

**BEFORE THE
SURFACE TRANSPORTATION BOARD**

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

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

**REPLY VERIFIED STATEMENT
OF
BENTE VILLADSEN

ON BEHALF OF THE
ASSOCIATION OF AMERICAN RAILROADS**

November 4, 2014

TABLE OF CONTENTS

	PAGE
I. Introduction and Summary	2
II. MSDCF	4
A. Introduction	4
B. Circularity	5
C. Transparency of the MSDCF	9
D. CTA Report	10
III. CAPM	11
A. Introduction	11
B. Market Risk Premium	12
1. Evidence on the MRP Range	13
2. Response to Issues Raised	22
3. Conclusions on the MRP	24
C. Beta	25
1. Magnitude of Beta	25
2. Beta Adjustments	26
3. Beta and Market Power	33
D. Risk-Free Rate and MRP	38
IV. OTHER RESPONSES	39
A. The Cost of Capital Depends on Its Use, Not Its Owner	39
B. Using More Than One Method to Estimate the Cost of Equity Is Common and Best Practice for Regulatory Purposes	40
C. BNSF's Fairness Opinion	42

EXHIBIT BV-1: Rolling Five-Year Betas for the Railroad Industry

EXHIBIT BV-2: Review of Regulatory Cost of Capital Methodologies, CTA Report

EXHIBIT BV-3: Figure 1 from Duarte & Rosa 2014

EXHIBIT BV-4: Derivation of the Value Line Forecasted MRP

I. Introduction and Summary

My name is Bente Villadsen and I am the same Bente Villadsen who filed a Verified Statement in support of the Association of American Railroads (AAR) opening comments in this proceeding on September 5, 2014.

I have been asked by the AAR to review and respond to the Opening Comments by the Western Coal Traffic League (WCTL), the Verified Statement of Dr. Harvey A. Levine (Levine Statement), and the Verified Statement of Professor Alexander J. Triantis (Triantis Statement). I have also been asked to review and respond to the Opening Comments of Arkansas Electric Cooperative Corporation (AECC Comments).

Based on my review of the filed material, as well as some of the cited data and literature, I continue to support the conclusions in my Verified Statement.¹ In addition, I also find that:

- The MSDCF as applied by the Board is not circular, as an increase in cash flow will be reflected in market prices, and not the cost of equity.
- The MSDCF is well-specified and auditable as done annually by the Surface Transportation Board.
- Reliance on the historical average MRP remains a valid method with textbooks, commercial data providers, and cost of capital experts recommending it.

¹ Verified Statement of Bente Villadsen, Docket No. EP 664 (Sub-No. 2), September 5, 2014 (Villadsen Statement), pp. 2-3.

- It is common to estimate the MRP using as many years as there are reliable data for.
- Survey results and literature that pre-date the financial crisis estimate the MRP below its historical average, while forward-looking methodologies estimate the MRP above its historical average. Therefore, the historical average is a reasonable compromise.
- The historical average MRP is objective and easy to implement and audit, whereas surveys are subjective and not auditable.
- Historical data, forecasted MRPs, recent studies, and even surveys show that the MRP exceeds 5%.
- The beta estimate as of the relevant estimation date remains the best proxy for the expected railroad beta. There is no support for restricting the railroad beta to a specific number or range.
- The beta estimate for a portfolio of publicly traded railroads that meets the Board's criteria is the best estimate for the industry.
- Evidence provided by the WCTL indicates that it is equally common for publicly traded companies to use raw and adjusted betas. Hence the Board's practice is in line with industry practice.
- The Board has implemented the CAPM in its original form without any adjustments. The Board should not selectively adjust one parameter without considering all plausible adjustments.

- There is no evidence that railroad betas have increased due to market power; there are plenty of more plausible alternative explanations for why railroad betas may have increased.
- It is a fundamental principle in finance that the cost of capital depends on its use and not on the ownership. BNSF's cost of equity depends on the systematic risk of BNSF's assets and cash flow; **not** on Berkshire Hathaway's or Union Pacific's beta.
- The fairness opinion on the sale of BNSF to Berkshire Hathaway is consistent with the Board's 2009 estimated cost of capital.
- The use of more than one method is endorsed by many utility cost-of-capital experts for regulatory purposes.

II. MSDCF

A. INTRODUCTION

WCTL's Opening Comments repeat many of the same criticisms of the MSDCF that WCTL and its witnesses, Professor Hodder and Mr. Fapp, made in WCTL's petition for a rulemaking proceeding, including the arguments that: (1) the MSDCF values are overstated because they are higher than values determined under the CAPM; (2) the second stage of the MSDCF fails to implement a smooth transition from Stage 1 to Stage 3; (3) Stage 3 of the model is deficient because it fails to achieve a smooth transition in cash flows; and (4) the MSDCF bases growth in firm-wide cash flow on earnings per share that increase faster than firm-wide earnings due to stock buybacks. The testimonies of WCTL's witnesses Dr. Levine and Professor Triantis largely echo the

criticisms made by WCTL's prior witnesses, Professor Hodder and Mr. Fapp. I have already addressed the criticisms noted above in my September Verified Statement.

Therefore the remainder of this section addresses the following new criticisms: (1) that the use of the MSDCF inherently is circular and (2) that the MSDCF is not transparent. This section also addresses the WCTL's use of a report that I co-authored for the Canadian Transportation Agency (CTA). I discuss the claim that the MSDCF is "far from the preferred method of determining the COC among regulatory agencies, the financial community, and academia"² in Section IV below.

B. CIRCULARITY

In its Opening Comments, the WCTL argues that there is an inherent "circularity" in the use of the MSDCF model to determine the cost of capital for the railroads. It claims that "the high MSDCF COE enables the railroads to raise their rates, and the rate increases result in projections of high earnings growth that drive the MSDCF COE. In other words, the model derives an increased cost of capital due to the railroads' ability to impose rate increases."³ This argument is fundamentally flawed in that it ignores the basic finance principle of market efficiency. Specifically, the WCTL assumes that a rate increase by the railroads would lead to an increase in their expected future cash flows *without* a commensurate increase in the market prices of their stock.⁴

² Verified Statement of Harvey A. Levine, Docket No. EP 664 (Sub-No. 2), September 5, 2014 (Levine Statement), p. 20.

³ Opening Comments of the Western Coal Traffic League, Docket No. EP 664 (Sub-No.2), September 5, 2014 (WCTL), p. 25.

⁴ In the Board's MSDCF model, if forecasted cash flows increase and prices remain unchanged, the implied cost of equity capital will increase such that the higher cash flows are more heavily discounted to reach the same present value.

However, unless the rate increase was to somehow substantially increase the railroads' systematic risk, this situation could not occur in an efficient market. Rather, the rise in expected cash flows would make railroad stock more attractive to investors, leading market prices to increase to a level reflecting the higher fundamental value, while the cost of equity capital remains unchanged. In the remainder of this section, I explain how the principle of market efficiency – a core and essential assumption for the implementation of all market models used to estimate the cost of capital,⁵ including the CAPM that the WCTL recommends – prevents any possibility of “circularity” in the MSDCF model.

At its most basic, the DCF model sets the value of an asset equal to the present value of its future cash flows. When performing DCF valuation of a stock, the current *fundamental* value (V_0) is determined by taking the sum of all future cash flows (C_t) expected to accrue to the stockholder, discounted at the appropriate cost of equity capital (r).

$$V_0 = \sum_{t=1}^{\infty} \frac{C_t}{(1+r)^t}$$

As I explained in my Verified Statement, the cost of capital represents an opportunity cost for an investor considering a particular investment: it is the return he or she could expect to earn on some other investment of equivalent risk.⁶ Therefore, if the current market price of a stock (P_0) were lower than the expected present value of its future cash flows (V_0), rational investors would want to purchase the stock, seeing it as

⁵ Stephen A. Ross, Randolph W. Westerfield, and Jeffrey F. Jaffe, *Corporate Finance*, 10th ed, 2013, (Ross, Westerfield and Jaffe 2013), Chapter 11.

⁶ Villadsen Statement, p. 4.

an opportunity to earn a return higher than the opportunity cost of capital (r) for an investment of equivalent risk. The resulting increased demand for the stock would tend to drive the price up until it matched the fundamental value (i.e., $P_0 = V_0$). Conversely, if P_0 were higher than V_0 , a rational investor would view the stock as “overpriced”, since purchasing it at the market price would yield an expected return below the cost of capital, r ; this would push the stock’s price downward toward its fundamental value. Only when $P_0 = V_0$ do investors view the stock as “fairly priced”.

Under the *efficient markets hypothesis*,⁷ we would expect securities markets to behave in precisely this fashion: investors collectively process the available information (e.g., financial data, price histories, analyst forecasts, etc.) about each security to determine its fundamental value. Their collective investment behavior then ensures that all securities are “fairly priced” such that $P_0 = V_0$ and any individual investment earns a return exactly equal its opportunity cost of capital (r).

Whether markets are in fact efficient is a matter of substantial academic debate.⁸ However, market efficiency is an essential assumption when DCF models are used in a regulatory setting to estimate the cost of capital. Estimating r in the DCF requires inputs for the future cash flows C_t and current value V_0 of each company in the proxy group. By setting the latter equal to the current market price ($P_0 = V_0$), regulators *implicitly assume that the stocks are fairly priced by the market*, i.e., that securities markets are efficient.

⁷ See, for example, Richard A. Brealey, Stewart C. Myers, Franklin Allen, “*Principles of Corporate Finance*,” 10th ed, 2011 (Brealey, Myers and Allen, 2011), pp. 314-325.

⁸ See the discussion in Brealey, Myers, and Allen, 2011.

Under this same assumption, an increase in expected future cash flows (e.g., due to a rate increase by the railroads) would, all else equal, lead to a commensurate increase in the market prices of railroad stocks, *not* an increase in the DCF-estimated cost of capital.

To see this point, consider the example of a hypothetical regulated firm that is expected to generate cash of \$5 per share next year ($C_1 = 5$), with perpetual 4% growth ($g = 4\%$) thereafter. If the current market value of the firm's stock is \$100 per share, then *assuming the stock is fairly priced*, the implied cost of equity capital is 9% according to the discounted cash flow model⁹:

$$r = \frac{C_1}{P_0} + g = \frac{\$5}{\$100} + 4\% = 9\%$$

Now suppose that the firm is permitted to increase its rates such that it will grow its cash by $g^* = 5\%$ in perpetuity instead of 4%. Since the rate increase is not likely to have changed the firm's systematic risk in any meaningful way, the appropriate cost of capital for investing in the firm will remain at 9%. In an efficient market, investors will incorporate the firm's improved future cash flows into their investing decisions, so that the market will arrive at the new fair value for the stock.

$$P_0^* = \frac{c_1}{r - g^*} = \frac{\$5}{0.09 - 0.05} = \$125$$

⁹ The discounted cash flow model is sometimes also called the "constant growth DCF" or "simple DCF" model. Note that this example uses a constant perpetual growth rate for simplicity. The principle demonstrated would be the same under the more complex assumptions of the Board's MSDCF model.

