cost of equity” with a “specified CAPM model.” *CAPM Decision* at 1-2. However, the Board also found that “[t]here may be merit to the idea of using” both the CAPM and the DCF models, because CAPM, despite its wide acceptance as a tool for calculating the cost of equity, “has certain strengths and weaknesses, and it may be complemented by a DCF model.” *Id.* at 13. Thus, using both approaches might result in “a more reliable, less volatile, and ultimately superior estimate than by relying on either model standing alone.” *Id.* In fact, “WCTL did not oppose the idea” of using an MSDCF as a check on CAPM and offered a model of its own design. *Id.* at 13 & n.40.

Although the *CAPM Decision* declined to adopt an MSDCF model because the record was insufficient to enable it to decide upon a particular one, the Board announced that it would explore the possibility of using an average of CAPM and a reasonable MSDCF in a separate sub-proceeding. *Id.* at 13-14. One month later, the Board issued an advance notice of proposed rulemaking instituting that sub-proceeding and inviting interested parties to submit comments. See Ex Parte No. 664 (Sub-No. 1), *Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry’s Cost of Capital*, Advance Notice of Proposed Rulemaking, served February 11, 2008 (“MSDCF ANPRM”). In August 2008, after reviewing the parties’ submissions, the Board issued a NPRM proposing to use the average of the estimates produced by CAPM and the Morningstar / Ibbotson MSDCF, finding that this MSDCF satisfied the four criteria which the Board had identified in the *MSDCF NPRM*.¹¹

¹¹ *MSDCF NPRM* at 4-6. In the *MSDCF NPRM*, the Board described four criteria that it would follow in deciding whether to adopt a multi-stage DCF. First, “and foremost,” the DCF model “should be a *multi-stage model*.” *Id.* at 3 (emphasis in original). Second, the DCF model “should

After receiving two more rounds of comments and evidence, the Board concluded in January 2009 that “using a simple average of CAPM and the Morningstar / Ibbotson multi-stage DCF model to calculate the cost of equity will yield a more precise determination than relying on CAPM alone.” *MSDCF Decision* at 1-2. The Board rejected WCTL’s various criticisms of the Morningstar / Ibbotson MSDCF, explaining in detail why none of them had merit. *Id.* at 6-15. Instead, the Board held that the Morningstar / Ibbotson model “meets our criteria for a suitable multi-staged DCF model,” and noted that “Indeed, WCTL’s own experts have relied on information from Morningstar / Ibbotson in other cost-of-capital contexts because the company is a highly regarded, independent provider of information on the cost of capital for hundreds of industries.” *Id.* at 7-8 & n.26. Using the average of that model and CAPM should produce “a stable yet precise estimate of the cost of equity that we can use in future regulatory proceedings and to gauge the financial health of the railroad industry.” *Id.* at 15.

B. The Morningstar / Ibbotson Multi-Stage Discounted Cash Flow Model

The Morningstar / Ibbotson three-stage DCF model is an objective, commercially accepted, and unbiased tool for calculating the cost of equity. It was developed by disinterested, and widely respected, third parties for use by the financial community in evaluating publicly traded equities and in making real-world investment decisions – not as a tool for litigation or advocacy. *MSDCF Decision* at 4, 7-8, 13. Moreover, the model can be estimated from readily

not focus on dividend payments only.” *Id.* Third, the DCF model “should be limited to those firms that pass the screening criteria set forth in *Railroad Cost of Capital – 1984*, 1 I.C.C.2d 989 (1985).” *Id.* at 4. Fourth, the Board must be satisfied that any multi-stage DCF model it might adopt “would, when used in combination with CAPM, enhance the precision of the resulting cost of equity estimate.” *Id.*

available data and can be modified to estimate the cost of equity for a particular group, such as the railroads passing the Board's screening criteria. *Id.* at 3-4.

The Morningstar / Ibbotson model is a multi-stage model. Unlike the single-stage DCF model previously used by the ICC and Board in pre-2009 cost of capital proceedings, which used a constant growth rate, the modified Morningstar / Ibbotson model uses three different growth rates of the railroads' cash flows:

- In each of the first five years of the model (Stage 1), the growth rate used is the median value of the three- to five-year growth estimates for each of the Class I railroads included in the model, as provided by railroad industry analysts.
- During years six through ten (Stage 2), the growth rate is the average of the earnings growth rate for the railroads for the first stage, taken as a whole.
- Beginning in year 11 and thereafter (Stage 3), the growth rate is assumed to be the long-run nominal growth rate of the aggregate U.S. economy.

See MSDCF Decision at 5-6, 8. Thus, the Morningstar / Ibbotson model reduces the possibility that the cost of equity might be overstated due to use of a constant growth rate.

Furthermore, the Morningstar / Ibbotson model discounts all relevant projected cash flows to shareholders, and not merely dividend payments, to reflect the fact that the value of a firm should be independent of its dividend policy, and that companies return profits to shareholders in ways other than by increasing dividends. The model incorporates a broad set of potential cash flows for equity investors by applying expectations of earnings growth to the firm's cash flows, not simply the actual dividend payout. Thus, the model captures all of the relevant cash flows that investors are likely to anticipate, whether those

cash flows take the form of dividends, stock repurchases, or reinvestment of earnings to obtain greater cash flows in the future. In addition, the model explicitly includes the impact of capital expenditures on firm cash flow and the measure of cash flow changes in the terminal period to account for reduced capital expenditures that would result as growth slows. *Id.* at 12-13.

The Morningstar / Ibbotson model as applied by the Board is also limited to the Class I railroads which meet the Board's 1984 *Cost of Capital* criteria. Each of those railroads is a Class I carrier that: (1) has rail assets greater than 50 percent of its total assets; (2) has a debt rating of at least BBB (Standard & Poor's) and Baa (Moody's); (3) is listed on the New York or American Stock Exchange; and (4) pays dividends throughout the year. *See MSDCF ANPR* at 3 n.5.¹²

When used in combination with CAPM, the Morningstar / Ibbotson MSDCF will produce a forecast that "is more accurate than relying on a single model." *MSDCF Decision* at 15.

C. WCTL's Never-Ending, But Constantly Changing, Attacks on the Models Adopted by the ICC and the Board

WCTL's current embrace of CAPM, and its attack on the MSDCF, is but the latest of its seemingly never-ending series of challenges to – and its constantly changing position regarding – the cost of equity model to be applied by the Board. Its current position stands in stark contrast to its prior attacks on CAPM and support for use of the MSDCF in conjunction with CAPM.

¹² BNSF is no longer included in the MSDCF model because it no longer meets the criteria for inclusion in its sample base for calculation of the cost of capital. *See Ex Parte No. 558 (Sub-No. 14), Railroad Cost of Capital-2010*, Decision served October 3, 2011, at 2 n.4.

1. WCTL's Opportunistic Flip-Flopping

For more than 15 years, WCTL and other shippers generally supported the use of the single-stage DCF and objected to the use of CAPM as “conceptually and technically flawed.” See, e.g., *Railroad Cost of Capital – 1982*, 367 I.C.C. at 670 ; Ex Parte No. 558 (Sub-No. 9), *Railroad Cost of Capital – 2005*, Decision served September 20, 2006, at 7 (WCTL’s endorsement of CAPM “is a reversal of the prior position of the shipper community that the ‘CAPM technique was conceptually and technically flawed’”) (quoting *Railroad Cost of Capital – 1982*, *supra*).

Then, in the Board’s proceeding to determine the railroads’ 1997 cost of capital, WCTL changed its position and asserted that the Board’s DCF methodology “produces a figure that is too high given current economic conditions, the financial condition of the railroads, and the regulatory purposes of the cost of capital calculation” – a contention that the Board rejected because WCTL provided no specific evidence to support it. *Railroad Cost of Capital – 1997*, 3 S.T.B. 176, 177 n.1 (1998).

Eight years later, WCTL (in reply comments) again challenged the use of the DCF model and argued that it should be replaced by CAPM because the results of the DCF model “overstated” the cost of equity. Ex Parte No. 558 (Sub-No. 9), *supra*, Decision at 6. In contrast to its current criticisms of the Morningstar / Ibbotson model, WCTL at that time based its proposed CAPM model on data provided by Ibbotson Associates, which WCTL described as “a leading provider of financial data [that] was acquired on March 1, 2006 by Morningstar, Inc., a leading provider of independent investment research.” WCTL Comments in Ex Parte No. 558 (Sub-No. 9), *Railroad Cost of Capital – 2005*, filed April 28, 2006, at 9-10. The Board rejected WCTL’s criticisms, citing its failure to present “compelling

evidence” that the DCF methodology was flawed. The Board noted that it was “witnessing a reversal of position, as the shipper community originally objected to the use of CAPM, arguably *because at the time it resulted in a higher cost of capital calculation.*” Ex Parte No. 558 (Sub-No. 9), *supra*, Decision served February 12, 2007, at 4 (emphasis added).

In comments that it filed in 2007 in Ex Parte No. 664, WCTL – again in contrast to its current position – argued that the Board should adopt *either* the CAPM-based approach *or* a MSDCF model, which (according to WCTL) generates “very similar results” and “directly addresses what is otherwise a major flaw in the DCF method as employed by the Board.”¹³ WCTL also maintained that using two or more reliable models would enhance the accuracy of a regulator’s estimate of the cost of equity. For example, WCTL stated that “the STB should not blindly follow any single model to determine the COE,” and that a “multiple-stage DCF model, properly applied, has considerable potential to serve as a check on the reasonableness of application of the CAPM approach.”¹⁴ Similarly, WCTL’s witness James Hodder, an economist offered as an expert on cost of capital methodologies, endorsed the use of a multi-stage DCF model in conjunction with CAPM and even suggested that the Board *require* the use of a second model.¹⁵

¹³ Comments of WCTL filed December 8, 2006, in Ex Parte No. 664, at 2. *See also* Summary of Hearing Testimony of WCTL, filed February 12, 2007, in Ex Parte No. 664, at 2 (“Both approaches, properly employed, should yield similar results, and both approaches should be considered and any differences reconciled”).

¹⁴ Reply Comments of WCTL filed October 29, 2007, in Ex Parte No. 664, at 19. *See also id.* at 3; Written Hearing Testimony of WCTL filed November 27, 2007, in Ex Parte No. 664, at 15 (“A multi-stage DCF model is particularly useful as a check on the CAPM results”).

¹⁵ *See* Reply Verified Statement of James E. Hodder filed October 29, 2007, in Ex Parte No. 664, at 3, 12. *See also* Transcript of February 15, 2007, Hearing in Ex Parte No. 664, at 95 (testimony of James E. Hodder) (“I would suggest you mandate a multi-phase DCF model”); *id.* at 96 (“I would suggest that you mandate a second estimation methodology based on some asset pricing model,” including either CAPM, Fama-French, or arbitrage pricing theory. “The basic idea here is that all

Once the Board instituted Ex Parte No. 664 (Sub-No. 1), however, WCTL's position again began to shift. In its initial comments, WCTL submitted two MSDCF models "of its own creation" which considered two alternative measures of cash flow (modified cash payout and free cash flow to equity), criticized the Morningstar / Ibbotson model, and ultimately contended that the issue of an MSDCF should be deferred for five years because "little [would] be gained at this time" from the use of MSDCF evidence, given the "lumpiness" of cash flows and the need for averaging such data.¹⁶ In its subsequent submissions, however, WCTL argued that the Board should not adopt the MSDCF proposed in the NPRM (which WCTL mischaracterized as the "AAR model") but should give "meaningful consideration" to WCTL's proposed MSDCF models.¹⁷

WCTL's Petition constitutes the latest change in its position. WCTL now proposes that the Board cease using *any* MSDCF – notwithstanding its development of its own MSDCF models in Ex Parte No. 664 (Sub-No. 1).

2. WCTL's Prior Attacks on the Morningstar / Ibbotson Model As Applied By the Board

Although its criticisms have varied, WCTL has consistently attacked the Morningstar / Ibbotson MSCDF ever since the Board first proposed its adoption in 2008 in the Ex Parte No. 664 (Sub-No. 1) proceeding. WCTL argued that the model should not be adopted because, *inter alia*, (1) the model has not been shown to be a reliable measure of the cost of capital for the railroad industry, and

three of these models are similar in the sense that they focus on first, a risk-free return, which includes both a real return and an inflation adjustment. ... [I]n the end, you should get out similar estimates"); *id.* at 97 ("The models are estimating [the cost of equity] imperfectly. But they should converge"); *id.* at 98 ("if the inputs used across the various models are consistent with each other, [the] difference [in the cost of capital estimates] should be modest").

¹⁶ See *MSDCF Decision* at 3; Comments of WCTL filed April 14, 2008, at 5-11, 16-17.

¹⁷ *MSDCF Decision* at 4-5; Reply Comments of WCTL filed October 15, 2008, at 7-10; Opening Comments of WCTL filed September 15, 2008, at 3-4, 15, 28-29.

a model more specific to the railroad industry should be adopted; (2) the model is too simple; (3) the model contains numerous technical flaws, including its underlying assumptions regarding the second-stage growth rate and its failure to take account of the exercises of stock options or share repurchases in measuring cash flows; and (4) its reliance on Ibbotson data for the growth rate for the first five years, without additional review or scrutiny. *See MSDCF Decision* at 7-14.

The Board correctly rejected all of these criticisms. *First*, the Board found it unnecessary to construct a railroad-only model because “a reputable independent vendor,” Morningstar/Ibbotson, “provides a suitable model for our purposes.” The Board further noted that WCTL’s own experts had relied on Morningstar / Ibbotson data in other cost of capital proceedings. *Id.* at 7-8.

Second, the Board held that the “simplicity” of the Morningstar / Ibbotson model is “a virtue,” because the Board’s goal was “not to make our calculation of the cost of equity more complex, but to make it more precise.” *Id.* at 8.

Third, the Board rejected WCTL’s purported “technical concerns” out of hand, because (1) WCTL provided no testimony to support them, and (2) several of the “concerns” “conflict with prior testimony by WCTL’s finance witnesses, raising serious questions about the validity of the critiques.” *Id.* The Board further found that in any event, WCTL’s “concerns” were without merit. The model’s second-stage growth rate was reasonable, because the returns of individual firms should revert to the industry average over time. The model’s assumption of high earnings growth for 10 years is also realistic, because the growth estimates “are driven more by market forces than regulatory concerns,” given the relatively small fraction of railroad traffic that is subject to the Board’s rate reasonableness jurisdiction. *Id.* at 8-9.

The Board also found no flaw in the model's failure to account for stock options and stock repurchases because the model "focuses on a broader measure of free cash flow that is potentially available to equity investors." *Id.* at 12. The Board pointed out that WCTL's own free cash flow model did not explicitly account for these stock transactions. *Id.*

Fourth, the Board found no merit in WCTL's concern regarding the use of Ibbotson data, because the model is a "commercially accepted" and "transparent" model with variables that can be estimated from readily available data, including Ibbotson. *Id.* at 13.

Despite the Board's ruling—and despite WCTL's decision not to appeal that ruling—WCTL has continued to attack the Board's use of the Morningstar / Ibbotson MSDCF in the Board's annual cost of capital determinations (the Ex Parte No. 558 sub-numbered proceedings), in disregard of the Board's prohibition of such an approach. In the *CAPM Decision*, the Board ruled that it would no longer entertain challenges to the Board's model in the "558 proceedings," because such challenges could lead to protracted litigation and delay of the release of the annual cost-of-capital figure. Instead, "future requests to change the [methodology] must be brought in a 664 proceeding, not in the annual 558 proceedings." *CAPM Decision* at 18.

Undeterred, WCTL attempted to challenge the Morningstar / Ibbotson methodology in the next "558 proceeding," and has done so in virtually every subsequent 558 proceeding. And the Board, citing its ruling in the *CAPM Decision*, has rejected every such attempt as procedurally improper.¹⁸

¹⁸ See Ex Parte No. 558 (Sub-No. 17), *Railroad Cost of Capital – 2013*, Decision served July 31, 2014, at 2-3; Ex Parte No. 558 (Sub-No. 16), *Railroad Cost of Capital – 2012*, Decision served August 30, 2013, at 9-10; Ex Parte No. 558 (Sub-No. 15), *Railroad Cost of Capital – 2011*, Decision served September 13, 2012, at 14-15; Ex Parte No. 558 (Sub-No. 14), *Railroad Cost of Capital – 2010*,

3. WCTL's Current Criticisms of the Morningstar / Ibbotson MSDCF Model Used By the Board

Although WCTL's current Petition argues that "the Board must rely solely on the CAPM values,"¹⁹ WCTL does not contend that any MSDCF model is inherently unreliable. Instead, it argues the Morningstar / Ibbotson MSDCF as applied by the Board suffers from "internal flaws ... when it is applied to the railroad industry." Petition at 3. For example, WCTL's witness Hodder testifies that the "problems" he identifies with the MSDCF "are not inherent characteristics of MSDCF models generally, but rather results of particular assumptions made by Morningstar / Ibbotson in implementing their version of the more general model." Verified Statement of James E. Hodder, at 11 ("Hodder V.S.").

Stripped of its rhetoric, WCTL's grievance lies not with the MSDCF model itself, but with the *results* of the Morningstar / Ibbotson MSDCF. WCTL's overriding criticism of the Morningstar/Ibbotson is that the cost of equity calculated under that model is too high, resulting in "unreasonably high rail rates." Petition at 2. Again and again, WCTL contends that because the MSDCF's estimates are higher than those calculated under CAPM, *a fortiori* the MSDCF's estimates are unreliable and should not be considered.²⁰ By contrast, although

Decision served October 3, 2011, at 10-11 n.18 (rejecting WCTL's proposed adjustment to Board-adopted CAPM and MSDCF); Ex Parte No. 558 (Sub-No. 12), *Railroad Cost of Capital - 2008*, Decision served September 25, 2009, at 2. WCTL similarly challenged the CAPM adopted by the Board within months of its adoption. See Ex Parte No. 558 (Sub-No. 11), *Railroad Cost of Capital - 2007*, Decision served September 26, 2008, at 7 (rejecting WCTL's calculation of beta because "it departs from the methodology adopted in" the *CAPM Decision*, using an "altogether different approach to estimate beta").

¹⁹ Petition at 3; see also *id.* at 1.

