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**BEFORE THE
SURFACE TRANSPORTATION BOARD**

PETITION OF THE WESTERN	)	
COAL TRAFFIC LEAGUE TO	)	
INSTITUTE A RULEMAKING	)	
PROCEEDING TO ABOLISH THE	)	EP 664 (Sub-No. 2)
USE OF THE MULTI-STAGE	)	
DISCOUNTED CASH FLOW	)	
MODEL IN DETERMINING THE	)	
RAILROAD INDUSTRY'S COST OF	)	
EQUITY CAPITAL	)	

OPENING COMMENTS OF THE WESTERN COAL TRAFFIC LEAGUE

WESTERN COAL TRAFFIC LEAGUE

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Pursuant to the decisions that the Surface Transportation Board (“Board” or “STB”) served in the above-captioned proceeding on December 20, 2013, April 2, 2014, and June 16, 2014, the Western Coal Traffic League (“WCTL”)¹ hereby submits its opening comments regarding the methodology that the Board should utilize to calculate the cost of equity (“COE”) portion of the railroad industry current cost of capital (“COC”).

¹ WCTL is a voluntary association, whose regular membership consists entirely of shippers of coal mined west of the Mississippi River that is transported by rail. WCTL members currently ship and receive in excess of 140 million tons of coal by rail each year. WCTL’s members are: Ameren Missouri, Arizona Electric Power Cooperative, Inc., CLECO Corporation, Austin Energy (City of Austin, Texas), CPS Energy, Entergy Services, Inc., Kansas City Power & Light Company, Lower Colorado River Authority, MidAmerican Energy Company, Minnesota Power, Nebraska Public Power District, Omaha Public Power District, Texas Municipal Power Agency, Western Fuels Association, Inc., and Wisconsin Public Service Corporation.

I. INTRODUCTION

The COC is a critical input for calculating variable costs, the associated jurisdictional threshold, stand-alone costs, and other Board-determined costs. The COE comprises most of the COC. A COE that overstates the railroads' opportunity cost of equity directly exposes captive shippers, including WCTL members, to unreasonably high rail rates. The burden of those high rail rates largely falls to the nation's consumers. The COC also colors the general perception of railroad costs, the level and reasonableness of railroad rates, and the health of the railroad industry. An accurate COC is important to WCTL and its members, as well as shippers generally.

In its January 2008 *CAPM Decision*,² the Board substantially improved its methodology for estimating the COE by replacing its flawed single-stage discounted cash flow ("SSDCF") methodology with the Capital Asset Pricing Model ("CAPM"). The change produced an immediate decline in the COE from 15.18% in 2005 under the SSDCF to 11.13% in 2006 under the CAPM.

Regrettably, the Board took a major step backwards just a year later in its *MSDCF Decision*³ when it adopted, at the behest of the Association of American Railroads ("AAR") and over WCTL's vigorous objections, a hybrid approach to calculate the COE as the simple average of its CAPM and Multi-Stage Discounted Cash Flow

² *Methodology to be Employed in Determining the Railroad Industry's Cost of Capital*, EP 664 (STB served Jan. 17, 2008) ("*CAPM Decision*").

³ *Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital*, EP 664 (Sub-No. 1) (STB served Jan. 28, 2009) ("*MSDCF Decision*").

(“MSDCF”) models. In 2008, the first year that the STB utilized its hybrid approach, the COC was 11.75%, not far below the 2005 SSDCF COC of 12.19%.

In the EP 664 (Sub-No. 1) proceedings leading to the *MSDCF Decision*, and in the subsequent annual COC determinations in EP 558, WCTL repeatedly noted various defects and deficiencies in the Board’s hybrid methodology and in the resulting annual determinations. The Board’s standard response in the annual EP 558 proceedings was that if WCTL wanted its concerns to be heard, it needed to file a petition to institute a rulemaking.⁴

WCTL filed such a petition in the instant docket on August 27, 2013. On December 20, 2013, the Board granted WCTL’s petition, over the objections of the AAR, and initiated this proceeding. On April 2, 2014, the Board served its notice requesting comments on how the Board should calculate the COE portion of the COC, and not merely on whether the Board should discard the MSDCF and return to relying solely on the CAPM.

Accordingly, WCTL submits its comments on how the STB should reform its calculation of the railroad industry COE. WCTL’s comments include verified statements from two finance experts, Dr. Harvey A. Levine and Professor Alexander J. Triantis. Dr. Levine is the former Vice President and Chief Economist of the AAR, where he was responsible for the AAR’s cost of capital submissions for eighteen years.

⁴ The Board maintained this position in its 2013 COC determination, even after WCTL filed its petition and the Board perceived enough merit to initiate the instant rulemaking. *Railroad Cost of Capital--2013*, EP 558 (Sub-No. 17) (STB served July 31, 2014), at 2.

Since that time, he has continued to consult and testify on railroad matters, including the cost of capital. Professor Triantis is the Dean and a Professor of Finance at the Robert H. Smith School of Business at the University of Maryland. Professor Triantis specializes in corporate finance, including matters involving the calculation and application of the cost of capital.⁵

II. SUMMARY

As explained in the attached verified statements of Dr. Levine (“Levine VS”) and Professor Triantis (“Triantis VS”), the Board should take three steps to improve its methodology for estimating the COE:

- First, the Board should discard the MSDCF and rely solely on the CAPM.
- Second, the Board should utilize a more realistic market risk premium (“MRP”) in the CAPM.
- Third, the Board’s CAPM should use a Blume-adjusted beta, such as that prepared by Value Line and Bloomberg.

Making these changes will result in a COE that better reflects the opportunity costs of investing in railroading, as perceived by the financial community, and will address the overcompensation that railroads receive at the expense of captive shippers. The Board’s methodology will also better reflect the standard practices within the financial community. The changes will also bring the Board’s practices close to those

⁵ Professor Triantis’s PhD advisor was Professor James E. Hodder. Professor Hodder, now an Emeritus Professor, is currently serving as a Visiting Scholar at the Securities and Exchange Commission and is not available as an expert witness for WCTL.

of the Canadian Transportation Agency (“CTA”), which recently reviewed these issues in substantial depth with full awareness of the Board’s hybrid methodology. Conversely, failure to take these measures will result in continuing inaccuracy in railroad COE/COC values and regulatory costs.⁶

The single best thing that the Board can do to improve its COE determinations is to eliminate the MSDCF and rely entirely on the CAPM. The MSDCF has created inaccuracy and overstatement in the Board’s COE. The MSDCF’s impact has been far greater and more adverse than depicted when it was added. The MSDCF lacks transparency and the CAPM’s direct linkage to the risk-reward relationship, investor expectations, and the market as a whole. The MSDCF instead exists in a self-contained universe that is heavily dependent on projected cashflows, which are difficult to predict, and a relationship between those future cashflows and the current market price that is inherently speculative and not amenable to confirmation. Even if the MSDCF methodology were otherwise sound, ongoing railroad stock buybacks distort its application by creating a mismatch between even accurate projections of growth in earnings per share and future firm-wide earnings and cashflows. The MSDCF is thus

⁶ Some problems will remain. In particular, the market treats operating leases as debt, but the Board refuses to do so based on generally accepted accounting principles (“GAAP”). However, the cost of capital is not part of GAAP, and the Board recognized its ability to depart from GAAP in *Western Coal Traffic League--Petition for Declaratory Order*, FD 35506 (STB served July 25, 2013), at 12 (“Because the statute directs the agency to follow GAAP ‘to the maximum extent practicable,’ we retain discretion to determine what is practicable and when deviations from GAAP are necessary.”). Another problem is that the Board’s composite sample excludes BNSF because it is now part of Berkshire Hathaway, Inc., but now includes the much smaller KCS. Dr. Levine explains how the CAPM may be adjusted to reflect a beta for BNSF.

prone to distortion in multiple respects, leading the CTA to reject it as even part of its COE methodology. *See* CTA Decision No. 425-R-2011, *Review of the methodology used by the CTA to determine the cost of capital for federally-regulated railway companies* (Dec. 9, 2011), *available at* <https://www.otc-cta.gc.ca/eng/ruling/425-r-2011> (“*CTA Decision*”). The Board should likewise reject use of the MSDCF.

The CAPM-only COE values will also be far more consistent with the COE values available from and utilized by the financial community. Unfortunately, the Board’s existing CAPM methodology will likely still yield COE values that are significantly overstated. For example, the Board determined a CAPM COE for 2013 of 12.52%, a value that is substantially higher than those from credible sources.⁷ Two additional steps are needed to achieve a reasonable COE for the railroad industry.

The first, and most important, is to use a MRP (sometimes called the equity risk premium or “ERP”) that fairly and accurately depicts the expected returns for the market as a whole. The Board currently uses an Ibbotson historical MRP (6.96% for 2013) based on data dating from 1926, despite abundant evidence that MRPs have been decreasing since that time, as the Board recognized when it adopted the 1926 base. Use of the 1926 base does not reflect the industry norm, what investors have been able to achieve more recently or, more importantly, what they reasonably expect to achieve in

⁷ For comparison, Professor Damodaran of the Stern School of Business at New York University, utilizing data from January 2014 (generally corresponding to the December 2013 data used by the Board for its 2013 determination) derives a CAPM COE for the railroad industry of 8.43%, utilizing a MRP of 5% and a risk-free rate of 3.03%. *See* Domodaran Online, *Cost of Capital by Sector* (last updated Jan. 2014), http://pages.stern.nyu.edu/~adamodar/New_Home_Page/datafile/wacc.htm.

the future. As a result, the Board's CAPM COE overstates, by a significant margin, the opportunity cost of capital for both equities generally and the railroad industry in particular.

The Board could obtain a more accurate MRP by using a shorter measurement period such as fifty years. Indeed, the CTA uses a 1954 base for railroads denominated in United States dollars. Alternatively, the Board can rely on credible surveys of the MRP values that are actually used in practice. Under either approach, the MRP in the current environment should not exceed 4.7%.

In addition, the Board should use a CAPM beta that includes a Blume adjustment to reflect the likelihood that the railroad industry will converge to a beta of 1.0 over time and also to address the substantial possibility that the high beta for at least 2013 reflects the exercise of market power by the railroads. Value Line and Bloomberg, the leading providers of beta materials, utilize the Blume adjustment, as does the CTA. Utilizing a Blume or similar adjustment will improve accuracy and conform to the standards and expectations of the financial community. The Board should consider utilizing the betas prepared by Value Line and/or Bloomberg rather than calculating its own. As explained by Dr. Levine, the Board could also attribute a value to BNSF to make the COE more reflective of the domestic railroad industry.

These and related matters are addressed further below and in the Levine and Triantis Verified Statements and attached exhibits.

III. THE BOARD SHOULD CEASE USING THE FLAWED MSDCF

As explained below and in the Levine and Triantis Verified Statements, the Board should discard the MSDCF and instead rely solely on the CAPM to determine the COE. The MSDCF has contributed to an overstated and inaccurate COE. The fact that the MSDCF values are overstated, and that the CAPM values are not too low, can be confirmed by comparison to available benchmarks and examination of the CAPM inputs. The MSDCF is also conceptually and pragmatically inferior to the CAPM, and the CAPM is the vastly preferred method for estimating the COE. In addition, the MSDCF suffers from severe technical flaws as applied to the railroad industry. The growth rate projections relied upon in the MSDCF are also tainted by circularity problems that the Board has never directly addressed. Accordingly, the Board should cease using the flawed MSDCF as part of its COE methodology.

A. The MSDCF Has Caused Overstatement in the COE

WCTL's petition in EP 664 (Sub-No. 2) demonstrated that inclusion of the MSDCF has caused overstatement in the COE. The following table, taken from the WCTL petition,⁸ shows the MSDCF's impact on the COE:

⁸ WCTL Petition in EP 664 (Sub-No. 2) (filed Aug. 27, 2013), at 5, and the attached Verified Statement of Professor James E. Hodder ("Hodder VS"), at 3. The WCTL Petition is included as Exhibit 1 to this filing. Dr. Levine provides an updated version of the table that includes data for 2013 in his Verified Statement at 8-9.

Table 1 Comparison of CAPM and MSDCF COE Values for 2008-2012			
Year	CAPM COE	MSDCF COE	Difference
2008	10.39%	15.95%	5.56%
2009	11.39%	13.34%	1.95%
2010	11.84%	14.13%	2.29%
2011	11.31%	15.83%	4.52%
2012	10.27%	16.53%	6.26%
Average	11.04%	15.16%	4.12%

Inclusion of the MSDCF increased the COE by a substantial amount, an average of 206 basis points during 2008-2012. This magnitude of increase substantially exceeds that anticipated when the Board included the MSDCF in the hybrid methodology. Specifically, the data that the AAR submitted for 1998-2007 showed an increase in the overall COC of only 73 basis points.⁹ The actual impact on the COC during 2008-2012 has been more than double that estimated by the AAR based on 1998-2007.¹⁰

The AAR's 2008 filing also stressed that the average hybrid MSDCF/CAPM COC during 1998-2007 of 9.96% still fell between the UBS and Bear Stearns benchmark COC values of 9.5% and 10%, respectively. However, the STB's actual hybrid COC since 2008 has fallen below 11% only once (in 2009, with a value of

⁹ AAR Reply Comments in EP 664 (Sub-No. 1) (filed Oct. 14, 2008), Stangle Verified Statement at 5 & Stangle Appendix. A copy of the Stangle Appendix is included as Exhibit 2.

¹⁰ The MSDCF comprises 50% of the COE, the average CAPM has exceeded the average MSDCF by 412 basis points, and $50\% \times 412 = 206$. During 2008-2012, equity averaged 76.51% of the capital structure, and 76.51% of 206 basis points equals 157.61 basis points, more than double the 73 basis points.

10.43%). Without the MSDCF, the COC during 2008-2012 would have averaged around 9.6%¹¹ and remained within the range of the earlier UBS and Bear Stearns benchmarks.

Moreover, the MSDCF COE value has exceeded the CAPM COE value for sixteen consecutive years. The Stangle Appendix submitted by the AAR in EP 664 (Sub-No. 1) showed that the MSDCF value was higher in each year from 1998-2007. The MSDCF COE values continued to exceed the CAPM COE values through 2008-2012 (*see* Table 1, *supra*) and in 2013 (per the Board's decision in EP 558 (Sub-No. 17)).

The overstatement in the MSDCF COE values compared to those produced by the CAPM cannot be dismissed as temporary or inconsequential.

**B. The MSDCF Values Are Too High, and
The CAPM Values Are Not Too Low**

The Board has previously acknowledged that the MSDCF COE values exceed the CAPM COE values, but has professed an inability to discern which values are correct or more reasonable. *See, e.g., Arizona Elec. Power Coop. v. BNSF Ry. Co. & Union Pac. R.R.*, NOR 42113 (STB served Nov. 22, 2011), at 137 (“Whereas AEPCO contends that the MSDCF results in a cost of equity that is too high when compared to CAPM, it is just as likely that CAPM results in a cost of equity that is too low.”).

Confirming that the MSDCF values are too high, and that the CAPM values are not too low, is not difficult. Available benchmark data from the financial investment community shows that the MSDCF values are too high. Furthermore, review of the

¹¹ The MSDCF/CAPM COC for 2008-2012 averaged 11.18%, but would have been about 9.6% without the MSDCF (11.18%-1.57% = 9.61%).

CAPM inputs utilized by the Board shows that they are not too low and are instead themselves too high.

1. The MSDCF and Even the Hybrid MSDCF/CAPM Values Are Too High Relative to Available Benchmarks

WCTL's Petition in EP 664 (Sub-No. 2) demonstrated that the Board's hybrid MSDCF/CAPM COE values are substantially overstated relative to such independent determinations as those of S&P and MarketGrader. In contrast, removing the MSDCF and relying only on the CAPM produces values that are much closer to the benchmarks. However, even the Board's CAPM-only figures remain high relative to the benchmarks, confirming the need to adjust the CAPM inputs. *See* WCTL Petition filed August 27, 2013 in EP 664 (Sub-No. 2), including the Verified Statement of Daniel L. Fapp dated August 27, 2013, included as Exhibit 1.

