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

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[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]

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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

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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

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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

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[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

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[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,

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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

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[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

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[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 [1]	EPS_1 [2]	Implied Growth [3]	# Shares, t=0 [4]	# Shares, t=1 [5]	Year 0 Cash Flow [6]	Estimated Year 1 Cash [7]	Actual Year 1 Cash [8]	Stock Price [9]	Buyback Cash [10]	Total Cash to Shareholders [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

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[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

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[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

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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

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[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

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[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

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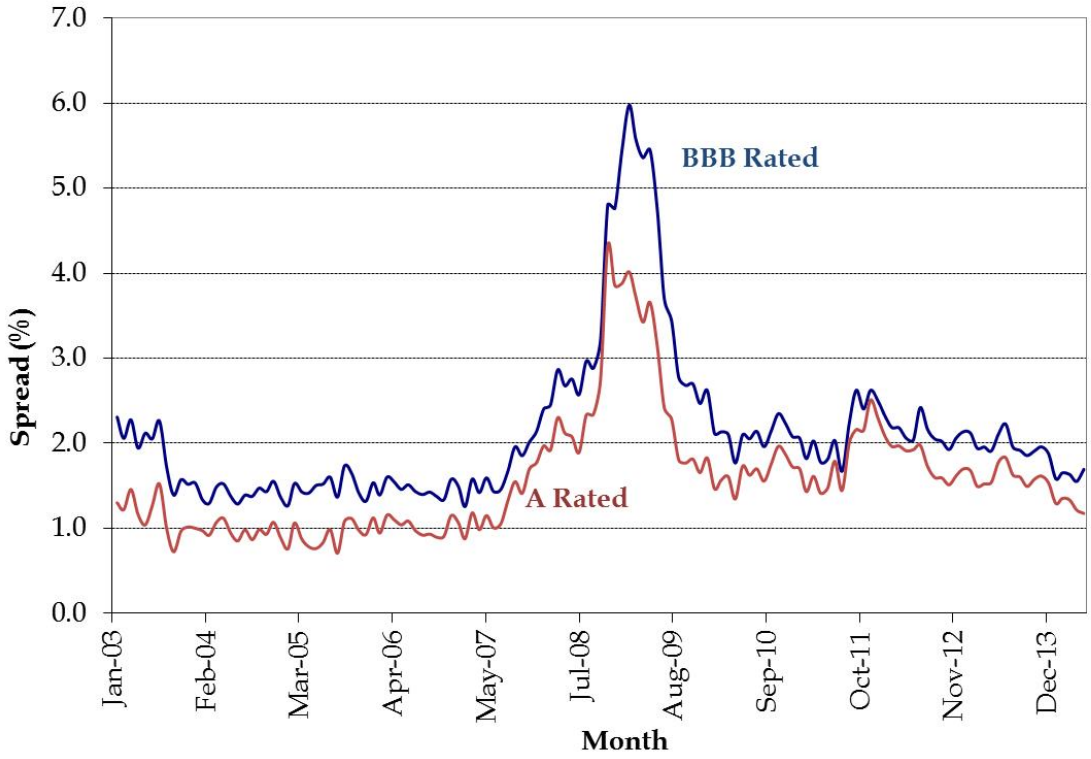
[33] Myers AER Report p. 8.

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.

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[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.

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[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.

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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]

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[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**

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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

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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.

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[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. (*Confidentia*l)