²⁰ See, e.g., Petition at 2 (MSDCF has "wrongfully increased the railroads' COE and COC significantly"); *id.* at 5 ("The use of the MSDCF raised the 2008-2012 average COE by over 200 basis points and the average COC by over 156 basis points, equating to an increase in the overall COC of 16%"); *id.* at 6-7 (use of the MSDCF "has increased overall COE/COC values," and "the

the annual cost of equity estimates calculated under CAPM have reached levels as high as 11.84 percent, WCTL does not criticize them as “unrealistically high.” Instead, WCTL argues that the difference between CAPM and the MSDCF “are too large to be dismissed.” *Id.* at 7. Tellingly, WCTL never discusses the possibility that CAPM is too low, although unusually persistent expansive monetary policy has increased the spread between Treasury debt and high quality corporate bonds making CAPM understate the cost of equity. *Villadsen V.S.* at 21-25.

WCTL asserts that the “substantial deviations” between CAPM and MSDCF estimates are due to several alleged flaws in the Board’s application of the Morningstar / Ibbotson MSDCF methodology. *First*, the second stage of the Morningstar / Ibbotson model fails to implement a “smooth transition” from the first stage to the third stage, and therefore allegedly creates a substantial upwards bias in the COE, because only three railroads (now four with KCS)—all of which have high projected growth rates—are included. Thus, the third stage, according to WCTL, “produces an abrupt reduction” in its growth rates to approximately one-third of the levels in the first two stages. *Petition* at 8; *Hodder V.S.* at 4-5.

Second, rather than achieve a smooth reduction in cash flows, the model has an “upward bias” that causes a “massive upward jump” in cash flows at the start of the third stage. Such increases, occurring “literally overnight” 10 years and a day after the start of the model, “are inherently implausible and indicate a modeling flaw.” *Petition* at 8; *Hodder V.S.* at 5-6.

MSDCF COE values are unrealistically high”); *id.* at 9 (“the Board’s MSDCF methodology is flawed; produces an overstated COE/COC for the railroads; and its utilization must cease”).

Third, the MSCDF bases growth in firm-wide cash flow on earnings per share (“EPS”), but supposedly fails to take into account stock repurchases by the railroads during 2008-2012 that have significantly reduced their net number of outstanding shares. The share reductions will allegedly cause EPS to increase faster than firm-wide earnings, thereby overstating growth in firm-wide earnings and cost of equity. Petition at 8; Hodder V.S. at 6-9.

The AAR opposed this Petition to start a rulemaking to explore whether the Board should discard the MSDCF model. With the difficulty and time spent settling on the current approach fresh in its mind, the AAR did not believe that WCTL had justified its request. But as the STB had repeatedly told WCTL to stop challenging the MSDCF model in the annual calculations, and instead present its concerns in a petition for rulemaking, the AAR understands why the Board chose to air out WCTL’s grievances in this proceeding. Perhaps this proceeding will lay WCTL’s unfounded claims to rest. As explained below, it would be profoundly unwise and unjustified to abandon the MSDCF model.

AAR COMMENTS

I. AVERAGING THE RESULTS FROM CAPM AND MSDCF REMAINS THE BEST PRACTICE FOR A RELIABLE ESTIMATE.

Estimating the cost of capital is difficult. Fundamentally, the cost of capital represents an opportunity cost for investors; by undertaking one particular investment, the investor foregoes the return she might earn on some other investment of equivalent risk. Villadsen V.S. at 4. The cost of capital therefore represents the *expected* return that a rational investor would require to make her indifferent between investments that are *expected* to have equivalent risk profiles. It is impossible, however, to ever “know” these investors’ expectations. Even after the fact, realized returns and risk measurements are only point observations from the distribution of outcomes that were possible at the time of the investment. “The best one can do is to *estimate* the parameters relating to the cost of capital using the techniques of modern finance.” *Id.* (emphasis added).

The Board’s use of two models to estimate the cost of equity is an eminently reasonable practice, because it enhances the precision of the estimate and, therefore, the reliability of the Board’s determination of the cost of capital. As explained by Dr. Villadsen, the Board’s approach is amply supported by the applicable economic literature and other regulatory agencies, which endorse the use of multiple models. Indeed, before its latest change of position, WCTL *supported* the use of multiple models. Abolishing the use of the Morningstar / Ibbotson MSDCF would be a serious economic and policy mistake that would produce less reliable results than those that are calculated using CAPM alone.

A. The Board’s Use of Multiple Models Is Reasonable.

The Board’s use of multiple models is the best method of ensuring a reasonable estimate of the cost of equity, because it “improve[s] estimation

techniques when each model provides new information,” and “combining forecasts from different models is more accurate than relying on a single model.” *MSDCF Decision* at 15. The use of multiple models not only generates stable results, but takes advantage of the strengths of different approaches. As the Board has explained:

Both CAPM and the multi-stage DCF models we propose to use have their own strengths and weaknesses, and both take different paths to estimate the same illusory figure. By using an average of the results produced by both models, *we harness the strengths of both models while minimizing their respective weaknesses. The result should be a stable yet precise estimate of the cost of equity* that we can use in future regulatory proceedings and to gauge the financial health of the railroad industry.

Id. (emphasis added). Even WCTL begrudgingly concedes that the use of multiple models has had some stabilizing effect on COE values. Petition at 5-6.

Indeed, notwithstanding WCTL’s exclusive focus on the alleged shortcomings of the Morningstar / Ibbotson MSDCF, both that model and CAPM have their own different strengths and weaknesses. *Villadsen V.S.* at 10-21. The Morningstar / Ibbotson MSDCF is a “commercially accepted” model by a “highly regarded, independent provider of information on the cost of capital for hundreds of industries.” *MSDCF Decision* at 4, 7-8, 13. The model is a forward-looking model that relies on the expected cash flow in the railroad industry. *Villadsen V.S.* at 10. This aspect of the model is important because the railroad industry is currently making large capital investments, which will impact railroads and their customers for a long time. *Id.* And, like most DCF models, the Morningstar / Ibbotson MSDCF uses company-specific growth rates in Stage 1 and long-term GDP growth in Stage 3, which is a substantial improvement over single-stage models which assumed no change in growth. *Id.* at 10-11.

In addition, the Morningstar / Ibbotson MSDCF relies on total free cash flow in Stages 1 and 2. *See* Villadsen V.S. at 11; *MSDCF Decision* at 12 (model does not explicitly account for stock options and stock repurchases “because it focuses on a broader stream of free cash flow that is potentially available to equity investors”). *See also* *MSDCF Decision* at 4. This is a key valuation metric, because cash “ultimately is what accrues to shareholders and what they care about. . . .” Villadsen V.S. at 11.

Like all models that seek to estimate this elusive cost of equity, the Morningstar / Ibbotson MSDCF has its weaknesses that inevitably flow from the simplifying assumptions used to render the model less daunting. The model relies on company-specific growth rates for Stage 1 and economy-wide growth in Stage 3 because in the very long run, long-term growth is expected to normalize to that of the economy. However, the horizon to Stage 3 is not universally agreed on. Villadsen V.S. at 11-12. Similarly, the model computes free cash flow in Stage 1 and Stage 2 as income before extraordinary items minus capital expenditures in excess of depreciation plus deferred taxes. However, in Stage 3, capital expenditures and depreciation are equal, and the adjustment to earnings before taxes will approach zero in the long term. *Id.* at 12. To smooth the transition to Stage 3, it is necessary to smooth both the growth rates and the cash flow – and the “disappearance” of capital expenditures can no longer be added to the cash flow available to shareholders. *Id.* at 13.

The CAPM adopted by the Board in 2008 also has both strengths and weaknesses. CAPM is a well-known, theoretically sound, “acceptable and widely used method” of calculating the cost of equity, and the theory underlying CAPM is “simple and intuitive.” *CAPM Decision* at 2, 4. Like the MSDCF, CAPM is

transparent and well-documented, and data are usually available for its estimation. CAPM is also theoretically sound. Villadsen V.S. at 20.

On the other hand, CAPM has several weaknesses. *First*, “the actual development of a particular [CAPM] model can be complex and requires the exercise of reasoned judgment.” *CAPM Decision* at 4. *See also Railroad Cost of Capital – 1986*, 3 I.C.C.2d 948, 958 (1987) (“The overall computation using the CAPM is quite complex”). As the ICC found, CAPM “requires the use of many assumptions ... Each of these can have a significant effect on the result obtained and each necessitates judgments on how best to define and measure it.” *Railroad Cost of Capital – 1981*, 365 I.C.C. at 741. *See also Ex Parte No. 558 (Sub-No. 9)*, *supra*, Decision served September 20, 2006, at 7.

Second, CAPM is backward-looking in nature because it relies on historical data in several respects:

- The model relies on 5 years of historical data to estimate Beta and measure the systematic, non-diversifiable risk factor for the railroad industry from 1926 to the present day. *See CAPM Decision* at 9-10; Villadsen V.S. at 20. Because Betas change with the market conditions and risks of an industry, the reliability of Beta may be undermined by delays in incorporating such changes. Villadsen V.S. at 20-21.
- The model also calculates the market risk premium by using historical data (the historical average of stock market performance dating back to 1926). *CAPM Decision* at 7-9; Villadsen V.S. at 20-21.
- Similarly, the risk-free rate in CAPM is calculated using current interest rates, not the interest rates that an investor might anticipate will affect a firm’s performance in the future. *Id.* at 4, 7 (risk-free rate is based on rate on 20-year Treasury bond).²¹

²¹ *See also Ex Parte No. 679, Assn. of American Railroads – Petition Regarding Methodology For Determining Railroad Revenue Adequacy*, Decision served October 24, 2008, 2008 WL 4695743 (S.T.B.), at *6 (“*Ex Parte No. 679 Decision*”) (“While CAPM has become a generally accepted method for estimating the cost of equity, it is routinely applied to historical costs to calculate a company’s return on investment”); *Railroad Cost of Capital – 1986*, 3 I.C.C.2d at 959 (computation

The backward-looking nature of CAPM means that it may not capture contemporaneous changes in the market, an industry, or a company. Villadsen V.S. at 20-21.

Third, because CAPM's risk-free rate is based on the current rate on a 20-year Treasury bond, the model is very sensitive to developments in that rate that may reflect monetary policy rather than economic, or industry-specific, conditions. *Id.* at 21.²²

Finally, the simple CAPM specification has been questioned by a number of eminent finance economists, including Eugene Fama, who won the 2013 Nobel Prize in Economics for his empirical analysis of asset prices in the field of financial economics. See E. Fama & K. French, *The CAPM is Wanted, Dead or Alive*, 51 J. OF FINANCE 1947 (Dec. 1996).

Although it now apparently finds no fault with CAPM, WCTL previously stated that it did "not suggest that CAPM is perfectly precise." Written Hearing Testimony of WCTL filed November 27, 2007, in Ex Parte No. 664, at 16. WCTL acknowledged that "there is ... room for statistical error and judgment in the derivation of the various inputs, particularly beta, for which a confidence level can be constructed." *Id.*

using CAPM is "based on the use of historical observations over many years"); *Railroad Cost of Capital - 1985*, 3 I.C.C.2d at 637 (same).

²² See *Adequacy of Railroad Revenue (1978 Determination)*, 361 I.C.C. 79, 92 (1978) ("Evidence based on the CAPM, like other types of cost of capital evidence, has its weakness[es]. For example, our analysis shows that this data is sensitive to the choice of dates for study periods, and that the calculated betas do not fully explain changes in railroad returns compared to changes in market returns").

B. The Academic and Economic Literature Overwhelmingly Supports the Board's Decision To Use Multiple Models.

The cost of equity is an “elusive” value “difficult to estimate,” because it is “not directly observable,” even historically. *AEP Texas North Co. v. STB*, 609 F.3d 432, 435, 443 (D.C. Cir. 2010). Consequently, there is no single, established “best method” for calculating the cost of equity, and the Board must rely on complex models to estimate that component. *Id.* at 435; *MSDCF Decision* at 15; *CAPM Decision* at 1. When asked to comment on the sole use of CAPM, Professor Myers stated: “Analysts and decision makers should consider estimates from other [non-CAPM] models or sources whenever the estimates are informative.”²³

Dr. Villadsen wholeheartedly endorses the use of multiple models when each model provides new information. Indeed, she testifies that use of more than one model is required to produce reliable results, no methodology for estimating the cost of equity is precise, and no single model is appropriate for all circumstances. *Villadsen V.S.* at 4-8, 21-22. Moreover, to the extent that there are upward biases in one model, any downward biases in other models must also be considered. While WCTL alleges that the MSDCF is biased upward, it has failed to consider that CAPM may have been biased downward during the time period in question. *Id.* at 22.²⁴ Nor does WCTL discuss the strengths of the Morningstar / Ibbotson MSDCF. *Id.*

Dr. Villadsen's position finds overwhelming support among academics and economists. Many other academics and practitioners recognize the

²³ Stewart C. Myers, “Estimating the Cost of Equity: Introduction and Overview,” submitted to the *Australian Energy Regulator* on behalf of the Australian Pipeline Industry Association, February 2013 (“Myers AER Report”), at 12.

²⁴ During the recent financial crisis, and especially from late 2008 through 2010, measures of market risk premium that were forward-looking increased substantially and therefore indicated that the historical measure might underestimate the market risk premium of the CAPM during that period. *Villadsen V.S.* at 23-24.

importance of using more than one method in calculating the cost of equity. At the Board's hearing in Ex Parte No. 664 in February 2007, the Federal Reserve Board noted that "academic studies had demonstrated that using multiple models will improve estimation techniques when each model provide[s] new information."²⁵ The Board reached the same conclusion in the *CAPM Decision*, finding that "there is robust economic literature confirming that, in many cases, combining forecasts from different models is more accurate than relying on a single model."²⁶

Professors Berk and DeMarzo of Stanford University and Harvard University, respectively, support the use of multiple methods in their corporate finance textbook. In describing the use of CAPM, DCF and other models by practitioners, they state:

It is not difficult to see why there is so little consensus in practice about which technique to use. All the techniques we covered are imprecise. Financial economics has not yet reached the point where we can provide a theory of expected returns that gives a precise estimate of the cost of capital. Consider, too, that all techniques are not equally simple to implement. Because the tradeoff between simplicity and precision varies across sectors, practitioners apply the technique that best suit their particular circumstances.²⁷

²⁵ Testimony of Gregory J. Evans, Assistant Director of Division of Reserve Bank Operations and Payment Systems, Board of Governors of the Federal Reserve System, at hearing held February 15, 2007, in Ex Parte No. 664, at 18. See also Written Testimony of Gregory J. Evans in Ex Parte No. 664, dated February 15, 2007, at 6; *MSDCF Decision* at 15; *CAPM Decision* at 13 n.42.

²⁶ *MSDCF Decision* at 15& n.63 (citing David F. Hendry & Michael P. Clements, *Pooling of Forecasts*, VII *Econometrics Journal* 1 (2004); J.M. Bates & C.W.J. Granger, *The Combination of Forecasts in Essays in Econometrics: Collected Papers of Clive W.J. Granger*, Vol. I: *Spectral Analysis, Seasonality, Nonlinearity, Methodology, and Forecasting* 391-410 (Eric Ghysels, Norman R. Swanson, & Mark W. Watson, eds., 2001); Spyros Makridakis and Robert L. Winkler, *Averages of Forecasts: Some Empirical Results*, XXIX *Management Science* 987 (1983)).

²⁷ J. Berk and P. DeMarzo, *Corporate Finance: The Core* 466 (3d ed. 2014).

The textbook of Bingham and Houston on the fundamentals of financial management similarly indicates that consultants generally use several methods, including CAPM and a discounted cash flow model, to assess the cost of equity.²⁸ Professor Roger Morin of Georgia State University, after analyzing CAPM, DCF and other models, concludes:

No one individual method provides the necessary level of precision for determining a fair return, but each method provides useful evidence to facilitate the exercise of an informed judgment. Reliance on any single method or preset formula is inappropriate when dealing with investor expectations because of possible measurement difficulties and vagaries in individual companies' market data.²⁹

The Board's decision to use multiple models was also unequivocally supported by the U.S. Department of Transportation ("DOT"). In its comments filed in Ex Parte No. 664 (Sub-No. 1), DOT stated that it "continues to support generally the use of MS-DCF in conjunction with CAPM to improve the reliability and stability of the Board's cost of equity calculation, *and supports in particular the Board's choice of the Morningstar / Ibbotson MS-DCF model. DOT recommends that in implementing this decision the STB use a simple average of the two methodologies.*" Comments of the U.S. Department of Transportation, filed September 15, 2008, in Ex Parte No. 664 (Sub-No. 1) ("DOT Comments") at 1-2 (emphasis added).³⁰

²⁸ E. Bingham and J. Houston, *Fundamentals of Financial Management* 317 (12th ed. 2009).

²⁹ R. Morin, *New Regulatory Finance*, Public Utilities Reports, Inc., 2006, at 428 (2006).

³⁰ See also DOT Comments at 6 ("The Morningstar / Ibbotson MS-DCF methodology is particularly suitable for use with CAPM for the reasons advanced by the Board"); *id.* at 7 ("Use of the Morningstar / Ibbotson MS-DCF model in conjunction with the recently adopted CAPM methodology should consistently produce" reliable and realistic estimates of the cost of equity).

Moreover, Dr. Villadsen's position is supported by a growing group of regulatory agencies that use multiple models to estimate the cost of equity. For example, State regulators generally use more than one method to determine the allowed cost of equity, although they typically do not specify the weight assigned to each methodology. In Canada, the British Columbia Utilities Board decided in May 2013 to use both the DCF and CAPM models for determining the cost of capital for a benchmark low-risk utility, and to give equal weight to both in determining the return on equity. Several States also use a combination of CAPM and DCF models to value property of State-regulated utilities. Villadsen V.S. Appendix A.

