BEFORE THE

SURFACE TRANSPORTATION BOARD

REVISIONS TO THE BOARD'S METHODOLOGY FOR DETERMINING THE RAILROAD INDUSTRY'S COST OF CAPITAL	))))))	**Docket No. EP 664 (Sub-No. 4)**

VERIFIED STATEMENT

OF

BENTE VILLADSEN

ON BEHALF OF

ASSOCIATION OF AMERICAN RAILROADS

January 15, 2020

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SURFACE TRANSPORTATION BOARD

Docket No. EP 664 (Sub-No. 4)

VERIFIED STATEMENT OF DR. BENTE VILLADSEN

I. INTRODUCTION AND SUMMARY

1. My name is Bente Villadsen. I am a principal with The Brattle Group (Brattle) in Boston, Massachusetts. I have more than 20 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 the Surface Transportation Board (STB or the Board), the Federal Energy Regulatory Commission (FERC), and before state regulatory agencies, as well as in Canada, overseas, and in international arbitrations. This work has pertained to electric, natural gas, and water utilities, natural gas pipelines, railroads, and telecommunications. I previously testified before the Board in 2014 and 2015 on matters concerning its methodology for determining the cost of capital for the railroads.[1] Other examples of my recent cost of capital work include reports or testimony on cost of capital and cost of capital methodology for pipelines and an electric utility before the FERC, testimony on the methodology to be applied in the determination of the weighted average cost of capital in property tax matters for a railroad and an electric utility, and cost of capital testimony for electric, gas distribution, and water utilities before various state and provincial regulatory commissions. I am a co-author of a text on practical implementation of cost of capital analysis for regulated industries,[2] as well as a number of articles on cost of capital topics including an article on the impact of the 2017 tax reform on regulated entities. 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

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1 *Pet. of W. Coal Traffic League to Institute Rulemaking Proceeding to Abolish Use of Multi-Stage Discounted Cash Flow Model in Determining R.R. Industry's Cost of Equity Capital*, EP 664 (Sub-No. 2), Villadsen Verified Statement (September 2014), Villadsen Reply Verified Statement (November 2014), and Hearing Appearance (July 2015).

2 Villadsen *et.al.*, "Risk and Return for Regulated Industries," Academic Press, May 2017.

Yale University and a MS and BS joint degree in mathematics and economics from University of Aarhus, Denmark. My complete resume is attached as Appendix D.

2. I have been asked by the Association of American Railroads (AAR) to comment on specific aspects of the Surface Transportation Board's September 30, 2019 Notice of Proposed Rulemaking (NPRM)[3] regarding its methodology for setting the cost of equity for the railroads, as well as on the Written Testimony Submitted by Mr. Roger J. Grabowski (Grabowski Testimony).[4]

3. The AAR has asked me to provide comments and evidence on the following topics.

- The merits of the current Multi-Stage Discounted Cash Flow Model (MSDCF) model and, specifically, whether the cost of capital calculations for 2018 were unusual;
- Whether the current MSDCF model could be improved by considering the date at which earnings per share growth rates and/or railroad stock prices are determined;
- Whether the proposed Step MSDCF model is reliable and, if not, what adjustments to the Step MSDCF model are needed should the STB decide to use a Step MSDCF model in addition to the current MSDCF model; and
- The modifications to the current MSDCF model proposed in the Grabowski Testimony.

4. Based on my review of the documents in this proceeding, data and analyses of data underlying the 2018 and prior years' cost of equity estimates, I have reached the following conclusions and opinions.

- The relatively high cost of equity results obtained from the Board's implementation of the MSDCF model for the year 2018 came about due to particular circumstances wherein unusual market conditions occurred coincident with a temporal mismatch between the growth rate and market capitalization inputs to the MSDCF model as observed at the end of December 2018. This unusual combination of factors would have been mitigated if the

[3] Surface Transportation Board, EP-664 (Sub-No. 4), decided September 30, 2019.

[4] Submitted in Docket No. EP-664 (Sub-No. 4) on November 4, 2019.

inputs were observed on a date when both sets of inputs (growth rates and market capitalizations) reflected contemporaneous information.

- A fundamental change to the STB's well-established methodology for determining the cost of equity for Class I railroads should not be undertaken based this unusual combination of factors occurring in a single year.
- If the Board's goal is to reduce the potential for unusual or anomalous conditions to influence its annual cost of equity determinations in the future, adopting the proposed Step MSDCF is not an appropriate way to do so. Indeed, the Step MSDCF as proposed could lead to an increase in volatility, precisely the opposite of the Board's stated goal.[5]
- I propose that, rather than instituting a new model, the Board should consider moving the observation date for stock price and growth rate inputs from the end of December to the end of January immediately following the end of the year in question. This would significantly limit the potential for timing inconsistencies inherent in the Board's current use of analyst growth rates observed as of the end of December, which are typically lagged relative to the December market price data. As my analysis demonstrates, this would promote internal consistency between the model's inputs, as well as improving the robustness of the MSDCF model results in successive annual implementations.
- If the STB does elect to proceed with the Step MSDCF model, it should consider other changes to the model to ensure internal consistency. Specifically, both growth rates and cash flows should transition gradually to steady-state levels. Consideration would also need to be given to the time horizon over which the company-specific growth rates are trended towards steady-state levels. This includes an assessment of the ongoing level of capital expenditure in the railroad industry, which has been relatively high in recent times.
- The Grabowski Testimony makes incorrect inferences based on the research it cites with respect to the growth rate assumed in the third-stage of the MSDCF model. In particular, the evidence presented in the cited research provides no relevant information pertaining to the growth rate of particular industries. Indeed, Mr. Grabowski's testimony ignores the Board's own past statements regarding the appropriateness of the third-stage assumptions regarding cash flow and growth in consideration of conditions specific to the railroad industry. Should the Board consider a deviation from its established model with respect

[5] NPRM at 5.

to the appropriate long-term growth rate, it would also need to consider other parameters in the model.

- It is my opinion that strong evidence should be provided before deviations are made from accepted practice and established precedent. With respect to Mr. Grabowski's recommendations there is no evidence that railroad companies will grow at rates slower than nominal GDP in the foreseeable future. To the contrary, given relatively high levels of capital expenditure, it is plausible that railroads will grow at rates that exceed GDP for an extended period of time, perhaps longer than the 10 years assumed in the current MSDCF model.

II. THE CURRENT MSDCF MODEL

A. SUMMARY OF CURRENT MSDCF MODEL

5. Under the Board's established MSDCF model, the cost of equity is the discount rate that equates a firm's market value to the present value of the expected stream of free cash flows that is available for distribution to equity investors.

6. The model includes three stages. In both Stage 1 and Stage 2, representing years 1-5 and years 6-10 respectively, free cash flow builds from the base level of "initial cash flow." In order to calculate initial cash flow, the model adjusts income before extraordinary items (IBEI) by deducting capital expenditures (CapEx) in excess of depreciation (D) and adding deferred taxes (DIT). Thus, the cash flow used in the model is a measure of free cash flow available to equity holders.

7. In the first stage of the current MSDCF model, initial cash flow grows in line with median projected growth rates in earnings per share (EPS) provided by railroad industry analysts (herein, brokers). Linking cash flows with projected EPS growth rates aligns the model with expected cash flow outcomes. All else being equal, it is logical to expect railroads with relatively high (low) capital expenditure will experience relatively high (low) growth in future cash flow.[6]

[6] In recent times, the qualifying Class I railroads have tended to have high levels of capital expenditure relative to depreciation (see Figure 9).

8. In the second stage of the current MSDCF model, the assumed growth rate is the simple average of all of the qualifying railroads' median three- to five-year growth rate estimates from Stage 1. The focus of the NPRM is a proposed change in the projected growth rate in Stage 2. In Section III, I discuss the assumptions in the proposed Step MSDCF model.

9. In Stage 3, which begins in year 11 and continues into perpetuity, each firm's growth rate is the projected long-run nominal growth rate of the aggregate U.S. economy. In Stage 3, cash flow equals IBEI (*i.e.*, D + DIT – Capex = 0). The rationale for this assumption is that in steady-state the perpetual capital expenditures will consist solely of maintenance capital (no growth capital), so that capital expenditures and depreciation are equal. Further, because deferred taxes are linked to capital expenditures,[7] this amount is expected to disappear as capital expenditures approach maintenance levels in the long-term steady-state equilibrium.[8] Therefore, the adjustment to IBEI (*i.e.*, D + DIT – Capex) will approach zero in the long term.[9]

B. COST OF CAPITAL ESTIMATES FOR 2018 WERE IMPACTED BY SEVERAL UNUSUAL FACTORS

10. The STB's implementation of the MSDCF model for the year 2018 was impacted by an unusual combination of factors affecting the model inputs observed as of the end of December in that year. Specifically, (1) railroad stock prices were low relative to both earlier in 2018 and early 2019, and (2) the EPS growth rate inputs used were high and substantially lagged relative to the date of the estimation. Both the stock prices and the EPS growth rates are inputs to the MSDCF model. For a given cash flow, a lower stock price and/or a higher EPS growth rate results in a higher cost of equity estimate. In this section, I demonstrate how these inputs as observed at year-end 2018 were unusual in a

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7 For capital-intensive industries such as the railroad industry, a large proportion of the deferred income tax is due to differences in the depreciation schedule for tax versus for Generally Accepted Accounting Principles ("GAAP") purposes.

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

9 While the current MSDCF model uses accounting depreciation and capital expenditure, an economic equilibrium would depend on the economic depreciation being equal to capital expenditure.

way that tended to directionally increase the resulting MSDCF cost of equity estimate. In short, for no other year that the STB has implemented the MSDCF to estimate the railroads cost of equity did an abrupt substantial change in market capitalization near the end of the year coincide with year-end observation of growth rate estimates that reflected a substantial "information lag." Uniquely for 2018, this combination of factors caused inconsistency between the stock price and growth rate inputs that contributed to the unusually high result.

11. A central assumption underlying the MSDCF model (or indeed any DCF-based model for inferring the cost of equity) is that market prices reflect investors' assessment of the present value of expected future cash flows to equity holders, discounted at the risk adjusted market cost of capital. Under this assumption, a decline in stock prices implies either that investors expect lower (or slower growing) cash flows in the future or that investors perceive a higher opportunity cost of investing in the stocks in question (*i.e.*, they apply a higher market cost of equity to discount the cash flows). The latter circumstance might be attributable to, for example, higher levels of perceived risk associated with railroad cash flows, or broader concerns about the risk of investing in risky assets more generally.

12. If a sustained stock price decline was driven by a decline in market expectations for future cash flow growth, the MSDCF model would reflect this via a reduction in the broker EPS growth estimates it uses as an input. In contrast, if a decline in stock prices reflects an increase in market-driven required return on equity investment, then one would expect the MSDCF to reflect this by calculating higher cost of equity estimates based on the same cash flow and growth rate inputs.

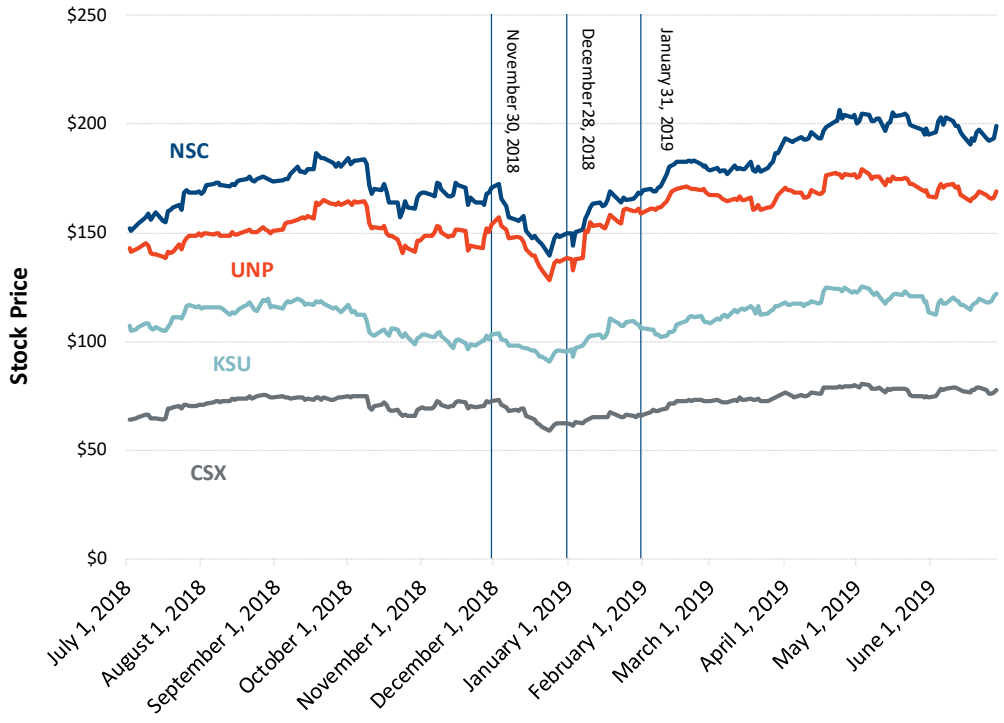
13. However, if there is a significant time lag between when market prices are observed and when the broker estimates were issued, it may be difficult to tell whether the MSDCF calculation is accurately interpreting changes in stock prices. For example, if brokers were delayed in updating their forecasts following a large decline in stock prices, then it would appear that investors' required rate of return had increased (even if an expectation regarding future cash flows were driving the stock price decline). As of December 28, 2018, (when the data for the STB's 2018 cost of capital determination were drawn) brokers

had not updated their EPS growth estimates following the large decline in the stock prices. Hence, there was a mismatch between the timing of the stock prices and the brokers' growth estimates that the 2018 cost of equity estimate relied upon. I demonstrate that just such a phenomenon likely contributed to the unusually high cost of equity estimates that were derived via the STB's implementation of the MSDCF in 2018.