As this example illustrates, it is market prices, and **not** the cost of equity, that increase when forecasted cash flows go up under the assumptions of the Board's MSDCF model. WCTL's argument that the MSDCF has an issue with "circularity" is therefore unsound according to basic finance principles.

C. TRANSPARENCY OF THE MSDCF

WCTL contends that the MSDCF is not transparent but rather "an opaque and presumptuous methodology" that "is effective only when the projections are correct."¹⁰

First, the MSDCF is clearly transparent. The model is well-specified and all of the parameters that it relies upon are publicly available, so that it readily can be audited.¹¹ I understand that the Surface Transportation Board reviews and, if needed, adjusts the MSDCF figures annually.¹² That is hardly characteristic of an opaque model.

Second, while the MSDCF model is in fact dependent on the projected growth in cash flow, the CAPM – to which Dr. Levine advocates shifting all weight from the MSDCF – is dependent on the estimated market risk premium, beta, and risk-free rate. Because each cost of capital model has its strengths and weaknesses, no single model is ideal and the implementation of any model necessarily requires choices that involve subjective judgments.¹³ Just as the outcome of the MSDCF hinges on the accuracy of

¹⁰ WCTL, p. 20. See also Levine Statement, p. 16.

¹¹ As discussed in my co-authored report, "Estimating the Cost of Equity for Regulated Companies" prepared for the Australian Energy Regulator for the Australian Pipeline Industry Association, February 2013 (AER Report) p. 30, when well specified, the MSDCF is easily replicated and therefore easy to audit. Note that the DCF model is referenced as DDM in Australia.

¹² See, for example, Surface Transportation Board Decision, Docket No. EP 558 (Sub-No. 17), Railroad Cost of Capital – 2013, decided July 30, 2014, p. 10.

¹³ AER Report, p. 9.

projected growth rates, the CAPM is only effective when the estimated beta reflects the actual forecasted systematic risk, the relied upon risk-free rate reflects the expected risk-free rate, and the market risk premium reflects the actual premium that investors require to hold stock rather than risk-free bonds.

D. CTA REPORT

Finally, the WCTL cites a portion of the Canadian Transportation Agency's (CTA) 2011 decision,¹⁴ which is attributed to a 2010 report that I co-authored regarding cost of capital methodologies.¹⁵ The WCTL uses this quote to support its criticism of the MSDCF. The WCTL quotes from the CTA's decision, but fails to recognize the context in which the statements were made. Therefore, its reliance on the report is misplaced.

The WCTL cites ¶207 of the CTA decision as support that

the DCF model is highly sensitive to growth rate estimates, which can vary widely among analysts – and that variation may increase in times of greater economic uncertainty. As such, the reliability of DCF methods can be questionable in times of economic turmoil or when an industry is in transition.¹⁶

While this statement is a quote from the CTA Decision, it pertains to the single-stage DCF model and is taken out of context. The portion of the Brattle CTA Report that the WCTL appears to be referencing continues:

If five-year growth rate forecasts are used as the constant growth rate, as is often the case, then the reliability of the [single-stage DCF]

¹⁴ Canadian Transportation Agency, Decision No. 425-R-2011, December 2011 (CTA Decision).

¹⁵ "Review of Regulatory Cost of Capital Methodologies" by Michael J. Vilbert, Bente Villadsen and Matthew Aharonian, prepared for the *Canadian Transportation Agency*, September 2010 (Brattle CTA Report). The report is attached as Exhibit BV-2.

¹⁶ WCTL p. 16.

model can be significantly reduced in periods of abnormally high or low growth. Moreover, the results of applying the methodology can be unstable over time, leading to rapid shifts from high cost of capital estimates to low ones. *Some of this sensitivity can be mitigated in the DCF framework by adjusting the growth path more realistically,* but this then opens the DCF model to some of the same subjective parameter concerns raised in implementing the CAPM.¹⁷
[emphasis added]

Thus, the CTA Decision was referencing the single-stage DCF and therefore the portion cited by the WCTL leaves out an important qualifier about using the single-stage DCF (with a constant company or industry-specific growth rate) and the ability of the MSDCF to mitigate those outcomes by relying on economy-wide growth in stage 3. In general, the Brattle CTA report simply analyzed the strengths and weaknesses of each model, including the CAPM and MSDCF. It did not endorse the use of only one model, nor did it find that one model was superior to others.

III. CAPM

A. INTRODUCTION

In its Opening Comments, the WCTL argues that “the CAPM is superior to the MSDCF both conceptually and pragmatically.”¹⁸ However, the CAPM, like every other model, has its strengths and weaknesses, both of which I discussed in my Verified Statement. Then, the WCTL, despite its overall glowing depiction of CAPM, contends that the CAPM “overstates” the cost of equity and requires certain “modifications” and “adjustments” to correct such “overstatements.” However, the discussion is one-sided

¹⁷ Brattle CTA Report, p. 4.

¹⁸ WCTL, p. 14.

in that the WCTL only points to “flaws” that could “overstate” the cost of equity, while failing to point out any aspects of the CAPM implementation that would result in an understatement of the COE. If the implementation of the CAPM is to be re-examined, it is necessary to review all aspects of the model and its performance during different circumstances; e.g., before and after the financial crisis.

The more detailed comments from the WCTL and its experts focus on the market risk premium (MRP) and the beta estimates that the Board’s cost of capital methodology relies upon. Therefore my comments on the WCTL filing focus on those parameters, although I caution against looking at the any one of the parameters that enters the CAPM estimate in isolation.

B. MARKET RISK PREMIUM

The WCTL and its experts focus their review of the MRP on surveys and on changing the period over which the historical arithmetic average MRP is estimated. The filing does not provide a literature review, textbook evidence, or evidence of regulatory practice for estimating the MRP. Instead, it references select surveys and a website. The academic literature on the MRP is vast and has changed over time. Much of the literature pertaining to the early 2000s (during the stock market boom) indicates an MRP that is lower than the long-term historical average MRP, while the more recent literature and current forward-looking methods suggest that the MRP is currently higher than the historical average MRP. Thus, there is no true consensus on what the MRP is. But there are reasonable ranges, and the historical average MRP as currently relied upon by the Board is in the middle of that range.

In the following sections, I first discuss the evidence on the plausible range of the MRP and show that the historical average is near the middle of that range. I then respond to particular points in the WCTL and AECC filings. Specifically, I address the claims that the Board's use of data going back to 1926 does not "reflect current investor expectations" and "the 1926 base is no longer the norm for measuring the MRP," as well as the assertion that that the Board should instead rely on 50 years of data.¹⁹ I also address the claims that a 4.7% risk premium is "consistent with, if not somewhat higher than, [the MRP] currently used by financial professionals"²⁰ and that "the MRP in the current environment should not exceed 4.7%."²¹ Finally, I comment on the use of survey data.

1. Evidence on the MRP Range

As noted above, there is currently no real consensus on what the expected MRP is. However, there are a number of articles and textbooks published by academics, estimates provided by commercial vendors, and regulatory precedents. Morningstar / Ibbotson argues to use a period going as far back as 1926 stating that:

"some analysts estimate the expected equity risk premium using a shorter, more recent time period on the basis that recent events are more likely to be repeated in the near future; furthermore, they believe that the 1920s, 1930s, and 1940s contain too many unusual events. This view is suspect because all periods contain "unusual" events. Some of the most unusual events of the last hundred years

¹⁹ WCTL p. 31, Levine Statement p. 13 and 24, Verified Statement of Prof. Alexander J. Triantis, Docket No. EP 664 (Sub-No. 2), September 5, 2014 (Triantis Statement), pp. 11-12

²⁰ Triantis Statement, p. 12.

²¹ WCTL, p. 7.

took place quite recently, including the inflation of the late 1970s and early 1980s, the October 1987 stock market crash, the collapse of the high-yield bond market, the major contraction and consolidation of the thrift industry, the collapse of the Soviet Union, the development of the European Economic Community, the attacks of September 11, 2001 and the more recent liquidity crisis of 2008 and 2009.”²²

Similarly, Professors Ross, Westerfield and Jaffe find that an estimate based on the historical U.S. MRP over as long a period as possible to be reasonable. The figure cited by the authors uses the period 1900 – today; for 1900 – 2013 the estimated MRP is 6.6%.²³ The 2014 Valuation Handbook put forth by Duff & Phelps estimates a risk premium of 6.96% for the period 1926 -2013. The text also reports a so-called supply side MRP that adjusts the MRP downward for the growth in the price to earnings ratio, resulting in an MRP of 6.18% for the period 1926 to 2013.²⁴ Table 1 below shows the historical MRP over 20-year government bonds from the 2013 SBBI Valuation Yearbook, the Credit Suisse Global Investment Returns Sourcebook 2014, and from my calculations using NYSE returns.²⁵ Only a select 50-year period (i.e., 1964-2013) yields a historical average MRP below 5%, whereas the use of other periods indicates an MRP close to the current 6.96%, regardless of whether the 1926-today period is expanded to include 1900-1925 or restricted to include only the post-war years: 1947-today.

²² Morningstar, “Ibbotson SBBI 2013 Valuation Yearbook,” p. 59.

²³ Ross, Westerfield and Jaffe 2013, p. 326 discuss the methodology. “Credit Suisse Global Investment Return Sourcebook 2014,” Table 10 of that text provides the long-term arithmetic MRP referenced above and Table 9 of the text provides the short-term MRP – currently 7.5%.

²⁴ Duff & Phelps, “2014 Valuation Handbook,” p. 3 – 19.

²⁵ Morningstar, “Ibbotson SBBI 2013 Valuation Yearbook,” p. 46.

Table 1: Historical Long-Term MRP Estimates

Historical Long Term Market Risk Premiums

	NYSE Long Term MRP	S&P Long Term MRP	US Long Term MRP
	[1]	[2]	[3]
1900 - 2013		6.66%	6.60%
1926 - 2013	6.64%	6.96%	
1947 - 2013	6.61%	6.84%	
1964 - 2013	4.68%	4.67%	
1974 - 2013	5.47%	5.50%	

Sources and Notes:

[1]: NYSE Returns from CRSP between 1926 and 2005. NYSE Returns from Bloomberg 2006 onwards. Interest Rates from Ibbotson Associates, *Stocks Bonds Bills and Inflation (S&P)* 2014 Classic Yearbook.

[2]: Duff & Phelps, *2014 Valuation Handbook*, Exhibit 3-6. S&P refers to Standard & Poor 500 Index. For the period 1947-2013, the 1947-2012 average reported in the 2013 Ibbotson Valuation Yearbook, page 74, was recalculated using the 2013 MRP calculated by taking the S&P 500 total stock returns from Bloomberg and subtracting out the 2013 income return on long-term government bonds taken from Ibbotson.

[3]: Dimson, Marsh and Staunton, *Global Investment Returns Sourcebook 2014*, p. 28.

Long term MRPs are average spreads between market returns and income or total returns on long-term Treasuries.