And it bears repeating that WCTL has offered no explanation for its change of heart and reversal of position. *See* Transcript of February 15, 2007, Hearing in Ex Parte No. 664, at 95 (testimony of James E. Hodder) ("I would suggest you mandate a multi-phase DCF model"). In October 2007, WCTL stated that "the STB should not blindly follow any single model to determine the COE," and that a "multiple-stage DCF model, properly applied, has considerable potential to serve as a check on the reasonableness of application of the CAPM approach."³¹ Similarly, Dr. Hodder again endorsed the use of a multi-stage DCF model in conjunction with CAPM:

As I have indicated on several occasions, the benefit of obtaining estimates from both the CAPM (or a similar model) and from a multiphase DCF model is that they use different approaches to very different types of inputs. However, they should yield similar cost of equity estimates if the input assumptions are consistent with each other. Both types of models have significant implementation issues. One is not better

³¹ Reply Comments of WCTL filed October 29, 2007, in Ex Parte No. 664, at 19. *See also id.* at 3; Written Hearing Testimony of WCTL filed November 27, 2007, in Ex Parte No. 664, at 15 ("A multi-stage DCF model is particularly useful as a check on the CAPM results").

than the other, but rather they are different. In the current circumstances, different perspectives can be helpful.³²

In view of the strengths and weaknesses of the CAPM and MSDCF models, the plethora of academic/economic literature endorsing the use of multiple models, and WCTL's own prior support for that approach, eliminating the MSDCF from the Board's determinations would be a serious economic and policy mistake. Continued use of an average of the estimates produced by a MSDCF and CAPM model is most likely to generate reasonable results.

II. WCTL HAS NOT JUSTIFIED ABANDONING THE MORNINGSTAR/IBBOTSON MSDCF MODEL.

A. WTCL Bears a Heavy Burden of Persuasion.

Given the above-described history of, and overwhelming support for, the use of multiple models, WCTL bears a "heavy burden of persuasion" to show that combining the results from the CAPM and Morningstar / Ibbotson MSDCF is unreasonable. *See Ex Parte No. 679 Decision*, 2008 WL 4695743, at *5 ("With this history in mind, AAR has a heavy burden of persuasion to show that its proposed approach overcomes these practical difficulties").³³ Indeed, in the context of the cost-of-capital calculation, the Board has stated that its policy is "not to depart from long-established methodology ... unless a party presented

³² See Reply Verified Statement of James E. Hodder filed October 29, 2007, in Ex Parte No. 664, at 12.

³³ See also Ex Parte No. 717, *Petition of the Association of American Railroads To Institute a Rulemaking Proceeding To Reintroduce Indirect Competition As a Factor Considered In Market Dominance Determinations of Coal Transported To Utility Generation Facilities*, Decision served March 19, 2013, at 7 ("Ex Parte No. 717 Decision") (because the Board "has devoted extensive consideration to its policy for limiting its market dominance inquiry to only evidence of direct competition," AAR has not persuaded the Board "that the Board should depart from its existing policy and reconsider evidence of product and geographic competition"); Finance Docket No. 26476 (Sub-No. 1), *Toledo, Peoria & Western Ry. Corp. - Trackage Rights Compensation - Peoria and Pekin Union Ry. Co.*, Opinion served September 20, 1994, 1994 ICC LEXIS 175, at *13 ("Issues regarding the appropriate interest rental rate have been resolved previously and, absent persuasive argument to the contrary, we will adhere to precedent").

compelling evidence that it is flawed.” Ex Parte No. 558 (Sub-No. 9), *supra*, Decision served February 12, 2007, at 4 (emphasis added). That is because “[t]here is a norm of regularity in government conduct that presumes an agency’s duties are best carried out by adhering to the settled rule” – a presumption that is “particularly strong where, as here, a party seeks to replace an established methodology with one the agency has previously rejected” (*i.e.*, the use of the CAPM alone to determine the cost of capital).³⁴

B. WTCL Does Not Challenge the Validity of Multi-Stage DCF Models, Offer Any Alternative, or Acknowledge the Known Weaknesses of the CAPM.

WCTL, however, does not even address, much less rebut, the Board’s rationale for applying the Morningstar / Ibbotson MSDCF model, rather than a single estimate of equity or an MSDCF model (like WCTL’s) made for litigation. Instead, WCTL rehashes some of the same arguments that it raised in 2008 (such as the alleged failure of the Morningstar / Ibbotson MSDCF to address stock repurchases) which were rejected by the Board in the *MSDCF Decision*.

WCTL does not claim that there is something inherently wrong with the Morningstar / Ibbotson MSDCF model. Instead, it faults the “particular assumptions made” in the model as applied by the Board. Petition at 9. However, all models make assumptions, as WCTL itself has conceded. *See Villadsen V.S.* at 8-9; WCTL Opening Comments filed September 15, 2008, at 5 (“Like any model, the AAR MSDCF proposal rests on a series of key assumptions”). Criticizing only those assumptions that might currently produce an outcome WCTL deems undesirable is classic, and inappropriate, cherry-

³⁴ Ex Parte No. 558 (Sub-No. 9), *supra*, Decision served September 20, 2006, at 7.

picking. It is the totality of the model and all its key assumptions that must be examined. Villadsen V.S. at 9.

Moreover, WCTL fails to acknowledge that *both* the CAPM *and* the Morningstar / Ibbotson MSDCF have certain aspects that *understate* the true cost of equity. For example, the CAPM understated the true cost of equity in recent years due to the financial crisis that began in 2008, which caused Treasury bond yields to decrease substantially (due in part to monetary policy) and widened the yield spread between corporate and Treasury bonds. Therefore, the cost of equity as estimated by the CAPM has been downward biased. Villadsen V.S. at 21-24.

As Professor Myers has explained:

Costs of equity derived from multi-stage dividend discount models are particularly useful now. With extremely low current interest rates, routine applications of the CAPM, which use “normal” equity risk premiums, can now yield cost of equity estimates that seem unreasonably low.³⁵

The CAPM sensitivity to low interest rates will influence the cost of equity derived from the model even after the unusual monetary policy period. CAPM is backward looking. It relies on a historic snap shot to estimate the current demands of inventors; but investors’ demands are forward looking. As such, even as a period of unusual monetary policy returns to normal, it will be several years before the bias in CAPM works its way out of the system.

WCTL also has not considered counterbalancing assumptions in the Morningstar / Ibbotson MSDCF that also understate the cost of equity. WCTL does not consider the possibility that the length of the first and second stages of the model may be set by limits on profitability or by longer-term requirements for capital investment, or that cash available for payout to investors should

³⁵ Myers AER Report at 8.

increase when the capital investments slow down and begin generating cash flow. As a result, the cash flows in the second and third stages are likely to produce downward biases in cash flows for Stage 2 or Stage 3 as long as the railroads continue to incur substantial capital expenditures. Villadsen V.S. at 12-14.

Furthermore, the Morningstar / Ibbotson model's calculation of cash flow does not include distributions to shareholders through stock purchases, and therefore understates the cash that is actually available to shareholders. This produces a downward bias in the cost of equity calculation that is likely to exceed any upward bias created from the method of measuring low growth rates relative to earnings per share. *Id.* at 14-15.

C. The Substantive Criticisms Leveled Against the Morningstar / Ibbotson MSDCF Do Not Merit Abandoning the Model.

WCTL contends that the model overstates the cost of equity because it (1) fails to implement a smooth transition from Stage 1 to Stage 3 and (2) bases growth in firm-wide cash flow on earnings per share that increase faster than firm-wide earnings due to stock buybacks. These criticisms do not merit abandoning the MSDCF model for three reasons.

First, all models have simplifying assumptions lest the complexities of the model render it useless. As Dr. Villadsen explains, elaborations on the MSDCF are complex and prone to create controversy as there are numerous additional data and assumptions that need to be incorporated into the model. Villadsen V.S. at 31-32. And the academic literature emphasizes the same point. Professors Berk and DeMarzo of Stanford University and Harvard University, respectively, observe that "all techniques are not equally simple to implement. Because the tradeoff between simplicity and precision varies across sectors, practitioners

apply the technique that best suit their particular circumstances.”³⁶ The Board has concluded that the “simplicity” of the Morningstar / Ibbotson model is “a virtue.” *MSDCF Decision* at 8.

Second, the simplifying assumptions used by the Morningstar / Ibbotson model are reasonable. The model begins by using firm-specific growth rates to project cash flows in the first period. In the second period, the model forgoes the firm-specific cash flows in favor of the industry average. The implicit assumption is that as the industry grows, companies that are lagging the pack will find ways to adopt best practices and otherwise trend towards the average. Meanwhile, companies that are leading the pack cannot remain in front forever, as competitors begin to replicate their best practices and draw the leader back toward the average growth for the industry. In the final period, the growth rates are assumed to standardize around the growth rate for the economy. Again, this feature is based on the reasonable assumption that no industry can outpace the general economy forever. These growth rates do not smoothly transition from period to period, but the choice of growth rates in each period is reasonable.

The jump in cash flows in the final period is also due to assumptions about the level of capital expenditures the industry will make in the long term. In the first two stages, the model defines free cash flow as earnings before extraordinary items, minus CapEx in excess of depreciation, plus deferred taxes. In the steady-state period, this assumption changes. The model assumes that CapEx will consist just of maintenance capital (no growth capital), so that CapEx and depreciation are equal. Further, because deferred taxes are linked to CapEx, this amount is expected to disappear as CapEx approaches maintenance levels in the long term steady-state equilibrium. Therefore, the adjustment to earnings

³⁶ J. Berk and P. DeMarzo, *Corporate Finance: The Core* 466 (3d ed. 2014).

before taxes (depreciation minus CapEx plus deferred taxes) will approach zero in the long term. The underlying rationale is that if a company continued to invest in growth capital in excess of depreciation, it would grow during the period that the model assumes is the steady state. Therefore, the Morningstar / Ibbotson MSDCF implicitly assumes a steady-state for *both* growth and cash flow generation.

While these assumptions are reasonable in theory, Dr. Villadsen offers two words of caution. Villadsen V.S. at 13 n.21. First, the steady-state of the railroad industry is reached when true economic depreciation—the decline in the *market* value of rail assets attributable to their usage in that year—equals capital expenditures. In the steady-state, the assumption is that economic depreciation and capital expenditures will converge. However, the model relies on an accounting measure of depreciation. Dr. Villadsen explains that it is likely that an observed spread between accounting depreciation and capital expenditures will extend far into the steady-state, because accounting depreciation is based on book values rather than current costs. *Id.* Second, the use of accounting depreciation—if less than the true economic depreciation of assets—will bias the MSDCF downwards as it is additive in Stages 1 and 2 (while capital expenditures are subtracted). “In other words,” Dr Villadsen explains, “if the Board MSDCF is understating the current economic depreciation of rail assets, then the Morningstar / Ibbotson MSDCF model will understate the true cost of equity for the railroad industry.” *Id.*

Finally, replacing the simplifying assumptions in the Morningstar / Ibbotson MSDCF model with a more complex MSDCF model that addresses WCTL’s concerns would have only a *de minimis* impact on the cost of equity calculation. Dr. Villadsen first evaluated the impact of the flaws alleged by

WCTL regarding the transition from Stage 1 to Stage 3. The lack of a smooth transition causes growth rates to drop and cash flows to jump in Stage 3. Dr. Villadsen's "1st Modified MSDCF" corrects both these alleged flaws. As shown, the difference between the current approach used by the Board and a model that smoothes the transitions is tiny (14.9% versus 14.1%). This small change to the MSCDF estimates are only component parts of the cost of equity, which in turn is only a component part of the total cost of capital, and therefore the impact on the overall cost of capital would be even smaller.

Dr. Villadsen then builds on this model to address the allegation about the impact of stock repurchases. "2nd Modified MSDCF" contains the same fixes in 1st Modified MSDCF to smoothly transition from Stage 1 to Stage 3, but then models the impact of stock repurchases on the cost of equity estimate. As shown below, properly modeling the presence of stock repurchases *increases* the cost of equity estimate from 14.1% to 14.5%. Finally, with the "3rd Modified MSDCF," she also evaluated how the estimates would change if the Board assumed that the railroad industry took longer to reach its steady state, where growth matched the economy. For all these models, Dr. Villadsen uses the same data the Board relied on to determine the MSDCF estimates for 2008 to 2012. The summary table from her report is reproduced below.

Comparison of STB MSDCF with Various Modified MSDCF

	STB MSDCF	1st MODIFIED MSDCF	2nd MODIFIED MSDCF	3rd MODIFIED MSDCF
2008	15.95%	15.16%	15.77%	16.61%
2009	13.34%	12.47%	13.19%	13.59%
2010	14.13%	13.60%	13.90%	14.35%
2011	15.83%	14.96%	15.10%	15.79%
2012	16.53%	15.77%	16.08%	16.71%
2013	13.40%	12.72%	12.72%	13.09%
Average	14.9%	14.1%	14.5%	15.0%

These results show that the criticism raised by WCTL cannot merit throwing away the MSDCF model. Moreover, these variations of the MSDCF model from tinkering with the assumptions in the model are comparable to the downward biases in CAPM due to the unusual fiscal policies that drove down the Treasury bond yield. According to Dr. Villadsen, “the downward bias in the CAPM due to downward pressure on the Treasury bond yield is above 1.1% for 2008-09, at least 0.3% for 2010, at least 0.50% for 2011-2012 and about 0.3% for 2013 for an average of about 0.63%.” *Id.* at 25. “Taking the fact that the CAPM and MSDCF are weighted equally in the Board’s methodology into account,” Dr. Villadsen explains, “this impact is of the same magnitude as making adjustments for the WCTL key criticisms.” *Id.* at 31.

AAR submits that Dr. Villadsen’s work shows the reasonableness of the MSDCF model used by the Board. WCTL never came to the table with any alternative. Dr. Villadsen, however, cautions that these complicated

modifications do not necessarily render the MSDCF model more reasonable, just more complicated:

All financial techniques used to estimate the cost of equity are inherently imprecise, whether we are speaking about a MSDCF model or CAPM. The results vary from year to year and are sensitive to assumptions that are just that, assumptions. In other words, there is a standard error associated with all models. The tiny difference between the STB's current MSDCF model and the modified versions reported above could readily be attributed to random noise.

Villadsen V.S. at 32.

D. The Multitude of WCTL's Residual, Undeveloped "Kitchen-Sink" Style Arguments Lack Any Merit.

Other criticisms of the Morningstar / Ibbotson MSDCF that WCTL makes as part of its "kitchen-sink" strategy are equally without merit and certainly insufficient to justify abandonment of the model.

For example, Witness Fapp's assertion that the cost of equity estimate used by Standard & Poors ("S&P") and MarketGrader are below the estimate computed under the Morningstar / Ibbotson model fails to provide any context for these figures (thus making them meaningless), fails to compare the cost of equity estimates from S&P and MarketGrader to the Board's cost of equity figure (which is the average of the Morningstar / Ibbotson model and the CAPM), and relies on only two of the many analysts who look at the railroad industry. *See* Fapp V.S. at 1-2; Villadsen V.S. at 19-20. Dr. Hodder's criticisms are similarly baseless. *See* Hodder V.S. at 9-11. His criticism that the model is based "on a limited number of forecasts," some of which date back to 2008, ignores the realities that (1) one of the forecasts involved a company having a small weight in the model (which accounts for only half of the overall cost of capital determined by the Board), (2) the model relies on the median analyst forecast,

not the “extreme” forecast cited by Dr. Holder, and (3) the CAPM uses five years of historical data. Villadsen V.S. at 17-19. Furthermore, although Dr. Hodder asserts that the model is “quite optimistic” in relying on historical real GDP growth plus the current inflation forecast, other sources and analysts predict a higher GDP growth than the sources cited by Dr. Hodder. Villadsen V.S. at 18-19.

At the heart of WCTL’s grievances rests a belief that a “substantial deviation” exists between the cost of equity computed under the MSDCF and the cost of equity computed under the CAPM. As discussed above, WCTL never considers that perhaps the problem child is the CAPM. WCTL studiously ignores any possibility that with extremely low interest rates, the CAPM was yielding unreasonably low estimates. Indeed, the sensitivity of CAPM to fluctuations in monetary policy is precisely why academics and finance practitioners use multiple models. This weakness of the CAPM is offset by using a MSDCF approach that is not as sensitive to monetary policy, albeit it is sensitive to other assumption like any forecasting model.

In any event, WCTL’s basic premise is incorrect. In 2013, the COE calculated under the Morningstar / Ibbotson MSDCF applied by the Board was 13.40 percent – only 0.88 percentage points than the 12.52 percent calculated under the CAPM.³⁷ There will be times where estimates generated by the CAPM fall well below those generated by a MSDCF model, times where it will fall above, and times (like now) where the results are basically the same. The Board will never be able to figure out which model is superior in a given fiscal environment – the world’s elite finance experts cannot settle on a single preferred approach. Villadsen V.S. at 4-5 (“[T]here is no consensus among academics or

³⁷ Ex Parte No. 558 (Sub-No. 17), *Railroad Cost of Capital – 2013*, Decision served July 31, 2014, at 11.

practitioners about which models are ‘best.’ For this reason, best practices use multiple models so as to glean useful information from each one based on its relative strengths.”). Instead, osculating estimates produced by these dueling models is the *reason* to use both to provide a more reliable and consistent estimate of the cost of equity.

III. IF THE BOARD IS INCLINED TO MODIFY THE MSDCF MODEL, IT WOULD NEED TO EXPLORE MORE THAN THE ASSUMPTIONS CHERRY-PICKED BY WCTL.

There is no reason to jettison the Morningstar/Ibbotson MSDCF. If the Board is not satisfied with certain assumptions in the model, or in the application of that model to the railroad industry, the obvious solution is to modify the assumptions. It would be a gross overreaction to jettison the model completely. Given the Board’s prior findings that the Morningstar/Ibbotson MSDCF is “commercially accepted,” and is “used to estimate the cost of equity for different industries” (*MSDCF Decision* at 4, 13), abolishing its use would be tantamount to “throwing the baby out with the bath water.” There is no basis for taking such a “drastic step.” *See FTC v. Actavis, Inc.*, 133 S.Ct. 2223, 2236 (2013) (court of appeals, in dismissing antitrust challenge to “reverse payment settlements” in patent infringement litigation because of concern that parties would otherwise need to litigate validity of patent, “throws the baby out with the bath water, and there is no need to take that drastic step”).³⁸

If the Board finds it necessary to modify the established Morningstar/Ibbotson MSDCF to tailor the model to the railroad industry, it

³⁸ *See also Public Utility Commission of Texas v. FCC*, 886 F.2d 1325, 1334-1335 (D.C. Cir. 1989) (in prohibiting local exchange carrier from providing additional interconnections to public switched network in Dallas, without attempting to distinguish interstate from intrastate telephone service, Texas PUC “sought no middle ground,” and FCC legitimately described PUC’s order as “drastic”; “it seems to us that, in effect, the Texas PUC threw out the interstate baby with the intrastate bath water”).

would need to consider what modifications might improve the MSDCF model, as applied to the railroad industry. Villadsen V.S. at 32. Any such consideration should include the correct phase-in period, the transition of growth rates and cash flows between Stage 1 and Stage 3, adjustment of the model to reflect stock repurchases, and adjustment of the model for capital expenditures by the railroads.