1. Stock prices were low relative to earlier in 2018 or early 2019

14. To understand the cost of equity calculation in 2018, I first reviewed stock prices for the four qualifying Class I railroads from July 2018 through June 2019.

Figure 1
Stock Prices, Qualifying Class I Railroads
July 1, 2018 – June 30, 2019



Source: Yahoo Finance.

15. As shown in Figure 1, all of the Class I railroads experienced reductions in their stock prices in the period just prior to the date of determination of the 2018 Cost of Capital on December 28, 2018. In the case of NSC and UNP, these reductions were particularly

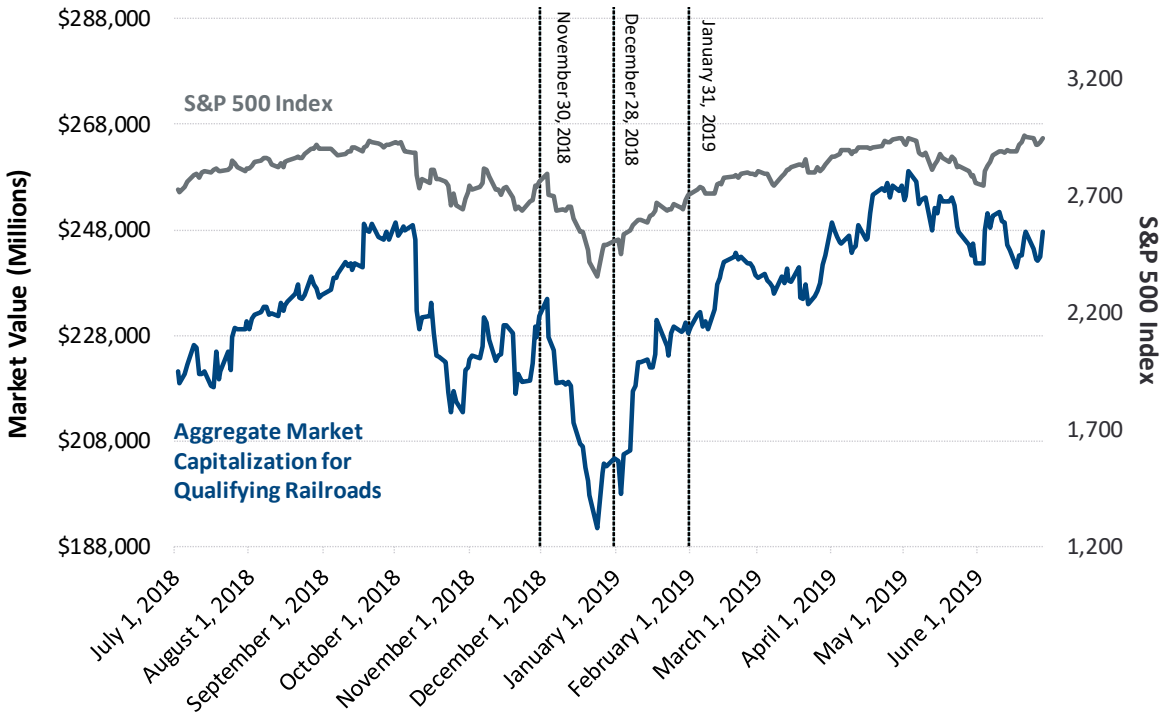
pronounced. However, the dip in stock prices in the fourth quarter of 2018 and especially in December of that year, was not unique to the Class I railroad companies; the same general trends were present in the stock market in general, for example as proxied by the S&P 500.[10]

16. Figure 2 below shows aggregate market capitalization for the four qualifying Class I railroads from July 2018 through June 2019. The aggregate market capitalization is instructive, as the Board's cost of equity determinations are weighted by market capitalization. Comparing Figure 2 below to Figure 1 above, it is clear that the decline in aggregate market capitalization for the qualifying railroads mirrors the stock price decline that occurred just prior to the December 28, 2018 date of observation used for inputs to the 2018 MSDCF cost of equity estimate. From the end of November 2018 to the end of December 2018, aggregate market capitalization dropped by 11.6%.[11] To put this in perspective, the average monthly change in aggregate market capitalization for the qualifying Class 1 railroads from January 2009 to September 2019 was 1.3%.

[10] *See*, for example, Chart No. 1 at page 26 of the April 22, 2019 Verified Statement of John T. Gray in STB Docket EP No. 558 Sub-No. 22, Railroad Cost of Capital – 2018.

[11] Source: Capital IQ.

Figure 2
Aggregate Market Capitalization of Qualifying Class I Railroads and S&P500 Index Level
July 1, 2018 – June 30, 2019



Source: Capital IQ.

17. I next considered whether there had been similar substantial fluctuations (either increases or decreases) in market capitalization during the month of December in prior years that could have impacted the Board's implementation of the MSDCF model in those years. Since the STB adopted the current MSDCF model (*i.e.*, starting in 2009), the only year besides 2018 for which a large decrease in aggregate market capitalization occurred in the month of December was 2015. In that year, aggregate market capitalization for the railroads declined by 8.9% (see Figure 3) during the month of December.[12]

[12] The market capitalization used in the MSDCF is measured at the end of December.

Figure 3
Change in Aggregate Market Capitalization

	% Change in December	% Change in January
	[1]	[2]
2009	2.1%	-8.4%
2010	3.9%	2.5%
2011	-0.3%	4.8%
2012	2.3%	7.6%
2013	4.3%	-0.7%
2014	0.8%	-4.4%
2015	-8.9%	-10.3%
2016	1.3%	9.1%
2017	3.2%	1.6%
2018	-11.6%	11.5%
Average	-0.3%	1.3%

Source: Capital IQ
Notes:
[1]: Percent change in aggregate market capitalization for the four railroads from the end of November to the end of December.
[2]: Percent change in aggregate market capitalization from the end of December of the given year to the end of January of the following year. For example, the first row of the table shows the change in aggregate market capitalization from the end of December 2009 to the end of January 2010.

18. However, in contrast to the situation in 2018, the EPS growth rates observed at year-end 2015 represented analyst estimates that had been updated relatively recently and thus did not have a substantial "information lag" relative to market prices. (*See* Figure 5.) Further, with respect to the 2015 MSDCF calculations, stock prices continued to decline into January 2016. Again, this contrasts to 2018, where the December dip was followed by a rebound in January 2019. (*See* Figure 3.) As a result, the December 2015 stock price decline did not result in substantial inconsistency in the inputs to the MSDCF model nor did it result in a large upshift (or downshift) in the calculated cost of equity for 2015. Thus, the circumstances in 2015 were not parallel to the unusual circumstances observed in 2018. (*See* Figure 11).

19. Put simply, the combination of a December stock price dip and a long lag in the IBES growth estimates observed at the end of December was unique to 2018. Such unusual inputs had not been observed previously during years the STB has used the MSDCF.

However, as discussed in the next subsection (II.B.2), the tendency of IBES growth rates observed at the end of December to reflect substantial information lag relative to contemporaneous market prices creates the potential for inconsistencies such as those observed for 2018 to re-occur in the future years. In Section V.B, I discuss potential simple amendments to the model implementation that reduce the risk that such circumstances will contribute to future volatility in the cost of capital estimates.

2. EPS growth rates were high and substantially lagged

20. Given the relationship between market capitalization and EPS growth data, I reviewed the EPS growth rate estimates that are included in the IBES consensus for each qualifying Class I railroad as of December 28, 2018. In Figure 4 below, the "Date" indicates when each individual broker's estimate was issued and submitted to IBES. The "lag" then represents the number of days elapsed from each estimate's date of issuance to the relevant date of observation.

Figure 4
Class I Railroads' December 2018 and January 2019 EPS Growth Estimates

	Pulled as of December 31, 2018			Pulled as of January 31, 2019		
Broker	Date	Lag	EPS Growth Estimate	Date	Lag	EPS Growth Estimate
[1]	[2]	[3]	[4]	[5]	[6]	[7]
UNP:						
Credit Suisse - North America	10/26/2018	63	21.2	1/25/2019	6	12.6
Name Withheld	10/26/2018	63	17.9	1/24/2019	7	13.3
Name Withheld	10/26/2018	63	20.0	1/1/2019	30	19.6
Name Withheld	10/25/2018	64	20.2	10/25/2018	98	20.2
NSC:						
Credit Suisse - North America	10/25/2018	64	19.9	1/25/2019	6	9.6
Name Withheld	10/25/2018	64	19.3	1/24/2019	7	10.8
Name Withheld	7/25/2018	156	14.3	1/24/2019	7	7.0
Name Withheld	7/17/2018	164	17.4	1/24/2019	7	8.1
CSX:						
Credit Suisse - North America	10/17/2018	72	27.4	1/17/2019	14	12.2
Name Withheld	12/2/2018	26	29.5	1/17/2019	14	12.1
Name Withheld	10/18/2018	71	28.8	1/16/2019	15	10.6
Name Withheld	7/18/2018	163	18.3	1/16/2019	15	11.8
KSU:						
Credit Suisse - North America	10/22/2018	67	15.7	1/20/2019	11	14.1
Name Withheld	12/5/2018	23	13.7	12/5/2018	57	13.7

Sources and Notes:
[1]: According to Thomson Reuters, brokers can now choose to have their name withheld from new data pulls.
[3]: Lag is equal to the number of days between 12/28/2018 and the date in [2].
[4], [7]: Pulled from Thomson Reuters IBES.
[6]: Lag is equal to the number of days between 1/31/2019 and the date in [5].

21. As shown at the left of Figure 4, EPS growth rate estimates for qualifying Class I railroads from IBES contributing brokers were substantially lagged as of December 28, 2018. In fact, the median lag across all the individual estimates was 67 days. By contrast, when the IBES contributing brokers' EPS growth estimates are observed as of the end of January 2019, the lag is much smaller, owing to the fact that the majority of analysts updated their estimates in mid to late January.

22. Long lag times create the potential for greater inconsistency between the constantly updating information on the market value of equity (*i.e.*, stock prices) and periodically updated broker estimates of future EPS growth. Such inconsistency, in turn, has the potential to reduce the precision and accuracy of cost of equity estimates derived (as in the

MSDCF model) based on the assumption that these two data points give coherent and contemporaneous information about market participants' expectations for future equity returns.