The SEC Form S-4 for the acquisition of BNSF by Berkshire Hathaway, Inc., provides other relevant and telling benchmarks for the railroad industry COE and COC.¹² The S-4 states that BNSF's Board of Directors retained Goldman Sachs and Evercore "as financial advisors in connection with the evaluation of the potential transaction" and that both firms delivered fairness opinions for the transaction. S-4 at 36-37, Annexes C and D. Their analyses were thus prepared for the purpose of valuating a large, publicly-traded railroad company.

¹² Berkshire Hathaway Inc., *Amendment No. 2 to FORM S-4* (Dec. 23, 2009) ("S-4"), available at <http://www.bnsf.com/about-bnsf/financial-information/berkshire-hathaway-merger-filings/> (Berkshire originally filed with S-4 with the Securities and Exchange Commission on Nov. 25, 2009, and then filed amendments on Dec. 21 and 23, 2009).

The S-4 recites that Goldman Sachs performed valuation analyses “using discount rates ranging from 8% - 12%, reflecting estimates of BNSF’s cost of equity,” and “discount rates ranging from 7.0% to 11.0%, reflecting estimates of BNSF’s weighted average cost of capital.” *Id.* at 49-50 (also noting “discount rates ranging from 7.0% to 11.0%, but using terminal values based on a perpetuity growth rate ranging from 1.5% to 3.5%”). Goldman Sachs thus utilized a median COE of 10% and a median COC of 9%.

Evercore used “discount rates ranging from 8.0% to 10.0%” reflecting “among other things, a weighted average cost of capital calculation” and “discount rates of 10.0% to 12.0%” reflecting “among other things, a cost of equity calculation.” *Id.* at 61. Evercore’s median COE was thus 11%, 100 basis points higher than Goldman Sachs, but it utilized the same median 9% COC as Goldman. The Goldman Sachs and Evercore median 9% COC value is lower than the 9.5% and 10% values established earlier by UBS and Bear Stearns, respectively, noted *supra*.

The Board’s MSDCF COE for 2009 was 13.34%, which exceeded the highest COE value (12%) considered by either Goldman Sachs or Evercore. Moreover, the 13.34% for 2009 was the **lowest** MSDCF COE value during 2008-2013. Similarly, the Board’s hybrid COC for 2009 was 10.43%, which falls towards the high end of Goldman Sachs’s COC range of 7%-11% and outside of Evercore’s COC range of 8%-10%. Even the MSDCF COE of 11.39% falls substantially above the Goldman Sachs median COE of 10% and also exceeds the Evercore median COE of 11%. The Board’s hybrid COC of 10.43% falls above the Goldman Sachs median COC of 9% and the

Evercore median value of 9%. The Goldman Sachs and Evercore analyses thus further confirm that the MSDCF values are unrealistic and that even the CAPM values are high.

In short, the available information indicates that (a) the MSDCF methodology has not produced reliable or even particularly credible values during the period that it has been utilized, and (b) even the Board's CAPM values are too high.

2. The STB's CAPM Inputs Are Not Too Low

As Dr. Levine explains in his Verified Statement, one of the benefits of the CAPM relative to the MSDCF is that the CAPM's three inputs, *i.e.*, the MRP, the risk-free rate ("RFR"), and the beta, are all very transparent. Levine VS at 8-13. Their transparency means that their reasonableness can be evaluated by comparison to established benchmarks. Accordingly, if the CAPM produced COE values that were too low, the low values should reflect the choice of particular inputs utilized in the model. *Id.* However, review of the Board's CAPM inputs reveals that they are not too low, but are too high in important respects. *Id.* Professor Triantis also confirms that adoption of best practices for the CAPM would result in lower inputs. Triantis VS at 6-15.

Consider first the RFR, for which the Board uses a 20-year United States Treasury bond. The interest rates and yields for Treasury bonds generally increase with longer maturities. The 20-year is relatively long, and thus carries a relatively high yield, particularly as compared to the 10-year (or shorter) Treasury bond that is often utilized in CAPM analysis, as discussed at 35-37, *infra*. The RFR is thus unlikely to contribute to an excessively low CAPM result. Levine VS at 9-11.

Consider next the MRP, for which the Board uses the historical 1926 base as compiled by Ibbotson. The 1926 base produces a relatively high MRP compared to other periods, and is thus unlikely to contribute to a CAPM result that is too low. *Id.* at 12-13; *see also* discussion at 31-38, *infra*.

The final CAPM input is the beta. The STB uses a five-year average, without any Blume or similar adjustment. The beta values calculated under the Board's methodology are generally higher than those available from other sources, especially as the other betas typically include a beta adjustment. Levine VS at 11-12; *see also* discussion at 40-42, *infra*. The Board's betas are thus unlikely to contribute to COE values that are too low.

In short, there is no reason to conclude that the Board's CAPM inputs are biased in a way that results in COE values that are too low. To the contrary, the CAPM inputs utilized by the Board are too high, as explained elsewhere in this filing.

C. The CAPM is Conceptually and Pragmatically Superior to the MSDCF

In their Verified Statements, Dr. Levine and Professor Triantis, like Professor Hodder previously, compare the MSDCF and CAPM methodologies and find that the CAPM is superior to the MSDCF both conceptually and pragmatically. Levine VS at 13-16; Triantis VS at 3-4, 15-18.

Dr. Levine and Professor Triantis both explain that the CAPM builds upon the principle that compensation for investors varies based upon risk, determines the return needed for investing in equities generally, and then ascertains the risk for investing

in a particular equity relative to equities generally, utilizing inputs that can be reviewed and evaluated. Levine VS at 7, 16-18, 21-24; Triantis VS at 3-4, 6-15.

Dr. Levine explains that the MSDCF model depends entirely upon (a) projections of future cashflow and its constituents, which are not necessarily stable, but are very difficult to project, and (b) the relationship of those projected cashflows to the market price of the company's stock (present value), which can fluctuate for a range of reasons.¹³ While a notion of risk may be implicit in the relationship of the projected cashflows to the present value, the relationship is anything but transparent or explicit. Because the critical relationship is only implicit, there is no internal means to determine whether the model is operating soundly. Levine VS at 15-16, 19-20.

Professor Triantis similarly notes that while discounted cash flow ("DCF") models are frequently employed, the utility of the DCF approach is generally limited by the strength of the underlying assumptions, such as growth rates, which are highly suspect in the case of the DCF approach to determining the COE. Triantis VS at 15-18. Professor Triantis explains that reverse engineering the DCF model to discern the implied COE discount rate "should be used only if one is relatively confident with all the other input assumptions that enter into the valuation procedure," adding that growth rates "may be the ingredient in the DCF that is most difficult to estimate properly," and "market

¹³ The CTA observed in ¶ 201 of its 2011 decision that "growth rate estimates, which are key variables in the DCF formula, are not auditable. In the case of the multi-stage DCF Model, more than one growth rate must be estimated and growth rates may need to be estimated farther into the future. The model responds to market conditions only indirectly, through company-specific stock prices, existing earnings (or cash flows) and assumed growth rates."

prices may not always correspond closely with the growth estimates of analysts”). *Id.* at 17-18.¹⁴

These problems become especially acute when the MSDCF calculation employs a limited number of growth estimates with a substantial divergence. Levine VS at 19-20; Triantis VS at 19. As the CTA explained:

Moreover, 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.

CTA Decision at ¶ 207 (quoting a study by the Brattle Group commissioned by the CTA to review existing COC methodologies).

The earnings growth forecasts used in determining the railroad COE reflect this variance. The AAR-provided data utilized for the 2013 cost of capital show six analyst estimates for two of the carriers (CSX and UP) and only four analyst estimates for the other two (KSU and NSC). CSX has two estimates at 5% or below, and two at 12.5% or above. The three other railroads have at least a 4.9% spread between their high and low estimates. That spread amounts to over a third of the simple average of the median growth rates of 12.47%. AAR Opening comments in EP 558 (Sub-No. 17) filed Apr. 21,

¹⁴ Professor Triantis separately discusses the particular limitations of the MSDCF model adopted by the STB. Triantis VS at 18-20; *see* discussion at 21-25, *infra*.

2014), Gray VS, Appendix L at 1. The 4.9% spread becomes very significant when compounded over five years, and more so when compounded over ten years.¹⁵

Moreover, the general track record for the accuracy of the long-term growth projections of the type deployed in the MSDCF is very suspect and undermines confidence in the MSDCF result. For example, Fama and French observed in 2002 that the “power to forecast dividend growth does not extend much beyond a year,” and “we can report that extending the forecast horizon from two to three years causes all hint of forecast power to disappear.”¹⁶ A later working paper by Patrick Cusatis and J. Randall Woolridge at Pennsylvania State University, *The Accuracy of Analysts’ Long-Term Earnings Per Share Growth Rate Forecasts* (January 24, 2008) (copy included as Exhibit 3), found that both one-year and long-term (the three-year to five-year forecasts utilized in the MSDCF) were not at all accurate and were generally overstated. An article summarizes their analysis as showing that “[o]n the five-year horizon, actual EPS growth clocked in almost 40% *below* analysts’ estimates” (original emphasis).¹⁷ Significantly, the Cusatis-Woolridge analysis found that “there is no evidence that analyst behavior has

¹⁵ Since the AAR calculates a simple average of the median growth rates of 12.47% (Appendix L), use of a low growth rate of 10% and a high growth rate of 14.9% to reflect the 4.9% spread is reasonable. Over five years, the difference in growth is 39 percentage points ($1.1^5 = 1.61$, and $1.149^5 = 2.00$). After ten years, the difference in growth is 142 percentage points ($1.1^{10} = 2.59$, and $1.149^{10} = 4.01$).

¹⁶ Eugene F. Fama & Kenneth R. French, *The Equity Risk Premium*, 57 J. of Finance 637, 650 (Apr. 2002). The Fama-French discussion relates to dividend growth, but dividends are relatively stable and thus predictable compared to the more complicated measure of cashflow employed in the MSDCF.

¹⁷ Joe Magyer, *The Wall St. Myth that could Destroy Your Portfolio*, The Motley Fool (May 1, 2008), <http://www.fool.com/investing/dividends-income/2008/05/01/the-wall-street-myth-that-could-destroy-your-portf.aspx>.

changed since” the SEC obtained the Global Analysts Research Settlements in 2003 and that analysts’ estimates “remain at levels that are unattainable given historic and expected GDP growth.” Exhibit 3 at 23.

A 2010 publication by McKinsey & Company provides further confirmation that analysts “were typically overoptimistic, slow to revise their forecasts to reflect new economic conditions, and prone to making increasingly inaccurate forecasts when economic growth declined,” and that this assessment was reinforced by recent data despite the analyst reforms. Marc Goedhart, Rishi Raj, & Abhishek Saexna, *Equity analysts: Still too bullish*, 35 McKinsey on Fin. 14, McKinsey & Co., Insights and Publications (Apr. 2010).¹⁸ “On average, analysts’ forecasts have been almost 100 percent too high. Capital markets, on the other hand, are notably less giddy in their predictions,” as reflected in price-to-earnings ratios. *Id.* at 16. The authors concluded that executives should avoid “respond[ing] to the pressures of forecasts, since even the market doesn’t expect them to do so.” *Id.* at 17.

As noted, Professor Triantis explains that the DCF COE “procedure should be used only if one is relatively confident with all the other input assumptions that enter into the valuation procedure.” Triantis VS at 17. “The MSDCF is most appropriate when there is confidence, if not outright certainty, that the projections of cash-flow growth are reliable.” Levine VS at 20. Such confidence is not warranted with respect to the high growth rates that have been the critical input in the Board’s MSDCF

¹⁸ The publication is available at http://www.mckinsey.com/insights/corporate_finance/equity_analysts_still_too_bullish.

determinations. As the Board itself acknowledged when it adopted the MSDCF, “[t]o say that analysts’ forecasts are unreliable and should not be used essentially would eliminate consideration of a multi-stage DCF in our cost-of-equity calculation.” *MSDCF Decision* at 14. The analysis indicates that the longer-term forecasts utilized in the MSDCF approach are not reliable, and the Board should not continue to rely on a discounted cash flow approach for estimating the COE.

In contrast, the three elements of the CAPM model -- RFR, MRP, and beta -- are very explicit, and their reasonableness can be easily verified and benchmarked. The RFR and MRP link the model directly to the performance of the market as a whole, and the beta serves to adjust the market performance to reflect the risks associated with the particular investment. The CAPM thus explicitly recognizes and addresses the risk-reward relationship, while that relationship in the MSDCF is implicit at best and thus murky. Moreover, the beta or risk relationship for a stable, mature industry such as the railroads should be close to the market as a whole. *See* Levine VS at 4-8, 16-18; Triantis VS at 3-4, 6-15.

The CAPM model is thus conceptually and pragmatically superior to the MSDCF model. As the CTA explained, “[t]he DCF Model requires assumptions about growth rates over future periods and the projection of an assumed future growth rate into perpetuity.” *CTA Decision* at ¶ 208. The CTA found that the CAPM was “clearly superior,” *id.* at ¶ 209, and concluded that it should be utilized exclusively:

CAPM is the only cost of equity model that was (at least partially) accepted by all stakeholders. The CAPM also has theoretical support, is widely used in regulatory settings, has

been systematically chosen by the Agency in each of the last 19 years, and has an intuitively rational way of characterizing risks (risk-free asset; equity market risk; company-specific non-diversifiable risk). Its three components react in different ways to market information (rapidly for the risk-free rate; moderately rapidly for the company-specific risk; and slowly for the equity market risk), providing both responsive and stable elements in the estimation of the cost of equity. Finally, relying solely on the CAPM would reduce uncertainty in the regulatory environment in which the Agency's cost of equity estimates are applied.

Accordingly, the Agency determines that, in the interest of providing greater certainty and transparency, it will use the CAPM alone to estimate the cost rate of equity for federally-regulated railway companies, and the practice of annually assessing the results of three models and applying judgement regarding the appropriate weight to assign to each will be discontinued.

Id. at 215-216; Levine VS at 17-18; Triantis VS at 21.

D. The CAPM is Vastly Preferred to Other COE Approaches

Professor Triantis explains that the CAPM is the vastly preferred approach for determining the COE, as confirmed by several significant studies. Triantis VS at 5-6, citing John Graham & Campbell Harvey, *The theory and practice of corporate finance: Evidence from the field*, J. of Financial Economics 61 (2001) (finding that 73.5% of companies always or almost always use CAPM to calculate COE, other methods are used much less frequently, and very few firms use DCF model), and R. Bruner, K. Eades, R. Harris, & R. Higgins, *Best practices in estimating the cost of capital: survey and synthesis*, Financial Management 27 (1998) (85% of companies surveyed use the CAPM to calculate the COE).

Professor Triantis also discusses a published survey that the Association for Financial Professionals (“AFP”) conducted in 2013 on “Estimating and Applying Cost of Capital” (“AFP 2013 Survey,” included as Exhibit 4).¹⁹ The survey found that 85% of all respondents, and 87% of publicly traded respondents, used the CAPM. In contrast, only 4% used the dividend discount model, 2% used the arbitrage pricing model, and 9% used other. AFP 2013 Survey at 4, discussed in Triantis VS at 5-6.

The STB’s prior finding that MSDCF models “are widely accepted as a method for” calculating the COE, *MSDCF Decision* at 14, is thus very suspect or in need of major qualification (*e.g.*, better suited for industries with lower growth rates). If the Board wishes to track financial industry norms, it should rely on the CAPM.

E. Technical Flaws in the Board’s MSDCF Model as Applied to Railroads

The preceding discussion addresses general problems with relying on a DCF approach to calculate the COE. However, there are also specific problems with the MSDCF as utilized by the Board.