A. The Correct Phase-In Period

If the Board sought to modify the Morningstar/Ibbotson model, it would have to consider the correct phase-in period to the steady-state (Stage 3) for the railroad industry. As part of this analysis, the Board would need to consider whether determining the correct period would depend on (a) projected traffic growth for the entire transportation industry, and (b) how long the railroads will continue to invest heavily to renew existing infrastructure and capacity growth. In addition, the lengths of the stages may change as the industry evolves, requiring an annual determination of the appropriate future time period for assumption of steady-state cash flows. Villadsen V.S. at 32.

B. Transition Between Stage 1 and Stage 3

WCTL complains that the Morningstar / Ibbotson MSDCF model applied by the Board does not smoothly transition growth rates from Stage 1 to Stage 3, which would lower the cost of equity estimate (holding everything else constant). Petition at 8; Hodder V.S. at 4-5. WCTL also contends that Stage 3 of the model fails to achieve a “smooth reduction in cash flows.” See Petition at 8; Hodder V.S. at 5-6. Notably, WCTL is not urging the Board to smooth that transition, which would *raise* the cost of equity estimate (holding everything else constant). As Dr. Villadsen explained, “[i]t is important to understand that any tapering of the growth rates from Stage II and a gradual movement towards

earnings before extraordinary items are linked; i.e., it would not be appropriate to consider only one smoothing effect without the other.” Villadsen V.S. at 27.

Accordingly, any attempt to modify the MSDCF to provide a smoother transition to the steady-state period must transition *both* the drop in growth rates *and* the rise in cash flows. The AAR does not believe that the time and devotion of limited agency resources is warranted, as the end result will simply be a more complex model with little improvement (or indeed change) in the result. As shown by Dr. Villadsen, these two “transitions” largely offset each other and any differences between the estimates produced by the models are random noise (i.e., statistically insignificant differences).

C. Adjusting the MSDCF To Reflect the Pattern of Returns To Shareholders From Stock Repurchases

The Board would have to consider how the model can be adjusted to reflect the pattern of returns to shareholders from stock repurchases. Unless the model takes this into account, the cost of capital may be substantially understated, because the “expected” returns to shareholders in the early years will be higher than those captured by the model, meaning that a larger discount rate (cost of capital) would be needed to explain current stock prices. *Id.* at 17.

D. Capital Expenditures

One of the defining features of the railroad industry is the massive level of capital investment needed to maintain and grow network capacity. If the Board wished to tailor the Morningstar / Ibbotson MSDCF to the railroad industry, it would need to model these large capital expenditures and how those expenditures will translate into higher growth in the future, including the cash flow growth that is generated by capital investments.

Stripped of the current simplifying assumptions embedded in the Morningstar / Ibbotson model, the resulting model would be more intricate. Yet it would lose the virtue of being a commercially designed model used to provide practitioners a uniform technique that can be used over a broad array of industries. After another long journey, it would be transformed into a model (like the current CAPM used by the STB) that was tailored and designed through the adversarial process for litigation purposes.

The Board, however, should embark on this complex journey to redesigning its MSDCF model *only* if it determines that WCTL has met the heavy burden of showing that the Morningstar / Ibbotson MSDCF model has flaws that require correction. As Dr. Villadsen cautions, “[a]ll financial techniques used to estimate the cost of equity are inherently imprecise, whether we are speaking about a MSDCF model or CAPM.” Villadsen V.S. at 32. WCTL has not met this heavy burden. Indeed, it is not asking the Board to explore alternative models.

The STB should therefore deny the Petition outright. Any benefits that might be derived from starting a proceeding to redesign the Morningstar / Ibbotson model would be outweighed by the substantial burdens that litigation of proposed modifications will impose on the Board and the parties. As demonstrated by the record in Ex Parte No. 664 and Ex Parte No. 664 (Sub-No. 1), the parties would be required to expend an enormous amount of resources and time in presenting evidence and argument on the issues. The Board would bear a heavy burden in analyzing and resolving them. The Board has rejected previous requests for modifications of its policies for those reasons,³⁹ and it should also do so here.

³⁹ See *Ex Parte No. 717 Decision*, at 2-3, 8-10 (excluding evidence of product and geographic competition because of the “inordinate amount of time and resources” that parties required to present such evidence and the “heavy burden” faced by the Board in reviewing it); *Ex Parte No.*

CONCLUSION

The cost of equity is an “elusive” value, because it is “not directly observable,” even historically. *AEP Texas*, 609 F.3d at 435, 443. Nor is there a “best” method to estimate this elusive value. The best the Board can do is use modern finance techniques. Yet all financial techniques used to estimate the cost of equity are inherently imprecise. The results vary from year to year and are sensitive to assumptions used.

It therefore remains the best practice under modern finance theory to use multiple models to calculate the cost of equity. WCTL has offered no basis for the Board to change course and swim against the sea of academic and financial literature supporting for this practice. Nor has WCTL addressed the practical reasons that the Board offered for using the Morningstar / Ibbotson MSDCF along with the CAPM, much less disputed them.

AAR urges the Board not to forget the lessons learned from its prior inquiry into this matter. It should instead maintain its course and reaffirm three bedrock principles that guided the agency to settling on its existing approach for estimate the cost of equity.

- *Use multiple models:* “[A]cademic studies had demonstrated that using multiple models will improve estimation techniques when each model provides new information”⁴⁰ and “there is robust economic literature confirming that, in many cases, combining forecasts from different models is more accurate than relying on a single model.”⁴¹

679 Decision, 2008 WL 4695743, at *5 (Board “will not set on a protracted reevaluation of our revenue adequacy approach unless AAR has provided a framework that appears to show sufficient promise to justify the considerable burden such a rulemaking would entail”).

⁴⁰ Testimony of Gregory J. Evans, Assistant Director of Division of Reserve Bank Operations and Payment Systems, Board of Governors of the Federal Reserve System, at hearing held February 15, 2007, in Ex Parte No. 664, at 18.

⁴¹ *MSDCF Decision* at 15 & n.63.

- *Steer clear of made for litigation models:* “[I]t is prudent to use an approach that was not developed simply as a tool for litigation before the Board, but rather to use an approach that has been tested in the marketplace and is used to estimate the cost of equity for different industries, not just the rail industry.”⁴²
- *Do not swing back and forth based on the results:* “As there are many different ways to estimate the cost of equity, the Board must take great care not to swing back-and-forth between parties’ preferred methodologies based on the results of the different approaches.”⁴³

For these reasons, WCTL’s Petition should be denied.

Respectfully submitted,



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⁴² MSDCF NPRM at 6.

⁴³ Ex Parte No. 558 (Sub-No. 9), *Cost of Capital – 2005*, Decision served February 12, 2007, at 4.

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**BEFORE THE
SURFACE TRANSPORTATION BOARD**

PETITION OF THE WESTERN COAL)
TRAFFIC LEAGUE TO INSTITUTE A)
RULEMAKING PROCEEDING TO)
ABOLISH THE USE OF THE MULTI-)
STAGE DISCOUNTED CASH FLOW)
MODEL IN DETERMINING THE)
RAILROAD INDUSTRY'S COST OF)
EQUITY CAPITAL)

Docket No. EP 664
(Sub-No. 2)

**VERIFIED STATEMENT
OF
BENTE VILLADSEN

ON BEHALF OF
ASSOCIATION OF AMERICAN RAILROADS**

September 5, 2014

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SURFACE TRANSPORTATION BOARD

Docket No. EP 664 (Sub-No. 2)

VERIFIED STATEMENT OF DR. BENTE VILLADSEN

I. Introduction and Summary

My name is Bente Villadsen and I am a principal with The Brattle Group (Brattle) in Cambridge, Massachusetts. I have more than 15 years of experience consulting on regulatory finance for regulated infrastructure companies in a variety of contexts. I have provided expert reports and testified on cost of capital issues in many jurisdictions, including before state regulatory agencies, the Bonneville Power Authority, in U.S. and international arbitrations, U.S. federal court, and overseas in Australia, Canada, Italy, and the Netherlands. This work has pertained to electric utilities, natural gas or oil pipelines, railroads, telecommunications, and water and wastewater utilities. Examples of my recent cost of capital work include reports or testimony on cost of capital methodology for Australian pipelines before the Australian Energy Regulator, cost of equity for regulated U.S. electric and water utilities, and cost of equity for a Canadian pipeline in a private arbitration. I am an instructor at Edison Electric Institute's Advanced Rate School, teaching "Current Issues in Cost of Capital." I hold a Ph.D. from Yale University and a MS and BS joint degree in mathematics and economics from University of Aarhus, Denmark. A full resume is attached as Appendix C.

I have been asked by the Association of American Railroads (AAR) to respond to the request of the Board to "address the cost of capital calculation" that it currently uses in making its annual determinations for the freight railroad industry, including review and comment on the submission of the Western Coal Traffic League (WCTL) and its experts, Professor James E. Hodder (Hodder) and Mr. Daniel L. Fapp (Fapp). In this

statement I accordingly comment on (i) the best practices regarding the use of one or more cost of equity estimation methods, (ii) WCTL's, Hodder's and Fapp's critique of the multi-stage discounted cash flow (MSDCF) model applied by the Board in its cost of capital determinations and (iii) the impact of potential adjustments to the Morningstar / Ibbotson MSDCF as applied by the Board that take key criticisms into account to estimated cost of equity for the railroad industry.

Based on my review of Morningstar / Ibbotson MSDCF as applied by the Board, the submission of the WCTL, Professor Hodder and Mr. Fapp as well as literature, analyses and my professional experience, I conclude as follows:

- Estimating the cost of capital is difficult. The cost of capital represents the *expected* return that a rational investor would require to make her indifferent between investments that are expected to have equivalent risk profiles. But clearly, it is impossible to ever "know" these expectations of rational investors. The best one can do is to estimate the parameters relating to the cost of capital using the techniques of modern finance.
- All financial techniques used to estimate the cost of equity are inherently imprecise. The results vary from year to year and are sensitive to assumptions that are just that, assumptions.
- It is important to use more than one model to estimate the cost of equity and two commonly used methods for regulatory purposes are the Capital Asset Pricing Model (CAPM) and a Discounted Cash Flow (DCF) model.
- The CAPM and MSDCF models take different paths towards estimating the cost of equity. Combining the models improves the estimation.

- It is the combined return on equity estimate – rather than the results from any one model – that matters for the purpose of assessing the cost of equity for the railroad industry. Therefore, the results from the MSDCF cannot and should not be viewed in isolation.
- The criticisms of the WCTL and its experts are selectively one-sided and fail to consider that elements of the model are interlinked. For example,
 - If the growth rates should transition smoothly from company specific to GDP growth in stage 2, then the free cash flow available for shareholders should also transition smoothly to the steady state income (before extraordinary items) during stage 2.
 - If growth rates are to be adjusted to account for decreasing share balances caused by share buybacks, then it is necessary to account for the cash distributed directly via buybacks when calculating free cash flows available for shareholders.
- Modifications of the Morningstar / Ibbotson MSDCF model as applied by the Board to take the criticisms by the WCTL and its experts into account would have *de minimus* impact on the estimated cost of equity.
- The submissions have not presented evidence that sole reliance on the CAPM would result in more accurate or reliable results.

II. Best Practice Is to Use Multiple Methods

A. WHY USING MULTIPLE MODELS IS PREFERABLE

Estimating the cost of capital is difficult. Fundamentally, the cost of capital represents an opportunity cost for investors;¹ by undertaking one particular investment, the investor foregoes the return she might earn on some other investment of equivalent risk. At the time of the investment, however, the returns (and risks) of such foregone opportunities are unknown. The cost of capital therefore represents the *expected* return that a rational investor would require to make her indifferent between investments that are *expected* to have equivalent risk profiles. To precisely measure the cost of capital thus requires precise knowledge of market expectations for risk and return across the universe of tradable risky assets. But clearly, it is impossible to ever “know” these expectations. Even after the fact, realized returns and risk measurements are only point observations from the distribution of outcomes that were possible at the time of the investment. The best one can do is to *estimate* the parameters relating to the cost of capital using the techniques of modern finance.

Financial scholars and practitioners rely on a variety of models to make these estimates. For example, the Capital Asset Pricing Model (CAPM) relies on historical measurements of the risk and returns of assets in the market to forecast the likely future risk-return relationship governing the cost of capital. In contrast, Discounted Cash Flow (DCF) models use prevailing forecasts of cash flows (or earnings) to infer the expected return consistent with current market prices. All models have their advantages and disadvantages, and there is no consensus among academics or practitioners about

¹ See, for example, Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, 10th Edition, 2013.

which models are “best.” For this reason, best practices use multiple models so as to glean useful information from each one based on its relative strengths.

In January 2009, the Board endorsed using a combination of the Capital Asset Pricing Model (CAPM) and Morningstar / Ibbotson Multi-stage Discounted Cash Flow (MSDCF) model (as applied by the Board) to determine the railroad industry’s cost of capital.² This was an important step as the Board previously had relied on only one method to estimate the cost of capital for the railroad industry.³ As my colleague, Stewart C. Myers, Robert C. Merton Professor of Finance of MIT, has so concisely and eloquently stated:

Use more than one model when you can. Because estimating the opportunity cost of capital is difficult, only a fool throws away useful information.⁴

And when commenting on the sole use of the CAPM, Professor Myers noted:

Analysts and decision makers should consider estimates from other [non-CAPM] models or sources whenever the estimates are informative.⁵

As I have discussed in other reports, I wholeheartedly agree that it is important to use the information available, and that means using more than one model when possible.⁶

² Surface Transportation Board, *STB Ex Parte No. 664 (Sub-No. 1)*, decided January 23, 2009 (STB 2009 Decision).

³ From 1981 – 2005 the Board relied on a single-stage DCF model and for 2006-07, the Board relied on the CAPM. Source: Surface Transportation Board, *STB Ex. Parte No. 664*, decided January 17, 2008 (STB 2008 Decision) pp. 3-4 and p. 7.

⁴ Stewart C. Myers, “On the Use of Modern Portfolio Theory in Public Utility Rate Cases: Comment,” *Financial Management*, Autumn 1978, p. 67.

⁵ Stewart C. Myers, “Estimating the Cost of Equity: Introduction and Overview,” submitted to the *Australian Energy Regulator* on behalf of the Australian Pipeline Industry Association, February 2013 (Myers AER Report) p. 12.

Academic scholars, practitioners and regulators tend to agree that the use of multiple methods is important. For example, professors Berk and DeMarzo of Stanford and Harvard Universities, respectively, in their corporate finance textbook comment on the use of the CAPM, DCF and other models by practitioners as follows:

It is not difficult to see why there is so little consensus in practice about which technique to use. All the techniques we covered are imprecise. Financial economics has not yet reached the point where we can provide a theory of expected returns that gives a precise estimate of the cost of capital. Consider, too, that all techniques are not equally simple to implement. Because the tradeoff between simplicity and precision varies across sectors, practitioners apply the techniques that best suit their particular circumstances.⁷

The text of Bingham & Houston, *Fundamentals of Financial Management* notes that when the authors work as consultants they generally use several methods including the CAPM and a discounted cash flow model to assess the cost of equity.⁸

Similarly, Roger A. Morin, in the context of U.S. regulation, mentions the use of the CAPM, DCF and other models, concluding:

No one individual method provides the necessary level of precision for determining a fair return, but each method provides useful evidence to facilitate the exercise of an informed judgment. Reliance on any single method or preset formula is inappropriate when dealing with investor

Continued from previous page

- ⁶ See, for example, Bente Villadsen et al., "Estimating the Cost of Equity for Regulated Companies," submitted to *the Australian Energy Regulator* on behalf of the Australian Pipeline Industry Association, February 2013 (Villadsen et al. AER Report).
- ⁷ Jonathan Berk and Peter DeMarzo, *Corporate Finance: The Core*, 3th edition, 2014, (Berk & DeMarzo 2014) p. 466.
- ⁸ Eugene F. Bingham and Joel F. Houston, *Fundamentals of Financial Management*, 12th edition, 2009, p. 317.

expectations because of possible measurement difficulties and vagaries in individual companies' market data.⁹

Looking at the Board's last review of its cost of capital estimation methodology in STB Ex Parte 664 and STB Ex Parte 664 (Sub No. 1), the Board noted:

While CAPM is a widely accepted tool for estimating the cost of equity, it has certain strengths and weaknesses, and it may be complemented by a DCF model. In theory, both approaches seek to estimate the true cost of equity for a firm, and if applied correctly should produce the same expected result. The two approaches simply take different paths towards the same objective. **Therefore, by taking an average of the results from the two approaches, we might be able to obtain a more reliable, less volatile, and ultimately superior estimate than by relying on either model standing alone.**¹⁰

In arriving at this conclusion, the Board took notice of comments from the Federal Reserve that "multiple models will improve estimation techniques when each model provides new information,"¹¹ and also stated that there is "robust economic literature confirming that, in many cases, combining forecasts from different models is more accurate than relying on a single model."¹²

As clearly illustrated above, many academics, practitioners and regulators find it preferable to use more than one estimation method to determine the cost of equity. I agree that it is important to use more than one estimation method and stress that models such as the CAPM and the multi-stage DCF models use different kinds of information. While the CAPM relies on historical information to determine the risk

⁹ Roger A. Morin, *New Regulatory Finance*, Public Utilities Reports, Inc., 2006, (Morin 2006) p. 428.

¹⁰ STB 2009 Decision, p. 3 (emphasis added).

¹¹ STB 2009 Decision, p. 15.

¹² STB 2009 Decision, p. 15. See also, David F. Hendry & Michael P. Clements, "Pooling of Forecasts," *VII Econometrics Journal* 7, 2004, pp. 1-31.

factor, beta (β), of the industry, the multi-stage DCF model uses forward looking growth estimates (and contemporaneous cash flow and price information) to infer the market's expected return for the industry. Thus, the two models attempt to estimate the same figure, but use different information to do so. The Board clearly recognized this in its 2009 decision regarding the use of both models. In Appendix A, I identify a number of other regulators who follow the Board's reasoned approach and use more than a single model to estimate the cost of equity.