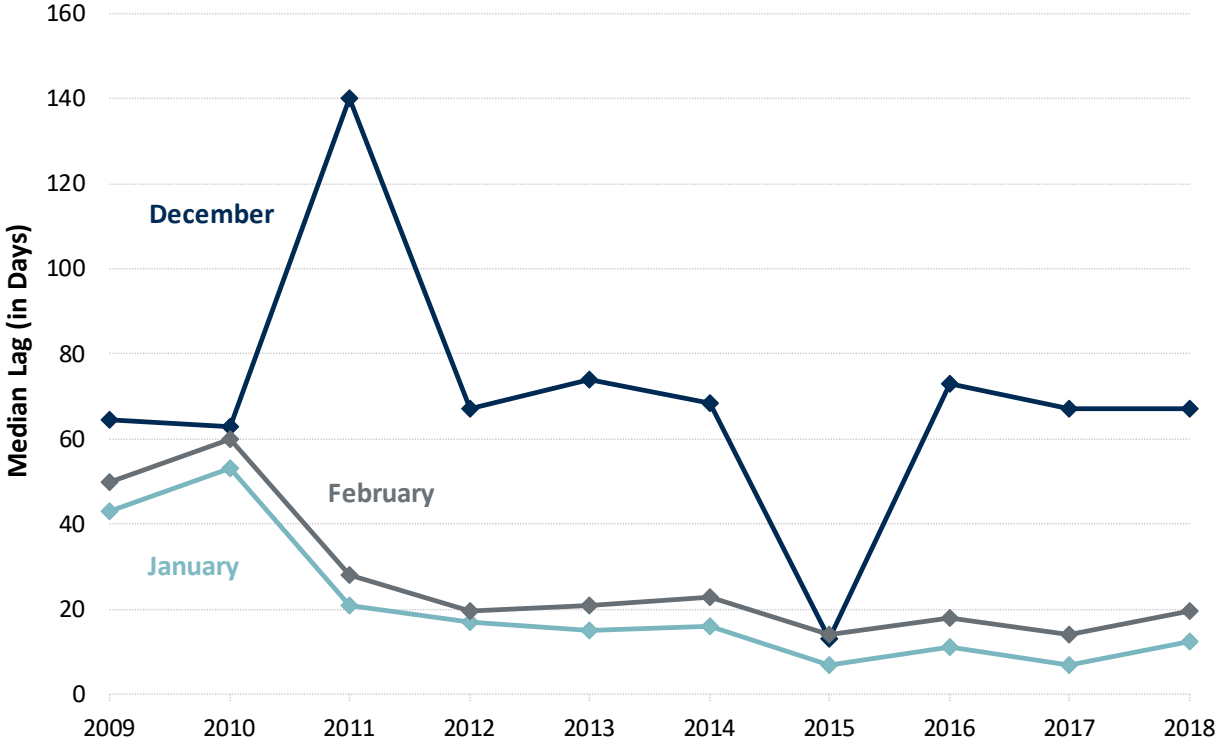
3. Lagged growth rates and unusual stock price movements substantially impacted the 2018 MSDCF results

23. To further understand whether 2018 was unusual, I reviewed lags in EPS growth data from 2009 through 2018 for the four qualifying Class I railroads.[13] The Thomson Reuters IBES database provides the most recent unexpired broker EPS estimates as of any given date. Figure 5 shows the median lag in EPS growth estimates as of the end of December (in keeping with the current MSDCF model), the end of January, and the end of the first week of February of each year.[14]

[13] I have not included BNSF, as BNSF was removed from the STB's cost of capital calculations after 2009 following its acquisition by Berkshire Hathaway.

[14] Specifically, December estimates are the last trading day of December, January estimates are the last trading day of January, and February estimates are the last trading day of the first week of February. For the purposes of this analysis, data is pooled across all qualifying Class I railroads.

Figure 5
Median Lag of Broker Estimates



Source: Thomson Reuters.
Notes: Broker estimates were pulled as of the last trading day of December, the last trading day of January and the last trading day of the first week of February. The estimates for January and February are presented for the following year than is shown in the chart. For example, the data points shown for 2018 are the estimates from December 2018, January 2019 and February 2019.

24. Figure 5 demonstrates that it is common to see a lag in EPS growth forecasts reported in December of each year. The median lag in analyst growth rate estimate updates at the end of December was 67 days over 2009-2018.

25. While the presence of a lag at December 2018 was not unusual relative to prior years' implementations of the STB MSDCF model, it *was* unusual that a steep decline in stock prices occurred during the period of lag between the issuance of analysts' growth estimates and the December 28 observation date used for the MSDCF calculation. Thus, the substantial, but relatively short-lived, decline in stock prices near the end of 2018 combined with the "typical" end of December lag since growth rates to potentially cause internal inconsistency in the MSDCF model's assumptions. This combination of factors may have distorted its results for that specific year.

26. Consistent lags in the December EPS growth data suggest that any unusual movements in stock prices in December will continue to pose problems for the MSDCF model in its current form. In Section V, I demonstrate that the lag is significantly reduced when using a logical alternative date for observing growth rate and stock price input data.

27. Notwithstanding the factors outlined by AAR that have placed upward pressure on growth estimates in recent years,[15] the unusual combination of factors discussed above was the most significant driver of the relatively high cost of equity capital calculation for 2018 and the large change from 2017. Specifically, there was a relatively sudden and short-lived reduction in the stock prices of qualifying Class I railroads, which coupled with substantially lagged EPS growth estimates, resulted in unusually high cost of equity estimates for 2018. Such an unusual combination of factors has not occurred in other years where the STB has implemented the MSDCF model, but similar inconsistencies could arise in the future if the growth rate estimates used are significantly lagged.

28. Compared to December 28, 2018, an observation date of January 31, 2019 captures stock prices that have somewhat recovered from the late 2018 decline as well as more recently updated EPS growth rate estimates that were generally lower than the substantially lagged estimates observed at the end of December. As I demonstrate in Section V below, it has been generally true over the years the STB has implemented the MSDCF that January observation of inputs leads to greater temporal consistency between the growth rate and market price inputs to the model.

29. In my opinion, a fundamental change to the STB's well-established methodology for determining the cost of equity for Class I railroads should not be undertaken based on an unusual combination of factors that contributed to an unusually high result from

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[15] According to the AAR: "Based on train-miles reported in Annual Report Form R-1, 2015 and 2016 were recession years for the railroad industry, and train-miles have not yet recovered to 2014 levels – even if unit trains (mostly coal) are excluded. Thus, it is not surprising that analysts now have higher growth expectations, especially when considering other factors such as lower tax rates and the implementation of precision scheduled railroading." *See* Comments of the Association of American Railroads EP-558 (Sub-No. 22) pp. 45-46 (PDF pp. 64-65).

implementing the MSDCF at a single point in time. Further, if the Board's goal is to reduce the potential for unusual or anomalous conditions to influence its annual cost of equity determinations in the future, I do not believe adopting the proposed Step MSDCF is an appropriate way to do so. Rather, as I explain in Section V below, it would be preferable to move the observation date for stock price and growth rate inputs to address the potential for timing inconsistencies inherent in the Board's current use of the typically-lagged broker growth rates that are observed as of the end of December.

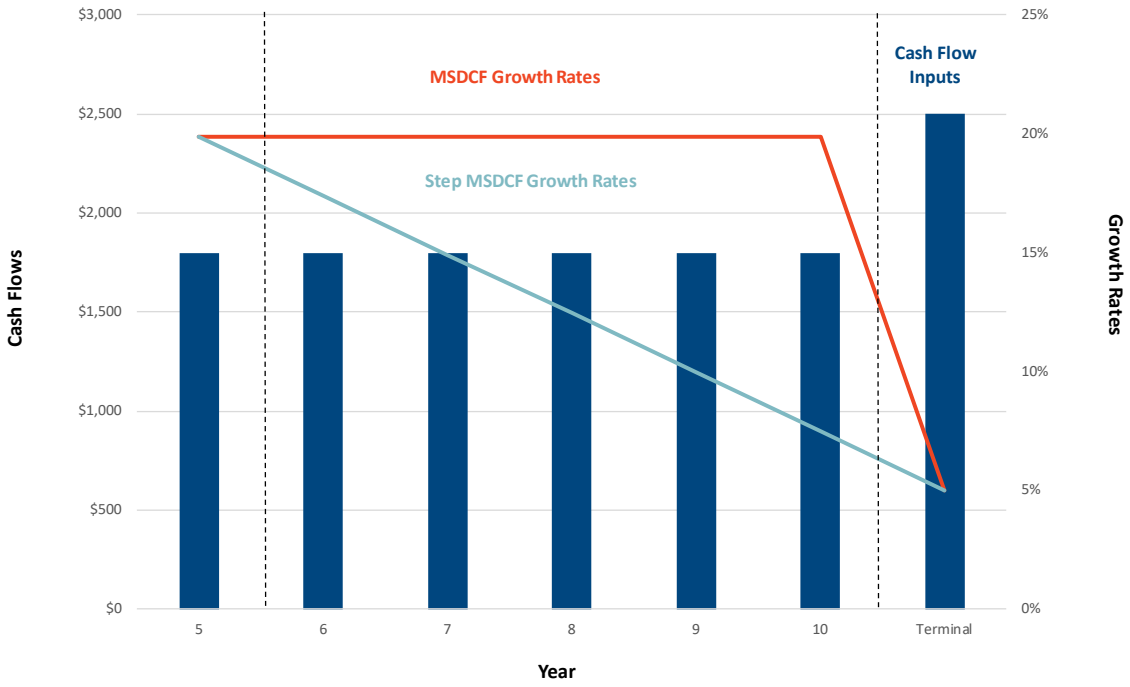
III. THE PROPOSED STEP MSDCF MODEL

30. The STB proposes to include two multi-stage DCF models in the determination of the cost of equity capital. Specifically, the STB's proposal is to include the current MSDCF and a new Step MSDCF, where the two models will be assigned 25% weight each in the determination of the cost of equity (with the remaining weight going to the CAPM). This section discusses the proposed Step MSDCF.

A. SUMMARY OF STB'S PROPOSED STEP MSDCF MODEL

31. As proposed in the NPRM, the Step MSDCF modifies the growth rates in the second stage of the model. In the proposed Step MSDCF model, the growth rate used in Stage 2 moves linearly from the EPS growth rates in Stage 1 to the perpetual growth rate assumed in Stage 3. In Figure 6, I show a simplified illustration of the difference between the current MSDCF model and the proposed Step MSDCF model.

Figure 6
Illustration of Difference in Assumptions, Current v. Step MSDCF



Notes: Chart shows the simple average of the four railroads 2018 cash flow and growth rate inputs in the current STB MSDCF model and the proposed Step MSDCF model. The vertical dashed lines separate the stages of the model.

32. As illustrated in Figure 6, growth rates and base cash flow assumptions for the current MSDCF model are the same in Stage 2 as Stage 1.[16] Under the STB's proposed amendment, there would be an alteration to the growth rate assumption in Stage 2. As shown in Figure 6, under the proposed Step MSDCF, there is a linear downward transition in growth rates between Stage 1 and Stage 3.[17] There is no change in the base cash flow assumptions—cash flow continues to build from the same initial cash flow, which includes adjustments for capital expenditure, depreciation and deferred taxes.

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16 For illustrative purposes, I have only included years 5-11 in Figure 6 and simplified the analysis. The figure shows the simple average of the four railroads 2018 cash flow and growth rate inputs. The actual model applies individual EPS growth rates to each railroad in Stage 1. In Stage 2, the growth rate is the simple average of all of the qualifying railroads' median EPS growth rate estimates from Stage 1.

17 The formula for the proposed Step MSDCF model is shown in "Revisions to the Board's Methodology for Determining the Railroad Industry's Cost of Capital", Docket No. EP 664 (Sub-No.4), Appendix A, November 22, 2019.

33. The rationale given by the STB for the changes appears to be twofold. First, the STB appears to be concerned about impact of unique events and volatility. To this end, the STB finds that when applied to historic data, the amended methodology produces a reduction in overall volatility in the cost of equity when combining CAPM and the MSDCF models.[18] Second, according to the NPRM, the new model is intended to enhance the robustness of results.[19] I address these potential benefits below.