Academic articles that were written in the late 1990s or early 2000s often found that the MRP was lower than the historical MRP based on various forward-looking models, such as market-wide versions of the DCF model. A recent article by Duarte and Rosa of the Federal Reserve of New York summarizes many of these models and also estimates the MRP from the models each year from 1960 through 2013.²⁶ The authors

²⁶ Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Consensus of Models," Federal Reserve Bank of New York, 2014 (Duarte & Rosa 2014).

then report the average as well as the 25 and 75-percentile of results. The authors find that the models are converging to provide a more comparable estimate and that the average annual estimate of the MRP is consistent with the academic literature and with forward-looking estimates such as Bloomberg's. Their analysis shows that the MRP was lower than its long-term historical average in the early 2000s, **but** is currently at an all-time high. Figure 1 from Duarte & Rosa 2014 is replicated as Exhibit BV-3, which shows the average estimated MRP (over 30-day T-bills) for 20 models.²⁷

For example, the authors estimate that the MRP reached an all-time high of 14.5% over 90-day T-bills in July 2013 for an approximate long-term MRP of 10.2%. Looking at the authors' figures and subtracting the difference between the 20-year government bond²⁸ and the 90-day T-bill, it appears that they find an MRP over 20-year Treasury bonds of approximately 6.5% during the 2008-10 period, 7.7% for 2010-12 and 8.0 – 8.7% since 2012.²⁹ These figures are broadly consistent with the forward-looking MRP calculated by Bloomberg and shown in Table 2 below. Bloomberg estimates its forecasted MRP using a DCF model for the market as a whole.³⁰ The table also shows the forecasted MRP for 2012-13 using Value Line data. The Value Line forecasted MRP was calculated using the basic same methodology as Bloomberg, but relying on Value

²⁷ Technically, Figure 1 from Duarte & Rosa plots the "first principal component" of the 20 models. This means that the authors used statistics to compute a weighted average that captures the most variability among the 20 models over time.

²⁸ The Board uses the yield on a 20-year government bond as its risk-free rate in the CAPM, so that the relevant MRP is over a 20-year government bond.

²⁹ Duarte & Rosa (2014) Figure 1, p. 18 and Bloomberg data on the yield on 90-day T-Bills and 20-year Government bonds.

³⁰ Bloomberg measures the market as the S&P 500 and uses the 10-year Treasury bond yield as the risk-free rate.

Line growth rates.³¹ For comparison, the table also shows the historical average MRP as reported by Ibbotson.

Table 2: Bloomberg and Value Line Forecasted MRP and Ibbotson Historical MRP³²

Year	Annual Forecasted MRP (Bloomberg)	Annual Historical MRP (Ibbotson)	Forecasted MRP (Value Line)
	[1]	[2]	[3]
2008	7.83%	6.47%	
2009	8.55%	6.67%	
2010	8.03%	6.72%	
2011	7.97%	6.62%	
2012	8.86%	6.70%	12.52%
2013	7.72%	6.96%	9.97%
<i>Average</i>	8.16%	6.69%	<i>nmf</i>

Sources and Notes:

[1]: Bloomberg as of 10/1/2014; Average of all MRP reported at the end of each month in year of interest. The MRP is calculated over the 10-Year Treasury bond yield.

[2]: Ibbotson SBBI 2014 Classic Yearbook, page 158. Average MRP from 1926 to year of interest.

[3]: Year-end Value Line data pulled 10/22/2014. MRP calculated over the 10-Year Treasury bond yield. Companies with no dividend yield or estimated growth rate were excluded from the analysis.

As Table 2 demonstrates, the forecasted MRP has been consistently higher than the historical average during the 2008-2013 period. I note that Bloomberg’s forecasted MRP and the forecasted MRP calculated using Value Line represent the excess market return over the 10-year Treasury bond yield, which merits two comments. First, Ibbotson’s historical MRP appropriately uses the realized return on Treasury bonds,

³¹ For comparability to the Bloomberg forecast, I used the 10-year Treasury bond yield as the risk-free rate. The details of the calculation are attached as Exhibit BV-4.

³² I do not have access to Value Line data for 2008-2011, but note that Roger A. Morin found the forward-looking MRP using Value Line data to be 7.7% over long-term bonds in 2008 (Direct Testimony and Exhibits of Roger A. Morin in the matter of the application of ALLETE d/b/a Minnesota Power in Docket E-015/GR-08-415, May 2008, p. 43).

while the forecasted MRP uses the yield on Treasury bonds. For the purpose of measuring a historical MRP it is the realized return rather than the forward-looking yield that is relevant.³³ Similarly, a forward-looking MRP appropriately uses a forward-looking yield as the risk-free measure. Second, the Board uses the 20-year Treasury Bond yield as the risk-free rate in its CAPM. Therefore, the forecasted MRPs in Table 2 should be adjusted downward for the difference between the 20-year and 10-year Treasury bond yields in order to form a valid comparison for the Board's current CAPM (with a 20-year risk-free rate). Even with this adjustment, the forecasted MRP has been well above the historical MRP as reported by Morningstar / Ibbotson every year from 2008 through 2012; the two figures became equal in 2013 (once the difference in yield has been accounted for).³⁴

There may be several reasons why the current MRP is estimated to be higher than the historical average. The literature includes studies of the impact of a recession on investors' attitude towards risk, the impact of volatility, and the fear of large disasters to mention a few.

For example, Professor Constantinides studies a classical utility model where consumers are risk averse and also summarizes some of the empirical literature. Constantinides draws from empirical evidence that shows that consumers become risk averse in times of economic recession or downturn, and equity investments accentuate

³³ Morningstar, "Ibbotson S&P 500 2013 Valuation Yearbook," pp. 55-56; Leonardo R. Giacchino and Jonathan A. Lesser, "Principles of Utility Corporate Finance," Public Utilities Report, Inc., 2011, pp. 234-235.

³⁴ To illustrate: Bloomberg's MRP for 2013 was 7.72% and the average spread between the 20-year and the 10-year government bonds in 2013 was 0.77%, so the Bloomberg forecasted MRP over a 10-year risk-free rate would be 7.72% minus 0.77% or 6.95%.

this risk.³⁵ (Increased risk aversion leads to a higher expected return for investors before they will invest.) Specifically, equities are pro-cyclical and decline in value when the probability of a job loss increases; thus, they fail to hedge against income shocks that are more likely to occur during recessions.³⁶ Consequently, investors require an added risk premium to hold equities during economic downturns. Constantinides writes:

In economic recessions, investors are exposed to the double hazard of stock market losses and job loss. Investment in equities not only fails to hedge the risk of job loss but also accentuates its implications. Investors require a hefty equity premium in order to be induced to hold equities. This is the argument that I formalize below and address the predictability of asset returns and their unconditional moments.³⁷

And

The first implication of the theory is an explanation of the counter-cyclical behavior of the equity risk premium: the risk premium is highest in a recession because the stock is a poor hedge against the uninsurable income shocks, such as job loss, that are more likely to arrive during a recession.

The second implication is an explanation of the unconditional equity premium puzzle: even though per capita consumption growth is poorly correlated with stocks returns, investors require a hefty premium to hold stocks over short-term bonds because stocks

³⁵ G.M. Constantinides, "Understanding the equity risk premium puzzle". In R. Mehra, ed., *Handbook of the Equity Risk Premium*, 2008, Elsevier, Amsterdam.

³⁶ G.M. Constantinides, G.M., and D. Duffie, "Asset Pricing with Heterogeneous Consumers", *Journal of Political Economy*, Vol. 104 (2), 1996: 219-240.

³⁷ G.M. Constantinides, "Understanding the equity risk premium puzzle." In R. Mehra, ed., *Handbook of the Equity Risk Premium*. 2008 Elsevier, Amsterdam.

perform poorly in recessions, when the investor is most likely to be laid off.³⁸

Empirically, several authors have found that market volatility and the market risk premium are positively related. For example, Kim, Morley and Nelson 2004³⁹ find that

When the effects of volatility feedback are fully taken into account, the empirical evidence supports a significant positive relationship between stock market volatility and the equity premium.⁴⁰

Additionally, in their article that won the annual Smith-Breeden Paper Award given by the American Finance Association and the *Journal of Finance*, Bansal and Yaron (2004) demonstrate that economic uncertainty plays an important role in explaining the MRP.⁴¹ In particular, they show that uncertainty is priced in the market. In their model, higher uncertainty (measured in their paper by volatility of consumption) leads to higher conditional MRP. Another implication of the analysis in the Bansal and Yaron paper is that even the unconditional MRP can increase if any of the following materialize: (i) investors become more risk-averse; (ii) shocks to economic uncertainty become more pronounced; (iii) periods of high economic uncertainty becomes longer lasting. To the extent that investors' risk aversion has experienced an adverse shock (i.e., gone up), the MRP must have increased. Furthermore, perception of more severe

³⁸ *Ibid.*.

³⁹ C-J. Kim, J.C. Morley and C.R. Nelson (2004), "Is There a Positive Relationship Between Stock Market Volatility and the Equity Premium," *Journal of Money, Credit and Banking*, Vol. 36.

⁴⁰ *Ibid.* p. 357. The authors rely on a statistical (Markov-switching) model of the ARCH type and data for the period 1926 to 2000 for their analysis.

⁴¹ Bansal, R., and A. Yaron (2004), "Risks for the Long Run: A Potential Resolution of Asset Pricing Puzzles", *Journal of Finance*, Vol. 59 (4): 1481-1509.

shocks to economic uncertainty and slower decay of higher uncertainty periods are likely to cause the MRP to remain higher even in the absence of any specific shock to the risk aversion parameter.

Finally, survey evidence such as that provided in the WCTL filing generally find the MRP is somewhat lower than the historical arithmetic average although the range of estimates vary widely. For example, the Fernandez et al paper cited by the WCTL finds that the average MRP used by respondents in the U.S. is 5.7%, which is well above the 4.7% suggested by the WCTL and its experts.⁴²

There are several methodological problems with surveys. First, it is not clear that the survey captures a representative cross-section of the academics or practitioners who estimate the cost of capital. Second, it is not clear what MRP the respondents have in mind: (a) is the MRP over a short-term or a long-term risk-free rate, (b) are the respondents considering today's economic conditions or expected conditions, and (c) how far into the future are the respondents forecasting the MRP (e.g., for the next month, year, or decade)? Without knowing the answer to these questions, it is difficult to know what the reported MRP measures. Furthermore, even if the average of the reported risk-free rate is consistent with a 10-year government bond yield as indicated by Professor Triantis,⁴³ it is not clear that this is the benchmark used by the respondents. Third, the surveys cannot be replicated and/or audited by an outsider. These three factors mean that surveys are not transparent. Therefore, surveys are to be used with

⁴² Pablo Fernandez, Javier Aguirreamalloa, and Pablo Linares, "Market Risk Premium and Risk Free Rate Used for 51 Countries in 2013: A Survey with 6.237 Answers," Working paper dated June 26, 2013.