A key problem in relying on a SSDCF model, as the Board did through 2005, is the assumption that the three-to-five-year growth rates utilized in the model will apply in perpetuity, especially when those growth rates are unsustainable because they exceed the projected growth rate for the economy as a whole. The Board recognized that this assumption was unwarranted in the *CAPM Decision* at 6. The Board attempted to address this problem in the *MSDCF Decision* by utilizing the Morningstar/Ibbotson

¹⁹ The study is available at http://www.afponline.org/mbr/reg/pdf/2013_AFP_Cost_of_Capital_Complete.pdf, after registration.

three-stage MSDCF model. One of the ostensible benefits of the MSDCF is a smooth and gradual transition between the initial growth rates and the terminal growth rate.

MSDCF Decision at 9.

In his Verified Statement that accompanied WCTL's Petition in EP 664 (Sub-No. 2), Professor Hodder reviewed the Board's MSDCF methodology. He found that the deviations between the MSDCF and CAPM values were too large to be dismissed and attributed them to several flaws in the Board's application of the Morningstar/Ibbotson "one-size-fits-all" MSDCF methodology to the railroad data. Hodder VS at 3-4. Professor Triantis discusses some of those and some additional flaws in his Verified Statement at 18-20.

As Professor Hodder explained, the second stage of the Board's MSDCF model fails to provide a smooth transition in the growth rates from the first stage to the third stage. He explained that the model included only three (now four) railroads, all with high projected growth rates.²⁰ Instead of a smooth transition, the third-stage produces an abrupt reduction as its growth rates are approximately one-third of those of the first two stages. The absence of a reasonable transition in the second stage creates a substantial upwards bias in the COE. Hodder VS at 4-5.

Professor Triantis adds that the better and standard approach is to prepare forecasts for each year in the valuation timeline, rather than rely on multi-year forecasts

²⁰ KCS's inclusion in 2013 exacerbates the problem. Despite its relatively low MSDCF COE, KCS actually has the highest growth rate. While KCS has low capitalization and cashflow compared to the other included railroads, its growth rate receives equal weighting in the second stage, thereby distorting the overall result.

and apply them for longer than specified by the analyst. He also notes the wide variance in the forecasts and their paucity as further undermining their reliability. The problem is compounded because the growth rates are unlikely to be sustained for the ten-year period assumed by the model. Triantis VS at 19-20.

Second, despite the lower growth rate, the model's third stage also fails to achieve a smooth reduction in cashflows. Instead, the redefinition of cashflows to equal earnings produces a sharp surge in cashflows -- exceeding 40% for CSX and NS in the 2012 COC decision -- at the start of the third stage. The increase again has an upward bias. Such large increases over a very short time frame (literally overnight) ten years and a day after the start of the model are inherently implausible and indicate a modeling flaw. Hodder VS at 5-6.

Professor Triantis notes the implausibility of the model's assumption in the third stage as applied to railroads that deferred taxes will never be repaid and that depreciation will equal capital expenditures, when substantial capital expenditures will be required and will reflect the impact of inflation. Adjusting for these factors will lower the terminal cash flow and thus reduce the COE. Triantis VS at 20.

Professor Hodder also identified, and Professor Triantis confirms, another problem with the MSDCF model as applied to railroads. Hodder VS at 9; Triantis VS at 19. The SSDCF model utilizes the dividend yield, the expected earnings growth rate, and the price, all measured on a share basis. In contrast, the MSDCF model uses earnings per share ("EPS") to project growth in firm-wide cash flows. EPS might work as a proxy for firm-wide growth in the MSDCF if stock shares remained constant. However, the

railroads have conducted stock buybacks that have significantly reduced their net number of shares outstanding during 2008-2012, and those buybacks are likely to continue.²¹

Analysts presumably take into account those buybacks to forecast the EPS growth. An analyst that ignores those buybacks will likely have an EPS forecast that is too low, and the increase in EPS is one reason for firms to engage in stock buybacks in the first place.

The share reductions cause EPS to increase faster than firm-wide earnings. For example, a firm that earns \$100 in both years one and two, but has 100 shares in year one and 97 in year two, will have EPS of \$1 in year one and \$1.031 in year two. EPS will thus increase by 3%, despite no change in total earnings. Using EPS to project firm cashflows under such conditions will overstate growth in firm-wide earnings, and the mismatch in the MSDCF again produces an overstated COE. Hodder VS at 6-9; Triantis VS at 19.

Professor Hodder further explained that the problems arise from the particular assumptions made in the Morningstar/Ibbotson MSDCF model and the Board's

²¹ For example, UP's November 21, 2013 press release and 8-K filing reported early renewal of its share repurchase program to allow UP to repurchase an additional 13% of its shares over the next four years (2014-2017). *See* Union Pac. Corp., *Form 8-K* (Nov. 21, 2013), http://www.up.com/investors/attachments/secfiling/2013/upc8k_112113.pdf. Buybacks of 13% over four years equate to a compound average rate of 3.1% per year. NS reported remaining authority to repurchase 38.3 million shares, or 12.4%, of 309.7 million shares outstanding during 2014-2017, corresponding to 2.96% per year. *See* NS, *2013 Annual Report*, pp. K1, K32 (2014), <http://www.nscorp.com/content/dam/nscorp/get-to-know-ns/investor-relations/annual-reports/annual-report-2013.pdf>.

application of the model to the railroad industry.²² Significantly, all have been present since the Board began using the MSDCF in 2008, and all serve to increase the resulting COE. Professor Hodder concluded that MSDCF COE estimates “are not reliable and are biased upward” and reflect “substantial” problems, whereas “the CAPM estimates during that period are apt to be far more accurate and credible.” Hodder VS at 11. Professor Triantis adds that the application of the MSDCF “approach is fraught with error and thus unreliable” and that the issues noted “help to explain why the cost of equity estimates obtained using the MSDCF in recent years by the STB have been systematically higher than those based on the traditional CAPM approach.” Triantis VS at 20.

Professors Hodder’s and Triantis’s analyses further confirm that the problem is not that the CAPM values are too low, but instead that the MSDCF values are too high.

**F. Circularity Problem in Using Analyst
Growth Estimates in the MSDCF**

In the *MSDCF* proceeding, WCTL explained that an additional problem in the Board’s continued reliance on growth rate projections in a DCF approach was the inherent circularity in those projections. The high MSDCF COE enables the railroads to raise their rates, and the rate increases result in projections in 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.” *MSDCF Decision* at 9.

²² Professor Hodder also noted that the MSDCF’s third stage growth rate appears to be overstated. Hodder VS at 10.

In adopting the MSDCF, the Board did “acknowledge that there is some relationship between the Board’s cost-of-equity determination and the returns that railroads may be permitted to earn on regulated traffic.” *Id.* at 10. The railroads’ strong interest and active participation in the cost of capital proceedings, including the instant one, confirm as much.

However, the Board sought to minimize the problem by claiming “that effect is a small component of overall growth in the rail industry and would not create the kind of fatal circularity that should preclude the use of a multi-stage DCF model.” *Id.* The Board asserted that “[m]ost rates fall below the [jurisdictional] threshold,” and “most of the remainder is either under contract ... [or] exempt from rate regulation.” *Id.* at 9. The Board added that “growth is not driven solely by rates, but can be driven by volume and productivity as well.” *Id.* at 9-10. The Board concluded that “[a]ctual railroad growth, or lack of growth, is what will determine the cost of capital, not simply pricing power.” *Id.* at 10.

None of the Board’s varied explanations survives examination.

The Board’s primary claim, that “[m]ost rates fall below the statutory threshold,” is deficient in three basic respects. First, the assertion rests on the very circularity it seeks to refute: a lower COE would reduce the statutory threshold and cause more traffic to fall above the jurisdictional threshold.

Second, the Board offered no factual support for its implicit assertion that the rate increases on so-called competitive traffic, meaning traffic falling below the jurisdictional threshold, substantially exceed the rate increases on captive traffic that falls

above the jurisdictional threshold. Even if the assertion had factual foundation,²³ it would still not support a COE that facilitated rate increases on captive traffic. If anything, the opposite result should apply: the carriers' ability to charge more on competitive traffic should reduce their need to increase rates on captive traffic. *See, e.g.*, 49 U.S.C. § 10701(d)(2).

Third, and most fundamental, the Board's focus on revenues is misplaced. While competitive traffic (falling below the jurisdictional threshold) may be the largest source of revenues, captive traffic (falling above the jurisdictional threshold) is the largest source of contribution (revenues in excess of variable costs), and earnings come from contributions, not merely revenues.

The Board's own Commodity Revenue Stratification Reports provide relevant data.²⁴ For example, consider data on revenues and contribution from 2007 (the data presumably available at the time of the *MSDCF Decision*) and 2012 (the most recent available):

²³ The data from the Commodity Revenue Stratification Reports discussed next shows that captive traffic has experienced a similar increase in the average R/VC ratio as competitive traffic.

²⁴ *See* STB, *Commodity Revenue Stratification Reports*, <http://www.stb.dot.gov/econdata.nsf/09a17a28a74b350d852573ae006d52cd?OpenView>.

Table 2 Source of Railroad Margins as Reported in STB Commodity Revenue Stratification Report (\$ in 000s)			
Traffic From 2007 Data			
Traffic R/VC Ratio	<100%	100% - <180%	180% and above
Revenues	\$8,928,609	\$28,262,704	\$19,599,034
Variable Costs	\$12,352,573	\$20,883,028	\$8,131,484
Contribution	(\$3,423,964)	\$7,379,676	\$11,467,550
Average R/VC Ratio	72%	135%	241%
Traffic From 2012 Data			
Traffic R/VC Ratio	<100%	100% - <180%	180% and above
Revenues	\$6,948,866	\$36,171,358	\$25,495,395
Variable Costs	\$9,749,824	\$26,076,185	\$10,442,118
Contribution	(\$2,800,958)	\$10,095,173	\$15,053,277
Average R/VC Ratio	71%	139%	244%

The Board's own data shows that the dollar contribution from captive traffic exceeds the contributions from profitable competitive traffic by roughly 50%, ignoring the competitive traffic with negative contribution. (Including negative contribution traffic within the competitive traffic increases the differential substantially.) Railroad earnings come primarily from captive traffic, not competitive traffic, and the Board's focus on mere revenues is erroneous.

The Board's references to exempt and contract traffic also amount to red herrings. The Commodity Stratification Report does not identify, at least not with any precision, the traffic that has been exempted from regulation or that moves under contract. However, coal and chemicals, the two largest revenue sources for the captive traffic, together account for about half of the revenues and profits/margins of the captive traffic, and neither has been exempted from regulation. Indeed, traffic falling above the jurisdictional threshold is generally less likely to have been exempted from regulation in

the first place. While a substantial portion of the competitive traffic may move under contract, the ability to obtain rate relief is apt to be a key determinant of the rates for such contracts, and the cost of capital is a prime input into both the jurisdictional threshold and the constrained market price. Beyond that, contracts do not last forever.

Growth in railroad traffic volumes also provides a poor explanation for the growth in railroad earnings or even revenues. Class I volumes remain below the peaks in carloads and tons originated (2006) and revenue ton-miles (2008). *See, e.g., AAR Railroad Facts 2013*, at pp. 24, 27-28 (data through 2012). Productivity also has not been a significant factor in recent growth since total factor productivity as measured by the RCAF productivity adjustment factor has been in the vicinity of 1% per year. Nonetheless, railroad profits and earnings have surged, overcoming a decline in 2009 due to the recession. *Id.* at 13-14, 17.

The factors identified by the Board -- competitive traffic, contract and exempt traffic, and growth in volumes and productivity -- thus do not explain the railroads' earnings and growth, especially since adoption of the MSDCF. The only factor that does explain the growth is the railroads' increasing exercise of pricing power: the railroads have simply been charging more for providing their services.²⁵

Unquestionably, the railroads have fared very well, especially on a comparative basis, since the recession, but it has been chiefly due to their ability to raise rates. For example, average revenue per ton originated rose from \$25.72 in 2006 to

²⁵ Stock buybacks contribute to higher earnings per share, but not higher total earnings.

\$38.41 in 2012, an increase of 49%. *Railroad Facts 2013* at 30. The Board is then relying on the railroad industry's higher rates as the basis for adopting a high cost of capital, which allows the railroads to charge more on their captive traffic. This circularity should be of true concern to the Board, but the Board instead swept it under the rug in its *MSDCF Decision*.²⁶ Discarding the MSDCF and relying instead solely on the CAPM would do much to avoid perpetuating the Board's past error.²⁷

IV. NEEDED ADJUSTMENTS TO THE BOARD'S CAPM

For the reasons stated above, the MSDCF should not be used to estimate the railroad industry COE, even as part of an average. The CAPM should be utilized instead.

As explained by Dr. Levine and Professor Triantis, the CAPM enjoys a straightforward linkage to investor expectations and to the relative risks and rewards of investment in railroads as opposed to competing investments. As a consequence, checking the reasonableness of the inputs and the results is very feasible. To the extent the model appears to produce what might be an anomalous result, determining its cause and reassessing the model's accuracy can be done pragmatically. One can also find

²⁶ The Board also cited WCTL's own use of a MSDCF model, *MSDCF Decision* at 10, but distorts the context. WCTL was addressing the infirmities in the Board's SSDCF model (or, later, the infirmities in the AAR's MSDCF model, which have proven to be substantial). WCTL's MSDCF, intended as a "sanity check," was not as dependent on the I/B/E/S projections.

²⁷ WCTL is also concerned that the increased beta observed by the AAR for the CAPM beta calculation for 2013 also reflects the railroads' increased exercise of market power. Use of the Blume adjustment would help to address this concern. *See* discussion at 43-45, *infra*.

publicly available sources for its three constituents, the RFR, the MRP, and the beta. The model's dominance (*e.g.*, used by 85% of respondents in the AFP 2013 Survey) is entirely logical. Levine VS at 9-13, 19-21; Triantis VS at 5-15.

While the CAPM should be utilized as the Board's sole COE methodology, modifications should be made to the MRP and beta measurement.

A. The Board Should Use a Lower, More Current MRP

In its notice that preceded the *CAPM Decision*, the Board "proposed to estimate the market-risk premium based on the performance of the stock market over the past 50 years, which equates today to a 5.2% equity-risk premium." *CAPM Decision* at 7-8. The Board recognized that a shorter measurement period would lead to a lower MRP as the MRP had been shrinking in recent years. *Id.* at 8. However, the Board ultimately decided in the *CAPM Decision* to utilize a MRP starting in 1926, the first year for which Ibbotson claims to have reliable data, which yielded a MRP of 7.13% for 2006. The Board claimed that the 1926 base represented the "more standard approach," but advised that "[i]f another approach (other than the use of this historical average) becomes the industry norm, parties should petition us to modify our approach in keeping with current practices." *Id.* at 8-9.

The Board should now revisit the issue and utilize a MRP in the range of 5% or lower for two basic and related reasons. First, utilizing data dating from 1926 does not reflect current investor expectations. The 1926 base is no longer the norm for measuring the MRP, and was not the norm even in 2008. Instead, the norm is to utilize a MRP that currently is not more than 5.0%. Second, the use of an older, and higher, MRP

that exceeds current investor expectations overstates the opportunity cost of capital for railroads and equities generally. Investors make choices in the current environment, not in the environment as it existed starting in 1926. The past may be a good guide to the future under some circumstances, but not when there is awareness that MRPs have declined since then. The effect of selecting an outdated and overstated MRP is the same as “select[ing] an approach that would systematically overstate the cost of equity,” precisely what the Board said it “will not knowingly” do. *Id.* at 11.

These two matters are discussed further below.

1. Use of the 1926-based MRP Does Not Reflect Current Expectations or Industry Norms

Dr. Levine and Professor Triantis both explain that use of the Ibbotson 1926 base for determining the historical MRP is not appropriate because it does not reflect current investor expectations or the norm within the financial industry. They also both conclude that fifty years strikes an appropriate balance to measure the MRP using an historical approach. Levine VS at 24; Triantis VS at 21-22. In that regard, Ibbotson/Morningstar calculates a 50-year MRP of 4.7% derived on the same basis as the 1926-based MRP of 6.96% that was used to calculate the 2013 COE. *Ibbotson SBBI 2014 Classic Yearbook* (2014), at 154.