B. THE PROPOSED STEP MSDCF MODEL DOES NOT REDUCE THE VOLATILITY OF THE MSDCF ESTIMATES OR ENHANCE THE ROBUSTNESS OF THE RESULTS

34. To understand how a change from the current MSDCF model to the proposed Step MSDCF model would impact the volatility of cost of equity estimates, I calculated the cost of equity using both models (see Figure 7 below).[20]

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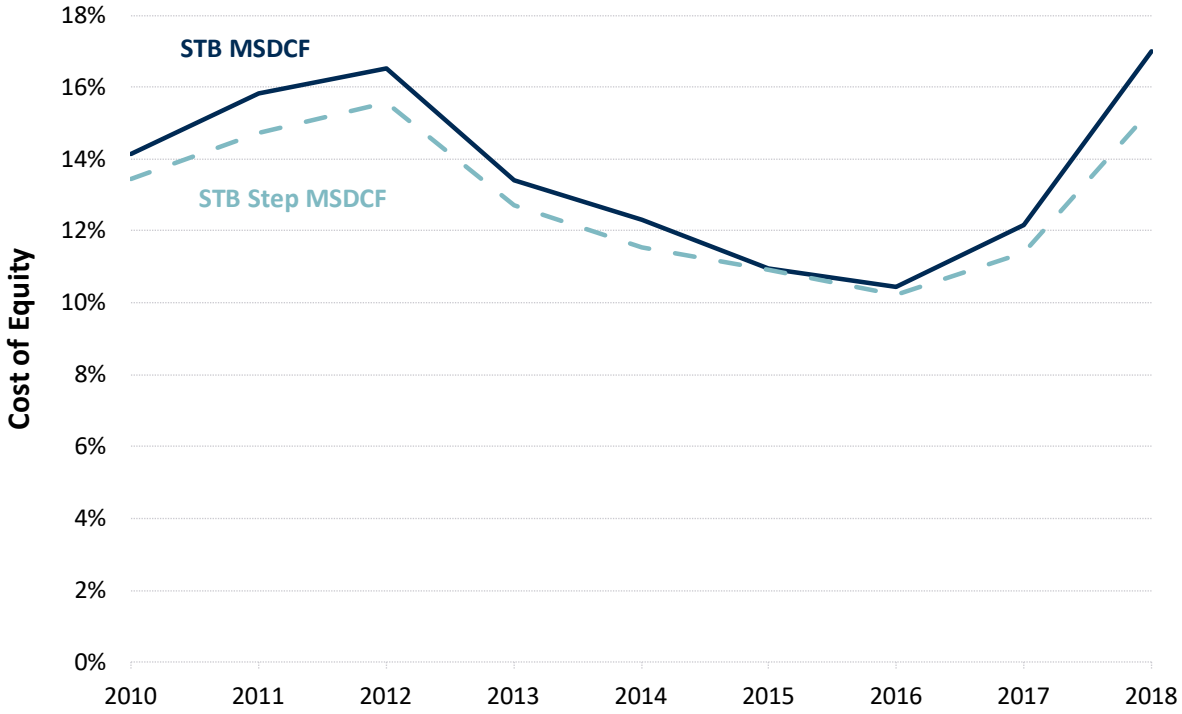
[18] Specifically, the NPRM states that: "Significant operating changes that occur over a relatively short period of time can have a unique effect on the Board's annual cost-of-capital determination, particularly if they are neither one-time events nor expected to cause permanent changes in the industry's growth rates. Once significant operating changes are fully implemented, any rate of growth that accompanied the operating changes may not continue to increase at the same level. Because the operating changes will, and future railroad changes that are currently unknown could, have a significant impact on the Board's cost-of-capital determination, the Board finds that now is an appropriate time to consider the addition of a model that could improve its methodology for estimating the cost-of-equity component of the cost of capital." (NPRM, pp. 4-5.)

The NPRM further states that: "When applied over a 10-year historical analysis period, the weighted average of the three models results in a lower variance than a forecast relying on the average of CAPM and Morningstar/Ibbotson MSDCF alone. For the period 2009 through 2018, the average of CAPM and Morningstar/Ibbotson MSDCF produces a cost of equity ranging from 10.31% to 13.86% with a standard deviation of 1.18. Over the same period, the weighted average of the three models produces estimates between 10.25% and 13.46% with a standard deviation of 1.09." (NPRM, p. 7.)

[19] Specifically, the NPRM states that: "As described in more detail below, the Board finds that the addition of Step MSDCF, when used in combination with the current Morningstar/Ibbotson MSDCF and CAPM, could enhance the robustness of the resulting cost-of-equity estimate during periods, like the present one, in which certain railroads are undertaking significant operating changes". The NPRM cites the potential for more robust results when averaging the results of multiple models. See NPRM, p. 5.

[20] In all my analysis of historic cost of capital data, I have not included results for 2009, as 2009 included BNSF. Including 2009 data does not alter any of my opinions.

Figure 7
DCF Cost of Equity: Current and Step MSDCF Models



35. As shown in Figure 7, the cost of equity tends to be slightly lower in the Step MSDCF model, but the year-over-year change is not substantially different. The lower cost of equity under the Step MSDCF is driven by differences in the Stage 2 growth assumptions – the Step MSDCF simply reduces the growth rates and makes no other changes to the model. The lower Stage 2 growth rate is a function of the perpetual growth being lower than the industry growth used in the STB's MSDCF. Simply put, the Step MSDCF slightly lowers the cost of equity estimates but does little or nothing to reduce the year-over-year variation in the estimates.[21]

36. The addition of a new method for calculating the cost of equity has the potential to improve the robustness of the overall cost of capital estimates. However, the proposed Step MSDCF

[21] The Step MSDCF model will result in higher estimates than the current MSDCF model if the expected EPS growth rates for railroads drops below the long-term perpetual economic growth rate (*i.e.*, the revenue of railroads is expected to decline as a percentage of the economy).

model is not really a different method for calculating the cost of equity. Rather, it is better described as the same method with alternative growth assumptions in one of the three stages.

37. Indeed, the proposed Step MSDCF could increase the volatility of the overall cost of equity estimates. Based on data from 2009-2018, the addition of the Step MSDCF reduces overall cost of equity as the cost of equity under the Step MSDCF is lower than the current MSDCF. However, this is merely an artifact of the data over this period, as Stage 1 growth rates have tended to exceed perpetual growth rates. Should we move into a lower short-term growth rate environment for railroads, then the Step MSDCF model will produce higher estimates of the overall cost of equity compared to the current MSDCF model.[22] The Step MSDCF does not reduce the year-to-year variability in the cost of equity estimates nor does it ensure a better alignment between the date of the stock prices and the brokers' growth estimates.

IV. A NEW MODEL CANNOT SIMPLY BE INTRODUCED BY MAKING ADJUSTMENTS TO THE GROWTH RATE IN THE SECOND STAGE

A. IF THE STEP MSDCF MODEL WERE INTRODUCED, THE STB WOULD NEED TO CONSIDER THE FOLLOWING

1. For consistency with growth rates, cash flow also needs to be smoothed

38. The Step MSDCF assumes a linear movement in growth rates from Stage 1 to Stage 3. It is reasonable to expect that the growth rate of a company will revert to the growth rate of the economy after a certain period of time. 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 current MSDCF model

[22] It is worth noting that in 2015 and 2016 Stage 2 growth rates were similar to the perpetual growth rate. For example, the stage 2 growth rate under the current MSDCF model was 5.49% in 2015, compared with a perpetual growth rate of 4.84% in 2015.

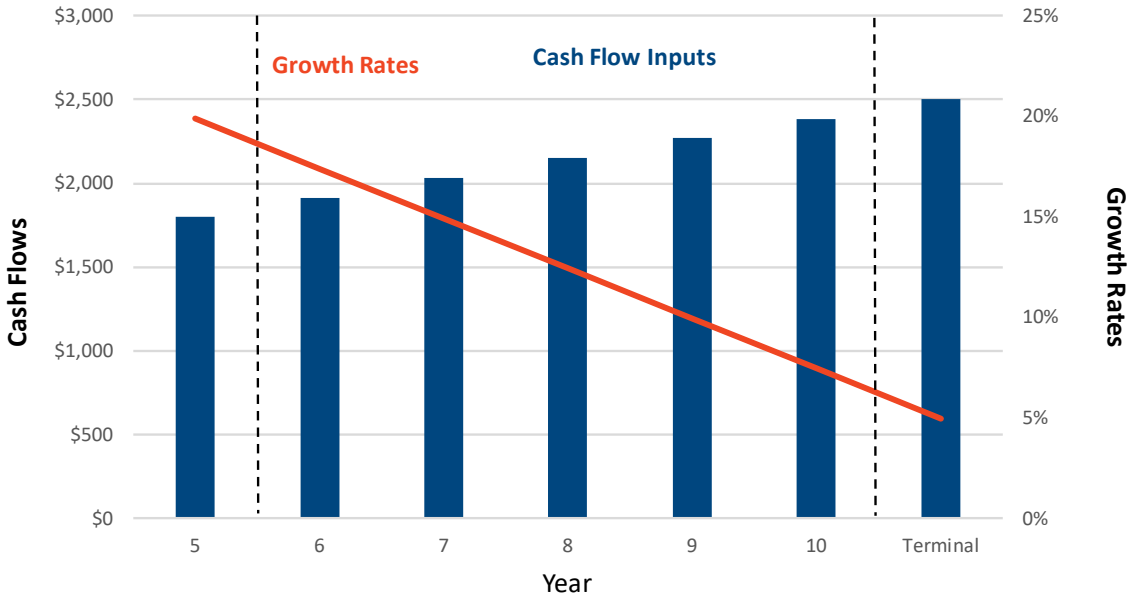
implicitly assumes Stage 3 is a steady-state for *both* growth and the impact of (net) investment on cash flow generation.

39. These are perfectly reasonable assumptions for the long-term. But, if Board elects to smooth the transition between stages one and three, it is necessary to do so in a consistent manner for the entire model. That is, *both* the growth rates *and* the transition to maintenance capital expenditures need to be smoothed. 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. No one account in the financial statements can be considered in isolation from the others, nor does any one component of the modeled evolution of cash flow in the MSDC model move in isolation from the others.

40. Therefore, the criticism about the lack of a smooth transition from Stage 1 growth to Stage 3 growth cannot be considered separately from the issue of the transition from 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, free cash flow 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 transition the cash flow measure towards a long-term one such as earnings before extraordinary items in a linear fashion over the course of Stage 2.

41. Therefore, to achieve internal consistency in the model, base cash flows should also follow a linear path from Stage 1 to Stage 3. Similar to Figure 6, I illustrate a linear transition in both growth rates and cash flows in Figure 8 below.[23]

Figure 8
Illustration of Step MSDCF with Smoothed Cash Flows



Notes: Chart shows the simple average of the four railroads' 2018 cash flow and growth rate inputs in the Step MSDCF model with smoothed cash flows. The vertical dashed lines separate the stages of the model.

42. As expected, the effect of these declines in growth rates and cash flow inputs are somewhat offsetting. Growth in free cash flow is driven by reductions in capital expenditures relative to depreciation. As capital expenditures decline and cash flow increases, the expected growth in future cash flow decreases.

43. The STB's proposed amendment focuses on a smoother transition in growth rates from Stage 1 to Stage 3. However, Stage 2 cash flows remain rooted in Stage 1 assumptions. If the goal of the Step MSDCF model is to create a smoother transition, then the model should

[23] To smooth cash flows, depreciation plus deferred taxes minus capital expenditures (D+DIT-CapEx) are eliminated linearly over the Stage 2 years. Once Stage 3 is reached the (D+DIT-CapEx) term has been reduced to zero.

apply a similar mechanism to cash flows. Appendix A includes the cost of equity formula required to smooth both cash flows and growth rates.

2. Consideration must be given to the time horizon over which the company-specific growth rates are trended towards GDP growth

44. In the very long-term, it is reasonable to expect that the growth of railroads will normalize to that of the broader economy. This represents a kind of steady state for railroads. 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.

45. The AAR noted that:

> The STB would need to consider whether determining the correct period would depend on (a) projected traffic growth for the entire transportation industry, and (b) how long the railroads will continue to invest heavily to renew existing infrastructure and capacity growth. In addition, the lengths of the stages may change as the industry evolves, requiring an annual determination of the appropriate future time period for assumption of steady-state cash flows.[24]

46. I agree that the railroad industry has in the recent past and is expected for the foreseeable future to continue heavy investments, so it is not clear what is the appropriate horizon for convergence to GDP. If the Board wants to customize the model to be uniquely applicable to the qualified Class I railroads, it ought consider the characteristics of the railroad industry.

47. Importantly, the current MSDCF is based on the commercial MSDCF model derived by Ibbotson and used to derive industry cost of equity estimates.[25] A deviation from this

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[24] Opening Comments of the Association of American Railroads, submitted in Docket No. EP-664 (Sub-No. 2) on September 5, 2014, p. 43.

[25] Duff & Phelps Cost of Capital Navigator, U.S. Industry Cost of Capital, Calculation of Industry Financial Statistics, accessed November 8, 2019, at pages 52-55.

model would customize the methodology the Board relies upon for the railroads and that cannot, in my opinion, be done by simply changing one parameter.

48. Therefore, if the Board seeks to adjust the Stage 2 growth assumptions in the commercially used Morningstar / Ibbotson MSDCF model, the Board ought to also consider other issues. For example, how the large capital expenditures by the railroads will translate into higher growth in cash flows in future years (e.g., beyond Stage 1), 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. In steady-state capital expenditures are roughly equal to total economic depreciation of existing assets. Figure 9 below shows that capital expenditure has significantly exceeded depreciation over the last 10 years. This consistent pattern suggests that cash flows may grow robustly over a relatively long time horizon and that assuming the steady-state is reached after only 10 years may understate the likely pattern of growth in railroad company cash flows.