⁴³ Triantis Statement, p. 14.

caution and the Board **cannot**, as suggested by the WCTL, “rely credibl[y] on surveys of the MRP values.”⁴⁴

Having looked at the historical, forecasted, and survey evidence on the MRP, I concur with Professors Ross, Westerfield, and Jaffe that an estimate based on the historical MRP is reasonable.⁴⁵

2. Response to Issues Raised

The WCTL and its experts suggest that the Board relies on 50-years of data to determine the MRP because data going back to 1926 does not “reflect current investor expectations” and is not the current norm.⁴⁶ Further, the WCTL and its experts suggest that an MRP above 5% is unreasonable.⁴⁷

Clearly, current investor expectations are not reflected in 50 years of data but rather in today’s markets, so a better measure of the *current* investor expectation would be the market forecasted MRP (using Bloomberg or Value Line data) illustrated in Table 2 (above at p. 17). In addition, if it is not the norm to determine the MRP using historical data back to 1926, then why are MBA textbooks such as Ross, Westerfield, and Jaffe (2013), investment banking publications, and cost of capital experts continuing to rely on this data? The reasons are eloquently stated by Professor Morin: “to avoid data mining”⁴⁸ and by Ciacchino and Lesser: “since history tends to repeat itself, for good or

⁴⁴ WCTL, p. 7.

⁴⁵ See, Ross, Westerfield and Jaffe 2013, p. 326.

⁴⁶ WCTL, p. 7 and p. 31.

⁴⁷ WCTL, p. 37, Levine Statement, p. 13, and Triantis Statement, p. 12-15.

⁴⁸ Roger A. Morin, “*New Regulatory Finance*,” Public Utilities Report, Inc., 2006, p. 156.

ill, arbitrary exclusions of certain historic years ‘because they can never occur again’ strikes us as either naïve, or an exercise in wishful thinking.”⁴⁹ I concur.

As discussed above, the textbook of Professors Ross, Westerfield and Jaffe uses as long a period as possible (1900 to 2013) to determine the MRP using the commercial data put together by Credit Suisse.⁵⁰ The text by Professors Ross, Westerfield and Jaffe is widely used in MBA programs and while the Morningstar / Ibbotson is a commonly used source for the MRP in the U.S., the data by Credit Suisse is commonly used in Europe. It is also common among regulatory cost of capital experts in the U.S. to base the MRP on the historical average MRP back to 1926; often using the Morningstar / Ibbotson data. For example, Professor Morin writes in his textbook that

to avoid data mining, a reasonable solution is to use the entire period for which reliable data is available.⁵¹

This approach is echoed by many practitioners who estimate the cost of equity for regulated entities.⁵² Put differently, there are certainly many applications that use all

⁴⁹ Leonardo R. Giacchino and Jonathan A. Lesser, *“Principles of Utility Corporate Finance,”* Public Utilities Report, Inc., 2011, p. 236.

⁵⁰ Ross, Westerfield and Jaffe 2013, p. 326 and *“Credit Suisse Global Investment Return Sourcebook 2014.”*

⁵¹ Roger A. Morin, *“New Regulatory Finance,”* Public Utilities Report, Inc., 2006, p. 156.

⁵² See, for example, Federal Communication Commission, *“Prescribing the Authorized Rate of Return: Analysis of Methods for Establishing Just and Reasonable Rates for Local Exchange Carriers,”* Wireline Competition Bureau, Staff Report, May 16, 2013 (FCC Staff Report), Direct Testimony and Exhibits of Roger A. Morin in the matter of the application of ALLETE d/b/a Minnesota Power in Docket E-015/GR-08-415, May 2008 (Morin Minnesota Testimony) p. 40; Direct Testimony of Paul R. Moul on behalf of Wisconsin Public Service Corporation in Application for Authority to Adjust Electric and Natural Gas Rates, April 1, 2014 (Moul WPS Testimony) p. 36; Direct testimony of Paul R. Moul for CLECO, July 14, 2008 (Moul Cleco

available data to determine the MRP and there is no specific reason for restricting the data to 50 years as opposed to 60, 40 or something else. Therefore, the use historical data back to 1926 continues to be the norm in many settings and I find that the reliance on all available data to be a reasonable approach. I also note that going back to the post-WWII period or all the way back to 1900 does not change the results substantially (See Table 1). It is noteworthy that **only if** the MRP is measured over a 50-year period does it approach the 5% that the WCTL argues is an upper bound; using a longer or shorter period leads to a substantially higher MRP.

3. Conclusions on the MRP

As Professor Triantis acknowledges:

The standard textbook method to estimate the MRP is to measure the historical difference between returns on an equity index and the returns on a risk-free benchmark.⁵³

I concur and further note that, at 6.96%, the historical average MRP estimated over the period 1926 to 2013 is between the survey results of 4-6% and the forward-looking market-based MRP estimates of 7-10%. Therefore, the historical average MRP is not only objective and easy to measure, but also represents a compromise between the survey results / early academic literature and the forecasted results. In addition, I note

Continued from previous page

Testimony), p. 60-61; Direct Testimony of James H. Vander Weide on behalf of MidAmerican Energy Company, June 25, 2014 (Vander Weide MidAmerican Testimony), p. 36-37. Many of these experts also relied on a forward-looking MRP.

⁵³ Triantis Statement, p. 9.

that it is actually quite common for textbooks, commercial data providers as well as cost of capital experts to rely on the historical average back to 1926.⁵⁴

C. BETA

1. Magnitude of Beta

The Arkansas Electric Cooperative Corporation (AECC) suggests that the Board

could consider setting beta at the "0.8 range" estimate originally provided to the Board by AAR's finance experts, or some other fixed estimate lower than 1 that is reasonably reflective of the unique stability of a revenue adequate rail industry relative to the market.⁵⁵

It appears that the AECC uses the .8 railroad industry beta cited by Professor Myers at the hearing on December 4, 2007 in the Ex. Parte 664 proceeding.⁵⁶ However, the AECC misrepresents Professor Myers statement, which was a summary of the **empirical results from estimating the railroad beta as of 2007**. Professor Myers made no statements about the plausible railroad beta in future years. Professor Myers goes on to

recommend the Commission consider weekly betas, betas weighed based on weekly rates of return here, as well as monthly.⁵⁷

The attached Exhibit BV-1 updates the so-called rolling betas that Professor Myers presented to the Board in 2007. The betas are rolling in the sense that each point

⁵⁴ See e.g., footnote 532 and Ross, Westerfield and Jaffe 2013.

⁵⁵ AECC Comments Regarding Cost-of-Capital Methodology Issues, p. 7.

⁵⁶ Ex Part 664, Transcript from December 4, 2007 Hearing, pp. 39-40.

⁵⁷ Ex Part 664, Transcript from December 4, 2007 Hearing, p. 40.

on the Exhibit BV-1 p. 1 shows the beta you would get looking at the weekly returns over the five years ending on each particular week. Clearly, the railroad beta has increased from about .8 in late 2007 to about 1.3 in 2013-14. Page 2 of the same exhibit presents the same data using monthly returns.

I note that the Board has relied on weekly returns since 2008 using market-value weighted data, which is the data shown in Exhibit BV-1. This continues to be a reasonable and commonly used estimation method.

2. Beta Adjustments

The WCTL and its experts, Dr. Levine and Professor Triantis, argue that the Board should adopt the Blume adjustment for the relied-upon betas and suggest that the Board use Blume-adjusted betas from Value Line or Bloomberg.⁵⁸ The WCTL also notes that other adjustments are sometimes applied, such as the Vasicek adjustment, which weighs the raw beta and what is believed to be the true beta according to the relative reliability (e.g., standard error) of the estimates.⁵⁹ Before discussing the pros and cons of either adjustment, it is important to understand what the adjustments are.

Both Blume (1971)⁶⁰ and Vasicek (1973)⁶¹ formulate their adjustments with the goal of making the empirical *measurements* of a particular stock's beta more likely to accurately estimate the "true beta" reflecting that stock's systematic risk in the context

⁵⁸ WCTL, p. 7. 40-43; Levine Statement, p. 10-12, and Triantis Statement, p. 8-9 and, p. 22-24.

⁵⁹ See, for example, Morningstar, "Ibbotson SBBi 2013 Valuation Yearbook," p. 78 for an exposition.

⁶⁰ M.E. Blume, "On the Assessment of Risk," *Journal of Finance* 26, 1971, pp. 1-10.

⁶¹ O.A. Vasicek, "A Note on Using Cross-Sectional Information in Bayesian Estimation of Security Betas," *Journal of Finance* 28, 1973, pp. 1233-1239.

of the CAPM. When a company's beta is estimated using historical market data, there is some sampling error caused by "noise" in the data and estimation process. The noise is somewhat reduced when a portfolio is used as is the case for the railroad beta. The market-weighted average beta for all assets is by definition 1.0, and repeated measurements indicate that the betas for **individual stocks** are clustered between 0.5 and 1.5. Given this information about the distribution of true betas across the entire market, an extremely high (e.g., 1.8) or low (e.g., 0.2) estimate of beta is more likely to reflect measurement (sampling) error than an accurate reflection of the security's systematic risk. I note that neither the railroad portfolio nor individual railroad betas are in the extreme range.

The Blume adjustment has an additional explicit goal of accounting for the empirical observation (made by Blume in his 1971 paper) that the beta measure for an individual stock tends to move toward the market-weighted average of 1.0 over time. Blume therefore performed a linear regression analysis comparing betas measured in one time period to betas measured in a subsequent time period.⁶² He found that the first period betas were not the best predictor of the subsequent period betas. Rather his 1970s analysis indicated that second-period betas were better predicted by taking a weighted average of the first-period beta estimates and the market-average beta of 1.0. The estimated coefficients of his regression equations suggested a weight of 2/3 on the first-period beta estimate and 1/3 on the market beta of 1.0. This regression analysis

⁶² M.E. Blume, "On the Assessment of Risk," *Journal of Finance* 26, 1971, pp. 1-10.

was the basis for calculating a “Blume adjusted” beta from the “raw” beta estimated based on historical market data:⁶³

$$\beta_{adj}^{Blume} = \frac{1}{3} \cdot 1 + \frac{2}{3} \beta_{raw}$$

Vasicek’s proposed adjustment, by contrast, focuses only on the issue of sampling error. In his 1973 paper on the topic,⁶⁴ Vasicek suggested adjusting an **individual company’s** estimated beta based on its sampling error (variance), relative to the variance in estimates based on prior knowledge/beliefs about the distribution of betas in the market. The Vasicek-adjusted beta for a company is also a weighted average – this one combining the “raw” beta estimate with an estimate based on the assumed prior distribution.⁶⁵ The weights are proportional to the variances of the raw beta estimate and prior beta, such that the estimate with smaller variance (i.e., the one that is estimated with less “noise”, and is thus considered more reliable) receives a higher weight:

$$\beta_{adjusted}^{Vasicek} = \frac{var(\beta_{prior})}{var(\beta_{prior}) + var(\beta_{raw})} \beta_{raw} + \left(1 - \frac{var(\beta_{prior})}{var(\beta_{prior}) + var(\beta_{raw})} \right) \beta_{prior}$$

⁶³ Note that while the “2/3” and “1/3” weightings have been widely adopted as intrinsic to the Blume adjustment, they are really an artifact of Blume’s estimates using NYSE data from the 1930s through the 1960s.