Dr. Levine explains that “the world has changed considerably since 1926” and that “[u]sing data back to 1926 gives inappropriate weight to bygone years when market financial and economic conditions were vastly different than current markets. There is abundant evidence that we have entered a ‘new normal’ and that investors do not

expect to face the same market conditions that are included in the 1926-Ibbotson base.”
Levine VS at 13, 24.

Professor Triantis notes that the statistical benefit of including additional data points diminishes and “becomes outweighed by the disadvantage of extending too far back into history to time periods that are not representative of current market conditions.” Triantis VS at 10. He notes that “many believe that the market risk premium is lower now than it was several decades ago” and reviews the rationales that have been advanced, including higher liquidity, more transparency, greater diversification, actual returns in excess of expected returns, and decline in the cost of equity itself. *Id.* 10-12.

Ample evidence demonstrates that the norm is not to calculate the market risk premium for the United States using data starting from 1926. For example, Aswath Damodaran wrote in 2008, the year of the *CAPM Decision*, that:

While there are many analysts who use all the data going back to the inception date, there are almost as many analysts using data over shorter time periods, such as fifty, twenty or even ten years to come up with historical risk premiums. The rationale presented by those who use shorter periods is that the risk aversion of the average investor is likely to change over time, and that using a shorter and more recent time period provides a more updated estimate.

Aswath Damodaran, *Equity Risk Premiums (ERP): Determinants, Estimation and Implications*, Stern Sch. of Bus., (Sept. 2008, with an Oct. 2008 update reflecting the market crisis) (“Damodaran 2008”), at 19.²⁸ Professor Damodaran further explains:

Given how widely the historical risk premium approach is used, it is surprising that the flaws in the approach have not drawn more attention. Consider first the underlying assumption that investors’ risk premiums have not changed over time and that the average risk investment (in the market portfolio) has remained stable over the period examined. We would be hard pressed to find anyone who would be willing to sustain this argument with fervor.

Id. at 25-26; Damodaran 2014 at 31.

Ample other evidence and analysis confirms that the 1926-based premium does not reflect current conditions. Elroy Dimson, Paul Marsh, and Mike Staunton of the London Business School discuss “The low-return world” in the Credit Suisse Global Investment Returns Yearbook 2013.²⁹ They review the Ibbotson historical 6.25% premium for 1926-1999 (what has since become about a 7% premium for 1926-2013) and state that “[i]t is now clear that this figure is too high as an estimate of the prospective equity premium.” *Id.* at 9. Their analysis builds on their earlier extended analysis in *Triumph of the Optimists: 101 Years of Global Investment Returns* (2002),

²⁸ The article is available at http://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID1286089_code20838.pdf?abstractid=1274967&mirid=1. Professor Damodaran publishes an annual update of his analysis. The same language appears at page 24 of the 2014 edition (updated March, 23, 2014) (“Damodaran 2014”), available at http://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID2409198_code20838.pdf?abstractid=2409198&mirid=1.

²⁹ Credit Suisse, *Credit Suisse Global Investment Returns Yearbook 2013* (Feb. 2013), <https://publications.credit-suisse.com/tasks/render/file/index.cfm?fileid=88F22B53-83E8-EB92-9D555B7A27900DAC>.

that future returns are likely to be lower. “Statistical logic tells us that future expectations must lie below today's optimists’ dreams. We can hope for, but we cannot expect, the optimists to triumph in the future.”³⁰

As explained by Professor Triantis, formal surveys obtain specific information regarding the market risk premiums and expected total market returns that practitioners actually utilize in practice. The MRP figures from those surveys are substantially lower than the Ibbotson historical figures and provide further confirmation that the Ibbotson 1926-based MRP does not represent the norm. Triantis VS at 12-15.

John Graham and Campbell Harvey, finance professors at Duke’s Fuqua School of Business, conduct a quarterly survey of Chief Financial Officers (“CFOs”) to determine the MRPs and expected total market returns that the CFOs utilize. Their 2013 survey of chief financial officers shows an average MRP (relative to the 10-year Treasury bond) of 3.83% and a total market return forecast of 5.46%.³¹ The 5.46% total market return is 378 basis points below the 9.24% utilized by the STB in 2012.³² The

³⁰ Elroy Dimson, Paul Marsh & Mike Staunton, *Triumph of the Optimists: 101 Years of Global Inv. Returns* 224 (Princeton Univ. Press, 2002).

³¹ John Graham & Campbell Harvey, *The Equity Risk Premium in 2013* (Jan. 28, 2013), at 4, http://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID2208001_code16198.pdf?abstractid=2206538&mirid=1.

³² Since the 2013 survey article is dated January 28, 2013, the more appropriate comparison is to the Board’s 2012 COC. The 2014 survey article, noted next, was published on April 7, 2014, and similarly appears more appropriately compared to the railroad industry calculation for 2013. The Board’s total market return of 9.24% for 2012 is the lowest since the Board began using the CAPM in 2006. Comparison of the total market returns is appropriate since the risk-free rate in the Graham and Harvey article reflects a 10-year Treasury bond, and the Board utilizes a 20-year Treasury bond, which normally carries a higher interest rate, which implies a lower MRP.

corresponding values in their 2014 survey are 3.73% and 6.43%.³³ The 6.43% total market return is 365 basis points below the total market return utilized for the railroad CAPM COE for 2013. *See* Triantis VS at 12-13.

The 2013 survey by the Association for Financial Professionals provides additional support for using a MRP not in excess of 5%. The AFP 2013 Survey shows that 41% of all respondents use a MRP of 5% or above, but 59% use a MRP below 5%, and 38% use a MRP of 3.9% below. AFP 2013 Survey at 11, *discussed in* Triantis VS at 13. Among members at publicly traded company, the split is 50%/50% at a 5% MRP and above. AFP 2013 Survey at 11. Accordingly, using a MRP higher than 5% would exceed expected investor market premiums as perceived by participating AFP members.

Moreover, the AFP 2013 survey indicates that the 5% (or lower) MRP is typically utilized in conjunction with a RFR that is lower than the 20-year U.S. Treasury. The AFP survey shows that 7% use a 30-year Treasury or other sovereign, 4% use a 20-year, 39% use a 10-year, 14% use a 5-year, 29% use a 1-year or 90-day, and 7% use other. *Id.* at 5, *discussed in* Triantis VS at 13-14. 47% of respondents use the current interest rate on the instrument, 18% use a forecasted rate, and 31% use an average rate over some period of time. *Id.* at 6. Consequently the total market return expected by the respondents is even further below the return indicated by the Board's CAPM.

³³ John Graham & Campbell Harvey, *The Equity Risk Premium in 2014* (Apr. 7, 2014), at 3, http://papers.ssrn.com/sol3/Delivery.cfm/SSRN_ID2422008_code16198.pdf?abstractid=2422008&mirid=1.

Professor Triantis also discusses a survey conducted in 2013 by Pablo Fernandez that found an average MRP of 5.7% in the United States.³⁴ However, the 5.7% MRP was observed in conjunction with a reported average RFR of 2.4%, which conformed to the 10-year United States Treasury Bond rate of 2.4%. The total market return, meaning the sum of RFR and MRP, was about 8.0%, approximately 2 percentage points (or 20%) below the value that the STB used for its 2013 CAPM determination (and 124 basis points below the 9.24% total return value that the Board used for 2012). Triantis VS at 14.

The Graham-Harvey, AFP, and Fernandez surveys thus confirm that CFOs and other practitioners do not generally utilize the 1926-based figure derived by Ibbotson, or anything particularly close to it, and instead indicate that a MRP not exceeding 4.7% (based on a RFR utilizing the 20-year U.S. Treasury bond) and a total market return not exceeding 8.2% are far more representative of current practices and norms. Professor Damodaran has elaborated on how the MRPs used by academics are substantially higher than those used by practitioners:

At the risk of sounding harsh, the risk premiums in academic surveys indicate how far removed most academics are from the real world of valuation and corporate finance and how much of their own thinking is framed by the historical risk premiums they were exposed to back when they were

³⁴ Pablo Fernandez, Javier Aguirreamalloa & Pablo Linares, *Market Risk Premium and Risk Free Rate used for 51 countries in 2013: A Survey with 6,237 Answers* (revised June 27, 2013), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=914160, discussed in Triantis VS at 14. Professor Fernandez is the PricewaterhouseCoopers Professor of Corporate Finance at the University of Navarra – IESE Business School in Madrid, Spain, and has conducted such surveys frequently in recent years.

graduate students. The risk premiums that are presented in classroom settings are not only much higher than the risk premiums in practice but also contradict other academic research (see the equity risk premium puzzle) that indicates that even the more moderate premiums used by practitioners in [*sic*] too high. In fact, if academics were investors and CFOs, not only would we seldom invest in equities, but few firms would ever make real investments and fewer still would add value by doing so.

Damodaran 2008 at 18. The 1926-based Ibbotson MRP thus does not reflect industry practices or expectations. *See also* Levine VS at 24; Triantis VS at 12-15.

The 1926-based Ibbotson MRP thus does not represent the industry norm, nor does it contribute to an accurate railroad industry COC. Instead, it substantially overstates the MRPs that are used by CFOs and others.

2. Use of a 1926-based MRP is Inconsistent with the Board's Stated Commitment to Accuracy in the COC

In the *CAPM Decision*, the Board considered the railroads' claim that the Board "should consider a range of estimates and adopt a point somewhere within the middle to upper portion of that range." *Id.* at 11. The Board squarely rejected the AAR's position:

We will not knowingly select an approach that would systematically overstate the cost of equity for the same reasons we would not select an approach that would systematically understate the cost of equity: neither outcome reflects a proper balancing of railroads' needs to achieve adequate revenues and shippers' interests in not paying unreasonable rates, and it would contravene the statute's directive that we base our regulatory policies on accurate cost data. *See* 49 U.S.C. 10101(13) (directing the Board to "ensure the availability of accurate cost information in regulatory proceedings"). Moreover, the carriers have not offered any principled way to select a cost of equity in the

upper end of a range in a non-arbitrary fashion. Finally, we do not agree that the public harm from underestimating the cost of capital is greater than the public harm from overestimating it. Permitting a carrier to earn excessive profits would harm the public and the nation's entire economy because customers would ultimately pay higher prices for goods sold as the transportation rates are passed along. Consumers would therefore be expected to reduce their consumption of a wide variety of goods, to a greater or lesser extent, based on higher shippers' prices. Accordingly, we will not deliberately bias our cost-of-capital determination in the carriers' favor.

Nor do we believe that it would be appropriate to consider a range of CAPM estimates, and select a figure in the middle.

Id. at 11-12. WCTL respectfully submits that the Board has done essentially what it said it would not do in (a) first adopting the 1926-based MRP in the CAPM, and (b) then averaging the CAPM with the overstated MRP with the even more overstated MSDCF.

The COE should represent the opportunity cost of capital, meaning the return that railroad investment needs to offer in order to attract or retain equity relative to other available investment opportunities and their associated risks. The Board should not set a COE that does anything more than that. Doing so provides railroads with an excessive return at the expense of captive shippers and misallocates societal resources.

Investors determine where to invest their funds based on their expectation of the return relative to risk in the current environment. The past may be relevant, but only as a guide to the present and the future. Where the Board uses a MRP derived from an older base, such as the Ibbotson 1926 base, despite awareness that returns have been systematically less in later years, then it is likely to be overstating the MRP, overcompensating railroads and their investors, and punishing captive shippers. Levine

VS at 24. The harm is not mitigated, but is instead exacerbated, when the already overstated MRP is averaged with even higher COE values that result from the MSDCF methodology. The Board should remove both features to avoid creating “deliberate[] bias [in]our cost-of-capital determination in the carriers’ favor.”

Dr. Levine further explains that the railroad industry has no need for any additive or surplus return relative to an accurately calculated COE. Dr. Levine explains that the railroads of today are not the railroads of the 1970s or early 1980s, that challenges that existed then, such as systemic operating inefficiencies, underused assets, and excessive regulation, have been substantially addressed, and that today’s Class I railroads have concentrated economic power, have been able to outsource a number of their functions, and have become very productive and efficient. Levine VS at 4-7. Accordingly, one would expect their systematic risk to approximate that of the market as a whole, especially given their benefits and advantages. *Id.* at 7, 14, 20-21. Furthermore, the railroads’ own depictions of their financial performance to their stockholders, and their related programs for compensating their executives, including comparisons of railroads’ performance relative to their peers in other industries, indicate that the four large Class I railroads are performing very well, and have no need to receive an enhanced cost of equity. *Id.* at 24-28.

B. The Betas Should Reflect a Blume Adjustment

The Board should use a Blume adjustment for the CAPM betas. The Blume adjustment assigns an approximately 2/3 weight to the observed beta with a 1/3

weight to a 1.0 beta in order to achieve a more accurate result. As the Board previously explained:

The Blume Adjustment is an approach that adjusts betas based upon the belief that betas tend to revert toward their mean value, or the market beta of one. In essence, high historical betas (those in excess of one) tend to overestimate betas in future time periods, and low historical betas (those under one) tend to underestimate betas in future time periods. See Marshall E. Blume, *On the Assessment Risk*, 26 J. of Fin. 1, 1-10 (1971).

Railroad Cost of Capital--2010, EP 558 (Sub-No. 10) (STB served Oct. 3, 2011), at 7 n.15.

Significantly, the CTA decided in 2011 to continue utilizing a beta adjustment in its CAPM-only calculation of the railroad cost of capital. The CTA found that “[m]ost financial data providers, such as Bloomberg, and Value Line, report adjusted betas using Blume’s methodology as their default beta.” *CTA Decision* at ¶ 379; see also *Ibbotson 2011 Valuation Yearbook* at 81 (also noting Bloomberg and Value Line use of Blume adjustment). The CTA thus “considers it appropriate to employ a methodology that is used by the majority of financial data providers, insofar as investor expectations are formed by financial analysts.” *Id.* at ¶ 380.³⁵ See also Levine VS at 23-24.

³⁵ The CTA also considered, but rejected, an alternate adjustment devised by Vasicek. Oldrich A. Vasicek, *A Note on Using Cross-Sectional Information in Bayesian Estimation of Security Betas*, 28 J. of Fin. 1233-39 (Dec. 1973). The CTA noted that “on average, the Blume and Vasicek adjustments provide estimates similar to each other . . . , supporting the Brattle Group’s contention that, because railway companies’ betas tend to be close to 1.0, their adjusted betas generally do not depart significantly from the unadjusted betas.” *CTA Decision* at ¶ 376. However, the CTA found that “[t]he Blume adjustment is the simpler, more easily understood, and easier to implement of the two methodologies. The Vasicek adjustment, while it could be considered theoretically more

Other information confirms the broad use of adjusted betas. In particular, the AFP found that 57% of respondents at publicly traded companies use an adjusted (Blume-type) beta. AFP 2013 Survey at 9.

Professor Triantis thus concludes that use of the Blume adjustment reflects best practices that should be utilized by the STB. Triantis VS at 8-9. The Board itself stressed the importance of following industry norms in its selection of the Ibbotson MRP dating from 1926. *See CAPM Decision* at 9. While the Board defectively applied the principle in that instance by misperceiving the industry norm, fidelity to the underlying principle of following industry norms requires adoption of the Blume adjustment for the reason articulated by the CTA.