In short, the combined use of the CAPM and a MSDCF model is preferable to relying on only the CAPM (or only the MSDCF).

III. WCTL's Criticisms of the Morningstar / Ibbotson MSDCF Model Do Not Warrant Abandoning This Well-Known, Forward-Looking Model.

A. WCTL DOES NOT CHALLENGE THE VALIDITY OF MULTI-STAGE DCF MODELS IN GENERAL – JUST AS APPLIED BY MORNINGSTAR / IBBOTSON

Neither Fapp nor Hodder inherently critique the use of a multi-stage DCF model, but rather focus their criticisms on the assumptions in the Morningstar / Ibbotson MSDCF model as applied by the Board. In his conclusions regarding the Board's MSDCF model, Hodder states:

These problems are not inherent characteristics of MSDCF models generally, but rather results of particular assumptions made by Morningstar/Ibbotson in implementing their version of the more general model.¹³

¹³ Hodder, p. 11.

First, no model corresponds exactly to the real world; all models are simplified approximations of reality, and each relies on a set of assumptions to draw useful conclusions about complex or otherwise unknowable phenomena. Cost of capital models are no exception – their assumptions are necessary simplifications used to infer information about market expectations of risk and returns. Thus, it is inappropriate to nit-pick specific assumptions, or favor particular assumptions that might lead to a specific outcome in the current environment. It is the totality of the models and their key assumptions that should properly be evaluated. For example, it is possible that one assumption in the current environment has a slight upward bias while another assumption has a slight downward bias, so that the offsetting biases lead to an accurate overall result. It is also plausible that these same assumptions may bias the results in a different direction in the near future. Thus, to evaluate the appropriateness of the cost of equity for the railroad industry, it is not sufficient to look to one model or a selected set of assumptions. Rather the results of both models and their underlying assumptions need to be examined.¹⁴

Second, the WCTL references the Board’s view that the use of multiple methods may stabilize the cost of equity and argues that ex post the year-to-year variability in the combined cost of equity estimate is higher than the year-to-year variability in the CAPM. This argument is misguided because the CAPM estimates, which are based on five years of historical information, by definition will change relatively little from year to year. The WCTL does not cite other reasons for using both methods provided by the Board such as the inherent uncertainty in any estimation method and that the models

¹⁴ See, for example, Berk & DeMarzo (2014), p. 466. See also Villadsen et al. AER Report, pp. 51-54.

may provide different information.¹⁵ The Board's view that the two models provide somewhat different information about the railroad industry's cost of equity is important and consistent with the literature and with my own experience. Therefore, the WCTL's focus on only one aspect of the reasons for using two models is misguided. There are, as stated by the Board, multiple reasons why more models may improve the estimation of cost of equity.

Third, the two models have different strengths and weaknesses. I focus on the MSDCF model's strengths and weaknesses next.

B. STRENGTHS AND WEAKNESSES OF THE MORNINGSTAR/IBBOTSON MSDCF MODEL

Like all models, the Morningstar / Ibbotson MSDCF has strengths and weaknesses, which I discuss below. Unless specified otherwise, my discussion pertains to the MSDCF as applied by the Board.

1. Strengths of the model.

A significant strength of the Morningstar / Ibbotson MSDCF is that it is a forward looking model that relies on the expected growth or development in the railroad industry. This is an important aspect of the model because the railroad industry currently is undertaking large capital projects, which will impact railroads and their various constituencies for a long time. In contrast, the CAPM is a backward looking model, so the information conveyed is more likely to reflect the railroad industry as it was in the past rather than as it will be in the future. Second, like most DCF models, the MSDCF uses company-specific growth rates in stage 1 and long-term

¹⁵ STB 2009 Decision, p. 15.

GDP growth in stage 3. This common feature of the model is a substantial improvement over, for example, single-stage models which assume the growth rate never changes.

Looking to some of the unique features of the Morningstar / Ibbotson model, it is a well-known commercial model that can be used by practitioners to assess the cost of capital for a variety of purposes.¹⁶

The model relies on free cash flow available for shareholders in stages one and two and on earnings before extraordinary items in stage 3.¹⁷ Because cash ultimately is what accrues to shareholders and what they care about, it is a key valuation metric. This is consistent with the Board's announcement in 2008 that a "broader measure of cash flow or shareholder returns should be incorporated" in a MSDCF.¹⁸

The main criticisms of the Morningstar / Ibbotson MSDCF model appear to be that (i) the model lacks a smooth transition in growth rates in stage 2; the related criticism that there is a disconnect between cash flows in years 10 and 11 (end of stage 2 and beginning of stage 3, respectively); and (ii) that the buyback of shares implies a potential inconsistency with the growth rates relied upon.¹⁹

2. Smooth transition to Stage 3

Like most multi-stage DCF models, the Morningstar / Ibbotson MSDCF relies on company-specific growth rates for stage 1 and economy-wide growth in stage 3,

¹⁶ See, for example, STB 2009 Decision p. 4.

¹⁷ The merits of this specification were discussed in STB 2009 Decision, pp. 11-12.

¹⁸ Surface Transportation Board Notice, "Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital," *Federal Register* / Vol. 73, No. 158, August 14, 2008, 47643.

¹⁹ STB 2009 Decision, pp. 8-9 addresses the stage 2 growth rate, pp.12 addresses the use of earnings used in year 11 and pp.11-12 addresses the share buyback issue.

because in the very long-term growth is expected to normalize to that of the economy, representing a kind of steady state for the companies in question. The rationale for this expectation is that no industry can outpace forever the entire economy or eventually it will swallow the entire GDP. The horizon to stage 3 is not universally agreed upon, however.

Similarly, the model imposes assumptions about the level of capital expenditures the industry will make in the long term. In particular, in the first two stages, the Morningstar / Ibbotson MSDCF determines free cash flow available to equity investors as earnings before extraordinary items, minus capital expenditures in excess of depreciation, plus deferred taxes. However, in steady-state, this assumption changes. In stage 3, the model assumes that capital expenditures will consist just of maintenance capital (no growth capital), so that capital expenditures and depreciation are equal. Further, because deferred taxes are linked to capital expenditures, this amount is expected to disappear as capital expenditures approach maintenance levels in the long term steady-state equilibrium.²⁰ Therefore, the adjustment to earnings before taxes (depreciation minus capital expenditures plus deferred taxes) will approach zero in the long term. While the Morningstar / Ibbotson MSDCF uses accounting depreciation and capital expenditure, an economic equilibrium would depend on the *economic* depreciation being equal to capital expenditure.

Again, the rationale is that if a company continued to invest in growth capital in excess of economic depreciation, it would expand its share of the economy during the period that the model assumes is the steady state. Therefore, the STB MSDCF implicitly

²⁰ Thus, the cash and accrual tax amounts are assumed to be the same.

assumes stage 3 is a steady-state for *both* growth and the impact of (net) investment on cash flow generation.

These are perfectly reasonable assumptions for the long-term.²¹ But if practitioners elect to smooth the transition between the first and final stages, they must do so in a consistent manner for the entire model. That is, they must smooth *both* the growth rates *and* the transition to maintenance capital expenditures. Simply put, as growth approaches the steady-state and capital expenditures approaches maintenance levels, the equity cash flows not used for capital expenditures will be available for shareholders. At the same time the deferred taxes will disappear, as they are linked to capital expenditures, and therefore will no longer represent a source of cash flow available to shareholders.²²

Therefore, the criticism about the lack of a smooth transition from stage 2 growth to stage 3 growth cannot be considered separately from the issue of the transition from

²¹ Two important observations are worth making, however. First, the steady-state of the railroad industry is reached when true economic depreciation, the decline in the *market* value of rail assets attributable to their usage in that year, equals capital expenditures. In the steady-state, the assumption is that economic depreciation and capital expenditures will converge. This is the reason for moving towards a state where there is no net growth in capital. The model relies on an accounting measure of depreciation. It is likely that an observed spread between accounting depreciation and capital expenditures will extend far into the steady-state, because accounting depreciation is based on book values rather than current costs. Second, the use of accounting depreciation – if less than the true economic depreciation of assets – will bias the MSDCF downwards as it is additive in Stages 1 and 2 (while capital expenditures are subtracted). In other words, if the Board MSDCF is understating the current economic depreciation of rail assets, then the Morningstar / Ibbotson MSDCF model will understate the true cost of equity for the railroad industry.

²² In practice, the timing of the disappearance of the deferred tax may not coincide exactly with the capital expenditures converging to maintenance capital, but may persist for a few years longer than the high capital expenditures. Therefore, ignoring this timing effect is likely to be conservative.

the growth levels of capital expenditures in stages 1 and 2 to maintenance levels of capital expenditures in stage 3. As growth slows over time and capital expenditures become focused primarily on maintenance (i.e., comparable to economic depreciation), the portion of earnings that is available as cash flow to shareholders will increase. Specifically, once the capital expenditures, which are deducted from the cash flow in stages 1 and 2, taper off, the free cash logically would increase. Therefore, if the higher early growth rates driven by high net investment (i.e., capital expenditures in excess of economic depreciation) taper off, the free cash flow available to shareholders increases as capital expenditures are reduced. As a result, a tapering of the growth rates in stage 2 would logically be combined with a transition from the reliance on free cash flow available to shareholders as determined initially to a more stable long-term cash flow (or income) measure. In other words, if the growth rates were to taper off linearly during stage 2, then it would also be reasonable to linearly transition the cash flow measure towards a long-term one such as earnings before extraordinary items over stage 2. The effect of these two changes would be somewhat offsetting. I discuss this issue further in Section IV below.

3. Growth forecasts in the presence of share repurchases

There is similarly no basis to reject the Morningstar / Ibbotson model based on its use of stage 1 growth rates derived from EPS forecasts. WCTL claims this biases the results upward when a company or industry undertakes large share buybacks. But WCTL considers only the potential effect on growth rates and not the effect of cash flows available to shareholders. As shown below, when considering the effect of share buybacks on expected cash flows available to shareholders, the overall bias of ignoring share buybacks is likely downwards, not upwards as suggested by WCTL.

When a company buys back shares at its current stock price, it distributes cash to shareholders who sell their shares; thus cash to shareholders is pulled forward in time. Rational investors would incorporate expectations around share buybacks when considering the purchase of a firm's equity. Thus, leaving out the cash distributed directly via buybacks ignores a source of expected return to shareholders. This biases the cost of equity estimates downward. As I will demonstrate, in the case of the railroad industry, this downward bias likely outweighs any upward bias caused by the application of an EPS-based growth rates.

Because Earnings per Share (EPS) are calculated as earnings divided by the number of shares outstanding, the EPS measure will increase as the number of shares declines. The criticism cited in (iii) above looks only to the impact of stock repurchases on EPS (via the lower number of shares in the denominator) and not to the additional cash flow that is distributed at the time of the buyback. In addition, as noted by Hodder (p. 8), it is not clear how analysts take share buybacks into account when forecasting EPS. However, the real question is not whether analysts forecast the EPS accurately, but whether there is a systematic upward bias in the forecasted cash flow available to shareholders. Specifically, if there is an upward bias in EPS growth rates, is such a bias outweighed by the downward bias in the measure of cash flow available to shareholders? The following table provides illustrative data.

Table 1: Illustration of the Interaction of Share Buybacks and Growth Rates

	EPS ₀	EPS ₁	Implied Growth	# Shares, t=0	# Shares, t=1	Year 0 Cash Flow	Estimated Year 1 Cash	Actual Year 1 Cash	Stock Price	Buyback Cash	Total Cash to Shareholders
	[1]	[2]	[3]	[4]	[5]	[6]	[7]	[8]	[9]	[10]	[11]
Facts	\$1.00	\$1.12	n/a	100	98	\$100	n/a	\$110	\$5	\$10	\$120
Analyst 1	\$1.00	\$1.10	10%	100	98	\$100	\$110	\$110	\$5	\$10	\$120
Analyst 2	\$1.00	\$1.12	12%	100	98	\$100	\$112	\$110	\$5	\$10	\$120

In Table 1 above, the first “Facts” row represents the actual circumstances, while rows 2 and 3 represent two different analysts’ forecasts. Column [1] represents the actual EPS in year 0, while Column [2] shows the actual (Facts row) or analyst forecasted (rows Analyst 1 and Analyst 2) EPS in year 1. Column [3] calculates the implicit growth rate from the forecasted EPS, columns [4] and [5] provide the number of shares outstanding in years 0 and 1 respectively, column [6] shows the year 0 cash flow, columns [7] and [8] show the forecasted and actual free cash flow available to shareholders, column [9] assumes the stock price is 5, so that the price-to-earnings ratio is 5. Finally, columns [10] and [11] show the amount of cash distributed due to share buybacks and the total cash that accrued to shareholders (free equity cash flow plus share buybacks).

The Morningstar / Ibbotson MSDCF determines the free cash flow as illustrated in column [7] and ignores the total cash flow available for shareholders in [11]. Therefore, while the estimated cash flow in year 1 (e.g. Analyst 2, column [7]) may be overstated, the total cash flow that accrued to shareholders (column [11]) is actually understated by the column [7] estimate in year 1. This will be the case provided the price is larger than the forecasted EPS in year 1. As the price-to-earnings ratio for the railroad industry is well above one, the near-term effect of the cash distribution from share buybacks outweighs any impact from the reliance on EPS growth. The cash distributed to shareholders is larger than the forecasted free cash flow to shareholders.²³ This effect is compounded over multiple years in the MSDCF model, where the errors illustrated above for a single year are compounded as buyback are recurring. But the same principle applies in any one year: if the price-to-earnings ratio is consistently greater than 1, any overestimation of cash flows caused by ignoring the effect on

²³ The price-earnings ratio for the four railroads whose data is used by the Board in making its annual cost of capital determination currently ranges from 15.8 to 22.6, according to *Value Line Investment Survey*, May 30, 2014.

growth rates from a drop in shares outstanding will be more than cancelled out by an underestimation caused by ignoring the value of the cash directly distributed via the share repurchase. According to my modeling of the railroad industry, the cumulative effect of these two corrections stages of the MSDCF model is in an upward movement in the estimated cost of equity. I illustrate this in Section V below.

The MSDCF model estimates the cost of equity from the stock price and the cash flow that accrues to shareholders over time. The basic idea is that if you discount the total cash flow that is expected to accrue to shareholders by the cost of equity, the amount should equal the stock price. The stock price is public knowledge, but the expected cash flow has to be estimated and the larger the expected cash flow is, the higher the cost of equity has to be for the discounted cash flow to equal the stock price. Because the expected cash flow is discounted, cash flow that occurs early contributes more to the current stock price than cash flow that occurs later. This is important because the cash that accrues to shareholders from share buybacks occurs immediately rather than later and therefore makes a substantial contribution to the stock price and hence the cost of equity (i.e., cash flow to shareholders is pulled forward in time). The MSDCF model does not capture the impact of share buybacks. Instead, it assumes the cash flow that shareholders are looking at to set the stock price is column [7] in Table 1: free equity cash flow. If the model uses the actual stock price (which will reflect the anticipated higher returns in the near term from stock repurchases) and forecasts free cash flow, it will understate the true expected return to shareholders (shown in column [11]) and the model will estimate a discount rate (the cost of equity) that is too low.

In sum, it is necessary to consider not only the impact on the growth rate of the share buybacks but also on the cash distributed to shareholders through the buyback. These two factors bias the results in opposite directions and are therefore potentially

offsetting – the overall impact depends not only on the magnitude of the share buybacks but also on the price-to-earnings ratio of the company that buys back shares.

4. Other specific criticisms raised by WCTL

The other criticisms leveled at the Morningstar model are minor and cannot justify a rash decision to throw away the useful information provided by a MSDCF model. Professor Hodder notes that there are relatively few analysts' forecasts and that some of the forecasts are dated.²⁴ One example he points to is that one forecast used for 2012 was made in 2008, meaning that it was four years old. In reviewing the impact of this, however, it is important to keep in mind that the company in question has a weight of only 20% in the MSDCF model and the MSDCF accounts for only half of the overall cost of capital, so that the MSDCF estimate for the company in question carries a weight of only about 10%. Further, the MSDCF model relies on the median analyst forecast so that extreme forecasts are not considered. It is also important to keep in mind that the capital markets data relied upon in the Board's CAPM uses five years of historical data,²⁵ so certainly CAPM data are more "dated" than are the growth rates in the MSDCF model. As for the number of analysts, even if there are only a few, they provide additional information as sought by the Board in its decision to use the MSDCF. Therefore, this is not a reason to abandon the method.

Also, according to Professor Hodder, the growth rates for one company varied from 4.6% to 15% in 2012. Looking at the actual data for 2012,²⁶ it appears that Hodder focused on the only company for which the variation is that large and again, it is a company with a relatively small weight in the overall calculation. For example, the

²⁴ Hodder p. 9-10.

²⁵ STB 2008 Decision, p. 10.

²⁶ STB Docket No. EP558 (Sub-No. 16) Appendix L, p. 2

largest company used in Board's estimates (whose capitalization is above 50% of the sample) has relied upon growth rates that vary from a low of 15.0% to a high of 16.0%.²⁷ Further, as the Board is focused on the median forecast, the very low or very high figures for any one company are ignored. Therefore, the variability in growth rates is not a reason to abandon the MSDCF as (i) it only pertains to the growth rates of one company that has a weight of about 10% in the overall ROE and (ii) the Board uses the median, so that extreme observations are ignored (in the examples cited by Hodder, both the low and high figures are ignored).

Lastly, Hodder states that "there is also an issue with how the Morningstar / Ibbotson approach estimates the long-run growth rate for the U.S. economy that is used in stage 3 of the MSDCF estimates."²⁸ Specifically, Hodder argues that the reliance on the historical real GDP growth plus the current inflation forecast is too optimistic. In support of his argument, Hodder cites several GDP forecasts from various sources that all are substantially lower than the Morningstar / Ibbotson forecasted GDP growth. However, Hodder does not provide information from other sources such as Blue Chip Economic Indicators,²⁹ which rely on analysts' forecast and predict a higher GDP growth than the sources cited by Hodder.

Witness Fapp points to the estimated Cost of Equity (CoE) being higher than that published by two specific sources: Standard & Poor's (S&P) and MarketGrader. There are several flaws in this critique. First, Mr. Fapp provides no context for either S&P's or

²⁷ *Ibid*, p. 4.