⁶⁴ O.A. Vasicek, “A Note on Using Cross-Sectional Information in Bayesian Estimation of Security Betas,” *Journal of Finance* 28, 1973, pp. 1233-1239.

⁶⁵ The term “prior distribution” refers to a concept in Bayesian statistics, in which statistical inference proceeds by updating an initial set of probability estimates – the “prior” – about a quantity to be estimated based on new information available in the data.

It is important to note that the assumed “prior” in a Vasicek adjustment *need not* be the market as a whole. Vasicek (1973, p 1237) suggested that the distribution of betas within a particular industry may be a better prior in some cases:

In some cases, more can be known about a stock than that it comes from a certain population. ... Thus, if a utility stock is considered, and it is known from previous measurement that betas of utilities are centered around 0.8 with a dispersion of 0.3, the [raw beta] estimate b is adjusted toward 0.8...

Under this interpretation,⁶⁶ the raw beta estimate for a particular company would be adjusted not necessarily toward 1.0, but rather toward a representative beta for companies in the same industry. This is particularly noteworthy in this proceeding, since the STB estimates beta for a value-weighted portfolio designed to represent the railroad industry; in this context, a Vasicek adjustment with an industry prior that uses the Board’s criteria for inclusion in the composite index would not adjust the raw beta at all!

The Blume adjustment, by contrast, always adjusts raw betas towards 1, in accordance with Blume’s empirical observations. However, as Professor Martin Lally points out in his 1998 paper weighing the relative merits of the Blume and Vasicek adjustments,

Blume’s explanation for the observed tendency of true betas to regress towards one invites certain doubts. Blume (1973) attributes the regression to the fact that “...new projects taken on by firms may tend to have less extreme risk characteristics than existing

⁶⁶ For an extensive discussion of the Blume and Vasicek adjustments, including a discussion of how the “industry prior” interpretation for Vasicek is widespread in the financial literature, see M. Lally, “An examination of Blume and Vasicek betas,” *The Financial Review* 33, 1998, pp. 183-198).

projects.”” However there is no reason to believe that this is an immutable law. If it were, all betas would eventually become one!⁶⁷

Lally’s critique highlights the fact that the tendency of betas to regress towards 1.0 on a market-wide basis is an empirical artifact; there is no theoretical explanation for why any individual company’s systematic risk should become more “average” over time.

As a result, if the railroad industry is restricted to the portfolio of railroads that qualify for inclusion in the composite railroad index,⁶⁸ the Vasicek adjusted beta and the raw beta are identical. However, if the railroad industry is expanded to include additional railroads from Value Line Investment Survey (Canadian National, Canadian Pacific, and Genesee & Wyoming),⁶⁹ it is possible to illustrate the adjustment. I emphasize that it is an illustration as the additional entities do not meet the Board’s criteria for inclusion. I also note that while the larger industry has a slightly lower beta, it also has a higher growth rate, so an inclusion in the CAPM but not the MSDCF would be selective and inappropriate.

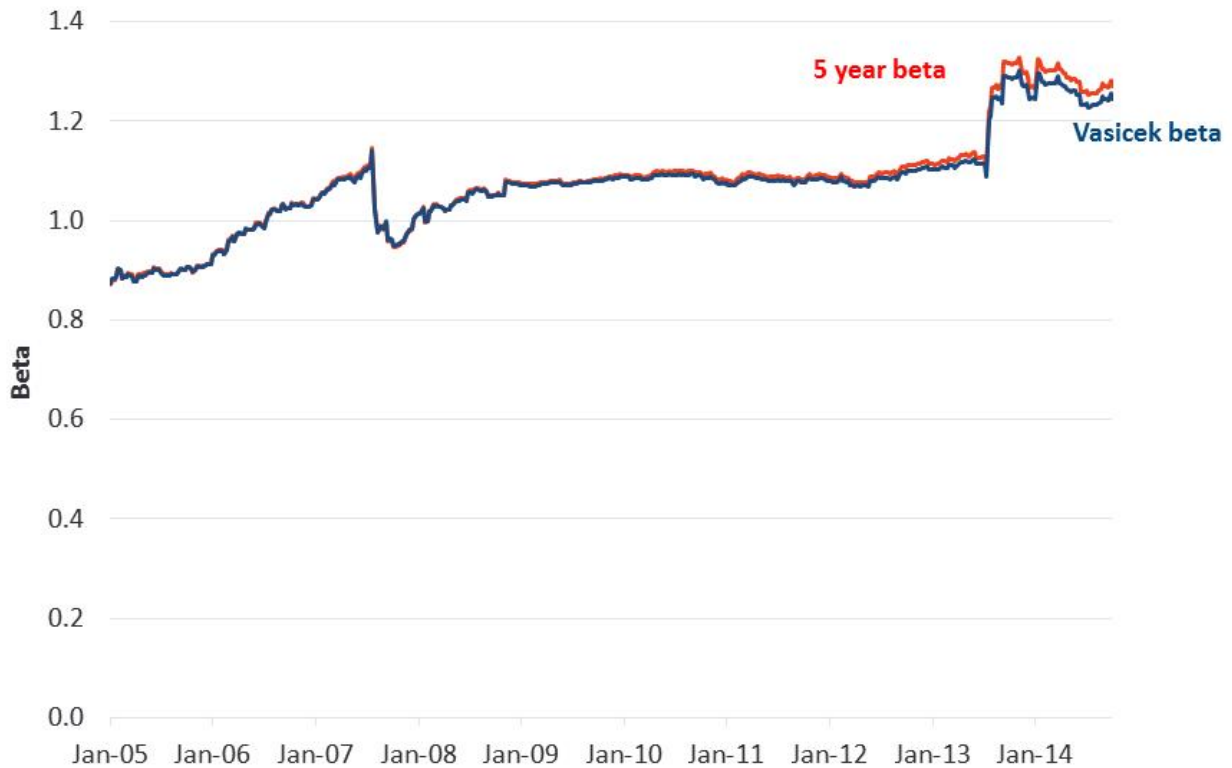
The effect of adjusting the railroad portfolio beta towards the beta of a larger railroad industry using Vasicek’s method is illustrated in Figure 1.

⁶⁷ *Ibid.*, p. 189.

⁶⁸ Class I carriers that (1) are listed on either the New York or American Stock Exchange, (2) paid dividends throughout the year, (3) had rail assets greater than 50% of their total assets, and (4) had a debt rating of at least BBB (Standard & Poor’s) and BAA (Moody’s). See Surface Transportation Board, Decision Docket No. EP 558 (Sub-No. 17), Railroad Cost of Capital – 2013, July 31, 2014, footnote 15.

⁶⁹ Other entities listed in Value Line’s railroad sector (American Railcar, GATX Corp., Greenbrier, and Trinity Inds.) appear to be manufacturing or leasing entities rather than operators of railroads.

Figure 1: Railroad Composite Beta and Vasicek Adjusted Railroad Beta (5-Year Weekly Beta)



As noted in my co-authored report for the CTA, the Vasicek adjustment uses information tailored to the data at hand while the Blume adjustment does not. As a result, the Vasicek adjustment is theoretically preferable but also more complex.⁷⁰ I also note that the report discussed available adjustment methodologies as well as their strengths and weaknesses but did not recommend a specific methodology.⁷¹

⁷⁰ Brattle CTA Report, pp. 40-42.

⁷¹ For an extensive discussion of the Blume and Vasicek adjustments, see M. Lally, "An examination of Blume and Vasicek betas," *The Financial Review* 33, 1998, pp. 183-198).

Further, while Value Line report Blume adjusted betas, as stated by Dr. Levine and Professor Triantis,⁷² Bloomberg provides both raw and Blume-adjusted betas, so both adjusted and raw betas are commercially available. I also note that the Australian Energy Regulator examined both the Blume and Vasicek adjustment and rejected both.⁷³

Finally, while Professor Triantis claims that a study by the Association of Financial Professionals (AFP Study)⁷⁴ “confirms the widespread use of the Blume adjustment”⁷⁵ he fails to note that the publication finds that of all respondents, the use of adjusted versus unadjusted betas is 50-50.⁷⁶

The Board has chosen to adopt a mainstream form of the CAPM model. Consistency and a balanced approach are important, so betas should not be adjusted for the purpose of lowering the cost of equity. Any modifications to the CAPM as currently implemented would need to consider the downward pressure on the risk-free rate from monetary policy and all evidence on the market risk premium rather than unilaterally complicate the beta estimates. As the methodology is used for a period of time, it is important to consider its performance over time; *e.g.*, before and after the financial crisis. Given that the Board relies on the portfolio beta, which is statistically more robust than company-specific betas, the econometrically-grounded Vasicek adjustment

⁷² WCTL, p. 7; Levine Statement, p. 11, and Triantis Statement, p. 22.

⁷³ *Australian Energy Regulator, “Better Regulation: Equity Beta Issues Paper”,* October 2013, p. 25.

⁷⁴ *Association of Financial Professionals, “2013 AFP Estimating and Applying Cost of Capital: Report of Survey Results.”* Attached to Triantis Statement as Exhibit 4

⁷⁵ Triantis Statement, p. 9.

⁷⁶ AFP Study, p. 9.

to beta is not very impactful, as it merely adjusts the beta towards that of the industry. In summary, it would not be appropriate to focus exclusively on beta adjustments or on a specific point in time. Rather, the evaluation of the CAPM implementation should consider both potential upward and downward biases. For betas in particular, it would be important to fully explore the factors that may have impacted the systematic risks of the industry before changing the methodology.

3. Beta and Market Power

The AECC claims that the “CAPM incorrectly interprets an increase in the exercise of rail market power as increased risk”⁷⁷ while the WCTL suggest using adjustments to “address the substantial possibility that the high beta for at least 2013 reflects the exercise of market power by the railroads.”⁷⁸

Neither the AECC nor the WCTL and its experts cite any academic support for this claim. Instead they criticize a 1994 article on the subject⁷⁹ that was provided in prior hearings. The WCTL categorizes the article as “dated,”⁸⁰ while the AECC argues that its empirical findings on the relationship between market power and beta were equivocal.⁸¹ Thus, the totality of academic “evidence” provided by the AECC and WCTL for the proposition that beta increases with market power is that a single paper

⁷⁷ AECC, p. 2.

⁷⁸ WCTL p. 7, 42-43, and 45.

⁷⁹ Paul S. Peyser, “Beta, Market Power, and Wage Uncertainty,” *Journal of Industrial Economics* 217, June 1994.

⁸⁰ WCTL, p. 43. See also AECC, Appendix A p. 6, note 5.

⁸¹ AECC, Appendix A p. 6, note 5.

from 1994 fails to conclusively demonstrate a relationship between beta and market power.