Figure 9
Aggregate Ratio of CapEx to Depreciation
($ Millions)

	Capital Expenditures	Depreciation	Ratio of CapEx to Depreciation
	[1]	[2]	[3]
2009	$5,426	$3,349	1.62
2010	$6,079	$3,438	1.77
2011	$8,128	$3,641	2.23
2012	$8,860	$3,934	2.25
2013	$8,587	$4,020	2.14
2014	$9,883	$4,264	2.32
2015	$10,429	$4,496	2.32
2016	$8,380	$4,670	1.79
2017	$7,629	$4,796	1.59
2018	$7,752	$4,971	1.56

Sources and Notes:
[1]: Sum of capital expenditures for the four Class I qualifying railroads, pulled from Capital IQ.
[2]: Sum of depreciation and amortization for the four Class I qualifying railroads, pulled from Capital IQ.
[3] = [1] / [2]

3. The Step MSDCF model, properly applied, introduces additional complexity

49. The NPRM outlines the required adjustments to the MSDCF formula. There is further complexity associated with the smoothing of cash flows in Stage 2 (see Appendix A). By contrast, the current MSDCF model is well understood by all parties. Moreover, as shown earlier, the amended MSDCF model does not reduce expected volatility.

V. MOVEMENT TO JANUARY EPS GROWTH DATA IS A SUPERIOR AND SIMPLE FIX THAT CAN STRENGTHEN THE CURRENT MSDCF MODEL

A. JANUARY EPS GROWTH DATA SIGNIFICANTLY REDUCES LAG

50. There are many reasons why brokers may choose to update their growth estimates. For example, brokers may update their forecasts following investor presentations, revenue guidance changes or following the announcement of management or strategic changes. Notwithstanding these potential drivers, the key driver of updates to EPS growth estimates in the railroad industry appears to be the release of earnings results.[26]

51. The tendency for brokers to update their forecasts immediately following earnings announcements is reflected in the substantial decrease in the median lag in EPS growth data when measured at the end of January (refer Figure 5). When measured on the last trading day in December of the analysis period (2009-2018), the median lag from the date of last estimate issuance is 67 days. The median lag is reduced by almost five times (to 14 days) when measured on the last trading day of January.[27]

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[26] Further, earnings releases are sometimes accompanied by other information that may cause brokers to adjust their EPS growth estimates (for example, announcement of management changes).

[27] Appendix B shows average, as opposed to median, lag data. I draw the same conclusion based on the average lags; there is a substantial reduction in lag when moving from December to January EPS growth data.

52. The reason that IBES EPS growth estimates are substantially "fresher" when observed at the end of January versus at the end of December is that analysts tend to issue updated estimates closely following the release of annual earnings results in mid to late January. Figure 10 below summarizes when the four qualifying Class I railroad companies announced their 2018 earnings (via detailed press release) and shows the number of brokers that updated their EPS growth rate estimates within two days of the release.

Figure 10
Timing of Broker Estimates Update

Company	Earnings Release Date	Number of Broker Estimates Released Within 2 Days of Earnings Release
[1]	[2]	[3]
UNP	1/24/2019	2 out of 4
KSU	1/18/2019	1 out of 2
NSC	1/24/2019	4 out of 4
CSX	1/16/2019	4 out of 4

Sources and Notes:
[2]: Earnings release dates were found in historical company press releases on EDGAR.
[3]: Reports the number of brokers to publish EPS growth estimates within two days of the date in [2] out of all current estimates. Pulled from Thomson Reuters IBES.

53. As shown in Figure 10, in 2018, the majority of the analysts seem to have timed their updates to follow (and perhaps reflect information from) the January earnings releases. Furthermore, no brokers updated their estimates in January more than two days after the earnings release, suggesting that the earnings release was indeed what was causing the brokers to update their estimates.

54. This timing pattern was not unique to the 2018 fiscal year end—it has been consistently observed in the railroad industry in recent years. Figure 13 in Appendix C shows that the qualifying Class I railroads consistently publish their Q4 earnings press releases around the third week in January. There are consistently several brokers updating their forecasts in January after the earnings results are released. Starting with the fiscal year 2015, nearly all brokers following the railroads have updated their estimates between the earnings releases and the end of January.

55. The tendency for brokers to update their forecasts following earnings announcements also explains the higher lags in the December growth estimates. Over the period from 2010 through 2018, 44% of estimates contributing to the IBES consensus observed at the end of December were the result of updates performed in the two weeks following third quarter earnings announcements in October (see Figure 14 in Appendix C). The timing of the observation date relative to the most recent earnings releases is clearly a key driver of lags in EPS growth data.

B. JANUARY EPS GROWTH DATA DELIVERS MORE CONSISTENT COST OF EQUITY ESTIMATES

56. The cost of capital is a forward-looking concept. Thus, cost of equity models can only provide an estimate of the true cost of equity. Notwithstanding this fundamental limitation, a reliable cost of equity model should be as robust as possible to fluctuations in its inputs, and thus should not be expected to experience sudden short-term deviations unless there are dramatic and sustained fundamental shifts in the underlying conditions the model seeks to measure.[28] Put differently, a more reliable cost of equity is also likely to be less volatile (absent shifts in the economy or industry).

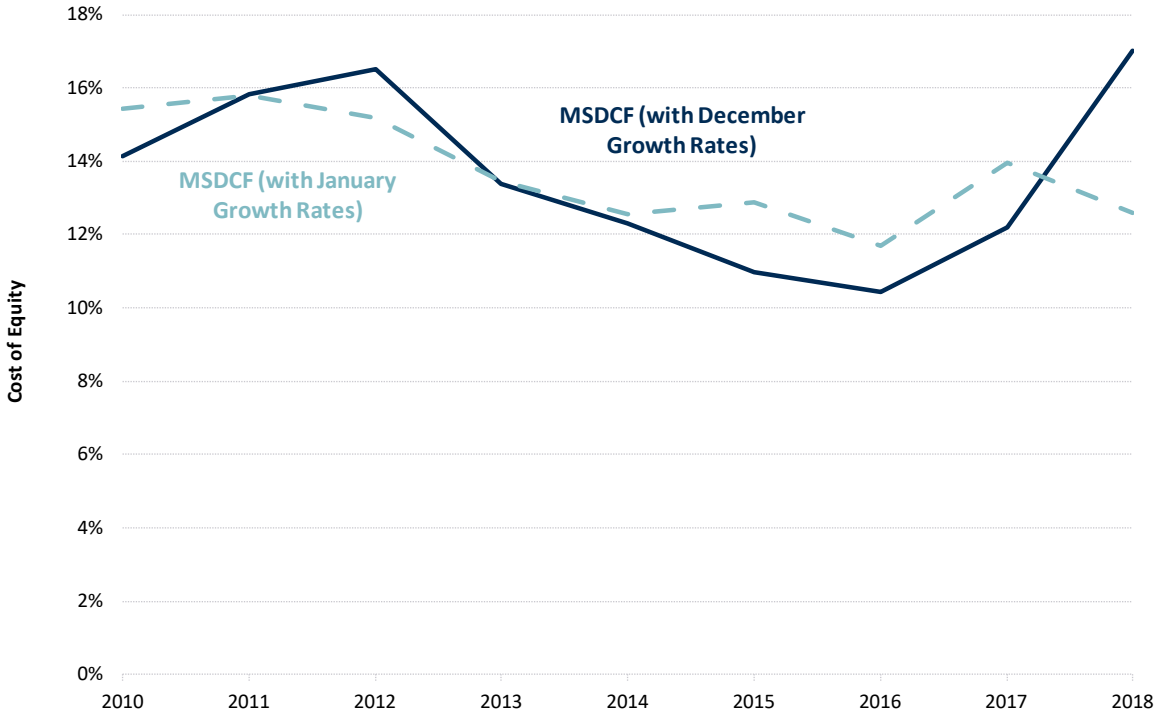
57. As demonstrated above in Section II.B and Section III.A, one potential issue with the STB's current procedure for implementing the MSDCF model is that it relies on December EPS growth estimates, which typically embed a substantial lag from the time the estimates were issued. This in turn creates the potential for internal inconsistency between the growth estimates and the December market capitalization that is also a key input to the model. The end of December market value may by happenstance turn out to be more or less inconsistent with the heavily lagged growth estimate inputs based on movements in market prices in any given year, since the discrepancy is likely more consequential when there are significant movements in market capitalization subsequent to the issuance of the EPS growth estimates. The long lag when observing inputs at the end of December therefore

[28] One example of a sustained fundamental shift might be the great financial crisis of 2007-2008 and the ensuing recession.

makes it likely that the MSDCF model results will be more volatile from year to year than they would be if the model were implemented at using an observation date with less lagged estimates.

58. Figure 11 shows weighted average cost of equity data under both the current MSDCF model and MSDCF model amended to reflect end of January observations of EPS growth and market capitalization data.[29] No other changes were made to the model.

Figure 11
Cost of Equity, December v. January MSDCF



59. When applied over a 9-year historical analysis period, the weighted average cost of equity from the current standard implementation of the STB MSDCF model (using end of

[29] When calculating the cost of equity for January, I obtained Stage 1 growth rate inputs by taking the median of all current broker estimates for each railroad, pulled as of the last trading day in January. To avoid outdated data, I excluded all estimates that were published over 180 days before the last trading day in January. I calculated market value inputs by multiplying stock prices (from Yahoo Finance) on the last trading day in January by shares outstanding from the end of Q4. I assume the same inputs for initial cash flows, terminal cash flows, and stage three growth rates as the STB does in its work papers.

December inputs) ranges from 10.44% to 17.01% with a standard deviation of 2.26%.[30] Over the same period, the weighted average cost of equity from the current MSDCF amended to reflect end of January observations of EPS growth and market capitalization data ranges from 11.71% to 15.80% with a standard deviation of 1.37%. This is captured in Figure 11, which shows that in prior years where the December estimates were relatively low, the January estimates are higher, while the high December estimates are replaced with lower January estimates. Thus, using estimates from January results in less volatile and smoother cost of equity estimates.

C. THERE IS NO SYSTEMATIC UPWARD OR DOWNWARD BIAS IN ROE ESTIMATES FROM SHIFTING THE INPUT DATA OBSERVATION DATE FROM DECEMBER TO JANUARY

60. An important aspect of amending the current MSDCF model to use a January observation date with substantially lower lag between market capitalization and EPS growth inputs is that it does not systematically lead to higher or lower cost of equity estimates over time. As shown in Figure 11, there is no systematic bias in moving the date of the market capitalization and EPS growth data. On average, the cost of equity remains about the same. Over the period from 2010 through 2018, the average cost of equity is 13.64% and 13.72% using December and January data respectively. Moving the date of EPS growth and market capitalization from December to January results in less lagged EPS growth estimates and smoother return on equity results, with no systematic upward or downward bias.

VI. COMMENTS ON SUBMISSIONS BY OTHER PARTIES

61. The AAR has also asked me to comment on the submission by Roger J. Grabowski (Grabowski Testimony).[31] The Grabowski Testimony recommends that the Board

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[30] When calculating the cost of equity for December, I assumed the same December EPS growth rates as did the STB in their work papers.

[31] Written Testimony submitted by Roger J. Grabowski, Managing Director, Duff & Phelps, November 4, 2019.

examines whether the stage three growth rate should be modified to be determined as follows:

- Start with the historical growth in real GDP
- Multiply by one-third
- And add the long-run expected inflation rate.[32]

Mr. Grabowski bases this recommendation on his interpretation of two research papers published in a practitioner journal in 2003 and 2010. He interprets these papers as supporting the proposition that the rate of earnings growth available to current investors must be adjusted downward by 2 percent from the overall rate of earnings growth to account for "dilution" attributable to the issuance of new equity shares in existing and new businesses.[33]

62. I have four primary concerns with Mr. Grabowski's proposal. First, the proposal fails to consider whether the research referenced in the Grabowski Testimony actually applies to railroads. Second, the Grabowski Testimony draws invalid inferences from the papers upon which it relies. Third, the STB's current MSDCF model is a commercially accepted model originally developed by "disinterested, respected third parties" and applied in Morningstar/Ibbotson publications.[34] Ibbotson/Morningstar consistently applied the model to all industries without implementing Mr. Grabowski's recommended third stage growth rate modifications, despite having access to the research papers Mr. Grabowski interprets as supporting his recommendation.[35] Fourth, as discussed in Section V above, it is not appropriate to change a single specification of the MSDCF model in isolation – any

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32 Grabowski Testimony, p. 4.

33 Grabowski Testimony, pp. 3-4.

34 Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital, STB Ex Parte No. 664 (Sub-No. 1) (Decision Jan. 23, 2009) at 4.