Dr. Levine likewise recommends use of a beta that includes a Blume adjustment and use of Value Line as a third-party provider of beta data. Levine VS at 23-24. He further recommends utilizing the UP beta as a proxy or partial proxy for the BNSF beta since UP is similar to BNSF in terms of size, scope, and location of operations. Excluding BNSF because it is not publicly traded thus inflates the beta of the remaining railroads. The distortion is particularly significant in the case of BNSF itself because BNSF's parent has a very low beta. Levine VS at 4-6, 19.

accurate than the Blume, presents serious implementation difficulties.” *Id.* at ¶ 377. The CTA ultimately found that the use of the Vasicek adjustment was not pragmatic. *Id.* at ¶ 378. The CTA noted that the Brattle Group also found some theoretical superiority for the Vasicek approach, but noted that “the Brattle Report adds that in general the Vasicek adjustment requires more computations and has not performed significantly better than the simplified Blume adjustment, which may be the reason the Vasicek adjustment is rarely employed by analysts in business and regulatory applications, and is not a standard reported by most data providers.” *Id.* at 379.

The beta figure for the 2013 adjustment further highlights the need for an adjustment. The Board calculated a beta of 1.3499, compared to 1.1543 for 2012, 1.1623 for 2011, and 1.1619 for 2010. Even the AAR conceded that the 2013 beta is “much higher” than the values for 2012 and 2011. *See* AAR Opening Comments in EP 558 (Sub-No. 17) filed Apr. 21, 2014, Gray VS at 35.

Gray’s statement offered a few comments to confirm the technical accuracy of the AAR’s 2013 calculation. He notes that higher values have resulted as the data are distanced from the bubble in tech stocks. He also comments that the Board, using a slightly different methodology that the Board did not adopt and the AAR does not endorse, had calculated some betas for individual railroads in excess of 1.33 in the first half of the 1990s. *Id.* But high betas for some individual railroads are a different thing than a high average beta for the railroad industry as a whole. Indeed, the STB had calculated average 10-year betas, but the highest value was in 1992, the first year, at 1.2383. *See* AAR Reply in EP 664 (Sub-No. 2) (filed Sept. 16, 2013), Gray VS at 8.

WCTL previously expressed concern that the exercise of market power could lead to increased earnings, higher stock prices, and thus inflated betas. The AAR responded by quoting one journal article stating that “[t]he upshot of these studies is that the empirical relationship between systematic risk and market power is unclear at this juncture.” *See* AAR Reply in EP 664 (filed Oct. 29, 2007), Hubbard/Stangle VS at 7 (quoting Paul S. Peyser, *Beta, Market Power and Wage Uncertainty*, 42 J. of Indus. Econ. 217 (June 1994). The study is dated, and stating that the relationship is “unclear”

does not preclude the possibility that the linkage could be significant, especially in particular cases for particular years.

WCTL is concerned that the 2013 beta submitted by the AAR is anomalously high and reflects the fact that railroads have become more profitable over the 2008-2013 measurement period by exercising their monopoly power. Railroad shares have done very well over this period compared to the market as a whole, as shown by the following table of data taken from Yahoo! Finance that compares the appreciation (adjusted for splits and dividends) for the past five years for UP, CSX, NS, KCS (KSU), and the S&P 500 (SPX):

Table 3 Comparison of Railroad and S&P 500 5-Year Returns			
Entity	Value as of Jan. 2, 2009	Value as of Dec. 31, 2013	Percentage Increase Over 5 Years
UP	\$22.36	\$82.81	270.3%
CSX	\$10.14	\$28.31	179.2%
NS	\$42.10	\$91.25	116.7%
KCS	\$19.90	\$123.14	518.8%
S&P 500 Index	931.80	1,848.36	98.4%
Note: Figures shown are adjusted values as reported by Yahoo! Finance on September 4, 2014.			

Superior performance need not necessarily translate into a higher beta, but the relationship is very plausible. For example, AAR witness Gray indicates that removal of KCS (by far, the best performing of the four railroad stocks over the past five years) serves to reduce the industry average beta from 1.3499 to 1.3308, even though KCS accounted for just 9% of the market capitalization of the four railroads as of January 3,

2014 (and presumably less overall as part of the five-year average). AAR Opening Comments in EP 558 (Sub-No. 17), filed April 21, 2014, Gray V.S. at 35, 44.

The railroads' stock performance is logically a function of their growth in earnings over the past five years. As explained in the discussion of circularity, the factor that best explains the growth in railroad earnings is the railroads' exercise of their pricing power, meaning charging customers more, because the growth cannot be explained by increases in volumes or productivity. Stock buybacks are a plausible contributing factor, but they have not been large enough to account for the excess growth, and the performance of the S&P 500 benchmark as the market proxy should reflect buybacks in the market as a whole.

WCTL is thus concerned that the same circularity between higher prices and a higher COC that taints the MSDCF may also extend to the calculation of the CAPM beta. Use of a Blume adjustment would serve to mitigate the market power that may reside in the relatively high beta values.

V. CONCLUSION

The MSDCF has made the Board's COE determinations less accurate and has contributed to systematic overstatement of the COE values. The MSDCF should not be part of the Board's COE methodology.

Reliance on only the CAPM conforms to mainstream financial practice. However, the Board should modify its CAPM by using a MRP that does not exceed 5% so as to conform to current investor expectations and common financial practice. The Board should also utilize a Blume adjustment in its beta calculation, or use a third-party

beta, such as Value Line, that reflects a Blume adjustment, so as to improve accuracy and reflect standard practices.

The result of these changes will be more accurate COE determinations.

Respectfully submitted,

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Dated: September 5, 2014

Its Attorneys

VERIFIED STATEMENT OF
HARVEY A. LEVINE

VERIFIED STATEMENT

OF

DR. HARVEY A. LEVINE

My name is Harvey A. Levine. Over the past 17 years, I have been an independent transportation consultant and the sole proprietor of Levine Consulting Services, located in Potomac, Maryland. Specializing in the inter-related subjects of economics and finance, with a concentration on the railroad industry, I have consulted to clients in both the public and private sectors, in the United States (U.S.) and Canada, and to freight carriers, trade associations representing both railroads and railroad shippers, law firms, and other entities. I received a Bachelor's degree in Business Administration, with a major in transportation economics, from the University of Pittsburgh; a Master of Business Administration degree, with an emphasis in economics, from Duquesne University; and, a PhD in Business Administration, with a major in transportation economics, from the American University, where I was the Fletcher Fellow in Transportation and a graduate assistant responsible for conducting research and teaching students in the business school.

Following a brief stint with the Atomic Energy Commission, I began my professional career in the transportation industry in 1965 as a Market Research Analyst, and subsequently the Assistant Director of Pricing Research, for the New York Central Railroad - a predecessor to Conrail. In 1997, I retired from the Association of American Railroads (AAR), where for 18 years, I was an officer and Vice President of the Economics & Finance Department. In the intervening years (1967-1979) I was employed by: Planning Research Corporation, where I was the Assistant Director of Transportation; the U.S. Department of

Transportation (DOT), where I was a Senior Economist; and, the Interstate Commerce Commission (ICC), where I was the Director of Economics. I also taught various business and economics courses at several universities.

Throughout my professional career, the interrelated subjects of cost-of-capital (COC) and revenue adequacy have been major focuses of my interest, study, and practical application. I wrote my PhD dissertation on the revenue needs of motor common carriers; evaluated alternative COC methodologies applicable to railroads during my employment at the DOT and the ICC; and, continued my interest in the subject as a senior consultant at R.L. Banks & Associates – a transportation consulting firm. I began my employment at the AAR in 1979, at a time when the ICC was developing its initial railroad COC methodology. I immediately became immersed in studying alternative COC methodologies ranging from a mixture of financial ratios to weighted-average, debt-equity models that included Discounted Cash Flow (DCF), Capital Asset Pricing (CAPM) and Comparative Earnings (CE). As the chief economist for the railroad industry, I, along with others, represented the industry in the ICC proceeding, Ex Parte 393 – Standards for Railroad Revenue Adequacy. Once the single-stage DCF (SSDCF) was adopted by the ICC, it was my responsibility to submit the annual railroad calculations (both the cost of debt and the cost of equity) to the ICC until 1995, and subsequently to the Surface Transportation Board (STB) in 1996 and 1997. Being responsible for filing the railroad COC over my 18 years at the AAR, while at the same time processing railroad financial information on behalf of the industry, gave me a unique perspective as to the impact of the SSDCF on both the railroad industry and its dependent customers. What I consistently observed was the steady improvement in railroad earnings, cash flow, and rates of return on capital investment, in the face of

findings that the railroads had failed to earn their COC, and thus that they were revenue inadequate. This disparity was the subject of my testimony before the U.S. Congress in 2001.¹ It was clear to me that the mismatch between the strong railroad financial performance and the alleged shortfall in the regulatory COC was due to shortcomings in the DCF approach. An industry that was truly failing to earn its COC would have been unable to attract and/or retain needed capital. There was no evidence of such shortfalls of capital.

Along with many others, I accepted an early-retirement offer from the AAR in 1997 and began my own consulting practice, with the AAR as my first client. My immediate assignment was to undertake a detailed analysis of the railroad COC and to prepare a manual of my findings, thoughts, and resources. Subsequently, I also consulted to the Canadian government on alternative methods to measure railroad profitability and revenue adequacy. And finally, I have consulted on a host of economic and finance issues in the transportation field throughout my career, and have testified before the: Canadian government, California Equalization Board, Canada Transportation Act Review Panel, ICC, Federal and State courts, Presidential Emergency Board, Railroad Commission of Texas, STB, U.S. Congress, U.S. Price Commission, and the Washington Metropolitan Transit Authority. A copy of my resume is attached to this statement.

In the current instance, I have been asked by counsel for the Western Coal Traffic League (WCTL) to provide my views regarding the current regulatory use of the multi-stage DCF (MSDCF) and the CAPM. In so doing, I am mindful that the railroad industry in 2014 has little, if any, resemblance to bygone years, and that the changes that have

¹ Statement of Dr. Harvey A. Levine before the Subcommittee of Surface Transportation and Merchant Marine, of the Committee on Commerce, Science, and Transportation, United States Senate, May 9, 2001.

occurred, have fostered a lower risk of investment in the direction of the overall market – that is, in the parlance of the CAPM, a beta of 1.0. The risk-return relationship is at the core of the COC, and understanding this relationship, and making it explicit and transparent is essential to a regulatory agency tasked with determining the COC of the railroad industry.

I. TENDENCY TOWARD MARKET RISK

While change has been broad and steady for the nation's railroads over many decades, in more recent years crucial organizational changes have led to a railroad industry that in many ways resembles the overall, national, for-profit marketplace. An excessive railroad labor force, systemic operating inefficiencies, underused assets, and unnecessary burdensome economic regulation, have been significantly reduced, if not eliminated. At the same time, the concentration of power within the railroad industry has increased. Consider the following:

1. Concentration of power: Four railroads – the Burlington Northern Santa Fe (BNSF), Union Pacific (UP), CSX, and Norfolk Southern (NS) account for 93% of the industry's business (revenue ton-miles), with the BNSF and UP accounting for about 69%.² The latter two railroads operate throughout the West and tend to be the longer-haul carriers that have gained significantly from economies of scale and density. In essence, while railroads have traditionally had a public nature and responsibility, their concentration of power has become so pronounced that in the mind of the federal government, they are probably “too big to fail.”

² Association of American Railroads, Railroad Facts, 2013 Edition, p. 68.

2. Ownership of the BNSF by Berkshire Hathaway (BH): The BNSF is owned by the fourth largest company in the U.S, and does not have a separate cost of capital. (The railroad is not listed on a stock exchange.) Rather, the actual cost of capital to the BNSF is the cost of capital to BH. It is possible that investors in BH consider that the BNSF accounts for about 19% of the parent company's total revenue,³ but to what degree is unknown. The BH beta is 0.27,⁴ significantly below the beta of all other railroads in the COC calculation of the STB. Thus, substituting a railroad, industry-wide beta in a CAPM calculation, sans the BNSF, is to overstate investment risk not only to the BNSF, but to the entire industry.
3. Market risk of UP: The beta for the other mega-railroad, the UP, is about 1.03.⁵ The UP has been a clear and well-documented financial success, especially in recent years, while enjoying many of the benefits of its public nature (as do the other railroads), such as: being immune from major work stoppages (labor strikes) under the Railway Labor Act; being largely immune from anti-trust legislation under the Sherman and Clayton Acts; being indemnified by Amtrak for accidents on its track involving Amtrak trains, even if the track structure was a contributing cause of the accidents; having the federal and State governments pay for the installation of automated gates

³ Percentage based on operating revenue as recorded from the BNSF annual report to the STB in 2013, and the BH annual report to shareholders in the same year.

⁴ Value Line and Bloomberg agree on the Berkshire Hathaway beta as being 0.25 for Class A stock and 0.29 for Class B Stock.

⁵ Value Line assigns a 1.04 beta to the UP, while Bloomberg lists a 1.02 beta.

at its grade crossings; and, enjoying exclusive rights of way granted to them by public authorities.

4. Shift of investment in rolling stock away from railroads: The railroad industry has steadily shifted investment in its freight-car fleet to private owners, including its customers. In 2013, of the 1.28 million freight cars operated by railroads, only 380,699, or 29.6%, were owned by Class I railroads.⁶ The trend toward railroad industry “de-investment” in freight cars has been long and steady. In 1980, the entire railroad industry (not just Class I railroads) owned 1,270,275 freight cars, compared with 473,383 in 2012,⁷ equating to a reduction of 63%. There is little, if any, reason to believe that this trend won’t continue. Such a transformation lowers the risk of investing in the railroad industry, especially since railroads collect fees (per diem) for freight cars on their property, whether in use or not. Furthermore, the railroad industry enjoys a special bankruptcy provision (Section 1168 of the Bankruptcy Act) that allows car owners to retain their assets in case of railroad bankruptcy, thereby helping to lower the industry’s investment risk.
5. Downsizing of fixed plant and increased productivity: The railroad industry has significantly reduced its miles of track owned, while at the same time, it has increased the productive use of its track structure. In 2012, Class I railroads owned 162,306 miles of track, compared with 270,623 miles in 1980,⁸ equating to a 40% reduction. During the same time, the industry’s

⁶ Rail Serve, “Railcar Ownership in North America,” www.railserve.com/stats.

⁷ Railroad Facts, op. cit., p. 51.

⁸ Ibid., p. 45.

output (ton-miles) increased from 919 billion to 1.7 trillion, or 85%.⁹ Consequently, from 1980 to 2012, the railroad industry realized a 210% gain in revenue-ton-miles per mile-of-track-owned.¹⁰ Such improvements have not only helped to lower the risk of investing in railroads, they have virtually eliminated claims that railroads are different than most other businesses in that they are plagued with systemic inefficiencies.

The above characteristics of the railroad industry not only lend themselves to the CAPM methodology – as discussed later in this statement – they are conducive to a market COC for the industry. In fact, the broad mix of commodities that railroads carry virtually parallels the non-service production that the country produces. The CAPM can best produce a credible COC for the entire market, as it employs a market risk-free interest rate, a market risk-premium rate, and a market-driven measure of risk. While it may be premature for the STB to adopt a market COEC, it would seem prudent that the agency keep this possibility in mind for possible future application – especially if another major railroad is purchased by a non-railroad entity, and the railroad is “de-listed” from the stock exchange. At the very least, the STB should require a firm predicate before determining that the railroad COC should be set a significant premium relative to the market as a whole.

The remainder of my statement is divided into four sections. First, I identify and expound upon the erroneous results produced by the MSDCF since 2008, showing the culprit to be an excessive MSDCF, as opposed to an understated CAPM. Second, I identify fundamental flaws in the MSDCF when applied to the railroad industry. Third, I discuss

⁹ Ibid., p. 27.

¹⁰ Railroad Facts, op. cit., p. 42.

why a modified CAPM would be appropriate as the sole regulatory COC methodology. And fourth, I offer five recommendations to the STB.

II. MSDCF'S EXCESSIVE RESULTS

In his verified statement included in the WCTL Petition in Ex Parte 664 (Sub-No. 2), dated August 27, 2013, James E. Hodder compared the results of the MSDCF and CAPM decisions by the STB, from 2008 to 2012. He rightfully concluded that the overages in the MSDCF, compared with the CAPM, are so significant and statistically troubling, that they *warrant investigation*.¹¹ I have added the 2013 proposed calculations to Professor Hodder's comparison, and have gone a step further by addressing a potential claim that the CAPM results over the past six years could have been understated.