²⁸ Hodder p. 10.

²⁹ *Blue Chip Economic Indicators: Top Analysts' forecasts of the U.S. Economic Outlook for the Year Ahead*, vol. 39, March 10, 2014. The monthly publication contains consensus forecast on growth rates, Treasury bond yields, etc. and its March and October issues contain long-term forecasts. It is one of the most commonly cited sources for long-term consensus forecasts.

MarketGrader's figures, which are not useful without additional information. Second, Fapp compares the cost of equity from MarketGrader / S&P to the MSDCF figures and not to the STB's cost of equity figures, which are of course based upon both the MSDCF and CAPM—not just the former. Third, Fapp relies on two sources for his discussion, but clearly there are many other analysts who cover the railroad industry.

In summary, none of the criticisms are reasons to abandon the inclusion of a multi-stage DCF model in the determination of the railroad industry's cost of equity capital.

C. STRENGTHS AND WEAKNESSES OF THE CAPM

All models have strengths and weaknesses, which is a key reason to use more than one model. The Villadsen et al. AER report discussed the relative strengths and weaknesses of the CAPM and multi-stage DCF models at length.³⁰ The following draws upon that discussion.

Among the strengths for both the MSDCF and the CAPM is the fact that the models are transparent and well-documented. In addition, the CAPM is theoretically sound and widely used by both researchers and practitioners. In addition, data are usually available for its estimation.

A characteristic of the CAPM is that it is backward looking. In the Board's application, the CAPM relies on five years of historical data to estimate beta and market data from 1926 to the present to estimate the market risk premium.³¹ The backward

³⁰ Villadsen et al. AER Report, Chapter III.

³¹ STB 2008 Decision p. 9.

looking nature of the CAPM means that it may not capture contemporaneous changes in the market, an industry, or a company.

The CAPM is sensitive to changes in the risk-free rate, which is determined as of the estimation date. Because the risk-free rate enters the CAPM linearly, the impact of a change in the risk-free rate is one-for-one. Further, changes in the risk-free rate may reflect monetary policy rather than changes in the cost of capital for private corporations, so that in times of substantial financial uncertainty, the model may lead to biased results.

The WCTL and its experts fail to even acknowledge a potential downward bias in the CAPM that may be substantial as the 20-year Treasury yield dropped by almost 200 basis points following the financial crisis,³² which caused the CAPM, everything else equal, to fall by the same amount.

IV. It Is the Combined ROE that Matters

It is important for the Board not to lose perspective in this proceeding. Financial economists can dazzle the Board with an array of ever increasingly complicated techniques to estimate the cost of equity for the railroad industry. And we can debate whether the strengths and weaknesses of the CAPM are greater or lesser than the strengths and weaknesses of a MSDCF model. In the end, I emphasize that the relevant question is not whether the cost of equity for the railroad industry as derived from MSDCF is appropriate, but if the combined CAPM **and** MSDCF estimate adopted by the

³² Bloomberg data indicates that the average yield on 20-year Treasury bonds was approximately 4.9% in 2007 (prior to the financial crisis), approximately 4.4% in 2008 and then had dropped to approximately 2.5% in 2012.

Board is appropriate. A unilateral discussion of the potential flaws in MSDCF fails to consider that the CAPM may have been downward biased in recent years due to unique market conditions. As explained recently by Professor Myers,

Costs of equity derived from multi-stage dividend discount models are particularly useful now. With extremely low current interest rates, routine applications of the CAPM, which use “normal” equity risk premiums, can now yield cost of equity estimates that seem unreasonably low.³³

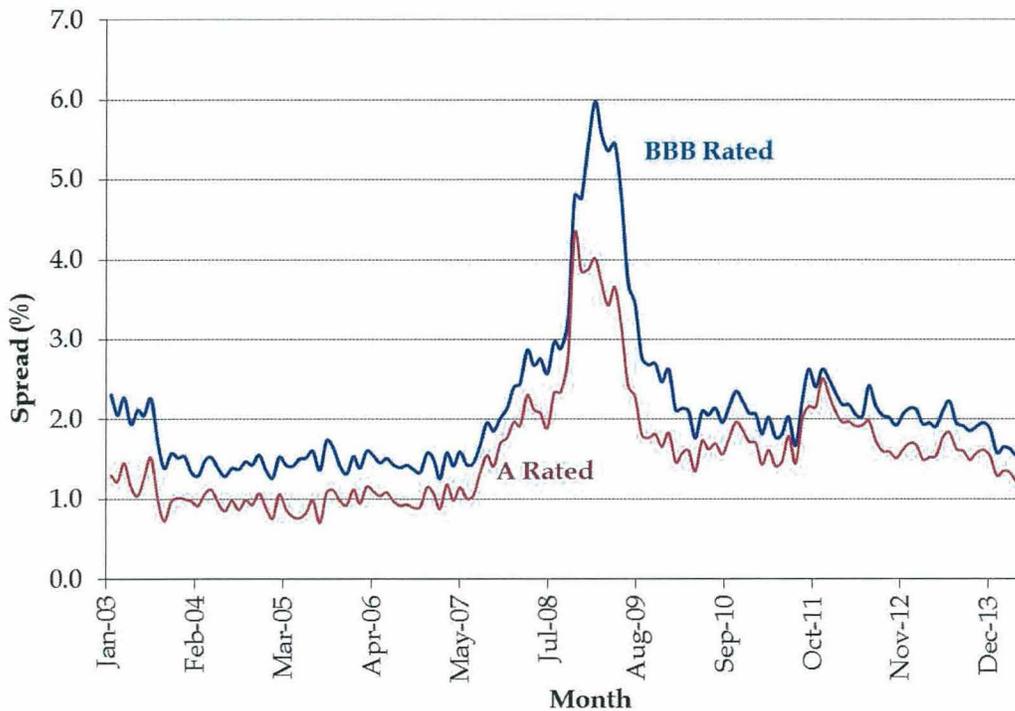
In particular, the financial crisis that occurred in 2008 caused Treasury bond yields to decrease substantially and the spread between corporate and Treasury bond yields to widen. Because (i) at least part of the drop in Treasury bond yields was caused by monetary policy rather than market fundamentals and (ii) the yield spread widened, the large drop in Treasury bond yields was not a reflection of a comparable drop in the railroads’ (or other corporate entities) cost of capital. Therefore, the cost of equity as estimated by the CAPM has been downward biased during the 2008-12 period considered by WCTL and its experts. This issue was not even acknowledged, let alone addressed in the filings by the WCTL and its experts.

I illustrate the potential severity of the bias in CAPM in these unusual fiscal times in Figure 1 below, which shows the yield spread between corporate composite bond indices of approximately 20-year maturity and 20-year Treasury bonds (used in the Board’s CAPM model). As is evident from the figure, both the corporate A and BBB yield increased dramatically relative to the yield on Treasury bonds during the financial crisis of 2008-09 and remains higher than before the financial crisis during the 2008-12 period considered by Fapp and Hodder. The increased yield spread is an indication that the cost of capital for corporations has dropped by less than the drop in the risk-free

³³ Myers AER Report p. 8.

rate. Therefore, the CAPM, which increases and decreases one-for-one with the risk-free rate, has understated the cost of equity capital during and post the financial crisis. As a result, the difference between the CAPM and MSDCF cost of equity estimates for 2008-12 reflects a downward bias in the CAPM's estimates.

Figure 1: Yield Spread between Corporate Bond Indices (BBB and A-rated) and Treasury Bonds



Source: Spreads calculated from Bloomberg's yield data.

During the height of the financial crisis in 2008-09, the spread between the yield on corporate bonds and government bonds widened dramatically as indicated in Figure 1 above.

Because the CAPM relies directly on the risk-free rate, a 1% increase / decrease in the risk-free rate leads to a 1% increase / decrease in the estimated cost of equity, so that a downward bias in the risk free rate will substantially impact the estimated cost of

equity. Because the yield spread increased after the 2008 financial crisis, reliance on the contemporaneous yield on the 20-year Treasury bond leads to a downward bias in the cost of equity estimated by the CAPM.

As shown in Table 2 below, the spread averaged above 2.6% in 2008-09, while the average from 1991 to 2007 was only a little over 1%. From 2010 onward the spread narrowed, but it has remained above the historical level.

Table 2: Spread between A-Rated Corporate Bonds and 20-Year Treasury Bonds

Period	A-Rated Corporate over Treasury (%)	Increase in spread compared to Jan 2003 - Dec 2007 (%)
Jan 2003 - Dec 2007	1.06	-
Jan 2008 - Dec 2008	2.65	1.59
Jan 2009 - Dec 2009	2.63	1.57
Jan 2010 - Dec 2010	1.66	0.60
Jan 2011 - Dec 2011	1.83	0.78
Jan 2012 - Dec 2012	1.80	0.74
Jan 2013 - Dec 2013	1.61	0.55

Source: Bloomberg

Because financial distress may increase the probability of default, I rely only on the A-rated corporate bonds for this purpose and note that the default risk of A-rated corporate bonds increased modestly between 2007 and 2008-09 and went back down to being measured at zero for 2010-13.³⁴ Therefore, only a small fraction of the increase in yield spread is explained by default risk. Because default risk increased more in 2008-09, I conservatively assign approximately 0.4% of the increase in spread to default risk

³⁴ Standard & Poor's, "2013 Annual Global Corporate Default Study and Rating Transitions," March 2014 reports that the default risk for A-rated corporate bonds was 0.38% in 2008, 0.22% in 2009, and zero during 2010-2013.

for 2008-09 and 0.2% for 2010-2013.³⁵ As a result, the downward bias in the CAPM due to downward pressure on the Treasury bond yield is above 1.1% for 2008-09, at least 0.3% for 2010, at least 0.50% for 2011-2012 and about 0.3% for 2013 for an average of about 0.63%.

In its 2009 decision to use a combination of the CAPM and MSDCF model, the Board explicitly acknowledged that each estimation approach simply approached the problem of determining the cost of equity differently.³⁶ I agree with the Board. The CAPM and a multi-stage DCF models both aim to determine the cost of equity as accurately as possible using different approaches.

V. If the Board Were To Correct Key Criticisms of the MSDCF Model Raised by the WCTL, the Impact Would Be Small.

Given the valuable information provided by a MSDCF, it would be foolish to throw away all that forward-looking information and rely exclusively on a backwards-looking CAPM, with its own limitations and deficiencies, as suggested by WCTL.³⁷ However, if the Board were inclined to tinker with its MSDCF, it cannot just look at the assumptions selectively highlighted by WTCL. It must explore all key assumptions in that model.

³⁵ Technically, the default rate of 0.38% in 2008 would increase the yield by approximately 0.381% if there were no recovery post default and by less if there were any expected recovery. Therefore, assigning 0.40% of the increase in yield spread to default risk is conservative.

³⁶ STB 2008, p. 2.

³⁷ WCTL Petition in EP 664 (Sub-No. 2) p. 1.

To illustrate how this might be done (and to show the *de minimus* nature of the criticisms leveled at the Morningstar / Ibbotson model), I made three changes to the MSCDF model and report the results below, the first two changes address criticisms presented by WCTL and a third change to tailor the length of stages of the MSDCF model to the railroad industry.

First, I address the related criticisms that (i) growth rates in stage 2 do not permit a smooth transition from stage 1 to stage 3 and (ii) cash flow jumps from the end of stage 2 to the beginning of stage 3.³⁸ The reason for the jump in cash flow is, as explained above, that stages 1 and 2 use free equity cash flow while stage 3 relies on earnings (before extraordinary items) as a steady state measure. I determined the impact of addressing WCTL's criticisms by implementing the following changes to the MSDCF:

- a. A linear tapering of the growth rate in stage 2, so that the growth rates moves 1/6 towards the GDP growth rate in each year of stage 2, so that it lands at the GDP growth rate in year 1 of stage 3.
- b. A linear smoothing of the transition from reliance on the free cash flow available to shareholders as measured by subtracting capital expenditures in excess of depreciation and deferred taxes from income (before extraordinary items) to simply income before extraordinary items. Specifically, the test assumes that the difference between free cash flows measured in stages 1 and 2 and earnings before extraordinary items, depreciation plus deferred taxes minus capital expenditures (D+DT-CapEx) are eliminated linearly over the stage 2 years. I.e., once stage 3 is reached the (D+DT-CapEx) term has been reduced to zero. Further, I normalized the (D+DT-CapEx) term in the same manner as the Morningstar / Ibbotson model does the free cash flow. Specifically, the average depreciation, deferred tax and capital expenditure is determined using the five years leading up to the year being analyzed, and the total is divided by total sales, which determines the 5-year ratio of (D+DT-CapEx) to Sales. The ratio is

³⁸ See, Hodder p. 8.

then multiplied by the total sales for the year to determine the average (D+DT-CapEx) for the year. This is done to be consistent with the calculation in the MSDCF model as implemented by the Board.

I refer to the modified model as the 1st Modified MSDCF. It is important to understand that any tapering of the growth rate in stage 2 and a gradual movement towards a steady state where capital expenditures are maintenance only are linked – it would not be appropriate to consider only one smoothing effect without the other. Using the data relied upon by the Board for the years 2008 to 2012, as well as the data submitted for 2013 to determine the 1st Modified MSDCF estimates, the results from the modified model are shown along with the original results in Table 3 below.

**Table 3: Comparison of Cost of Equity Estimates from
STB MSDCF and 1st Modified MSDCF**

	STB MSDCF	1st MODIFIED MSDCF
2008	15.95%	15.16%
2009	13.34%	12.47%
2010	14.13%	13.60%
2011	15.83%	14.96%
2012	16.53%	15.77%
2013	13.40%	12.72%
Average	14.9%	14.1%

In interpreting the results, it is important to recognize that Table 3 above only addresses one aspect of the criticism against the MSDCF and that the MSDCF is only half of the estimated cost of equity. It is therefore important not to view the results in Table 3 as final, but rather as a step along the way in addressing the WCTL criticism.

Table 3 shows that tapering the growth rates during stage 2 and making a linear transition from the estimate of free equity cash flow to earnings before extraordinary items – such that the jump between year 10 and year 11 cash flows disappears – results in a decrease in the cost of equity estimates from the multi-stage DCF model of on average 0.8%, so that the net impact on the cost of equity from assigning equal weight to the CAPM and the multi-stage DCF would be 0.4% on average. However, as noted above, this is only one step in the analysis of the assumptions in the Morningstar / Ibbotson MSDCF.

Second, I have explored how to model the presence of stock repurchases. As described above, the failure to consider how this practice adjusts the pattern of returns to stockholders is likely biasing the results downwards. To adjust for the fact that growth rates are based on forecasts of earnings per share, I multiplied each year's modeled cash flows by the ratio of the average shares outstanding in that year vs. the prior year. In other words,

$$Cash_t^{adjusted} = Cash_{t-1} * (1 + g) * \left(\frac{shares_t}{shares_{t-1}} \right)$$

In the first stage of the model, I perform this adjustment on the total cash flows to shareholders, $EBEI - (CapEx - Depreciation + Deferred Taxes)$. However, in the second stage, I apply the share correction only to the growth in earnings before extraordinary items (EBEI), since I smooth the net effect of capital expenditures, depreciation and deferred taxes toward zero. Finally, I add to each year's equity cash flows the actual dollar value of funds distributed via stock repurchases in that year. In forecasting the cash value of buybacks beyond the period for which I have historical data, I interpolate from forecasts of shares outstanding and stock prices from Value Line during stage 1, but then taper the value of buybacks toward zero in stage 2. Thus, this model is consistent with the other adjustments I have made, and accounts *not only* for

the effect of changes in shares outstanding on forecasting earnings growth, *but also* for the actual cash distributed directly to shareholders during a share repurchase. Again, it is important to consider both effects if share buybacks are to be modeled. I refer to this model as the 2nd Modified Model, when share buybacks are tapered in stage 2 and show the results from this analysis in Table 4 below.

**Table 4: Comparison of STB MSDCF,
1st Modified MSDCF, and 2nd Modified MSDCF**

	STB MSDCF	1st MODIFIED MSDCF	2nd MODIFIED MSDCF
2008	15.95%	15.16%	15.77%
2009	13.34%	12.47%	13.19%
2010	14.13%	13.60%	13.90%
2011	15.83%	14.96%	15.10%
2012	16.53%	15.77%	16.08%
2013	13.40%	12.72%	12.72%
Average	14.9%	14.1%	14.5%

Table 4 compares the 2008 - 2013 cost of equity estimates resulting from the 2nd Modified Model to those from the 1st Modified Model and to those from the original version used by the Board. As is apparent from the table, the effect of accounting for share buybacks—appropriately incorporating the direct cash flows to shareholders as well as correcting earnings forecasts for the impact of share reductions—along with a tapering of both the growth rates and smoothing of the transition to income in stage 2—results in a cost of equity estimate that is very close to that of the Morningstar / Ibbotson MSDCF as applied by the Board. The overall results from taking two key criticisms from the WCTL and its experts into account show that the cost of equity estimates from the MSDCF model decrease by an average of 0.4%. When averaged with

the results from CAPM, this would translate into a decrease in the cost of equity of 0.2%.³⁹

Finally, I have explored how to tailor the stages of the MSDCF model to the railroad industry. Morningstar / Ibbotson used the same stages for all industries. The value of this approach is that it offers a uniform approach that could be used to compare costs of equity across industries, which is a point the Board appreciated in its 2009 decision. If the MSDCF is to be tailored to the railroad industry, an important consideration is the time horizon over which the growth rates taper towards the economy-wide growth. I have reviewed recent testimony by the AAR in the Board's proceeding on grain rate regulation that discussed the projected traffic growth for the railroad industry.⁴⁰ These projections indicate substantial growth in transportation volumes to 2045, so that it is more reasonable to adjust the horizon of stage 2 upward than downward. To illustrate the impact, I adjusted the model to include a longer stage 2, so that the steady state is assumed to be reached in year 16 rather than year 11. Making that adjustment to the model (together with the smoothing between stages and the proper modeling of stock repurchases) leads to the 3rd Modified MSDCF, which assumes stock buybacks taper off in stage 2 as in the 2nd Modified MSDCF. The results of this model are shown in Table 5 below.

³⁹ Summary information on growth rates and cash flow in the MSDCF and modified MSDCF for 2012 is provided in Appendix B.