35 *See*, for example, 2013 Ibbotson Cost of Capital Yearbook, page 13. This 2013 edition of the Morningstar/Ibbotson publication (issued *after* the papers cited by Mr. Grabowski were published) explains that the MSDCF model's third stage growth rate is the "[e]conomy wide long-term growth rate per the 2013 Ibbotson SBBI Valuation Yearbook […] comprised of the expected long-term inflation forecast and the historical GDP growth rate …".

potential modification of the third-stage growth assumption would necessitate consideration of what other assumptions might need to be adjusted to ensure consistency.

63. The Grabowski Testimony says that the relevant stage three growth is "the expected long-term organic growth rate in cash flows for the railroad industry."[36] However, the determination of the growth rate the Grabowski Testimony suggests is based on the stock market in general and **not** on the railroad industry.

64. The papers attached to the Grabowski Testimony[37] were never intended to provide a robust estimate of the long-term growth rate for particular companies or industries. Rather, the papers suggest that an investor in a nonspecific portfolio of existing common stocks should expect lower than GDP growth, as newer companies have faster growth rates.[38] The papers' conclusions that future growth in earnings for existing equity will necessarily be subject to "dilution" of 2% relative to overall economic growth have not been extensively cited and corroborated in the finance literature.[39] Despite this, the Grabowski Testimony asserts that that the historical average "dilution" estimates derived based on the papers' particular assumptions should be applied in the STB's application of the MSDC to the railroad industry. While the key finding in the cited papers—that substantial economic growth comes from new enterprises—is true, that does not support Mr. Grabowski's conflation of the growth of a generic portfolio of common stocks and the growth that would apply to any particular industry. Just as new industries and businesses enter the economy

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36 Grabowski Testimony p. 2.

37 Bernstein, William J. and Robert D. Arnott, "Earnings Growth: The Two Percent Dilution," *Financial Analysts Journal* 2003 and Bradford Cornell, "Economic Growth and Equity Investing," *Financial Analysts Journal* 66, 2010.

38 There is a vast literature examining stockholder returns from small public companies compared with larger public companies (see, for example, Fama and French, Journal of Financial Economics 33 (1993) 3-56). However, this literature does not examine whether the long-term growth rates of existing public companies are lower than GDP growth.

39 Both articles appear in the Financial Analysts Journal, a practitioner journal published by the CFA Institute. If the articles had such far ranging implications as implied by Mr. Grabowski, the implications would have been investigated by leading academic journals. The cited papers, dated 2003 and 2010, are thought provoking pieces of interest to market analysts, but do not in themselves constitute a robust body of empirical or theoretical evidence sufficient to support Mr. Grabowski's proposal.

and may spur rapid growth, many previously active enterprises disappear or shrink substantially (*e.g.*, fixed line phones, river ice delivering business, etc.). Such companies will over a substantial period of time show poor performance that offsets the performance of healthy ongoing businesses. The papers provide no ability to distinguish between new businesses offsetting the decline in poorly performing businesses or new businesses offsetting growth in established businesses that do continue to operate in growing industries. Nor do the papers attempt to identify how rates of "dilution" (or accretion, which the papers acknowledge can occur when mature businesses use some earnings to repurchase equity) vary across different industries. Without such study, the papers Mr. Grabowski cites do not say anything meaningful about the appropriate stage three growth for railroads.[40]

65. Indeed Mr. Grabowski's own textbook on how to calculate the cost of capital (published in 2011 *i.e.*, *after* the cited articles) makes no mention of any dilution in earnings when estimating long-term growth rates. In his textbook, Grabowski discusses growth rate assumptions in the third stage of a MSDCF, and does not criticize or provide any alternative to the standard assumption that long-term growth rates are based on the rate of expected GDP growth.[41]

66. Notwithstanding these unsupported inferences drawn in the Grabowski Testimony, there is no evidence that railroads in particular should be expected to have long-term earnings growth slower than the growth rate of the economy. To the contrary, consistently extensive capital expenditures by the railroad industry suggest that railroad earnings are likely to sustain robust growth for a substantial period of time. As shown in Figure 9, aggregate capital expenditure for Class I railroads has consistently exceeded depreciation by a solid margin in recent years. The railroads' pattern of heavy investment in long-lived revenue-

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[40] Many listed companies are expected to grow at rates that exceed GDP growth into the longer term (although never perpetually, as this would imply that such companies would subsume the economy eventually). Indeed, many listed companies are themselves very large investors in venture capital and new higher-growth enterprises. See, for example, public data provided by CB Insights and available at www.cbinsights.com.

[41] See Grabowski, Roger and Pratt, Shannon, "Cost of Capital in Litigation", pp. 43-49 and 258-263.

generating assets suggests that the industry may not in fact reach the "steady state" condition assumed for the third stage of the model in the assumed time frame. If this is the case, it would certainly be inappropriate to apply a third stage growth rate that is *lower* than the overall rate of economic growth to the growing capital intensive railroad industry starting immediately in year 11 of the model.

67. The Board has in past decisions explicitly recognized the importance of adopting internally consistent and reasonable assumptions regarding cash flows and growth rates in Stage 3 of the MSDCF. In its Decision adopting the MSDCF, the Board wrote

> We find reasonable the assumption regarding the terminal stage cash flows. In the terminal growth stage, the Morningstar/Ibbotson model sets capital expenditures equal to depreciation (i.e., net investment is assumed to be zero) because that assumption is consistent with an industry reaching a steady state of operations and growing at a rate equal to that of the overall economy. **This assumption may run counter to the actual investment plans of the major railroads**, but it does not bias the cost of equity upwards […]. Rather, if we relaxed the assumption of zero net investment, we would also have to relax the assumption that the growth rate in the third stage is equal to the long-run growth rate of the overall economy. **If the railroads were to continue making large capital expenditures in excess of depreciation during the third stage of the model, this stage of the model would have above-normal growth prospects.** Thus, lowering the cash flows […] would require a counterbalancing increase in growth rate […]. It would also require the Board to make a long-run forecast of the amount of capital investment in the railroad industry and the long-run growth rates. The difficulty of that endeavor probably explains why Morningstar/Ibbotson adopted the simplifying assumption of zero net investment for the terminal phase of the DCF model. We also find this simplifying assumption reasonable, as it permits a reasonable estimate of the cost of equity without a complex and detailed company-specific forecast of industry conditions 11 years into the future and beyond.[42]

68. Thus, in implementing the Morningstar/Ibbotson MSDCF, the Board correctly recognized that modeling steady state (*i.e.*, zero net investment) cash flows for the railroads growing the same rate as the overall economy starting in year 11 is a simplifying assumption that is "reasonable" even though it may not match the actual expected pattern of railroad industry investment and growth.[43] In my opinion, this assumption would cease to be reasonable if

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[42] Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital, STB Ex Parte No. 664 (Sub-No. 1) (Decision Jan. 23, 2009) at 13 (emphasis added).

[43] I note that Mr. Grabowki's own Duff & Phelps publications cite the above passage from the 2009 STB Decision in a footnote explaining the stage 3 cash flow modeling assumptions for the MSDF. The

Mr. Grabowski's proposed imposition of stage three growth *much slower* than overall economic growth were implemented without any commensurate consideration of how railroad industry investment and growth relate to those of the overall economy.

69. Ultimately, the fundamental flaw in Mr. Grabowki's proposal is that it seeks to modify one component of the Board's current MSDCF model without consideration for the impact on the overall reasonableness of the model's established assumptions in aggregate. As discussed in Section IV above, it is inappropriate to change just one parameter in a well-established, commercial model. Should the Board decide to rely on a **customized** railroad model, I submit that it should also consider whether and how factors other than the Stage 2 or Stage 3 growth rates must be modified to maintain a reasonable and internally consistent set of assumptions for the model.

VII. CONCLUSION

70. As outlined in the NPRM, the only difference between the current MSDCF and the proposed Step MSDCF is the assumed growth rate in Stage 2. The primary motivation for the amended model appears to be a reduction in volatility or susceptibility to unique events, and an associated increase in the robustness of the cost of equity estimates. However, I show that the proposed Step MSDCF model does not achieve any of these goals.

71. The key driver of 2018 cost of equity movements was an unusual combination of factors influencing the model inputs. This included a short-lived reduction in market capitalizations for qualifying Class I railroads, coupled with EPS growth estimates that were lagged and likely inconsistent with the contemporaneous market capitalizations. More reliable results can be obtained by making a simple amendment to the existing model, namely a movement from December to January EPS growth estimates. I show that moving

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footnote acknowledges that "[t]he long-term relationship between capital expenditures and depreciation has been subject to different opinions and various applications," and states that Duff & Phelps adopted the "simplifying assumption" that "capital expenditures and depreciation will be equal in the long-run" in order to be consistent with the Morningstar/Ibbotson Cost of Capital Yearbook. *See* Duff & Phelps Cost of Capital Navigator, U.S. Industry Cost of Capital, Calculation of Industry Financial Statistics, accessed November 8, 2019, at page 54, footnote 77.

to January EPS estimates is unbiased, produces similar historical average cost of equity measurements and reduces volatility. Alternatively, given the unusual factors that impacted the STB's cost of equity result for 2018, a reasonable response would also be to maintain the current methodology.

72. The proposed Step MSDCF is not so much a different model, but rather the same model with alternative growth assumptions. The lower overall volatility in the total weighted average cost of capital calculations obtained by the STB using historic data is driven by a lower cost of capital calculation under the Step MSDCF model for 2018 and not a general decrease in the volatility of the results. Under alternative scenarios, the proposed Step MSDCF model would increase the volatility of cost of capital estimates.

73. With good reason, the STB has previously rejected a smoothing approach. According to the STB Decision dated October 31, 2016: "[A]ttempting to create smoother transitions between the stages would only add more complexity to the MSDCF model, but not necessarily more precision."[44] I further demonstrate that the proposed Step MSDCF model is internally inconsistent, and that properly applied, a transitional model would address both a transition in cash flows and growth rates. However, the smoothing of cash flow data adds additional complexity to the model.

74. Lastly, the proposal in the Grabowski Testimony to modify the Stage Three growth is similarly flawed in that it considers only one parameter without any evidence that such modification better captures the railroad industry's characteristics.

[44] Surface Transportation Board Decision, Docket No. EP 664 (Sub-No. 2), p. 13.

VERIFICATION

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

Executed: ___1-14-2020_____

BENTE VILLADSEN

APPENDIX A: FORMULA FOR SMOOTHED CASH FLOWS IN STAGE 2

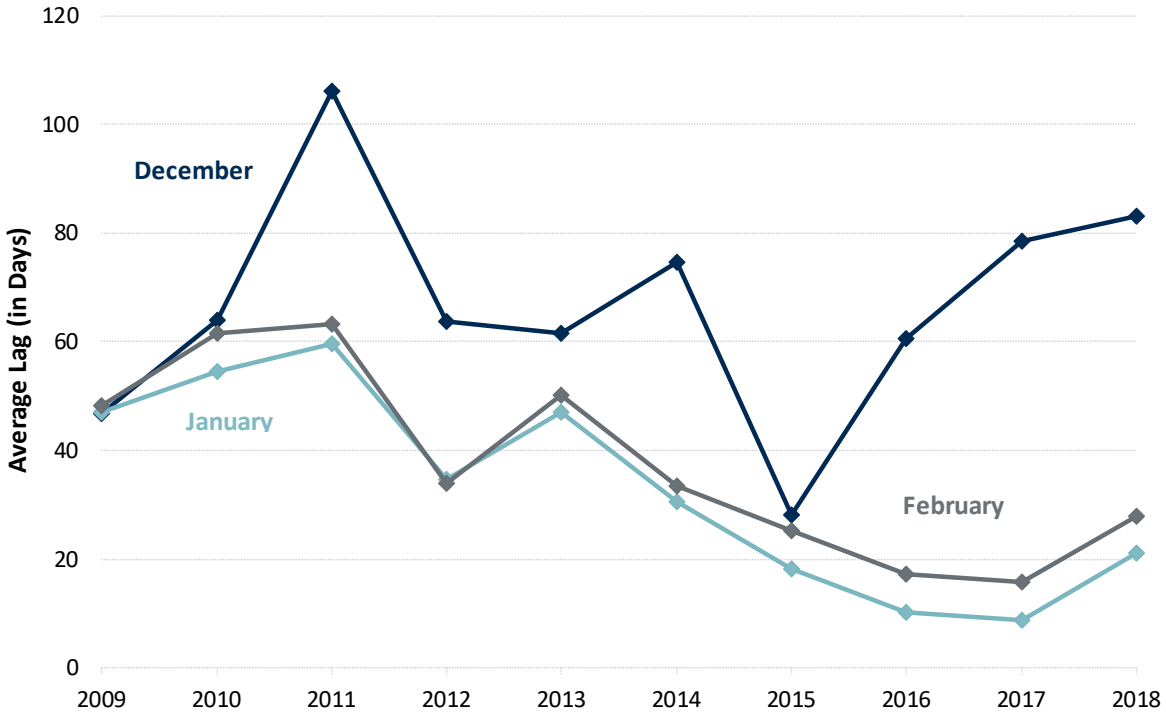
Following is the cost of equity formula for smoothing both cash flow and growth rates in Stage 2. There are no changes required to the formula in other stages and no changes to the other defined terms in the NPRM.