In place of the academic citations or empirical evidence, the AECC cites its own statements from previous proceedings before the Board, in which it argued that if the exercise of market power were to lead to higher stock returns for the railroad industry, this could drive an increase in betas.⁸² This logic is flawed, indicating a fundamental misunderstanding of how beta reflects systematic risk; namely by measuring how company (or portfolio) returns move *relative* to returns on the market. The *level* of returns is immaterial. For an entity's measured beta to increase, its returns would have to increase *more* when the market increases *and decrease more* when the market decreases. If returns were to reach a stable elevated level due to an exercise of market power (or for any other reason), they might reasonably be expected to vary *less* with the market's ups and downs. This would *decrease beta*. Thus, the AECC's claims about the relationship between market power and beta rests on the flawed argument that higher levels of returns would necessarily lead to higher betas.

To the best of my knowledge, there is no literature that finds a positive relationship between market power and systematic risk (beta). The literature on the relationship between beta and market power found that market power reduced beta or that it the relationship could not be measured – **not** that market power increased beta. As a matter of theory, I would expect that a firm that has higher market power and therefore better controls its market would – all else equal – have a lower cost of capital, although it may be impossible to measure the magnitude of the effect. As I discuss

⁸² AECC, Appendix A p. 5, note 3.

below, there are many academic studies confirming that systematic risk is decreased by the exercise of market power. But I have yet to find any academic paper that finds a positive relationship between beta and market power.

To elaborate, Moyer and Chatfield (1983) concluded that “industry concentration ratios and market risk (beta) are strongly related. Firms in highly concentrated industries tend to be associated with low levels of systematic risk and vice versa, ...”⁸³ A similar result is found in Sullivan (1978)⁸⁴ and confirmed in Lee, Chen & Liaw (1995),⁸⁵ who use theoretical model to show that “the firm’s systematic risk is negatively correlated with market power in its product market.”⁸⁶

While there are papers like the Peyser 1994 paper that found an inconclusive relationship between beta and the market power of a firm or industry,⁸⁷ I have not been able to find an academic paper that shows a positive relationship and neither the AECC nor the WCTL or its experts have provided a study that contradicts the existing literature. Therefore, the increase in the industry’s beta estimate is more likely to have been caused by other factors such as the financial crisis of 2008 leading the 2008-12 betas to drop, the large capital expenditures in the industry, or the composition of the industry’s traffic mix.

⁸³ R. Charles Moyer and Robert Chatfield, “Market Power and Systematic Risk,” *Journal of Economics and Business* 35, 1983, p. 128-129.

⁸⁴ Timothy G. Sullivan, “The Cost of Capital and the Market Power of Firms,” *The Review of Economics and Statistics* 60, 1978, pp. 209-217.

⁸⁵ This paper is essentially an extension of the 1994 Peyser paper cited by the WCTL.

⁸⁶ Cheng-Few Lee, K.C. Chen and K. Thomas Liaw, “Systematic Risk, Wage Rates, and Factor Substitution,” *Journal of Economics and Business* 47, 1995, p. 277.

⁸⁷ See, for example, Kit Pong Wong, “Cournot Oligopoly and Systematic Risk,” *Journal of Economics and Business* 47, 1995 and the Peyser 1994 paper cited by the WCTL.

First, Figure 1 and Exhibit BV-1 attached to this Reply Statement shows that the railroad betas dropped at the start of the financial crisis and then recovered in 2013, when the last data pertaining to 2008 were excluded from the 5-year estimation period. Because beta is measured against the market, the beta of an individual firm or industry is effected by market developments and the composition of the market. Thus, a change could be caused by changes in the industry or by changes in the market. As Figure 1 above shows, the railroad beta dropped substantially at the start of the financial crisis in 2008 and then recovered once the data pertaining to the start of the crisis dropped out of the estimation. *I.e.*, it appears that the railroad beta in 2013 simply went back to its pre-crisis trend. This explains the increase in beta for 2013.

Second, regarding the impact of the increasing capital expenditure, Professors Berk and DeMarzo of Stanford University comment on the effect of increasing fixed costs to variable costs:

Another factor that can affect the market risk of a project is its degree of operating leverage, which is the relative proportion of fixed versus variable cost.⁸⁸

Professor Morin states:

Higher margins, due to increased fixed cost or operating leverage, magnify the effect of demand risk on beta.⁸⁹

Similarly, Professors Ross, Westerfield, and Jaffe, state:

Operating leverage magnifies the effect of the cyclicity of a firm's revenues on beta. That is, a firm with a given sales

⁸⁸ Jonathan Berk and Peter DeMarzo, *Corporate Finance: The Core*, 3rd edition, 2014, p. 420.

⁸⁹ Roger A. Morin, *New Regulatory Finance*, 2006, p. 238.

cyclicality will increase its beta if fixed costs replace variable cost in its production process.⁹⁰

Thus, to the degree that capital expenditures increase operating leverage, the cost of capital increases. Therefore, it is plausible that the large capital expenditures by the railroad industry in recent years have increased the relative share of fixed costs in the railroad industry's costs.

Third, the beta of the railroad industry depends on systematic risk of the railroad assets and the variability of the industry's returns relative to the market. Therefore, if the composition of the railroad industry's assets or the return that is generated from these assets has changed, the systematic risk has changed. So since 2007 there has been a reduction in the amount of coal, transportation equipment and mixed shipments that the Class I railroads carry, while there has been an increase in chemicals, crude and food products,⁹¹ there may have been a shift in the risk profile of the industry in recent years.

In summary, there is no evidence that the estimated railroad betas have increased due to "market power." It is much more plausible that railroad betas have simply recovered from the impact of the financial crisis. It is also possible that they have increased due to other factors such as capital expansions and / or because of a change in the risk of the railroads' cash flow caused by changing traffic mix.

⁹⁰ Stephen A. Ross, Randolph W. Westerfield, and Jeffrey Jaffe, *Corporate Finance*, 10th edition, 2013, p. 410.

⁹¹ AAR, "Railroad 10-year trends 2003-2012," pp. 45-46.

D. RISK-FREE RATE AND MRP

The Levine Statement submitted in support of WCTL looks at risk-free rates of varying maturity and states that “the STB employs a relatively high risk-free rate in its CAPM calculation. ... Thus, there has been no downward pull on the CAPM results since 2008, emanating from the risk-free, interest rate component.”⁹² In its Opening Comments, the WTCL argues similarly that “... the AFP 2013 survey indicates that the 5% (or lower) MRP is typically utilized in conjunction with a [risk-free rate] that is lower than the 20-year U.S. Treasury. ... Consequently, the total market return expected by the respondents is even further below the return indicated by the Board’s CAPM.”⁹³

This commentary is both confusing and misguided. When Dr. Levine refers to a lack of “downward pull” from the risk-free rate, I believe he means to argue that using a lower risk-free rate would necessarily decrease the CAPM results. The WCTL seems to be making the same claim. However, according to fundamental finance principles, it is incorrect to consider the direct effects of a lower risk-free rate on the CAPM without also considering its impact on the MRP. The MRP must be measured over a certain risk-free rate, so if the maturity of the risk-free rate is reduced, the MRP needs to be measured over that shorter maturity risk-free rate. Because it usually is more costly to borrow long term than short term (the yield curve is increasing), the MRP measured over 10-year Treasury bonds will be higher than the MRP measured over 20-year Treasury bonds. Thus, contrary to the arguments of the WCTL and Dr. Levine, there would two effects on the CAPM from using a shorter-maturity instrument for the risk-

⁹² Levine Statement p. 10-11.

⁹³ WCTL, p. 36.

free rate: a direct decrease due to the lower interest rate *and* an increase due to using a higher MRP.

The Ibbotson MRP relied upon by the Board is measured over long-term government bonds, which Ibbotson defines as bonds having a “maturity near 20 years.”⁹⁴ Therefore, the Board’s use of a 20-year risk-free rate and the Ibbotson long-term MRP is consistent.⁹⁵

IV. OTHER RESPONSES

A. THE COST OF CAPITAL DEPENDS ON ITS USE, NOT ITS OWNER

The Levine Statement on p. 5 states that “the actual cost of capital to the BNSF is the cost of capital to BH [Berkshire Hathaway].” The WCTL cites this statement to support its claim that “[e]xcluding BNSF...inflates the beta of the remaining railroads. This distortion is particularly significant in the case of BNSF itself because BNSF’s parent has a very low beta.”⁹⁶ However, the notion that BNSF’s cost of capital is equal to that of its corporate parent is a fundamental misconception. Standard financial economics hold that the cost of capital depends on the risk of the underlying assets and **not** on the owner of the asset. As noted by Professors Ross, Westerfield and Jaffe,

If a corporation has a number of divisions, each in a different industry, it would be a mistake to assign the same discount rate to each division.⁹⁷

⁹⁴ Morningstar, “Ibbotson SBBI 2013 Valuation Yearbook,” p. 221.

⁹⁵ For additional discussion of this point, see Exhibit BV-2, pp. 22-23.

⁹⁶ WCTL, p 42.

⁹⁷ Stephen A. Ross, Randolph W. Westerfield, and Jeffrey Jaffe, “Corporate Finance,” 10th Edition, 2013 (Ross, Westerfield & Jaffe 2013), p. 413.

Professors Brealey, Myers and Allen agree

The opportunity cost of capital depends on the use to which that capital is put.... The true cost of capital depends on project risk, not on the company undertaking the project.⁹⁸

Thus, using Berkshire Hathaway's beta as a proxy for the beta of BNSF would violate basic financial economics principles.

B. USING MORE THAN ONE METHOD TO ESTIMATE THE COST OF EQUITY IS COMMON AND BEST PRACTICE FOR REGULATORY PURPOSES.

WCTL relies on the Triantis Statement to argue that the CAPM is "vastly preferred to other COE approaches."⁹⁹ Yet, the vast majority of U.S. state regulatory commissions look to more than one method when determining utilities' cost of equity and several state tax authorities combine the CAPM and a version of the DCF to determine ad valorem taxes. Also, the Federal Energy Regulatory Commission (FERC) relies exclusively on a version of the discounted cash flow model to estimate the COE. Thus, there is ample precedent for using more than one method among regulatory entities and expert witnesses often present evidence on multiple methods. As expressed by Professor Morin, in a utility rate case in response to the question

Does the financial literature support the use of more than a single method to determine return on equity?

Dr. Morin replies:

⁹⁸ Richard A. Brealey, Stewart C. Myers, and Franklin Allen, *Principles of Corporate Finance*, 11th Edition, 2014 (Brealey, Myers & Allen 2014), p. 219-220.

⁹⁹ WCTL, p. 20. See also Triantis Statement, p. 5-6.

Yes. The authoritative financial literature strongly supports the use of multiple methods.¹⁰⁰

And he explains:

Each methodology has its own way of examining investor behavior, its own premises, and its own set of simplifications of reality. Investors do not necessarily subscribe to any one method, nor does the stock price reflect the application of any one single method by the price-setting investor. Absent any hard evidence as to which method outperforms the other, all relevant evidence should be used, without discounting the value of any results, in order to minimize judgmental error, measurement error, and conceptual infirmities.¹⁰¹

Similarly, many other cost of capital experts recommend using more than one method.¹⁰² A recent report by the staff of the Federal Communication Commission also endorsed the use of more than one method including the CAPM and a DCF model.¹⁰³ I wholeheartedly agree with Professor Morin and other cost of capital experts that it is important to use more than one method as discussed in my Verified Statement.¹⁰⁴

¹⁰⁰ Morin Minnesota Testimony, page 22.