⁴⁰ Association of American Railroads, "Rail Transportation of Grain, Rate Regulation Review," STB Ex Parte No. 665 (Sub-No. 1), June 26, 2014, pp. 19-20.

**Table 5: Comparison of STB MSDCF,
1st, 2nd and 3rd Modified MSDCF**

	STB MSDCF	1st MODIFIED MSDCF	2nd MODIFIED MSDCF	3rd MODIFIED MSDCF
2008	15.95%	15.16%	15.77%	16.61%
2009	13.34%	12.47%	13.19%	13.59%
2010	14.13%	13.60%	13.90%	14.35%
2011	15.83%	14.96%	15.10%	15.79%
2012	16.53%	15.77%	16.08%	16.71%
2013	13.40%	12.72%	12.72%	13.09%
Average	14.9%	14.1%	14.5%	15.0%

Looking at Table 5 above it is clear that taking two key criticisms of the WCTL and its experts into account (2nd Modified MSDCF) has *de minimus* impact on the estimated cost of equity, and similarly, extending stage 2 to be more consistent with the railroad industry’s growth expectations, also has minimal impact on the cost of equity.

In comparison, the CAPM has, as discussed above, been downward biased over the period due to the impact of monetary policy on government interest rates that are not reflective of corporate capital costs. As noted, this downward bias averaged about 1.1% for 2008-09, 0.3% for 2010, 0.5% for 2011-12 and 0.3% for 2013 or about 0.6% during the period. Taking the fact that the CAPM and MSDCF are weighted equally in the Board’s methodology into account, the CAPM impact is of the same magnitude if not larger than making adjustments for the WCTL key criticisms.

In the end, I do not believe the Board needs to expend its limited resources pursuing some kind of “best” MSDCF model for the railroad industry. The elaborations on the MSDCF that I have illustrated above are complex and prone to create

controversy as there are numerous additional data and assumptions that need to be incorporated into the model. All financial techniques used to estimate the cost of equity are inherently imprecise, whether we are speaking about a MSDCF model or CAPM. The results vary from year to year and are sensitive to assumptions that are just that, assumptions. In other words, there is a standard error associated with all models. The tiny difference between the STB's current MSDCF model and the modified versions reported above could readily be attributed to random noise.

Moreover, should the Board seek to make such changes to the Morningstar / Ibbotson MSDCF model, it would need to consider other issues such as how the large capital expenditures by the railroads will translate into higher growth in cash flows in future years, as well as to settle on when the industry is likely to reach its steady state (stage 3), where the massive capital expenditures will no longer be needed to meet current and future demand and will settle down to a steady-state where capital expenditures are roughly equal to total economic depreciation of existing assets. The potential downward bias in the CAPM due to currently very low government interest rates should also be considered.

In my opinion, the search for a MSDCF perfectly tailored to the railroad industry is misguided as there are many standard financial techniques of which the Board has reviewed and selected two. Any financial model will necessarily be a better fit in some years than others, so selecting a railroad specific model based on 2008-13 will necessarily lead to controversy in future years, when industry and market circumstances change. I emphasize that it is important to take a comprehensive view of the cost of equity estimation for the railroad industry (or any industry) and evaluate the allowed return on equity rather than the results from one of two relied upon models.

VI. Conclusion

The STB wisely recognized that “[a]s there are many different ways to estimate the cost of equity, the Board must take great care not to swing back-and-forth between parties’ preferred methodologies based on the results of the different approaches.”⁴¹ And the sentiment that the Board expressed in its Ex Parte 664 (Sub-No. 1) decision remains valid today:

[I]f our exploration of this issue has revealed nothing else, it has shown that there is no single simple or correct way to estimate the cost of equity for the railroad industry, and countless reasonable options are available.⁴²

As illustrated above, many academics, practitioners and regulators prefer to use more than one technique to estimate the cost of equity.

I agree wholeheartedly that it is important to use more than one estimation method, and it is particularly helpful to use different models (such as the CAPM and the multi-stage DCF models) that use different kinds of information. The Morningstar / Ibbotson MSDCF model remains a sound technique and a relevant tool (along with the CAPM) for estimating the costs of equity for the railroad industry. In my professional opinion, WCTL has not justified a decision to throw away valuable, forward-looking information that can help the Board in the difficult task of estimating the railroad cost of equity.

⁴¹ Surface Transportation Board, Decision STB Ex Parte No. 558 (Sub-No. 9), decided September 15, 2006.

⁴² STB 2009 Decision p. 15.

APPENDIX A: Regulatory Practice in Using Multiple Models

1. State and Provincial Regulators

In the U.S., rates for a number of regulated entities are determined by several federal entities as well as regulators in each of the fifty states and the District of Columbia. Federal regulators tend to have well-specified methods to determine the cost of equity with the Federal Energy Regulatory Commission relying exclusively on the discounted cash flow model, while the STB and the Federal Reserve both use a combination of the CAPM and the multi-stage discounted cash flow model. While state regulators typically do not specify a particular method or methods, they commonly review evidence from several estimation methods and parties before issuing a decision on the allowed cost of equity. They generally use more than one method but most do not specify the weight assigned to each method.

a) New York

The New York State Public Service Commission (NY PSC) explicitly favors a weighted blend of DCF and CAPM for ROE estimation. The NY PSC has in a recent decision relied on the CAPM and a DCF model to calculate the ROE and assigned a weight of two-thirds to the DCF estimate and one-third to the CAPM estimate.^{43,44}

⁴³ SNL: *Regulatory Research Associates, New York State Public Service Commission*. Last updated December 14, 2013. Access: <http://www.snl.com/interactivex/CommissionDetails.aspx?ID=4081607&Type=1&State=NY>

⁴⁴ See also Prepared Testimony of Craig E. Henry, *In the Matter of Consolidated Edison Company of New York*, Case 06-G-1332, March 2007, p. 7.

b) British Columbia Utilities Board

Starting in British Columbia in 1994, the British Columbia Utilities Commission (BCUC) completed the first generic cost of capital proceeding in Canada, which established a benchmark ROE and a formulaic approach to updating the allowed ROE annually.⁴⁵ Shortly thereafter, other Canadian regulators followed suit and similarly established a benchmark ROE and an annual updating formula. These formulae were linked to the change or forecasted change in Treasury bond yields.

The BCUC's views evolved as the various models arrived at more or less plausible results. For example, in its 2009 decision, the BCUC found:

The Commission Panel agrees that a single variable is unlikely to capture the many causes of changes in ROE and that in particular the recent flight to quality has driven down the yield on long-term Canada bonds, while the cost of risk has been priced upwards.⁴⁶

As a result, the BCUC assigned less weight to the CAPM than it had previously and higher weight to the DCF.

In May of 2013, the BCUC released its most recent decision regarding the appropriate methodology for determining cost of capital for a benchmark low-risk utility. The BCUC established that **"the DCF and CAPM should be given equal weight**

⁴⁵ BCUC Decision in the Matter of Return on Common Equity BC Gas Utility Ltd., Pacific Northern Gas Ltd., West Kootenay Power Ltd., June 10, 1994 (BCUC 1994 Decision), pp. 39-40.

⁴⁶ BCUC in the Matter of Terasen Gas Inc., Terasen Gas (Vancouver Island) Inc., Terasen Gas (Whistler) Inc. and Return on Equity and Capital Structure Decision, G-158-09, Decided December 16, 2009 (BCUC 2009 Decision), p. 73.

in determining the ROE,⁴⁷ because both have solid theoretical foundations and “explicitly recognize the opportunity cost of capital.”⁴⁸

The decision recognizes that both models have advantages and shortcomings and found that the most helpful DCF estimates were the multi-stage estimates.⁴⁹ The decision notes that the DCF model assumes “unlike the CAPM, that investors hold realistic investment horizons; both short and long-term investors estimate all dividends that the firm will provide over its lifetime.”⁵⁰ However, any estimates from this model are only as accurate as the growth rate assumptions used, and these assumptions can be “strong, and hence unlikely to correspond to reality.”⁵¹ On the other hand, CAPM estimates, despite strong theoretical underpinnings, might be, for instance, adversely impacted by poor estimates of the risk premium if there is a lack of “conditioning on the current state of the capital markets.”⁵²

2. State Ad Valorem Taxation

Several U.S. states use a combination of the CAPM and DCF models for the purpose of valuing property of state assessed industries such as airlines, gas, electric and water utilities, pipelines, railroads, and telephone companies. In doing so, the states need to determine a cost of equity for the industry being assessed. Like the rate of return regulators cited above, the states’ choice of estimation method for this purpose

⁴⁷ BCUC Generic Cost of Capital Proceeding (Stage 1) Decision, Decided May 10, 2013 (BCUC 2013 Decision), p. 80.

⁴⁸ BCUC 2013 Decision, p. 56.

⁴⁹ BCUC 2013 Decision p. 71.

⁵⁰ BCUC 2013 Decision, p. 67.

⁵¹ BCUC 2013 Decision, p. 69.

⁵² BCUC 2013 Decision, p. 65.

provide insight into what estimation methods state regulators use to determine the cost of equity.

According to Pratt and Grabowski,⁵³ California, Colorado, Oklahoma, Texas, Washington and Wyoming use a combination of the CAPM and discounted cash flow models, while Nevada relies on the discounted cash flow model albeit state statute also allows for the use of the CAPM and a bond-rate plus premium method.⁵⁴

The Board's decision to use a combination of the CAPM and the MSDCF is consistent with the decisions of other regulators, who also combine estimation results. The sentiment that the Board expressed in its Ex Parte 664 (Sub-No. 1) decision remains valid:

[I]f our exploration of this issue has revealed nothing else, it has shown that there is no single simple or correct way to estimate the cost of equity for the railroad industry, and countless reasonable options are available.⁵⁵

I agree. And many other regulators similarly rely on a combination of models with the most frequently used regulatory cost of equity estimation methods being versions of the CAPM and discounted cash flow models.

⁵³ Roger J. Grabowski is a managing director at Duff & Phelps LLC, which will publish the Morningstar / Ibbotson MSDCF model and figures going forward.

⁵⁴ Shannon P. Pratt and Roger J. Grabowski, *Cost of Capital in Litigation: Applications and Examples*, 2011, pp. 206-10.

⁵⁵ STB 2009 Decision p. 15.

APPENDIX B: Summary Information on Growth Rates and Cash Flow in MSDCF and Modified MSDCF for 2012

Table B-1: 2012 CSX Growth Rate Comparison

Stage	Year	STB Growth Rates	Revised MSDCF Growth Rates
Year 0	2012	-	-
Stage 1	2013	14.70%	14.70%
	2014	14.70%	14.70%
	2015	14.70%	14.70%
	2016	14.70%	14.70%
	2017	14.70%	14.70%
Stage 2	2018	14.07%	13.16%
	2019	14.07%	11.63%
	2020	14.07%	10.09%
	2021	14.07%	8.55%
	2022	14.07%	7.02%
Stage 3	2023 onwards	5.48%	5.48%

Table B-2: 2012 CSX Cash Flow Comparison

Stage	Year	STB Projected Cash Flows	1st Modified MSDCF Projected Cash Flows	2nd Modified MSDCF Projected Cash Flows
Year 0	2012	1,202	1,202	1,936
Stage 1	2013	1,379	1,379	1,704
	2014	1,581	1,581	2,353
	2015	1,814	1,814	2,599
	2016	2,080	2,080	2,769
	2017	2,386	2,386	3,063
Stage 2	2018	2,722	2,986	3,385
	2019	3,105	3,585	3,691
	2020	3,542	4,170	3,938
	2021	4,040	4,727	4,181
	2022	4,609	5,240	4,410
Stage 3	Terminal Value	53,458	45,402	37,524

Table B-3: 2012 NSC Growth Rate Comparison

Stage	Year	STB Growth Rates	Revised MSDCF Growth Rates
Year 0	2012	-	-
Stage 1	2013	12.10%	12.10%
	2014	12.10%	12.10%
	2015	12.10%	12.10%
	2016	12.10%	12.10%
	2017	12.10%	12.10%
Stage 2	2018	14.07%	11.00%
	2019	14.07%	9.89%
	2020	14.07%	8.79%
	2021	14.07%	7.69%
	2022	14.07%	6.58%
Stage 3	2023 onwards	5.48%	5.48%

Table B-4: 2012 NSC Cash Flow Comparison

Stage	Year	STB Projected Cash Flows	1st Modified MSDCF Projected Cash Flows	2nd Modified MSDCF Projected Cash Flows
Year 0	2012	1,160	1,160	2,448
Stage 1	2013	1,300	1,300	1,882
	2014	1,458	1,458	2,051
	2015	1,634	1,634	2,419
	2016	1,832	1,832	2,145
	2017	2,053	2,053	2,352
Stage 2	2018	2,342	2,550	2,680
	2019	2,672	3,047	3,000
	2020	3,048	3,535	3,287
	2021	3,477	4,008	3,570
	2022	3,966	4,456	3,843
Stage 3	Terminal Value	51,388	42,241	36,062

Table B-5: 2012 UNP Growth Rate Comparison

Stage	Year	STB Growth Rates	Revised MSDCF Growth Rates
Year 0	2012	-	-
Stage 1	2013	15.40%	15.40%
	2014	15.40%	15.40%
	2015	15.40%	15.40%
	2016	15.40%	15.40%
	2017	15.40%	15.40%
Stage 2	2018	14.07%	13.75%
	2019	14.07%	12.09%
	2020	14.07%	10.44%
	2021	14.07%	8.79%
	2022	14.07%	7.13%
Stage 3	2023 onwards	5.48%	5.48%

Table B-6: 2012 UNP Cash Flow Comparison

Stage	Year	STB Projected Cash Flows	1st Modified MSDCF Projected Cash Flows	2nd Modified MSDCF Projected Cash Flows
Year 0	2012	2,617	2,617	4,091
Stage 1	2013	3,020	3,020	5,173
	2014	3,485	3,485	5,897
	2015	4,022	4,022	5,544
	2016	4,641	4,641	6,806
	2017	5,356	5,356	7,508
Stage 2	2018	6,109	6,515	7,962
	2019	6,969	7,675	8,382
	2020	7,950	8,805	8,657
	2021	9,068	9,871	8,931
	2022	10,344	10,840	9,178
Stage 3	Terminal Value	137,949	122,147	99,183

APPENDIX C: Resume of Dr. Bente Villadsen

Dr. Bente Villadsen is a principal at The Brattle Group. Her work concentrates in the areas of regulatory finance and accounting. Her recent work has focused on accounting issues, damages, cost of capital and regulatory finance. In the regulatory finance area, Dr. Villadsen has testified on cost of capital and accounting, analyzed credit issues in the utility industry, risk management practices as well the impact of regulatory initiatives such as energy efficiency and de-coupling on cost of capital and earnings. Among her recent accounting work, she has been involved in accounting disclosure issues and principles including impairment testing, fair value accounting, leases, accounting for hybrid securities, accounting for equity investments, cash flow estimation as well as overhead allocation. Dr. Villadsen has estimated damages in the U.S. as well as internationally for companies in the construction, telecommunications, energy, cement, and rail road industry. She has filed testimony and testified in federal and state court, in international and U.S. arbitrations and before state and federal regulatory commissions. Her testimonies and expert reports pertain to accounting issues, damages, discount rates and cost of capital for regulated entities.

Dr. Villadsen holds a Ph.D. from Yale University's School of Management with a concentration in accounting. She has a joint degree in mathematics and economics (BS and MS) from University of Aarhus in Denmark. Prior to joining The Brattle Group, she was a Professor of Accounting at the University of Iowa, University of Michigan, and at Washington University in St. Louis where she taught financial and cost accounting. She has also taught graduate classes in econometrics and quantitative methods. Dr. Villadsen also worked as a consultant for Risoe National Laboratories in Denmark.

AREAS OF EXPERTISE

- Regulatory Finance
 - Cost of Capital
 - Cost of Service (including prudence)
 - Energy Efficiency, De-coupling and the Impact on Utilities Financials
 - Relationship between regulation and credit
 - Risk Management

- Regulatory Advisory
- Accounting and Corporate Finance
 - Application of Accounting Standards
 - Disclosure Issues
 - Credit Issues in the Utility Industry
- Damages
 - Stock Price Drop
 - Lost Profit

EXPERIENCE

Regulatory Finance

- On behalf of American Water, California Water, EPCOR, Portland General Electric, and other parties, Dr. Villadsen has testified on cost of capital in state regulatory proceedings and before Bonneville Power Authority. In recent proceedings, her testimony included an evaluation of the impact of the financial crisis on the cost of capital and well as testimony on credit metrics and the implication of being non-investment grade.
- On behalf of the Australian Pipeline Industry Association (APIA), she led a study and co-authored a report on cost of equity and debt estimation methods. The equity report was filed with the Australian Energy Regulator as part of the APIA's response to the Australian Energy Regulator's development of rate of return guidelines and both reports were filed with the Economic Regulation Authority by the Dampier Bunbury Pipeline.
- In connection with the AWC Companies application to construct a backbone electric transmission project off the Mid-Atlantic Coast, Dr. Villadsen submitted testimony before the Federal Energy Regulatory Commission on the treatment the accounting and regulatory treatment of regulatory assets, pre-construction costs, construction work in progress, and capitalization issues.
- On behalf of ITC Holdings, she filed testimony with the Federal Energy Regulatory Commission regarding capital structure issues.