$$MV_{i0} = \sum_{t=1}^{5} \frac{CF_{i0}(1+g_{i1})^t}{(1+r_i)^t} + \sum_{t=6}^{10} \frac{(CF_{i0}+\left(\frac{IBEI_{i0}-CF_{i0}}{6}\right).(t-5))(1+g_{i1})^5 \prod_{p=1}^{t-5}(1+Step_{ip})}{(1+r_i)^t} + \frac{\frac{IBEI_{i10}(1+g_3)}{r_i-g_3}}{(1+r_i)^{10}}$$

Where $p = t - 5$

APPENDIX B: AVERAGE LAG CHART

Figure 12
Average Lag Chart



APPENDIX C: TIMING OF BROKER GROWTH RATE UPDATES

Figure 13
Timing of Broker Updates in Response to Q4 Earnings Releases

	NSC		UNP		KSU		CSX		Aggregate
	Earnings Release Date	Growth Estimate Updates	Earnings Release Date	Growth Estimate Updates	Earnings Release Date	Growth Estimate Updates	Earnings Release Date	Growth Estimate Updates	
2010	1/25/2011	50% (2 of 4)	1/20/2011	40% (2 of 5)	1/27/2011	67% (2 of 3)	1/24/2011	33% (1 of 3)	47% (7 of 15)
2011	1/24/2012	50% (3 of 6)	1/19/2012	50% (3 of 6)	1/23/2012	33% (1 of 3)	1/23/2012	25% (1 of 4)	42% (8 of 19)
2012	1/22/2013	40% (2 of 5)	1/24/2013	33% (1 of 3)	1/22/2013	0% (0 of 3)	1/22/2013	33% (1 of 3)	29% (4 of 14)
2013	1/22/2014	33% (1 of 3)	1/23/2014	33% (1 of 3)	1/24/2014	0% (0 of 2)	1/15/2014	25% (1 of 4)	25% (3 of 12)
2014	1/26/2015	33% (1 of 3)	1/22/2015	33% (1 of 3)	1/23/2015	33% (1 of 3)	1/13/2015	50% (1 of 2)	36% (4 of 11)
2015	1/27/2016	100% (3 of 3)	1/21/2016	100% (3 of 3)	1/22/2016	67% (2 of 3)	1/12/2016	75% (3 of 4)	85% (11 of 13)
2016	1/25/2017	100% (3 of 3)	1/19/2017	75% (3 of 4)	1/20/2017	100% (2 of 2)	1/17/2017	75% (3 of 4)	85% (11 of 13)
2017	1/24/2018	100% (3 of 3)	1/25/2018	100% (3 of 3)	1/19/2018	100% (2 of 2)	1/16/2018	100% (3 of 3)	100% (11 of 11)
2018	1/24/2019	100% (4 of 4)	1/24/2019	50% (2 of 4)	1/18/2019	50% (1 of 2)	1/16/2019	100% (4 of 4)	79% (11 of 14)
Total		65% (22 of 34)		56% (19 of 34)		48% (11 of 23)		58% (18 of 31)	57% (70 of 122)

Sources and Notes:
Earnings releases were found on EDGAR. The "Growth Estimate Updates" columns report the number of brokers that updated their estimates subsequent to the Q4 earnings release, observed as of the last trading day in January.

Figure 14
Timing of Broker Updates in Response to Q3 Earnings Releases

	NSC		UNP		KSU		CSX		Aggregate
	Earnings Release Date	Growth Estimate Updates	Earnings Release Date	Growth Estimate Updates	Earnings Release Date	Growth Estimate Updates	Earnings Release Date	Growth Estimate Updates	
2010	10/27/2010	50% (1 of 2)	10/21/2010	25% (1 of 4)	10/21/2010	0% (0 of 2)	10/12/2010	0% (0 of 3)	18% (2 of 11)
2011	10/26/2011	40% (2 of 5)	10/20/2011	20% (1 of 5)	10/21/2011	50% (2 of 4)	10/18/2011	0% (0 of 5)	26% (5 of 19)
2012	10/23/2012	100% (3 of 3)	10/18/2012	100% (2 of 2)	10/19/2012	33% (1 of 3)	10/16/2012	100% (2 of 2)	80% (8 of 10)
2013	10/23/2013	0% (0 of 2)	10/17/2013	33% (1 of 3)	10/18/2013	50% (1 of 2)	10/15/2013	33% (1 of 3)	30% (3 of 10)
2014	10/22/2014	100% (2 of 2)	10/23/2014	67% (2 of 3)	10/17/2014	50% (1 of 2)	10/14/2014	0% (0 of 3)	50% (5 of 10)
2015	10/28/2015	0% (0 of 1)	10/22/2015	33% (1 of 3)	10/16/2015	33% (1 of 3)	10/13/2015	25% (1 of 4)	27% (3 of 11)
2016	10/26/2016	33% (1 of 3)	10/20/2016	50% (2 of 4)	10/18/2016	100% (2 of 2)	10/12/2016	75% (3 of 4)	62% (8 of 13)
2017	10/25/2017	50% (2 of 4)	10/26/2017	33% (1 of 3)	10/20/2017	100% (2 of 2)	10/17/2017	0% (0 of 2)	45% (5 of 11)
2018	10/24/2018	50% (2 of 4)	10/25/2018	100% (4 of 4)	10/19/2018	50% (1 of 2)	10/16/2018	50% (2 of 4)	64% (9 of 14)
Total		50% (13 of 26)		48% (15 of 31)		50% (11 of 22)		30% (9 of 30)	44% (48 of 109)

Sources and Notes:
Earnings releases were found on EDGAR. The "Growth Estimate Updates" columns report the number of current broker estimates, as of the last trading day in December, that were published within two weeks after the Q3 earnings release.

APPENDIX D: RESUME OF DR. BENTE VILLADSEN

Dr. Bente Villadsen's 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. 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 advisory work is the review of regulatory practices regarding the return on equity, capital structure, recovery of costs and capital expenditures as well as the precedence for regulatory approval in mergers or acquisitions. Dr. Villadsen's accounting work has pertained to 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 on 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, Dr. Villadsen was a faculty member at Washington University in St. Louis, University of Michigan, and University of Iowa.

She has taught financial and managerial accounting as well as econometrics, quantitative methods, and economics of information to undergraduate or graduate students. Dr. Villadsen serves as the president of the Society of Utility Regulatory Financial Analysts for 2016-2018.

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 worthiness
  - Risk Management
  - Regulatory Advisory in Mergers & Acquisitions
- Accounting and Corporate Finance
  - Application of Accounting Standards (GAAP and IFRS)
  - Disclosure Issues

  - Credit Issues in the Utility Industry
  - Impairment
- Damages and Valuation (incl. international arbitration)
  - Utility valuation
  - Lost Profit for construction, oil & gas, utilities
  - Valuation of construction contract
  - Damages from the choice of inaccurate accounting methodology

EXPERIENCE

Regulatory Finance

- Dr. Villadsen has testified on cost of capital and capital structure for many regulated entities including electric and gas utilities, pipelines, railroads, water utilities and barges in many jurisdictions including at the FERC, the Surface Transportation Board, the states of Alaska, Arizona, California, Hawaii, Illinois, Michigan, New Mexico, New York, Oregon, and Washington as well as in the provinces of Alberta and Ontario.
- On behalf of the Association of American Railroads, Dr. Villadsen appeared as an expert before the Surface Transportation Board (STB) and submitted expert reports on the determination of the cost of equity for U.S. freight railroads.
- For several electric, gas and transmission utilities as well as pipelines in Alberta, Canada, Dr. Villadsen filed evidence and appeared as an expert on the cost of equity and appropriate capital structure for 2015-17. Her evidence was heard by the Alberta Utilities Commission.
- Dr. Villadsen has estimated the cost of capital and recommended an appropriate capital structure for natural gas and liquids pipelines in Canada, Mexico, and the US. using the jurisdictions' preferred estimation technique as well as other standard techniques. This work has been used in negotiations with shippers as well as before regulators.
- For the Ontario Energy Board Staff, Dr. Villadsen submitted evidence on the appropriate capital structure for a power generator that is engaged in a nuclear refurbishment program.
- She has estimated the cost of equity on behalf of Anchorage Municipal Light and Power, Arizona Public Service, Portland General Electric, Anchorage Water and Wastewater, American Water, California Water, and EPCOR in state regulatory proceedings. She has also submitted testimony before the Bonneville Power Authority. Much of her testimony involves not only cost of

capital estimation but also capital structure, the impact on credit metrics and various regulatory mechanisms such as revenue stabilization, riders and trackers.

- In Australia, she has submitted led and co-authored a report on cost of equity and debt estimation methods for the Australian Pipeline Industry Association. 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. She has also submitted a report on aspects of the WACC calculation for Aurizon Network to the Queensland Competition Authority.
- In Canada, Dr. Villadsen has co-authored reports for the British Columbia Utilities Commission and the Canadian Transportation Agency regarding cost of capital methodologies. Her work consisted partly of summarizing and evaluating the pros and cons of methods and partly of surveying Canadian and world-wide practices regarding cost of capital estimation.
- Dr. Villadsen worked with utilities to estimate the magnitude of the financial risk inherent in long-term gas contracts. In doing so, she relied on the rating agency of Standard & Poor's published methodology for determining the risk when measuring credit ratios.
- She has worked on behalf of infrastructure funds, pension funds, utilities and others on understanding and evaluating the regulatory environment in which electric, natural gas, or water utilities operate for the purpose of enhancing investors ability to understand potential investments. She has also provided advise and testimony in the approval phase of acquisitions.
- On behalf of utilities that are providers of last resort, she has provided estimates of the proper compensation for providing the state-mandated services to wholesale generators.
- 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 other rate base issues on behalf of Balfour Beatty Infrastructure Partners before the Michigan Public Service Commission.
- On behalf of financial institutions, Dr. Villadsen has led several teams that provided regulatory guidance regarding state, provincial or federal regulatory issues for integrated electric utilities, transmission assets and generation facilities. The work was requested in connection with the institutions evaluation of potential investments.
- For a natural gas utility facing concerns over mark to market losses on long term gas hedges, Dr. Villadsen helped develop a program for basing a portion of hedge targets on trends in market volatility rather than on just price movements and volume goals. The approach was refined and approved in a series of workshops involving the utility, the state regulatory staff, and active intervener groups. These workshops evolved into a forum for quarterly updates on market trends and hedging positions.
- She has advised the private equity arm of three large financial institutions as well as two infrastructure companies, 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 specific states' approaches to the recovery of capital expenditures riders and trackers. She has also reviewed the assumptions or worked directly with the acquirer's financial model.
- On behalf of a provider of electric power to a larger industrial company, Dr. Villadsen assisted in the evaluation of the credit terms and regulatory provisions for the long-term power contract.
- For several large electric utility, 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 to hedge gas costs. This work was used in connection with prudence reviews of hedging costs in Colorado, Oregon, Utah, West Virginia, and Wyoming.
- 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. For the owner of Heathrow and Gatwick Airport facilities, she has assisted in estimating the cost of capital of U.K. based airports. The resulting report was filed with the U.K. Competition Commission.

- For a Canadian pipeline, Dr. Villadsen co-authored an expert report regarding the cost of equity capital and the magnitude of asset retirement obligations. This work was used in arbitration between the pipeline owner and its shippers.
- 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).
- For several infrastructure companies, Dr. Villadsen has provided advice regarding the regulatory issues such as the allowed return on equity, capital structure, the determination of rate base and revenue requirement, the recovery of pension, capital expenditure, fuel, and other costs as well as the ability to earn the allowed return on equity. Her work has spanned 12 U.S. states as well as Canada, Europe, and South America. She has been involved in the electric, natural gas, water, and toll road industry.