¹⁰¹ *Ibid.*, page 21 - 22.

¹⁰² *Ibid.*, page 22. Some other recent examples of the reliance on multiple models for the purpose of determining the cost of equity for regulated companies are found in the Direct Testimony of Paul R. Moul on behalf of Wisconsin Public Service Corporation in Application for Authority to Adjust Electric and Natural Gas Rates, April 1, 2014 (Moul WPS Testimony) p. 5; Direct testimony of Paul R. Moul for CLECO, July 14, 2008 (Moul Cleco Testimony), p. 5; Direct Testimony of Robert B. Hevert on behalf of Union Electric Company, Ameren Missouri, July 3, 2014 (Hevert Ameren Testimony), p. 7; Direct Testimony of Roger A. Morin on behalf of Minnesota Power, May 2, 2008 (Morin Minnesota Power Testimony), p. ; Direct Testimony of James H. Vander Weide on behalf of MidAmerican Energy Company, June 25, 2014 (Vander Weide MidAmerican Testimony).

¹⁰³ FCC Staff Report at 7147-7148.

¹⁰⁴ Villadsen Statement p. 4-8 and sources referenced.

C. BNSF'S FAIRNESS OPINION

In its Opening Comments, the WCTL refers to certain cost of capital estimates used in valuation analyses performed by Goldman Sachs and Evercore as part of the SEC Form S-4 for the acquisition of BNSF by Berkshire Hathaway. However, in comparing the Board's 2009 overall (or "composite") cost of capital to the weighted average cost of capital "benchmarks" calculated by Goldman Sachs and Evercore, the WCTL makes a fundamental mischaracterization, resulting in a specious comparison.

The source of the confusion lies in the different goals (and corresponding differences in methodology) of the cost of capital calculations performed by the Board and those performed by BNSF's financial advisors. The 10.43% Composite Cost-of-Capital computed by the Board for 2009 represents a required return on assets independent of financing – what corporate finance textbooks refer to as an "unlevered cost of capital"¹⁰⁵ – that is calculated as a weighted average of the *pre-tax* cost of debt and the *after-tax* cost of equity.¹⁰⁶

$$(1) \quad r_U = (\%E) \cdot r_E + (\%D) \cdot r_D$$

In contrast, when financial analysts perform valuation analyses using the Discounted Cash Flow (DCF) method, they typically employ an implicitly *after-tax*

¹⁰⁵ See, for example, Jonathan Berk and Peter DeMarzo, *Corporate Finance*, 2nd ed. (Prentice Hall, 2011), p. 391 and 398.

¹⁰⁶ Surface Transportation Board Corrected Decision, Docket No. EP 558 (Sub-No. 13) Railroad Cost of Capital – 2009, page 12. Note that the reference to "... the 2009 composite after-tax cost of capital" means that the cost of *equity* was computed based on the *levered, after-tax* cash flows of the railroads (in the DCF method) and the *levered* (implicitly after-tax) portfolio beta (in the CAPM). The STB's Composite Cost of Capital incorporates the after-tax cost of equity, but uses the *pre-tax* cost of debt.

version of the weighted average cost of capital (WACC). Indeed, when valuing a firm as the sum of its discounted *unlevered* free cash flows,¹⁰⁷ corporate finance theory *requires* that the discount rate account for the tax deductibility of interest payments. In other words, when discounting unlevered free cash flows, the correct discount rate for this kind of valuation analysis is the *after-tax* WACC.¹⁰⁸

$$(2) \quad r_{WACC} = (\%E) \cdot r_E + (\%D) \cdot r_D(1 - \tau_c)$$

Assuming Goldman Sachs and Evercore used standard finance theory, the “weighted average cost of capital” in BNSF’s Fairness Opinion must refer to the *after-tax* WACC (r_{WACC}), not the unlevered cost of capital (r_U). The description of Evercore’s DCF analysis confirms this. Evercore explicitly states that it is discounting “projected unlevered free cash flows” and a terminal value calculated as a multiple of BNSF’s “2014 projected EBITDA” (i.e., earnings *before interest, taxes, depreciation and* amortization) and thus must use a weighted average cost of capital that accounts for the tax deductibility of interest.

Evercore calculated implied per share equity reference ranges for BNSF ... based on the sum of the (i) implied present values, using discount rates ranging from 8.0% to 10.0% derived by taking into consideration, among other

¹⁰⁷ *Unlevered free cash flows* (also called *free cash flows to capital* or simply *free cash flows*) represent the cash flows that accrue to all the owners of a firm – both the equity holders and debt holders. They are *unlevered* in the sense that they neither deduct interest payments, nor account for the tax deductibility of those interest payments – they are the cash flows to capital that would occur if the firm had no debt and were 100% financed by equity. When performing DCF valuation analyses, analysts forecast unlevered free cash flows and then use a discount rate – the after tax WACC – that accounts for the actual financing and debt tax benefits of the project.

¹⁰⁸ Jonathan Berk and Peter DeMarzo, *Corporate Finance*, 2nd ed. (Prentice Hall, 2011), p. 596. See also Richard A. Brealey, Stewart C. Myers, Franklin Allen, *Principles of Corporate Finance*, 10th ed. (McGraw-Hill, 2011), p. 433.

things, a **weighted average cost of capital calculation**, of **BNSF's projected unlevered free cash flows** for calendar years 2010 through 2014 and (ii) implied present values, using discount rates ranging from 8.0% to 10.0%, of the **terminal value of BNSF's future cash flows** beyond calendar year 2014 calculated by applying a range of EBITDA terminal multiples of 6.75x to 8.25x derived from the selected peer companies as described in "Peer Group Trading Analysis" above to BNSF's calendar year **2014 projected EBITDA**.¹⁰⁹

Goldman Sachs likewise must have performed its DCF analysis using the after-tax WACC. The description of that analysis in the SEC Form S-4 indicates that "Goldman Sachs ... calculated the present value of BNSF's terminal value at December 31, 2014 by applying a range of **enterprise value/EBITDA multiples** of 5.5x to 9.5x to **BNSF's estimated 2014 EBITDA**."¹¹⁰ EBITDA is a common proxy for unlevered free cash flows, in that it also ignores the tax deductibility of interest payments. By using EBITDA to calculate terminal value on an enterprise value (i.e., the value of the entire firm independent of its financing) basis, Goldman Sachs reveals that it was projecting cash flows as they would accrue to BNSF's assets if they were 100% equity financed. Therefore, correct application of fundamental corporate finance principles would again require the analysts to discount those cash flows using the after-tax WACC.

Therefore, the weighted average cost of capital ranges used by Goldman Sachs (7-11%) and Evercore (8-10%) are clearly after-tax WACC (r_{WACC}) numbers, while the

¹⁰⁹ Amendment No. 2 to SEC Form S-4 ("SEC Form S-4"), filed December 23, 2009 by Berkshire Hathaway, Inc. with respect to its merger agreement with Burlington Northern Santa Fe Corporation, page 61. Emphasis added.

¹¹⁰ SEC Form S-4, page 49. Emphasis added.

Board's Composite Cost of Capital for the same time period (10.43%) represents the unlevered cost of capital (r_U), calculated using the *pre-tax* cost of debt and the *after-tax* cost of equity. The two are not the same and the former cannot be used directly as valid benchmarks for the latter.

It is, however, a simple matter to restate either estimate to permit a valid comparison. Indeed, the two quantities differ only by the so-called interest tax shield, which is the cost of debt times the tax rate. The after-tax WACC is simply the unlevered cost of capital, less the interest tax shield weighted by the percentage of debt in the capital structure:

$$(3) \quad r_{WACC} = r_U - (\%D) \cdot r_D \cdot \tau_C$$

$$\text{Or} \quad r_U = r_{WACC} + (\%D) \cdot r_D \cdot \tau_C$$

To allow for an true "apples-to-apples" comparison between the STB's cost of capital calculation and the weighted average cost of capital ranges used in BNSF's Fairness Opinion, I have used the parameters from the 2009 STB Cost of Capital Decision, along with a representative marginal composite corporate tax rate of 40%, to determine the equivalent unlevered cost of capital corresponding with the discount rates used by Evercore and Goldman Sachs. Table 3 below shows the conversion of several after-tax WACC (r_{WACC}) estimates within the Goldman and Evercore ranges to unlevered cost of capital (r_U) estimates by adding back the weighted value of the interest tax shield.

For example, the "median" discount rate used in both Evercore's and Goldman Sachs's DCF valuation analyses was 9%. As explained above, this is an after-tax WACC (r_{WACC}), which implicitly accounts for the tax-deductibility of interest payments by

subtracting the weighted value interest tax shield from the unlevered cost of capital (r_U). Using the STB's 2009 cost of debt ($r_D = 5.72\%$) and a 40% tax rate, I calculate that the interest tax shield equates to a 2.92% return ($0.40 \cdot 5.72\% = 2.29\%$). Applying the STB's 2009 debt percentage in the railroad capital structure ($\%D = 29.10\%$), provides an estimate of 0.67% as the weighted value of the interest tax shield ($0.2910 \cdot 2.29\% = 0.67\%$). I add this value back to the 9% after-tax WACC to get an unlevered cost of capital of 9.67%. Table 3 below shows this calculation for the full range of Goldman Sachs's estimates. The resulting unlevered cost of capital values run from 7.7% to 11.7%. The 10.43% composite cost of capital for the railroad industry for 2009 is thus well within both the 7.7% to 11.7% range estimated by Goldman Sachs and the narrower 8.7% to 10.7% range estimated by Evercore.

Table 3 – Conversion of After-tax WACC Discount Rates to Unlevered Cost of Capital

Pre-tax Cost of Debt	[a]	5.72%
Tax Rate	[b]	40.00%
Interest Tax Shield	[c] = [a]*[b]	2.29%
Debt Percentage in Capital Structure	[d]	29.10%
Weighted Interest Tax Shield	[e] = [c]*[d]	0.67%

After-tax WACC Discount Rate		Weighted Interest Tax Shield	Equivalent Unlevered Cost of Capital
[1]		[2]	[3] = [1] + [2]
7.0%	[f]	0.67%	7.7%
8.0%	[g]	0.67%	8.7%
9.0%	[h]	0.67%	9.7%
10.0%	[i]	0.67%	10.7%
11.0%	[j]	0.67%	11.7%

Sources & Notes:

[a],[d]: Surface Transportation Board Corrected Decision, Docket No. 558 (Sub-No. 13) Railroad Cost of Capital--2009.

[b]: Representative composite state and federal corporate marginal tax rate

[f]-[j]: Range of discount rates used in Goldman Sachs's DCF valuation analysis per BNSF's Fairness Opinion.

[g]-[i]: Range of discount rates used in Evercore's DCF valuation analysis per BNSF's Fairness Opinion.