- Testimony on the impact of transaction specific changes to pension plans and rate base issues on the cost of service on behalf of Balfour Beatty Infrastructure Partners before the Michigan Public Service Commission.
- Dr. Villadsen has authored or co-authored reports on rate of return in connection with a review of regulatory practice for both regulators and other parties. The reports were submitted to the Netherlands Competition Authority, the British Columbia Utilities Commission, the Canadian Transportation Agency, the Australian Energy Regulator, the Economic Regulation Authority of Western Australia, and the Communications Regulatory Authority of Italy.
- She has advised the private equity arm of two large financial institutions as well as an infrastructure company, a sovereign fund and pension fund in connection with their acquisition of regulated transmission, distribution or integrated electric assets in the U.S. and Canada. For these clients, Dr. Villadsen evaluated the regulatory climate and the treatment of acquisition specific changes affecting the regulated entity, capital expenditures, specific cost items and the impact of regulatory initiatives such as the FERC's incentive return or riders and trackers. She has also reviewed the assumptions or worked directly with the acquirer's financial model.
- In a matter before Bonneville Power Administration, Dr. Villadsen filed expert testimony on behalf of customers regarding the cost of capital for electric utilities and the appropriate discount rate to apply to a government entity's cash flows.
- For several large electric and gas utilities, Dr. Villadsen reviewed the hedging strategies for electricity and gas and modeled the risk mitigation of hedges entered into. She also studies the prevalence and merits of using swaps and options to hedge gas costs. This work was used in connection with prudence reviews of hedging costs in Colorado, Oregon, Utah, West Virginia, and Wyoming. As part of these engagements, hedging workshops for stakeholders were conducted to obtain consensus on hedging policy issues.
- She estimated the cost of capital for major U.S. and Canadian utilities, pipelines, and railroads. The work has been used in connection with the

companies' rate hearings before the Federal Energy Regulatory Commission, the Canadian National Energy Board, the Surface Transportation Board, and state and provincial regulatory bodies. The work has been performed for pipelines, integrated electric utilities, non-integrated electric utilities, gas distribution companies, water utilities, railroads and other parties.

- In a matter pertaining to regulatory cost allocation, Dr. Villadsen assisted counsel in collecting necessary internal documents, reviewing internal accounting records and using this information to assess the reasonableness of the cost allocation.
- She has been engaged to estimate the cost of capital or appropriate discount rate to apply to segments of operations such as the power production segment for utilities.
- In connection with rate hearings for electric utilities, Dr. Villadsen has estimated the impact of power purchase agreements on the company's credit ratings and calculated appropriate compensation for utilities that sign such agreements to fulfill, for example, renewable energy requirements.
- Dr. Villadsen has been part of a team assessing the impact of conservation initiatives, energy efficiency, and decoupling of volumes and revenues on electric utilities financial performance. Specifically, she has estimated the impact of specific regulatory proposals on the affected utilities earnings and cash flow.
- On behalf of Progress Energy, she evaluated the impact of a depreciation proposal on an electric utility's financial metric and also investigated the accounting and regulatory precedent for the proposal.
- For a large integrated utility in the U.S., Dr. Villadsen has for several years participated in a large range of issues regarding the company's rate filing, including the company's cost of capital, incentive based rates, fuel adjustment clauses, and regulatory accounting issues pertaining to depreciation, pensions, and compensation.
- Dr. Villadsen has been involved in several projects evaluating the impact of credit ratings on electric utilities. She was part of a team evaluating the

impact of accounting fraud on an energy company's credit rating and assessing the company's credit rating but-for the accounting fraud.

- For a large electric utility, Dr. Villadsen modeled cash flows and analyzed its financing decisions to determine the degree to which the company was in financial distress as a consequence of long-term energy contracts.
- For a large electric utility without generation assets, Dr. Villadsen assisted in the assessment of the risk added from offering its customers a price protection plan and being the provider of last resort (POLR).

Accounting and Corporate Finance

- On behalf of a taxpayer, Dr. Villadsen recently testified in federal court on the impact of discount rates on the economic value of alternative scenarios in a lease transaction.
- In an arbitration matter before the International Centre for Settlement of Investment Disputes, she provided expert reports and oral testimony on the allocation of corporate overhead costs and damages in the form of lost profit. Dr. Villadsen also reviewed internal book keeping records to assess how various inter-company transactions were handled.
- Dr. Villadsen provided expert reports and testimony in an international arbitration under the International Chamber of Commerce on the proper application of US GAAP in determining shareholders' equity. Among other accounting issues, she testified on impairment of long-lived assets, lease accounting, the equity method of accounting, and the measurement of investing activities.
- In an arbitration matter before the American Arbitration Association, she provided expert reports on the equity method of accounting, the classification of debt versus equity and the distinction between categories of liabilities in a contract dispute between two major oil companies. For the purpose of determining whether the classification was appropriate, Dr. Villadsen had to review the company's internal book keeping records.

- Dr. Villadsen provided an expert report in a matter before the International Chamber of Commerce regarding the calculation of the final adjustment in an acquisition. The specific topic of her expert report was the distinction of accrual and cash flow measures of costs.
- In U.S. District Court, Dr. Villadsen filed testimony regarding the information required to determine accounting income losses associated with a breach of contract and cash flow modeling.
- Dr. Villadsen recently assisted counsel in a litigation matter regarding the determination of fair values of financial assets, where there was a limited market for comparable assets. She researched how the designation of these assets to levels under the FASB guidelines affect the value investors assign to these assets.
- She has worked extensively on litigation matters involving the proper application of mark-to-market and derivative accounting in the energy industry. The work relates to the proper valuation of energy contracts, the application of accounting principles, and disclosure requirements regarding derivatives.
- Dr. Villadsen evaluated the accounting practices of a mortgage lender and the mortgage industry to assess the information available to the market and ESOP plan administrators prior to the company's filing for bankruptcy. A large part of the work consisted of comparing the company's and the industry's implementation of gain-of-sale accounting.
- In a securities fraud matter, Dr. Villadsen evaluated a company's revenue recognition methods and other accounting issues related to allegations of improper treatment of non-cash trades and round trip trades.
- For a multi-national corporation with divisions in several countries and industries, Dr. Villadsen estimated the appropriate discount rate to value the divisions. She also assisted the company in determining the proper manner in which to allocate capital to the various divisions, when the company faced capital constraints.

- Dr. Villadsen evaluated the performance of segments of regulated entities. She also reviewed and evaluated the methods used for overhead allocation.
- She has worked on accounting issues in connection with several tax matters. The focus of her work has been the application of accounting principles to evaluate intra-company transactions, the accounting treatment of security sales, and the classification of debt and equity instruments.
- For a large integrated oil company, Dr. Villadsen estimated the company's cost of capital and assisted in the analysis of the company's accounting and market performance.
- In connection with a bankruptcy proceeding, Dr. Villadsen provided litigation support for attorneys and an expert regarding corporate governance.

Damages

- On behalf of a taxpayer, Dr. Villadsen testified on the economic value of alternative scenarios in a lease transaction regarding infrastructure assets.
- For a foreign construction company involved in an international arbitration, she estimated the damages in the form of lost profit on the breach of a contract between a sovereign state and a construction company. As part of her analysis, Dr. Villadsen relied on statistical analyses of cost structures and assessed the impact of delays.
- In an international arbitration, Dr. Villadsen estimated the damages to a telecommunication equipment company from misrepresentation regarding the product quality and accounting performance of an acquired company. She also evaluated the IPO market during the period to assess the possibility of the merged company to undertake a successful IPO.
- On behalf of pension plan participants, Dr. Villadsen used an event study estimated the stock price drop of a company that had engaged in accounting fraud. Her testimony conducted an event study to assess the impact of news regarding the accounting misstatements.

- In connection with a FINRA arbitration matter, Dr. Villadsen estimated the value of a portfolio of warrants and options in the energy sector and provided support to counsel on finance and accounting issues.
- She assisted in the estimation of net worth of individual segments for firms in the consumer product industry. Further, she built a model to analyze the segment's vulnerability to additional fixed costs and its risk of bankruptcy.
- Dr. Villadsen was part of a team estimating the damages that may have been caused by a flawed assumption in the determination of the fair value of mortgage related instruments. She provided litigation support to the testifying expert and attorneys.
- For an electric utility, Dr. Villadsen estimated the loss in firm value from the breach of a power purchase contract during the height of the Western electric power crisis. As part of the assignment, Dr. Villadsen evaluated the creditworthiness of the utility before and after the breach of contract.
- Dr. Villadsen modeled the cash flows of several companies with and without specific power contract to estimate the impact on cash flow and ultimately the creditworthiness and value of the utilities in question.

PUBLICATIONS AND REPORTS

Report on "Cost of Capital for Telecom Italia's Regulated Business" with Stewart C. Myers and Francesco Lo Passo before the *Communications Regulatory Authority of Italy* ("AGCOM"), March 2014. *Submitted in Italian.*

"Alternative Regulation and Ratemaking Approaches for Water Companies: Supporting the Capital Investment Needs of the 21st Century," (with J. Wharton and H. Bishop), prepared for the *National Association of Water Companies*, October 2013.

"Estimating the Cost of Debt," (with T. Brown), prepared for the Dampier Bunbury Pipeline and filed with the *Economic Regulation Authority*, Western Australia, March 2013.

"Estimating the Cost of Equity for Regulated Companies," (with P.R. Carpenter, M.J. Vilbert, T. Brown, and P. Kumar), prepared for the Australian Pipeline Industry Association and filed with the *Australian Energy Regulator* and the *Economic Regulation Authority*, Western Australia, February 2013.

“Calculating the Equity Risk Premium and the Risk Free Rate,” (with Dan Harris and Francesco LoPasso), prepared for *NMa and Opta, the Netherlands*, November 2012.

“Shale Gas and Pipeline Risk: Earnings Erosion in a More Competitive World,” (with Paul R. Carpenter, A. Lawrence Kolbe, and Steven H. Levine), *Public Utilities Fortnightly*, April 2012.

“Survey of Cost of Capital Practices in Canada,” (with Michael J. Vilbert and Toby Brown), prepared for *British Columbia Utilities Commission*, May 2012.

“Public Sector Discount Rates” (with rank Graves, Bin Zhou), *Brattle* white paper, September 2011

“FASB Accounting Rules and Implications for Natural Gas Purchase Agreements,” (with Fiona Wang), *American Clean Skies Foundation*, February 2011.

“IFRS and You: How the New Standards Affect Utility Balance Sheets,” (with Amit Koshal and Wyatt Toolson), *Public Utilities Fortnightly*, December 2010.

“Corporate Pension Plans: New Developments and Litigation,” (with George Oldfield and Urvashi Malhotra), Finance Newsletter, Issue 01, *The Brattle Group*, November 2010.

“Review of Regulatory Cost of Capital Methodologies,” (with Michael J. Vilbert and Matthew Aharonian), *Canadian Transportation Agency*, September 2010.

“Building Sustainable Efficiency Businesses: Evaluating Business Models,” (with Joe Wharton and Peter Fox-Penner), *Edison Electric Institute*, August 2008.

“Understanding Debt Imputation Issues,” (with Michael J. Vilbert and Joe Wharton and *The Brattle Group* listed as an author), *Edison Electric Institute*, June 2008.

“Measuring Return on Equity Correctly: Why current estimation models set allowed ROE too low,” *Public Utilities Fortnightly*, August 2005 (with A. Lawrence Kolbe and Michael J. Vilbert).

“The Effect of Debt on the Cost of Equity in a Regulatory Setting,” (with A. Lawrence Kolbe and Michael J. Vilbert, and with “*The Brattle Group*” listed as author), *Edison Electric Institute*, April 2005.

“Communication and Delegation in Collusive Agencies,” *Journal of Accounting and Economics*, Vol. 19, 1995.

“Beta Distributed Market Shares in a Spatial Model with an Application to the Market for Audit Services” (with M. Hviid), *Review of Industrial Organization*, Vol. 10, 1995.

SELECTED PRESENTATIONS

“Advanced Capital Structure and Liability Management,” Edison Electric Institute & American Gas Association’s Advanced Utility Accounting Seminar, Denver, August, 2014.

“Capital Investments and Alternative Regulation,” National Association of Water Companies Annual Policy Forum, December 2013.

“Current Issues in Cost of Capital,” Edison Electric Institute Advanced Rate School, July 2014, 2013, 2012.

“Accounting for Power Plant,” SNL’s Inside Utility Accounting Seminar, Charlotte, NC, October 2012.

“GAAP / IFRS Convergence,” SNL’s Inside Utility Accounting Seminar, Charlotte, NC, October 2012.

“International Innovations in Rate of Return Determination,” Society of Utility Financial and Regulatory Analysts’ Financial Forum, April 2012.

“Utility Accounting and Financial Analysis: The Impact of Regulatory Initiatives on Accounting and Credit Metrics,” 1.5 day seminar, EUCI, Atlanta, May 2012.

“Cost of Capital Working Group Eforum,” Edison Electric Institute webinar, April 2012.

“Issues Facing the Global Water Utility Industry” Presented to Sensus’ Executive Retreat, Raleigh, NC, July 2010.

“Regulatory Issues from GAAP to IFRS,” NASUCA 2009 Annual Meeting, Chicago, November 2009.

“Subprime Mortgage-Related Litigation: What to Look for and Where to Look,” Law Seminars International: Damages in Securities Litigation, Boston, May 2008.

“Evaluating Alternative Business / Inventive Models,” (with Joe Wharton). EEI Workshop, Making a Business of Energy Efficiency: Sustainable Business Models for Utilities, Washington DC, December 2007.

“Deferred Income Taxes and IRS’s NOPR: Who should benefit?” NASUCA Annual Meeting, Anaheim, CA, November 2007.

“Current Issues in Cost of Capital,” (with M.J. Vilbert). EEI Electric Rates Advanced Course, Madison, 2005.

“Issues for Cost of Capital Estimation,” (with M.J. Vilbert). EEI Cost of Capital Conference, Chicago, 2004.

"Discussion of 'Are Performance Measures Other Than Price Important to CEO Incentives?'" *Annual Meeting of the American Accounting Association, 2000.*

"Contracting and Income Smoothing in an Infinite Agency Model: A Computational Approach," (with R.T. Boylan) *Business and Management Assurance Services Conference, Austin 2000.*

TESTIMONY

Expert Report on specific accrual and cash flow items in a Sales and Purchase Agreement in international arbitration before the *International Chamber of Commerce*. Case No. 19651/TO, July 2014.

Rebuttal Testimony regarding Cost of Capital before the *Oregon Public Utility Commission* on behalf of Portland General Electric, Docket No. UE 283, July 2014.

Direct Testimony on the rate impact of the pension re-allocation and other items for Upper Peninsula Power Company in connection with the acquisition by BBIP before the *Michigan Public Service Commission* in Docket No. U-17564, March 2014.

Expert Report on cost of equity, non-recovery of operating cost and asset retirement obligations on behalf of oil pipeline in arbitration, April 2013.

Direct Testimony on the treatment of goodwill before the *Federal Energy Regulatory Commission* on behalf of ITC Holdings Corp and ITC Midwest, LLC in Docket No. PA10-13-000, February 2012.

Direct and Rebuttal Testimony on cost of capital before the *Public Utilities Commission of the State of California* on behalf of California-American Water in Application No. 11-05, May 2011.

Direct Testimony, Rebuttal Testimony, and Hearing Appearance on cost of capital before the *New Mexico Public Regulation Commission* on behalf of New Mexico-American Water in Case No. 11-00196-UT, May 2011, November 2011, and December 2011.

Direct Testimony on regulatory assets and FERC accounting before the *Federal Energy Regulatory Commission* on behalf of AWC Companies, ER11-13-000/Eli-1-3-000, December 2010.

Expert Report and deposition in Civil Action No. 02-618 (GK/JMF) in the *United States District Court for the District of Columbia*, November 2010, January 2011.

Direct Testimony, Rebuttal Testimony, and Rejoinder Testimony on the cost of capital before the *Arizona Corporation Commission* on behalf of Arizona-American Water in Docket No. W-01303A-10-0448, November 2010, July 2011, and August 2011.

Direct Testimony on the cost of capital before the *New Mexico Public Regulation Commission* on behalf of New Mexico-American Water in Docket No. 09-00156-UT, August 2009.

Direct and Rebuttal Testimony and Hearing Appearance on the cost of capital before the *Arizona Corporation Commission* on behalf of Arizona-American Water in Docket No. W-01303A-09-0343, July 2009, March 2010 and April 2010.

Rebuttal Expert Report, Deposition and Oral Testimony re. the impact of alternative discount rate assumptions in tax litigation. *United States Court of Federal Claims*, Case No. 06-628 T, January, February, April 2009. (*Confidential*)

Direct Testimony, Rebuttal Testimony and Hearing Appearance on cost of capital before the *New Mexico Public Regulation Commission* on behalf of New Mexico-American Water in Docket No. 08-00134-UT, June 2008 and January 2009.

Direct Testimony on cost of capital and carrying charge on damages, U.S. Department of Energy, *Bonneville Power Administration*, BPA Docket No. WP-07, March 2008.

Direct Testimony, Rebuttal Testimony, Rejoinder Testimony and Hearing Appearance on cost of capital before the *Arizona Corporation Commission* on behalf of Arizona-American Water in Docket No. W-01303A-08-0227, April 2008, February 2009, March 2009.

Expert Report, Supplemental Expert Report, and Hearing Appearance on the allocation of corporate overhead and damages from lost profit. *The International Centre for the Settlement of Investment Disputes*, Case No. ARB/03/29, February, April, and June 2008 (*Confidential*).

Expert Report on accounting information needed to assess income. *United States District Court* for the District of Maryland (Baltimore Division), Civil No. 1:06cv02046-JFM, June 2007 (*Confidential*)

Expert Report, Rebuttal Expert Report, and Hearing Appearance regarding investing activities, impairment of assets, leases, shareholder equity under U.S. GAAP and valuation. *International Chamber of Commerce (ICC)*, Case No. 14144/CCO, May 2007, August 2007, September 2007. (Joint with Carlos Lapuerta, *Confidential*)

Direct Testimony, Rebuttal Testimony, and Hearing Appearance on cost of capital before the *Arizona Corporation Commission* on behalf of Arizona-American Water in Docket No. W-01303A-06-0491, July 2006, July 2007.

Direct Testimony, Rebuttal Testimony, Rejoinder Testimony, Supplemental Rejoinder Testimony and Hearing Appearance on cost of capital before the *Arizona Corporation Commission* on behalf of Arizona-American Water in Docket No. W-01303A-06-0403, June 2006, April 2007, May 2007.

Direct Testimony, Rebuttal Testimony, Rejoinder Testimony, and Hearing Appearance on cost of capital before the *Arizona Corporation Commission* on behalf of Arizona-American Water in Docket No. W-01303A-06-0014, January 2006, October 2006, November 2006.

Expert report, rebuttal expert report, and deposition on behalf of a major oil company regarding the equity method of accounting and classification of debt and equity, *American Arbitration Association*, August 2004 and November 2004. (*Confidential*)

VERIFICATION

I, Bente Villadsen, declare under penalty of perjury, that the foregoing statement is true and correct to the best of my knowledge and belief and that I am qualified and authorized to file this statement.

Executed: 9-1-2014

B. Villadsen
BENTE VILLADSEN