Shown below are the MSDCF and CAPM results since 2008. During this period, the MSDCF exceeded the CAPM in every one of the six years and in three of those years, the excess ranged between 40% and 61%, with an average annual overage of 32%. As discussed below, these overages cannot be explained away by claiming that the CAPM has been understated - either in 2013 or in other years since 2008, when comparative figures would probably have been similar, albeit to different degrees.

¹¹ James E. Hodder, "Western Coal Traffic League Petition in Ex Parte 664 (Sub. No. 2)," August 27, 2013, p. 3.

<u>Year</u>	<u>MSDCF</u>	<u>CAPM</u>	<u>% MSDCF Exceeds CAPM</u>
2008	15.95%	10.39%	53%
2009	13.34	11.39	17
2010	14.13	11.84	19
2011	15.83	11.31	40
2012	16.53	10.27	61
2013	<u>13.40</u>	<u>12.52</u>	<u>7</u>
Average	14.86	11.29	32% ¹²

Risk-Free Interest Rate

Over the past six years, the STB has adopted risk-free interest rates ranging from 2.5% to 4.4%, and averaging 3.6%. These rates were based on the yield-to-maturity of 20-year U.S. Treasury bonds. While these rates are acceptable and accurate, there are alternative risk-free investments that the STB could have adopted – especially in recognition that the country was feeling the impacts of government induced suppression of interest rates (particularly shorter-term) following the worst recession (depression) since 1929. Largely due to the implementation of the Troubled Asset Relief Program enacted in 2008, and three Quantitative Easing programs enacted by the Federal Reserve in 2008, 2010 and 2012, interest rates in recent years have fallen dramatically. As shown below, and as expected, interest rates on 10-year Treasury bonds have been consistently lower than the rates on 20-year bonds, and there is a basis to support 10-year Treasury rates as the appropriate risk-free return. As stated by the Association for Financial Professionals, *The selection of a financial instrument for estimating risk-free rates is critical in calculating*

¹² The average excess is 33.0% when calculated vertically (six figures between 7% and 61%) and 31.6% when calculated horizontally (14.86% compared with 11.29%). The midpoint between the two calculations is 32%.

*the cost of equity using CAPM. The 10-year Treasury note (or other sovereign instrument) is the most commonly used instrument across organizations . . .*¹³

	<u>Market Risk-free Interest Rates</u>						
<u>Treas. Bond</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>Average</u>
20 year	4.4%	4.1%	4.0%	3.6%	2.5%	3.1%	3.6%
10 year	3.7%	2.5%	3.7%	3.4%	2.0%	1.9%	2.9%

Furthermore, as detailed in their annual reports and proxy statements, two railroads (UP and NS) use market risk-free interest rates to determine the present value of future shares of stock awarded to their executives. The exception, CSX, assumes that the present value of its stock into the future, so no risk-free rates are provided in its proxy statements.¹⁴ As shown below, the railroad figures are also lower than those used by the STB. The UP seems to use a relatively short-term return period, while the NS apparently employs a 10-year time period. The railroads' choice of future time periods (in determining present value) reveals their perspectives as to the foreseeable length of time that aligns investor and their executives' interests.

	<u>Market Risk-Free Interest Rates</u>						
<u>Railroad</u>	<u>2008</u>	<u>2009</u>	<u>2010</u>	<u>2011</u>	<u>2012</u>	<u>2013</u>	<u>Average</u>
UP ¹⁵	2.8%	1.9%	2.4%	2.3%	0.8%	0.8%	1.7%
NS ¹⁶	3.7%	2.9%	3.6%	3.4%	2.0%	1.9%	2.9%

The major point of the above comparisons is not that a short-term, risk-free interest rate should supplant the 20-year bond rate in the CAPM, but that that the STB employs

¹³ Association for Financial Professionals, 2013 AFP Estimating and Applying Cost of Capital Report of Survey Results, October 2013.

¹⁴ CSX, 2013 Proxy Statement, "Notice of 2014 Annual Meeting of Shareholders, May 7, 2014," pp. 48 and 49. CSX does not discount future long-term incentive to executives, but rather calculates all such benefits at present value – that is, the railroad assumes that the present value of the benefits equals the value at time of declaration of the future compensation.

¹⁵ Union Pacific Corporation, 2014 Proxy Statement, April 1, 2014," p. 51 and 2012 Proxy Statement, p. 49.

¹⁶ Norfolk Southern Railroad, 2013 Annual Report, P. K-70, 2011 Annual Report, p. K-67, and 2010 Annual Report, p. K-66.

relatively high risk-free rates in its CAPM calculation. For example, the CTA uses three-year and five-year government bonds. Thus, there has been no downward pull on the CAPM results since 2008, emanating from the risk-free, interest rate component.

Beta

Comparing the volatility of railroad stock prices (valuations) with the volatility of stock prices in the S&P 500, has produced the following regulatory-derived betas for the railroad industry.

<u>Year</u>	<u>Beta</u>
2008	0.937
2009	1.092
2010	1.162
2011	1.162
2012	1.154
2013 (p)	<u>1.350</u>
Average	1.143

These betas exclude the BNSF starting in 2010, and instead, implicitly assign the weighted-average (by market valuations) betas of the other railroads to the BNSF. This would appear to often produce an overstatement of the railroad industry's average beta, as the beta for the BNSF could be expected to more resemble the relatively lower beta of the UP, than the higher betas of the CSX, NS, and KCS (when it is included.) Using Value Line betas (which as explained later contain a Blume adjustment), shown below is a credible alternative calculation of the railroad industry's weighted-average beta for 2013, incorporating the BNSF by assigning it the same beta as the UP. Based on annual revenue for the purpose of illustration (there is no valuation for the BNSF), as shown below, the railroad industry beta of 1.108 falls below the preliminary STB-derived beta of 1.350 in 2013.

<u>Railroad</u>	<u>Beta</u>	<u>Weight</u>	<u>Beta</u>
KCS	1.54	3%	.046
CSX	1.20	17	.204
NS	1.20	16	.192
UP	1.04	32	.333
BNSF	1.04	<u>32</u>	<u>.333</u>
Total		100%	1.108

Recognizing that the STB excludes the BNSF from its COEC calculation, a second alternative beta calculation can be made using the current STB approach – that is, also excluding the BNSF by reweighting, based on market value, the other railroads as though the BNSF didn't exist, but, by using Value Line betas. As shown below, this second beta calculation also results in a lower beta than the STB figure of 1.350 in 2013. In essence, as with the risk-free return, it is not the beta that has had a downward impact on the STB calculation of CAPM results since 2008.

<u>Railroad</u>	<u>Beta</u>	<u>Weight</u>	<u>Beta Absent BNSF</u>
KCS	1.54	2%	0.031
CSX	1.20	22	0.264
NS	1.20	21	0.252
UP	1.04	<u>55</u>	<u>0.572</u>
Total		100%	1.119

I could have made a third calculation of an alternative beta using the BH beta – in whole or in part – as a surrogate for the BNSF beta, but chose not to do so, in that the point has already been made about the relatively high beta adopted by the STB, and using the BH beta would simply be another illustration of this point.

Market Risk Premium

The STB uses a long-term measure of the market risk premium to calculate the CAPM, and Ibbotson is certainly a logical source of historic returns of S&P 500 companies,

but going back to 1926 is a questionable practice. After all, the world has changed considerably since 1926 with the development of international companies, the computer revolution, and the consolidation of major business entities into mega-corporations and conglomerates. Many of today's companies, products and services didn't exist during the first half of the 20th century. The railroad industry is a case in point, in that it peaked in the early part of the 20th century, and in subsequent years has been consolidated into four dominant carriers with greatly reduced labor, fixed plant, and inefficiencies. Furthermore, economic regulation has changed, labor unions have had less impact, technology has altered efficiency and competitiveness, the railroads have efficiently outsourced many of their activities (locomotives and railcars, for example), and new products have altered buying habits. Giving equal weight to the individual 88 years in the Ibbotson data base improperly diminishes the relative importance of the more contemporary market characteristics.

Striking a balance between a long enough time period that would produce stability and adequate consideration of the more contemporary business environment, the STB could have adopted a 50-year Ibbotson data base in its CAPM calculation. The Ibbotson risk-premium rate going back to 1964 was 4.7%, compared with 7.0% going back to 1926.¹⁷ Consequently, like the other two CAPM components, the STB calculation of the risk-premium return did not cause an understatement of the COEC since 2008.

¹⁷ Ibbotson, SBBI Classic Yearbook, p. 154.

III. FUNDAMENTAL FLAWS OF THE MSDCF

While both the MSDCF and CAPM have their individual attributes and issues, the positives and negatives are not equal. The results of a single year illustrate this point. In 2012 the MSDCF produced a COEC of 16.53% - up from the 15.83% in the previous year. The 16.53% figure was not only 61% higher than the 10.27% CAPM figure, it was unreasonably high by virtually any standard of comparison. After all, fixed-interest investments such as interest from bank savings accounts, Treasury bills, and bonds, tended to fall in a 0.2% to 3.0% range, and it would seem highly unreasonable to assume that investors would not provide funds to railroads unless they expected incredibly high returns (multiple figures) above what they could expect from fixed-income alternatives. Moreover, the MSDCF 16.53% COEC in 2012 was in a year when the risk-free, return rate was at its lowest level, 2.5%. It is difficult to understand how a company or industry can have its highest COEC at a time of the lowest risk-free and fixed-income, return rates. This is especially puzzling when one considers that the “downside” risk of investing in the contemporary railroad industry has become relatively low. Aside from the low-risk characteristics of the railroad industry that are identified in Section I of this statement, railroads enjoy a customer base consisting of many dependent shippers who endure the “pass-through” of increased railroad costs. Furthermore, railroads have a significant fuel efficiency advantage over their major competitive mode of transportation, trucking, and in fact, the trucking industry has become the railroads’ largest customer. And finally, the downward pressure for a reduction of coal use in this country has been offset in substantial part by an increase in the transportation of petroleum. As stated by the AAR in 2013, *Crude Petroleum and Natural Gas . . . tonnage increased over 250 percent as railroads transported*

*much of the new domestic production from shale rock formations such as the Bakken Formation in the Northern Plains.*¹⁸

In view of the above, it is reasonable to wonder why such high equity costs have been produced by the MSDCF. I believe that the answer lies in the reliance of the MSDCF on projected growth rates in railroad earnings, capital investment, depreciation, and deferred taxes. Whether a SSDCF or a MSDCF, the projection of growth rates and cash flow is fraught with presumption and credibility issues. In rejecting any DCF approach for application to Canadian railroads, the CTA cited the statement in the Brattle Report, 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 ... the results of applying the methodology can be unstable over time, leading to rapid shifts from high cost of capital estimates to low ones.¹⁹

While the multi-staged DCF theoretically mitigates some of the problems of a single-stage DCF, it introduces new ones. Quite simply, there are new and varied assumptions built into the three stages of the five-year forecast period, as there are different methodologies applied in each of these periods. In reality, it is highly questionable as to whether investors project five (much less ten or more) years in advance when making their investment choices, or a lesser or greater amount; if they treat the first five years of their forward-looking thinking in a manner similar to the three-stage approach in the current MSDCF methodology; if they believe that such “accounting conventions” as depreciation rates and deferred-tax practices will continue as they have existed over the past five years; or if the model otherwise reflects investor expectations. Rhetorically speaking, if the MSDCF links future cash flows to present value, and the BNSF has no present value, is not

¹⁸ Railroad Facts, *op. cit.*, p. 5.

¹⁹ The Brattle Group, “Review of Regulatory Cost of Capital Methodologies,” Prepared for Canadian Transportation Agency, September 2010, Paragraph 27, quoted in CTA Decision at Paragraph 207

about one third of the railroad industry missing from this methodology? Also, because the MSDCF reconciles future cash flows to market capitalization, discounting is vulnerable to changes in the number of shares outstanding (due to buybacks), as Professor Hodder has previously explained in his statement in Ex Part 664, Sub. No. 2, August 27, 2013. In essence, the MSDCF suffers from the following deficiencies as a regulatory standard to determine the railroad COC:

1. It is highly dependent on projected growth rates in cash flow and there is little, if any, basis for having confidence in such projections when applied to the capital-intensive railroad industry, where depreciation and deferred taxes – emanating from capital investment and national tax policy - are major segments of cash flow.
2. Its methodology (data employed and calculations) is not transparent. The relationship between risk and reward is implicit, and does not lend itself to benchmarking.
3. There is no comparative perspective (opportunity cost) of the result with risk-free returns, alternative fixed-income returns, and/or alternative risk-premium returns found elsewhere – and after all, the COEC is an opportunity cost that is highly relative.
4. It excludes about a third of the industry (the BNSF), and has no basis for assuming that the excluded railroad mirrors the calculations of the included railroads.

IV. APPROPRIATENESS OF A MODIFIED CAPM

Unlike the MSDCF, the CAPM is transparent in regard to alternative investment opportunities in open capital markets, explicitly building on a basic tenet of economics and finance – that is the risk-reward relationship. The three components of the CAPM are publicly available and can readily be benchmarked against a variety of well-known measures. First, risk-free yields for varying future time periods are published by the federal government and financial institutions, as Treasury Bills and Bonds are often the instrument of choice, and reflect an active, liquid, and well-defined marketplace. Second, betas are publicly available information, obtainable from a variety of sources, including Value Line, the Bloomberg service, Morningstar, S&P Capital I.Q., the Yahoo company profile service, and the Berra Beta Book. And third, risk-free rates of return are available from Ibbotson Associates, going back to 1926, or more appropriately, adopting a more recent time frame such as 50 years. The historic returns are also in the public arena, as is considerable information about projected/expected returns, as discussed in this proceeding by Professor Triantis. All three of the CAPM components can be readily benchmarked against a variety of similar, publicly available data sets, enabling the STB to analyze the validity of CAPM results.

The CAPM is aligned with the perspective of potential investors. It identifies the return investors can expect even if they are totally risk adverse. It informs them as to what financial institutions believe about relative investment risks. It incorporates data sources and values that financial advisors use. It provides evidence as to the expected return of equities, based on broad market performances. And, it is futuristic, relative, and a displayer of opportunity cost, just as the COEC is supposed to reflect.

In adopting the CAPM as its sole measure of the railroad COEC, the CTA stated:

CAPM is the only cost of equity model that was (at least partially) accepted by all stakeholders. The CAPM also has theoretical support, is widely used in regulatory settings, has been systematically chosen by the Agency in each of the last 19 years, and has an intuitively rational way of characterizing risks (risk-free asset; equity market risk; company specific non-diversifiable risk). Its three components react in different ways to market information (rapidly for the risk-free rate; moderately rapidly for the company-specific risk; and slowly for the equity market risk), providing both responsive and stable elements in the estimation of the cost of equity. Finally, relying solely on the CAPM would reduce uncertainty in the regulatory environment in which the Agency's cost of equity.²⁰

Finally, the overall benefit of the CAPM is that it identifies a clear relationship between investment risk and the expected rate of return. Higher risk demands potentially higher returns and vice versa. If properly constructed, a workable CAPM would assume somewhat of a linear relationship between betas (risk) and market-risk rates of return, and this relationship under the CAPM is transparent.

V. RECOMMENDATIONS

I offer five recommendations to the STB, with explanations of each recommendation in following discussions.

1. Stop relying on the MSDCF and rely entirely on a modified CAPM.
2. Continue to use the yield of the 20-year U.S. Treasury bond for the risk-free rate.
3. Adopt betas published by Value Line, or from a similar source of financial information, and average two betas – one with, and one without the BNSF - to

²⁰ Canadian Transportation Agency, "Review of the Methodology Used by the Canadian Transportation Agency to Determine the Cost of Capital for Federally-Regulated Railway Companies," Decision No. 425, December 9 2011, Paragraph 215.

determine a railroad industry beta; the beta that includes the BNSF should employ the UP beta as a surrogate for the BNSF beta.