Accounting and Corporate Finance

- For an electric utility subject to international arbitration, Dr. Villadsen submitted expert testimony on the application of IFRS as it pertains to receivables, the classification of liabilities and contingencies.
- In international arbitration, she submitted an expert report on IFRS' requirements regarding carve out financials, impairment, the allocation of costs to segments, and disclosure issues.
- On behalf of a construction company in arbitration with a sovereign, Dr. Villadsen filed an expert report report quantifying damages in the form of lost profit and consequential damages.
- In arbitration before the International Chamber of Commerce Dr. Villadsen testified regarding the true-up clauses in a sales and purchase agreement, she testified on the distinction between accruals and cash flow measures as well as on the measurement of specific expenses and cash flows.
- 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.

- On behalf of a taxpayer, Dr. Villaden has provided an expert report on the nature of the cost of equity used in regulatory proceedings as well as the interest rate regine in 2014.
- 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 a proceeding before the International Chamber of Commerce, she provided expert testimony on the interpretation of certain accounting terms related to the distinction of accruals and cash flow.
- In an arbitration 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.
- 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 confidential retention matter, Dr. Villadsen assisted attorneys for the FDIC evaluate the books for a financial investment institution that had acquired substantial Mortgage Backed Securities. The dispute evolved around the degree to which the financial institution had impaired the assets due to possible put backs and the magnitude and estimation of the financial institution's contingencies at the time of it acquired the securities.
- In connection with a securities litigation matter she provided expert consulting support and litigation consulting on forensic accounting. Specifically, she reviewed internal documents, financial disclosure and audit work papers to determine (1) how the balance's sheets trading assets had been valued, (2) whether the valuation was following GAAP, (3) was properly documented, (4) was recorded consistently internally and externally, and (5) whether the auditor had looked at and documented the valuation was in accordance with GAAP.
- 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 and Valuation

- For the Alaska Industrial Development and Export Authority, Dr. Villadsen co-authored a report that estimated the range of recent acquisition and trading multiples for natural gas utilities.
- 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.

BOOKS

"*Risk and Return for Regulated Industries*," (with Michael J. Vilbert, Dan Harris, and A. Lawrence Kolbe) Elsevier, May 2017.

PUBLICATIONS AND REPORTS

"Impact of New Tax Law on Utilities' Deferred Taxes," (with Mike Tolleth and Elliott Metzler), *CRRI 37th Annual Eastern Conference*, June, 2018.

"Implications of the New Tax Law for Regulated Utilities," The Brattle Group, January 2018.

"Using Electric and Gas Forwards to Manage Market Risks: When a power purchase agreement with a utility is not possible, standard forward contracts can act as viable hedging instruments," *North American Windpower*, May 2017, pp. 34-37.

"*Managing Price Risk for Merchant Renewable Investments: Role of Market Interactions and Dynamics on Effective Hedging Strategies*," (with Onur Aydin and Frank Graves), Brattle Whitepaper, January 2017.
"Aurizon Network 2016 Access Undertaking: Aspects of the WACC," (with Mike Tolleth), filed with the *Queensland Competition Authority*, Australia, November 2016.

"Report on Gas LDC multiples," with Michael J. Vilbert, *Alaska Industrial Development and Export Authority*, May 2015.

"Aurizon Network 2014 Draft Access Undertaking: Comments on Aspects of the WACC," prepared for Aurizon Network and submitted to the *Queensland Competition Authority*, December 2014

"Brattle Review of AE Planning Methods and Austin Task Force Report." (with Frank C. Graves) September 24, 2014.

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

"Managing Price Risk for Merchant Renewable Investments," (with Onur Aydin) *EIA Electricity Pricing Workgroup* (webinar), April 30, 2019.

"Decoupling and its Impact on Cost of Capital" presented to *SURFA Members and Friends*, February 27, 2019.

"Current Issues in Cost of Capital" presented to *EEI Members*, July, 2016-19.

"Introduction to Capital Structure & Liability Management", presented at *the American Gas Association (AGA)/Edison Electric Institute (EEI) "Introduction and Advanced Public Utility Accounting Courses"*, August 21, 2018, August 20 2019.

"Lessons from the U.S. and Australia" presented at *Seminar on the Cost of Capital in Regulated Industries: Time for a Fresh Perspective?* Brussels, October 2017.

"Should Regulated Utilities Hedge Fuel Cost and if so, How?" presented at *SURFA's 49 Financial Forum*, April 20-21, 2017.

"Transmission: The Interplay Between FERC Rate Setting at the Wholesale Level and Allocation to Retail Customers," (with Mariko Geronimo Aydin) presented at *Law Seminars International: Electric Utility Rate Cases*, March 16-17, 2017.

"Capital Structure and Liability Management," *American Gas Association and Edison Electric Institute Public Utility Accounting Course*, August 2015-2017.

"Current Issues in Cost of Capital," *Edison Electric Institute Advanced Rate School*, July 2013-2017.

"Alternative Regulation and Rate Making Approaches for Water Companies," *Society of Depreciation Professionals Annual Conference*, September 2014.

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

"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.

"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

Affidavit regarding the creation of a regulatory asset for earthquake related costs on behalf of Anchorage Water and Wastewater submitted to the *Regulatory Commission of Alaska*, December 2019.

Expert Report and Hearing Appearance on Going Concern and Impairment, *American Arbitration Association*: International Engineering & Construction S.A., Greenville Oil & Gas Co. Ltd and GE Oil & Gas, Inc., November, December 2019.

Expert Report on IFRS Issues and Forensics. *SIAC Arbitration* No. 44 of 2018, October 2019.

Expert Report on IFRS issues. *ICC Arbitration* No. 23896/GSS, September 2019.

Direct Testimony on the cost of debt and equity capital as well as capital structure on behalf of Young Brothers, LLC. submitted to the *Public Utilities Commission of the State of Hawaii*, Docket No. 2019-0117, September 2019.

Expert Report on discount rates in property tax matter for Union Pacific Company in *Union Pacific Railroad Co. v. Utah State Tax Comm'n, et. al.,* Case No. 2:18-cv-00630-DAK-DBP, Utah August 2019.

Answering Testimony on the Cost of Equity on behalf of Northern Natural Gas Company submitted to the *Federal Energy Regulatory Commission*, Docket No. RP19-59-000, August 2019.

Direct Testimony, Rebuttal Testimony, and Hearing Appearance on Cost of Equity on behalf of DTE Electric Company submitted to the *Michigan Public Service Commission*, Docket No. U-20561, July, October, December 2019.

Prepared Direct Testimony on Cost of Capital for Northern Natural Gas Company submitted to the Federal Energy Regulatory Commission, Docket No. RP19-1353-000, July 2019.

Prepared Direct Testimony on Cost of Capital and Term Differentiated Rates for Paiute Pipeline Company submitted to the Federal Energy Regulatory Commission, Docket No. RP19-1291-000, May 2019.

Expert report, deposition, and oral trial testimony on behalf of PacifiCorp in the Matter of *PacifiCorp, Inc. v. Utah State Tax Comm'n,* Case No. 180903986 TX, Utah District Court April, May, September 2019.

Direct Testimony, Rebuttal Testimony, and hearing appearance on the cost of capital for Southern California Edison submitted to the *California Public Utilities Commission*, Docket No. A.19-04-014, April 2019, August 2019.

Prepared Direct Testimony on the cost of equity for Southern California Edison's transmission assets submitted to the *Federal Energy Regulatory Commission*, Docket No. ER19-1553, April 2019.

Direct and Rebuttal Testimony on cost of equity for Consolidated Edison of New York submitted to the *New York Public Service Commission*, Matter No. 19-00317, January, June 2019.

Direct Testimony on cost of capital and capital structure for Northwest Natural Gas Company submitted to the *Washington Utilities and Transportation Commission*, Docket No. 181053, December 2018.

Pre-filed Direct Testimony and Reply Testimony on cost of capital and capital structure for Anchorage Water Utility and Anchorage Wastewater Utility submitted to the *Regulatory Commission of Alaska*, TA163-122 and TA164-126, December 2018, October 2019.

Direct Testimony on cost of capital for Portland General Electric Company submitted to the *Oregon Public Utility Commission* on behalf of Portland General Electric Company (with Hager and Liddle), EU 335, February 2018.

Direct Testimony and Rebuttal Testimony on cost of capital for NW Natural submitted to the *Oregon Public Utility Commission* on behalf of NW Natural, UG 344, December 2017, May 2018.

Direct Pre-filed Testimony and Reply Pre-filed Testimony on cost of equity and capital structure for Anchorage Water and Wastewater Utilities before the *Regulatory Commission of Alaska*, TA161-122 and TA162-126, November 2017, September 2018.

Direct Testimony, Rebuttal Testimony, deposition, and hearing appearance on wholesale water rates for Petitioner Cities, *Texas Public Utility Commission*, PUC Docket 46662, SOAH Docket 473-17-4964.WS, November 2017, January, June, July, October 2018.

Affidavit on Lifting the Dividend Restriction for Anchorage Water Utility for AWWU, *Regulatory Commission of Alaska*, U-17-095, November 2017.

Written Evidence, Rebuttal Evidence and Hearing appearance on the Cost of Capital and Capital Structure for the ATCO Utilities and AUI, 2018-2020 Generic Cost of Capital Proceeding, *Alberta Utilities Commission*, October 2017, February – March 2018.

Written Evidence, Rebuttal Evidence, and Hearing Appearance on Regulatory Tax Treatment for the ATCO Utilities and AUI, 201802020 Generic Cost of Capital Proceeding, *Alberta Utilities Commission*, October 2017, February – March 2018.

Affidavit on the Creation of a Regulatory Assets for PRV Rebates for Anchorage Water Utility, submitted to the *Regulatory Commission of Alaska*, U-17-083, August 2017.

Direct and Rebuttal Testimony, Hearing Appearance on Cost of Capital for California-American Water Company for California-American Water submitted to the *California Public Utilities Commission*, Application 17-04-003, April, August, September 2017.

Direct, Rebuttal, Surrebuttal, Supplemental, Supplemental Rebuttal Testimony and Hearing Appearance on the Cost of Capital for Northern Illinois Gas Company submitted to the *Illinois Commerce Commission*, GRM #17-055, March, July, August, September, and November 2017.

Direct and Rebuttal Testimony on Cost of Capital for Portland General Electric Company submitted to the *Oregon Public Utility Commission* on behalf of Portland General Electric Company, Docket No. UE 319, February, July 2017.

Pre-filed Direct and Reply Testimony and Hearing Appearance on Cost of Equity and Capital Structure for Anchorage Municipal Light and Power, *Regulatory Commission of Alaska*, Docket No. TA357-121, December 2016, August and December 2017.

Expert report and Hearing Appearance regarding the Common Equity Ratio for OPG's Regulated Generation for OEB Staff, *Ontario Energy Board*, EB-2016-0152, November 2016, April 2017.

Pre-filed Direct Testimony on Cost of Equity and Capital Structure for Anchorage Municipal Wastewater Utility, *Regulatory Commission of Alaska*, Docket No. 158-126, November 2016.

Expert Report and Reply Expert Report on damages (quantum) in exit arbitration (with Dan Harris), *International Center for the Settlement of Investment Disputes*, October 2016, October 2018.

Direct Testimony on capital structure, embedded cost of debt, and income taxes for Detroit Thermal, Michigan Public Service Commission, Docket No. UE-18131, July 2016.

Direct Testimony on return on equity for Arizona Public Service Company, Arizona Corporation Commission, Docket E-01345A-16-0036, June 2016.

Written evidence, rebuttal evidence and hearing appearance regarding the cost of equity and capital structure for Alberta-based utilities, the Alberta Utilities Commission, Proceeding No. 20622 on behalf of AltaGas Utilities Inc., ENMAX Power Corporation, FortisAlberta Inc., and The ATCO Utilities, February, May and June 2016.

Verified Statement, Verified Reply Statement, and Hearing Appearance regarding the cost of capital methodology to be applied to freight railroads, the *Surface Transportation Board* on behalf of the Association of American Railroads, Docket No. EP 664 (Sub-No. 2), July 2015, September and November 2014.

Direct Testimony on cost of capital submitted to the Oregon Public Utility Commission on behalf of Portland General Electric, Docket No. UE 294, February 2015.

Supplemental Direct Testimony and Reply Testimony on cost of capital submitted to the *Regulatory Commission of Alaska* on behalf of Anchorage Water and Wastewater utilities, Docket U-13-202, September 2014, March 2015.

Expert Report and hearing appearance 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 and November 2014. (*Confidential*)

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. (with A. Lawrence Kolbe, Michael J. Vilbert, *Confidential*)

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, EL11-13-000, 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. (*Confidential*)

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

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

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

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

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

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

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

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

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

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

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

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

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

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