The WCTL's mischaracterization of the weighted average cost of capital ranges used by Goldman Sachs and Evercore (i.e., treating them as though they represented an unlevered cost of capital rather than a true after-tax weighted average cost of capital) renders its "benchmarking" of the Board's 10.43% Composite Cost of Capital invalid.

Furthermore, it is possible to estimate the cost of equity implied by a given after-tax WACC. Applying Equation 4 below, I have determined that--using the parameters from the Board's 2009 Cost of Capital Decision and a 40% representative corporate tax rate--the cost of equity consistent with an after-tax weighted average cost of capital of 10.0% is 12.7%. Similarly, the cost of equity implied by an 11.0% after-tax weighted average cost of capital is 14.1%. This means that that 12.37% Cost of Common Equity determined by the Board for 2009 (based on the CAPM and MSDCF models) is consistent with some of the "benchmark" cost of capital estimates considered by BNSF's financial advisors and reported in the SEC Form S-4 for Berkshire Hathaway's acquisition of BNSF.¹¹¹

$$(4) \quad r_E = \frac{r_{WACC} - (\%D)r_D(1-\tau_c)}{\%E}$$

The WCTL's improper apples-to-oranges comparison also calls into question the its claims that "[t]he Board's MSDCF COE for 2009 ... exceeded the highest COE value (12%) considered by either Goldman Sachs or Evercore" and that "[e]ven the CAPM [sic] COE of 11.39% falls substantially above the Goldman Sachs median COE of 10% and also exceeds the Evercore median COE of 11%."¹¹² As demonstrated above, the

¹¹¹ The SEC Form S-4 refers to certain "cost of equity calculations" performed by Evercore and Goldman Sachs in reference to other valuation methods. However, BNSF's financial advisors can be assumed to have considered cost of equity estimates consistent with the after-tax cost of capital discount rates they used for DCF valuation.

¹¹² WCTL, p. 12.

weighted average cost of capital ranges used by the financial advisors imply COE values as high as 14.1% (for Goldman Sachs) and 12.7% (for Evercore); furthermore, according to Equation 4, the “median” after-tax WACC used by both companies (9%), implies a COE of 11.3%. Thus the WCTL’s claims about the relationship of the Board’s 2009 cost of equity estimates to the values “considered by either Goldman Sachs or Evercore” are exaggerated at best.

Finally, it is worth noting that these claims are accompanied by a thoroughly misleading statement, namely that “the 13.34% [MSDCF COE] for 2009 was the **lowest** MSDCF COE value during 2008-2013.”¹¹³ It would seem the WCTL is implying that other years’ MSDCF COE values can meaningfully be compared to the cost of capital estimates used in BNSF’s Fairness Opinion. However, since the opinions of Goldman Sachs and Evercore were officially rendered on November 2, 2009,¹¹⁴ it is reasonable to assume that the cost of capital calculations would rely on data of similar vintage to that used by the STB in determining its 2009 cost of capital for the railroad industry. It defies logic and financial practice to suggest that the financial advisors’ 2009 calculations would represent a valid benchmark for the cost of capital in, for example, 2012.

¹¹³ WCTL, p. 12. Emphasis in original.

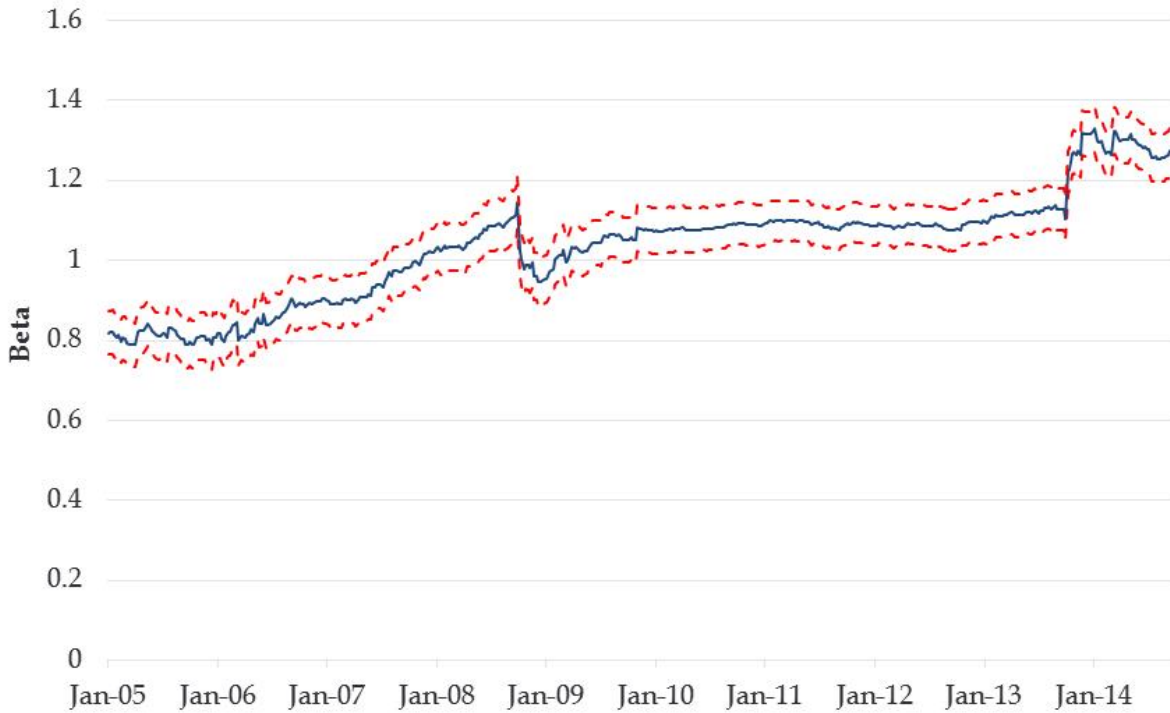
¹¹⁴ SEC Form S-4, pages C-1 and D-1.

EXHIBIT BV-1
Rolling Five-Year Betas for the Railroad Industry

Exhibit 1, Panel A

Rolling Five-year Betas for the Railroad Industry

Weekly Returns



Sources and notes: Market Capitalization and returns for railroad stocks and the S&P 500 Index from Bloomberg as of 10/10/2014. Betas are calculated from weekly rates of return on a market-value weighted portfolio of the five major US railroads: CSX, NSC, KSU, UNP, and BNI (until February 12, 2010 when BNI was bought). 3-month Treasury bill rates are subtracted from the portfolio and market returns. The Regression equation includes an intercept. Data include returns from 2000. Dashed lines show beta estimates plus and minus one standard error.

Exhibit 1, Panel B

Rolling Five-year Betas for the Railroad Industry

Monthly Returns



Sources and notes: Market Capitalization and returns for railroad stocks and the S&P 500 Index from Bloomberg as of 10/10/2014. Betas are calculated from monthly rates of return on a market-value weighted portfolio of the five major US railroads: CSX, KSU, NSC, UNP, and BNI (until February 12, 2010 when BNI was bought). 3-month Treasury bill rates are subtracted from the portfolio and market returns. The Regression equation includes an intercept. Data include returns from 2000. Dashed lines show beta estimates plus and minus one standard error.

EXHIBIT BV-2

Review of Regulatory Cost of Capital Methodologies

Prepared by: Michael J. Vilbert, Bente Villadsen and Matthew Aharonian

For

The Canadian Transportation Agency

September 2010

EXHIBIT BV-3
Figure 1 from Duarte & Rosa 2014

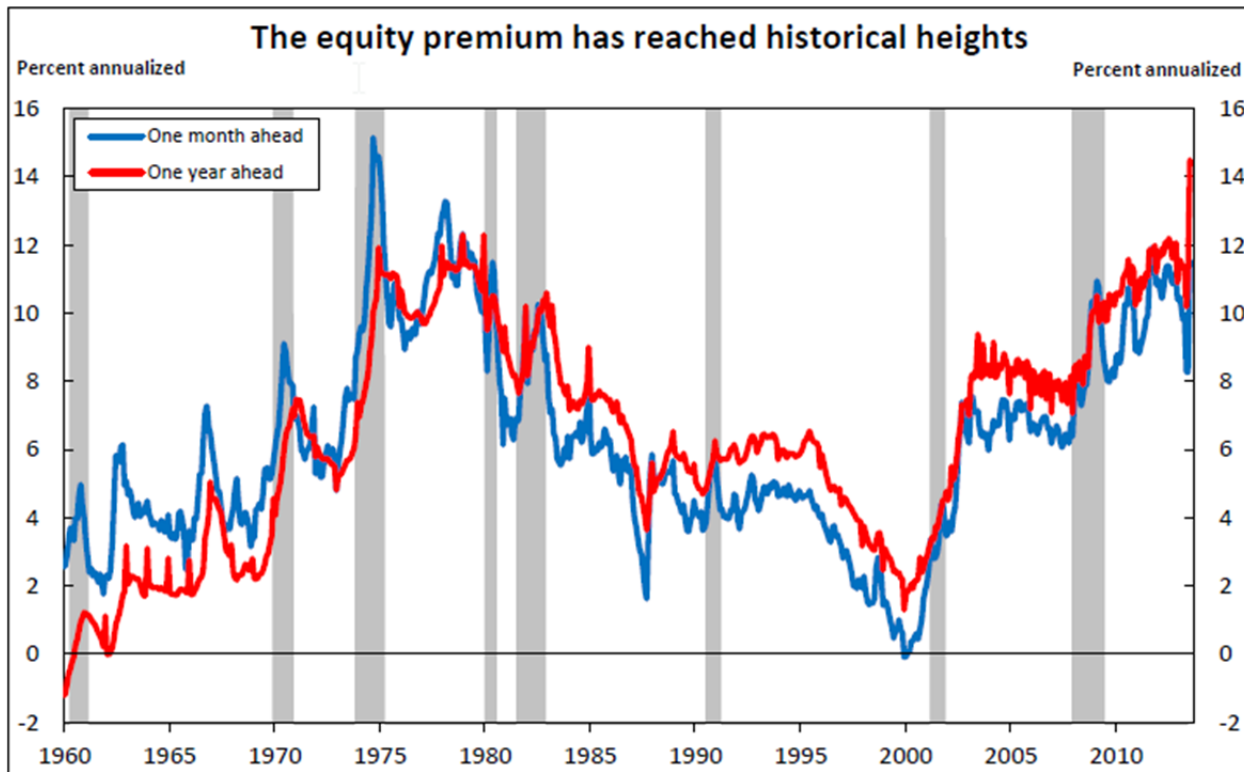


Figure 1 The equity risk premium (expected excess returns) over a one year ahead and one month ahead horizons are the first principal components of 20 models of the equity premium. The models include time-series and cross-sectional regressions, dividend discount models and surveys. Shaded bars are NBER recessions.

Source: Fernando Duarte and Carlo Rosa, "The Equity Risk Premium: A Consensus of Models," Federal Reserve Bank of New York, 2014, Figure 1.

EXHIBIT BV-4
Derivation of the Value Line Forecasted MRP