4. Cease using the Ibbotson 1926-based, risk premium and employ either a more recent period, such as 50 years, or an estimate of the premium currently expected by investors, as evidenced by a reputable alternative source.
5. Benchmark the components and the results of the CAPM determinations.

To illustrate what the railroad COEC would have been in 2013 under the recommended, modified CAPM in 2013, three figures were adopted: (1) a risk-free yield of 3.12%, based on the 20-year Treasury bond rate (2) a beta of 1.114, based on the average of two Value Line betas: 1.108 with the BNSF and 1.119 without the BNSF, and (3) a market-risk premium of 4.7%, based on Ibbotson data back to 1964. The result is an 8.3% COEC, deriving from $3.12\% + 1.114(4.7\%)$. Shown below are the comparisons with the 2013 CAPM, assuming the STB accepts the proposed 2013 calculations of the AAR.

	<u>STB</u>	<u>Modified</u>
risk-free return	3.12%	3.12%
beta	1.3499	1.1140
risk-premium return	<u>6.96%</u>	<u>4.7%</u>
cost of equity capital	12.5%	8.3%

If anything, the recommended, modified COEC is conservatively on the high side – at least in the example above for 2013 - in that the average beta for the BNSF (with and without the BNSF) is higher than if the UP beta would have been used exclusively as a surrogate for BNSF, or if in a similar vein, the BH beta was used.

Place Sole Reliance on the CAPM

While it could be proffered that the array of alternative investment opportunities are implicit in the MSDCF – through the relationship between railroad valuations and expected cash flow - in reality the MSDCF is an opaque and presumptuous methodology. It produces a discount rate only after future returns are identified, and thus is effective only when the projections are correct. Otherwise, the MSDCF is simply a mathematical calculation. Projected cash flows are not necessarily expected cash flows. The MSDCF is most appropriate when there is confidence, if not outright certainty, that the projections of cash-flow growth are reliable. Such certainty may be best suited to an individual investment, but it is far less appropriate for a capital-intensive industry with varying operating traits, tens of thousands of investments, and disparate practices affecting investment and cash flow. And certainly, it is diminished in reliability when virtually one third of the railroad industry – the BNSF – is excluded from the determination because it is a component of a much larger conglomerate. No wonder the MSDCF is far from the preferred method of determining the COC among regulatory agencies, the financial community, and academia.

Over the past six years, the regulatory MSDCF has produced unrealistically high results, exceeding the CAPM results by as much as 61% in a single year. Furthermore, the MSDCF results over the past six years would have exceeded by even greater amounts, CAPM calculations based on credible alternative betas and risk-premium returns. While the CAPM also relies on historic data, it does so in a much more benign way than the MSDCF. Under the CAPM, the risk-free interest rate is a current (forward-looking) figure and the historic data base of the market-risk premium has more consistency and certainty

than five years of individual railroad financial data. In addition, one can derive a current expected premium by utilizing surveys and/or market data. It is the beta that theoretically has the potential for disconnect between the past and the future, but it is just one of three components under CAPM, and, in the case of railroads, has a central tendency toward the market beta, thereby reducing the chance of erroneous results. In fact, the demand for the commodities that railroads transport often mirrors the general economy, to the extent that the Federal Reserve Bank relies on weekly railroad car-loadings as a concurrent indicator of the state of the national economy.

Most significantly, the CAPM goes to the heart of the COC – the relationship between perceived risk and perceived reward. While choices have to be made about CAPM inputs, they fall within the realm of market data that are available to potential investors, are easy to understand, and are far more credible and transparent than calculations made under the MSDCF. Unnecessarily complicating COC calculations discredits the results, as is likely the case with the MSDCF. Thus, the STB should align itself with the Canadian government (CTA) and rely solely on a well-defined and transparent CAPM to determine the COC for our nation's railroads. Also noteworthy is that the large Canadian railroads have a presence in the U.S., and to some degree, are competitors of railroads in this country.

Continue to Use a Risk-Free Interest Rate Based on 20-Year Treasury Bond

The 20-year U.S. Treasury bond rate is sensible, and thus should be retained. While there is a rationale for adopting the 10-year bond rate as the risk-free interest rate - and the 10-year bond appears to be more commonly utilized at least in academic work - the 20-year Treasury bond is still a reasonable choice, as its stability outweighs the benefit of a shorter, forward-thinking time frame. Furthermore, as stated by the Association for

Financial Professionals, *Finance theory recommends matching the life span of a project with the duration of the financial instrument used for risk-free rate estimates.*²¹ And finally, there is no certainty that 20-year rates would always be higher than 10-year rates, as the difference in interest rates between these two periods depends on the shape of the yield curve. Inverse yield curves may not be common, but they do occur.

Use Value Line Betas

It is unnecessary to require the railroad industry to calculate betas, and then to have the STB audit them. Credible betas are already produced by financial-service entities – particularly, Value Line. While recommending, but not endorsing Value Line as the sole source of credible company betas, I have used the company as a credible and widely accepted source of betas, for the purpose of this statement. Based in New York City, Value Line is an independent investment research and financial publishing firm, whose predecessor company traces back to 1931. In its current form, Value Line was incorporated in 1982. It is a publicly traded company, listed on the NASDAQ exchange as “VALU,” and publishes extensive financial data, both in print and electronic formats on virtually all of the major, publicly traded companies in the U.S. – including all of the railroads. Value Line information is available by individual subscription, and through financial institutions, such as stock brokerage companies.²² The attributes of the Value Line betas for application to the railroad CAPM are that they: (1) are credible (2) mirror the methodology approved by the STB (3) are based on five-year stock volatilities like the STB

²¹ Association for Financial Professionals, *Ibid.*, p. 5.

²² Value Line is available at many public libraries and can usually be accessed on-line at no cost through their websites. Value Line uses the NYSE Composite Series, which is a broader measure of the general market than the NYSE Composite Series. The CTA uses the NYSE to measure the portion of the Canadian railroad stocks traded in the U.S. market.

calculations (4) are inexpensive to obtain (5) are available to one and all (6) are used by a large portion of financial institutions and investors, and (7) are undoubtedly more relied upon by potential investors than STB calculations.

The Value Line betas employ a Blume adjustment, reflecting the tendency of beta values to revert to 1.0 over time,²³ and the CTA adopted a Blume adjustment in its CAPM methodology, stating that:

Most financial data providers, such as Bloomberg and Value Line, report adjusted betas using Blume's methodology as their default beta. According to the Brattle Report, from a decision-theory point of view, this estimate is generally inferior to Vasicek's²⁴ adjustment, which computes a specific weighting tailored to the information content of the data. However, the Brattle Report adds that in general, the Vasicek adjustment requires more computations and has not performed significantly better than the simplified Blume adjustment, which may be the reason the Vasicek adjustment is rarely employed by analysts in business and regulatory applications, and is not a standard reported by most data providers.²⁵

The CTA goes on to conclude that its responsibility in developing a COC methodology is to be consistent with what is generally accepted in the financial community. It stated that:

As the Agency, for the most part, uses beta to forecast a cost of capital rate for a future period, the Agency considers it appropriate to employ a methodology that is used by the majority of financial data providers, insofar as investor expectations are formed by financial analysts. Also, there is greater transparency with the Blume adjustment as compared to the Vasicek method, which better meets the Agency's reasonableness criteria. Accordingly, the Agency will continue to use the Blume methodology to adjust beta.²⁶

In using the Value Line Betas, I also recommend that the STB include a beta for the BNSF, based on an average of two surrogate betas: (1) the beta of the UP – the railroad that most closely mirrors the operation of the BNSF, and (2) the weighted-average beta of the

²³ Marshall E. Blume, "On the Assessment Risk," 26 Journal of Finance, 1-10, 1971.

²⁴ Oldrich A. Vasicek, "A Note on Using Cross-Sectional Information in Bayesian Estimation of Security Betas," 28, Journal of Finance, 1233-1239, 1973.

²⁵ Canadian Transportation Agency, "Review," op. cit., Paragraph 380.

²⁶ Ibid.

other railroads included in the COEC determination. In this way, the BNSF is not solely implicitly assigned the higher beta of the railroad industry in general, and yet, it does not assume the much lower beta of its parent company, BH.

Adopt a Risk-Premium Yield Based on 50 Years of Ibbotson Data

Utilize a market risk premium that better reflects current investor expectations, such as a rolling 50-year average based on the Ibbotson historical data. Thus, for the 2014 COC calculation, the time frame for the Ibbotson returns would be 1964 to 2013. Using data back to 1926 gives inappropriate weight to bygone years when market financial and economic conditions were vastly different than current markets. There is abundant evidence that we have entered a “new normal” and that investors do not expect to face the same market conditions that are included in the 1926-Ibbotson base.

Arguments can be made that using a shorter historic period, such as 20 years, would better capture current investor expectations, but the offsetting concern is that there would be excessive fluctuations from year to year, especially given recent financial events such as the market collapse in 2000 and 2008. Current investor expectations could be better measured by relying on the use of credible surveys or perhaps the market premium implied by a DCF analysis of the market as a whole. These matters are addressed by Professor Triantis in this proceeding.

Benchmark the Inputs and Results

Third, the STB should benchmark the COC with peer groups and standards similar to those used by the railroads themselves to align non-salary, executive compensation with investor expectations. In so doing, the railroads have virtually identified what they believe to be, is their COC. The benchmark process would not be for the purpose of developing an

alternative COC to the CAPM, but rather to provide evidence that a component needs to be re-examined for credibility and applicability. Of course, in the case of the CAPM, its individual components require relatively little benchmarking in that risk-free interest rates are published by the federal government, and risk-premium yields are published by reputable financial entities. What remains is the beta, and even here, if say Value Line betas are adopted, they can readily be compared with betas from other financial institutions and analyzed based on differences in time periods, data, and measurement standards.

In regard to benchmarking the ultimate COC, this is precisely what I did as part of my testimony to Congress in 2001. As I stated to the Senate committee:

Railroad data in annual reports to shareholders, and supplemental data to the Securities & Exchange Commission (SEC), is often in conflict with industry-wide data distributed to and by the STB, and especially that agency's annual determination of revenue adequacy.²⁷

In this case, my benchmark was the relevant data reported by railroads themselves in their annual reports and in meetings with shareholders -- more precisely, their proxy statements (notices to shareholders of annual meetings). I went on to cite examples where railroads informed their shareholders that they had met their financial goals, had invested billions of dollars in purchasing other railroads, and had rewarded their executives with long-term compensation based on achieving specific thresholds, only to be deemed by the ICC to not have earned their COC. But aside from my relatively cursory examples, benchmarking financial performance has long been a practice of for-profit companies in general, and the railroads in particular.

²⁷ Harvey A. Levine, op. cit.

UP

In determining the levels of distribution of non-salary (long-term), executive compensation, it is the UP philosophy, to align the interests of its shareholders with the interests of its executives.²⁸ To accomplish this goal, the UP compares, among other financial measures, the company's ROIC (return on invested capital) and its total shareholder return with the returns of a Peer Group.²⁹ The Peer Group is comprised of 18 companies, selected:

. . . after surveying U.S. based public companies in the same Global industry Classification System (GICS) industry Group with comparable revenues and market capitalization and other U.S.-based public companies with comparable (i) revenues, (ii) operating income, (iii) total assets, (iv) market capitalization and (v) employees, while excluding pharmaceuticals, high-tech, insurance and financial services companies.³⁰

Based on a comparison with its Peer Group, the UP develops an ROIC "threshold target," and a "maximum" level of the ROIC, molded into three-year averages. The railroad strives for an ROIC between the median and 75th percentile of the Peer Group performance. Achieving the ROIC threshold is akin to earning the COC. In recent years, based on its target ROIC, the UP has more than earned its COC.³¹ In fact, in 2013, the UP five top executives earned combined salaries (\$3.0 million) that equated to just 8.3% of their total compensation (\$36.3 million).³² Clearly, both UP executives and UP shareholders have reaped significant benefits from the railroad earning its COC.

²⁸ Union Pacific Corporation, 2014 Proxy Statement, *op. cit.*, p. 31.

²⁹ Ibid., p. 26.

³⁰ Ibid., p. 50.

³¹ Ibid., pp. 44-47.

³² Ibid., p. 51.

NS

As with other railroads, the NS ties its long-term, executive compensation to shareholder performance goals. As the NS recently stated, the railroad:

. . . continued to grant as in past years, long-term incentive awards consisting of options, restricted stock units, and performance shares, all of whose ultimate value is based on shareholder return. The value of performance shares is also tied to achievement of disclosed goals for total stockholder return, return on average invested capital and operating ratio.³³

Beginning in 2011, the NS narrowed its peer group – for the purpose of benchmarking its executive compensation – to the other North American Class I railroads, including the two Canadian railroads.³⁴ Since the larger of these railroads employ a broad peer group, as discussed herein, for benchmarking purposes, the NS is indirectly also using such a wider network.

The financial criteria that NS uses to award non-salary, executive compensation varies with the type of compensation distributed. For example, in the case of cash bonuses, the two key factors are operating income and operating ratio.³⁵ For “performance shares” of stock, three financial standards are equally weighted: return on average invested capital, total stockholder return, and operating ratio.³⁶ In 2013, the top-ranking seven executives of NS received companied salaries (\$4.3 million) that equated to 16.6% of their total compensation (\$26.1 million).³⁷ Obviously, both NS shareholders and NS executives benefitted from the railroad earning its COC in 2013.

³³ Norfolk Southern Railroad, 2014 Proxy Statement, May 8, 2014, p. 32.

³⁴ Ibid., pp. 33 and 35.

³⁵ Ibid., p. 41.

³⁶ Ibid., p. 42.

³⁷ Ibid., p. 48.

CSX

Similar to the UP and NS, CSX also aims to align a significant portion of its executive compensation with the interests of its shareholders.³⁸ Financial measures are benchmarked with a *group* of 18 companies, known as the “Comparator Group,” with characteristics similar to CSX, *including revenue, assets, net income, market capitalization, number of employees, industry type, and business complexity*.³⁹ The performance measure(s) are subject to change under the CSX program, and as stated by CSX, it:

... considers various financial measures for use as the key performance measure, such as OR, free cash flow, ROA and return on invested capital. OR is defined as annual operating expense divided by annual operating revenue adjusted by excluding nonrecurring items ... The Company choose OR due to its historical high-correlation to Company stock price, alignment with shareholder interests and the ability of employees to understand the impact of their actions in relation to Company performance.⁴⁰

In 2014, CSX expanded its performance standard, adding a measure of return on investment. According to CSX:

... the opportunity for incremental OR improvement prompted us to seek an equally weighted additional financial measure to drive employee performance and value creation. Accordingly, the Company added return on assets (“ROA”) as an additional financial measure ... to supplement OR.⁴¹

CSX goes on to reveal that consistent with its philosophy executive salaries were a minor portion of total pay in recent years. For example, in 2013, the five identified, and highest-ranking executives earned a combined salary (\$3.56 million) that equated to 13% of their total compensation (\$27.25 million).⁴² Clearly, both CSX shareholders and CSX executives have benefited from the railroad earning its COC in 2013.

³⁸ CSX, 2014 Proxy Statement, May 7, 2014, op. cit., p. 35.

³⁹ Ibid., p. 37.

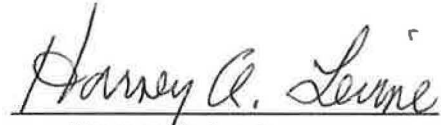
⁴⁰ Ibid., p. 43.

⁴¹ Ibid., p. 33.

⁴² Ibid., p. 48.

VERIFICATION

I, HARVEY A. LEVINE, verify under penalty of perjury that the foregoing Verified Statement is true and correct. Further, I certify that I am qualified and authorized to file this Verified Statement.


Harvey A. Levine

Dated: August 21, 2014

HARVEY A. LEVINE

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An independent consultant and expert witness with concentration on economics, finance, statistics, safety, and national transportation policy. Retired in 1997 from the Association of American Railroads, where for 18 years was the Vice President of the Economics & Finance (in some years also "Policy") Department, and: Chief Economist, Chairman of the Pension Board, Chairman of the Training Committee, Administrative Office to the Finance and Accounting Divisions, member of the Tax and Railroad Policy committees, and Rail Representative on the National Transportation Stakeholders Committee. Since 1997, provided consultation to clients in the United States and Canada, focusing on competitive transportation issues, railroad cost of capital and revenue adequacy; railroad mergers, grade-crossing safety, governmental regulatory policies, and transportation planning.

EDUCATION

- BBA, University of Pittsburgh, 1961, economics and transportation (Senatorial Scholarship)
- MBA, Duquesne University, 1964, economics and finance (Graduate Fellow)
- PHD, American University, 1972, transportation economics (Fletcher Fellow)

PROFESSIONAL EMPLOYMENT

- 1963-1965: Contract Administration, Atomic Energy Commission, Naval Reactors
- 1965-1968 Market Research Analyst, Asst. Dir. Pricing, New York Central RR
- 1968-1970: Director Transportation, Planning Research Corporation
- 1970-1972: Senior Economist, United States Department of Transportation
- 1972-1973: Director of Economics, Interstate Commerce Commission
- 1973-1979: Senior Consultant, Vice President, R. L Banks & Associates, Inc.
- 1979-1997: VP., Economics, Policy, Finance, Association of American Railroads
- 2002-2006: Director, Crossing to Safety, Angels on Track Foundation
- 1997-2014: President, Levine Consulting Services

TEACHING AND RELEVANT PART-TIME EMPLOYMENT

- Assistant Professor, Duquesne, American, and Howard Universities
- Lecturer: American Trucking Association, Association of American Railroads, and Interstate Commerce Commission
- Summer transportation employment: Tariff Auditor, Charles Donoley & Associates (1961) and Westinghouse Electric Corporation (1962)

ORAL TESTIMONY

- Canadian Government
- California Equalization Board
- Canada Transportation Act Review Panel
- Interstate Commerce Commission
- Judicial Bodies (Federal/State Courts)
- Presidential Emergency Board
- Railroad Commission of Texas
- Surface Transportation Board
- United States Price Commission

- United States Congress
- Washington Metropolitan Transit Authority

PUBLICATIONS

- Books: National Transportation Policy: A Study Of Studies, Small Railroads, and the USSR and Its Railroad System (self published)
- Articles: About 50 articles in various journals and business publications including: Angels On Track Foundation Article Series, ICC Practitioners Journal, International Transportation Journal, Logistics News Weekly, Massachusetts School of Law Journal, Public Utilities Fortnightly, Traffic Quarterly, Traffic World, Transportation Journal, and Transportation Research Forum Proceedings,
- Reports: Hundreds of studies and reports including the creation of statistical publications for the Association of American Railroads

PERSONAL

- Born: August 11, 1939, Pittsburgh, Pennsylvania
- Marital Status: Married, two grown children (grandfather)
- Hobbies: Painting, music and golf

SOME CLIENTS SINCE 1997

- Accurso Law Firm: Kansas City, Missouri
- Alliance For Rail Competition: Washington, D.C.
- Angels On Track Foundation: Salineville, Ohio
- Association of American Railroads: Washington, D.C.
- Banks, R.L. & Associates: Washington, D.C.
- Beal, Micheaels & Slack, Phoenix, Arizona
- Conway & Conway: Louisville, Kentucky
- Crow, Carl V.: Houston, Texas
- Dakota, Minnesota & Eastern Railroad: Brookings, South Dakota
- Davis, Bethune & Jones: Kansas City, Missouri
- Fednav Limited: Montreal, Quebec, Canada
- Hahn, Loeser and Parks: Cleveland, Ohio
- Kielty, Thomas W.: Los Angeles, California
- Kirklin Thompson & Pope, Portland, Oregon
- Lang, Michener: Vancouver, B.C., Canada
- Langdon, Emison, Kuhlman & Evans: Lexington, Missouri
- Los Angeles County, California
- Lloyd & Cavanagh: Chicago, Illinois
- Luscar, Ltd: Edmonton, Alberta, Canada
- Myers, Pottroff and Ball: Manhattan, Kansas
- O'Conner Consulting Practice: Washington, D.C.
- Omni Trax, Inc.,: Denver, Colorado
- Parsons Transportation, Deleu Cather & Associates: Washington, D.C.
- Phillips & Sweeney: Chicago, Illinois
- Stites & Hopkins: Kansas City, Missouri
- Western Canada Shippers' Summit: Vancouver, B.C., Canada
- Western Coal Traffic League (Slover & Loftus), Washington, D.C.

VERIFIED STATEMENT OF
ALEXANDER J. TRIANTIS

Verified Statement of Prof. Alexander J. Triantis

My name is Alexander J. Triantis. I am the Dean of the Robert H. Smith School of Business at the University of Maryland, College Park.

I obtained my PhD at Stanford University in 1988, and after one year as a Visiting Scholar at MIT's Sloan School of Management, I have spent the last twenty-five years as a professor of finance at the University of Wisconsin - Madison (1989-1996) and at the University of Maryland (1996-present), teaching and conducting research in the area of finance. I served as Chair of the Finance Department at the University of Maryland from 2006 until 2011.

I have conducted extensive research in the area of corporate finance, particularly on topics related to the evaluation of corporate investments, the impact of capital structure on corporate value, and corporate risk management. I have published numerous articles in leading academic journals, including in the *Journal of Accounting and Economics*, *Journal of Finance*, *Journal of International Economics*, *Journal of Law and Economics*, *Management Science*, and the *Review of Financial Studies*, and in practitioner journals such as *RISK*, *Journal of Applied Corporate Finance* and *Mergers and Acquisitions*. My research has been featured in *Business Week*, *CFO* magazine, *Financial Times*, *New York Times*, *Wall Street Journal*, and numerous other periodicals.

I served two terms (2000-2006) as an Editor of *Financial Management*, which is one of the largest circulation academic journals in the area of Finance. I have also served on the editorial boards of other prominent journals in finance and business:

Associate Editor of *Management Science*, Advisory Editor of *Journal of Applied Corporate Finance*, and Senior Editor for *Production and Operations Management*.

I have consulted in the areas of corporate finance and valuation to multinational corporations and organizations such as Accenture, Airbus, Deloitte, DuPont, Ernst & Young, Hyatt, Jefferies and Company, Lockheed Martin, Marriott, Morgan Stanley, PwC, U.S. Dept. of Energy, and the World Bank.

A copy of my resume is attached as Exhibit A.

I have been asked by the counsel for the Western Coal Traffic League (WCTL) to provide my opinion regarding the suitability of the Capital Asset Pricing Model (CAPM) and the Multi-Stage Discounted Cash Flow model (MSDCF) as methodologies to estimate the current cost of equity for the railroad industry for use by the Surface Transportation Board (STB).

In my statement, I will explain why the CAPM is the preferable methodology to use to estimate the cost of equity, based on both the strength of its conceptual underpinnings and its related prevalence in practice. I will also provide some specific recommendations about how best to apply the CAPM, particularly with

regards to estimating two of the required inputs, the equity beta and the market risk premium, so that the results will be more accurate and better conform to financial industry norms. I will then review the MSDCF and address several pitfalls in trying to use this model to back out the cost of equity, concluding that it should not be relied upon by the STB.

The CAPM is the most common and appropriate way to estimate the cost of equity

The CAPM was developed in academia approximately fifty years ago. It is widely considered to be one of the most celebrated achievements in the history of finance and economics. Professor William Sharpe, who was the leading figure in developing the CAPM model, received the 1990 Alfred Nobel Memorial Prize in Economic Sciences (typically referred to simply as the Nobel Prize in Economics) for this important contribution to the field of financial economics.

The intuition behind the CAPM is straightforward and logical. Investors require a higher return to bear more risk, and the risk of a particular asset is its marginal contribution to the risk of well-diversified portfolios of securities held by investors. If investors view a stock as over-priced, i.e., that they would not get sufficient return on their investment given the current price level and associated risk, then supply of the asset will exceed demand and the price must decrease to a level where investors will be willing to hold the stock. Thus, in equilibrium, stock prices will adjust so that

the expected return will compensate properly for the risk that investors expect to bear. The CAPM also appropriately captures the opportunity cost of holding onto a stock: a stock must provide the same compensation for risk as the investor would receive for holding the stock of another company with comparable risk.

Since stocks are risky, their expected (average) return going forward should exceed that of a “risk-free” asset, such as a U.S. Treasury bond. The CAPM provides a very simple way to gauge this additional return, known as the “risk premium.” It stipulates that the risk premium on a particular stock should equal the risk premium for the overall market, called the “market risk premium” (MRP) or “equity risk premium” (ERP), scaled up or down (i.e., multiplied) by a risk factor, called the beta of the stock.

The beta captures the marginal risk contribution of the stock to the overall risk of the market portfolio. A stock with a beta greater than one has a larger than average effect on the aggregate portfolio risk, and thus would require a higher risk premium above the risk-free rate than the MRP to entice investors to hold it. Conversely, a stock with a beta less than one should have an expected return lower than that of the overall stock market. The beta reflects only the “systematic risk” of a stock, signifying the portion of the risk that cannot be diversified away by holding a large basket of assets, and thus that investors must bear, requiring additional expected return.

The CAPM is far and away the best known, and most used, model to estimate the cost of equity. Numerous survey results confirm this. For instance, a widely cited survey of large corporation CFOs by Professors Graham and Harvey in 1999, conducted in conjunction with the Financial Executives Institute (FEI)¹, finds that 73.5% of the companies always or almost always use the CAPM to calculate the cost of equity. Other methods are much less frequently used. The next most popular methods involve either using average historical stock returns or employing a CAPM but including some additional risk factors. Very few firms back out the cost of equity from a dividend discount (DCF) model. While the method of backing out the cost of equity was found to be frequently used in a much earlier cost of capital survey conducted by Gitman and Mercurio in 1982², it appears that this method has fallen out of favor as the CAPM has become more widely adopted.

Bruner, Eades, Harris and Higgins³ conducted a smaller survey in 1998 of companies that were selected by peers to be best in class for their practice of financial management. They find that 85% of the companies surveyed used the CAPM to compute the cost of equity.

A more recent study by the Association for Financial Professionals (2013) confirms the widespread use of the CAPM in practice. Its survey finds that 85% of

¹ J. Graham and C. Harvey, "The theory and practice of corporate finance: Evidence from the field," *Journal of Financial Economics* 61 (2001).

² L. Gitman and V. Mercurio, "Cost of capital techniques used by major U.S. firms: Survey and analysis of Fortune's 1000," *Financial Management* 11 (1982).

³ R. Bruner, K. Eades, R. Harris, and R. Higgins, "Best practices in estimating the cost of capital: survey and synthesis," *Financial Management* 27 (1998).

organizations use the CAPM to estimate their cost of equity (87% of publicly traded companies use the CAPM). In contrast, it finds that only 4% of companies back out a cost of equity from the dividend discount model, and the Arbitrage Pricing Model (which uses multiple factors) is used only 2% of the time.

These studies show that senior financial executives, whose responsibility it is to make investment decisions on behalf of shareholders, rely on the CAPM to estimate the cost of equity. No other model has adoption rates anywhere near the same frequency as the CAPM. To the extent the STB's objective is to track the practices of the financial community, the STB should utilize the CAPM. The CAPM is theoretically well grounded and well suited for practice in that it is clear what factors drive the cost of equity and what their effect is on the cost of equity.

Best practices in applying the CAPM to estimate the cost of equity

There are only three inputs required to use the CAPM to estimate the cost of equity: the "risk-free" rate, the beta of the company's stock, and the MRP. I will review the best practices in estimating each of these three inputs.

Estimating the risk-free rate

Since the stock is being compared to a comparable risk-free asset that an investor may purchase, it is best to use a risk-free asset that has cash flows over a similarly

long time period as a mature company's stock, or in turn its capital assets, would have. More specifically, a U.S. Treasury Bond with the same "duration" – a measure of the value-weighted average time from the present at which cash flows are received - should be used. The current rate on a ten-year U.S. Treasury Bond is most often used according to the 2013 survey conducted by the Association for Financial Professionals. However, I understand that the STB's current practice is to utilize a 20-year U.S. Treasury bond as the risk-free rate to reflect the long-lived nature of railroad assets.

Also, whatever benchmark Treasury bond is used to estimate the risk-free rate should be consistent with the benchmark that is used to compare against the expected market return in order to estimate the MRP. In particular, using a 20-year Treasury bond as the risk-free rate in conjunction with a MRP based on a 10-year Treasury bond will likely result in an excessive expected total market return and an overstated cost of equity, unless an offsetting adjustment is made.

Estimating the equity beta

The beta of equity is the measure that captures the future systematic risk of a company's stock. The typical procedure used to estimate a company's stock beta is to use historical data about the weekly or monthly returns on the stock and a market index over a defined period of time. The covariance between the stock and market returns, normalized (divided) by the variance of the market return captures

the past systematic risk of the stock. These historical betas can be found through several sources, though Bloomberg is the most common source for finance professionals and individual investors may be more likely to rely on Value Line.

It is common to use monthly return data over the past five years to provide a reasonable number of data points (sixty monthly returns) to estimate beta. One could also obtain sufficient data points by using weekly returns over the past year, but using data over a shorter time period increases the possibility that the past year was an unusually high risk or low risk period that is not representative of the future risk profile of the firm.

Even using the past five years of data could lead to a situation where the beta obtained is an upward or downward biased estimate of the future beta. Specifically, Blume (1971 and 1975)⁴ empirically documented that when a firm has a historically estimated beta higher than one (the average market beta), future betas tend to be lower than the historical beta, and vice-versa when the beta is estimated to be lower than one. In other words, betas tend to revert to a mean of one.

Based on Blume's findings, it is common in practice to use an "adjusted beta" (or Blume-adjusted beta), calculated by multiplying the historically estimated beta by $\frac{2}{3}$ and adding that to $\frac{1}{3}$ ($\frac{1}{3}$ times one), thus giving the historical beta a weighting of $\frac{2}{3}$ and the average market beta a weighting of $\frac{1}{3}$ to capture the

⁴ M. Blume, "On the Assessment of Risk," *Journal of Finance* 26 (1971); M. Blume, "Betas and Their Regression Tendencies," *Journal of Finance* 30 (1975).

mean regressive tendency of beta. This weighting procedure is used by Bloomberg, Value Line, and others. It is also a standard adjustment that is required knowledge for finance professionals taking the CFA exam. This weighting procedure results in less year-to-year variation in beta estimates, which seems to be particularly well-suited for the regulatory rate-setting environment. The 2013 survey of the Association for Financial Professionals confirms the widespread use of the Blume adjustment. If the STB's objective is to reflect the common practices of the investment community, the STB should include such an adjustment. The adjustment should also contribute to stability in the STB's results over time.

Estimating the market risk premium using historical data

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. This procedure tracks historical returns on a market index such as the S&P 500 that covers a large percentage of the capitalization of the U.S. market, and on a U.S. T-Bond with the same maturity as that used to estimate the current risk-free rate. As mentioned earlier, the 10-year U.S. T-Bond is a common benchmark, although the STB has opted in the past for a 20-year U.S. T-Bond, which should produce a lower MRP.

A key question in the historical risk premium calculation is how long of a historical time period should be used. The time period should be several decades as opposed

to several years. If one were to use simply the last few years of stock data, the average stock return could reflect a bullish run-up or a bearish decrease in stock prices that is short-lived and not representative of what investors expect to receive to compensate them for bearing equity risk over a longer period of time.

Also, from a statistical estimation perspective, the estimation error (standard error) around a point estimate decreases with the number of data points used for estimation. The estimation error decreases with the square root of the number of observation points. That means that going from one year to four years halves the estimation error, going from four to sixteen years of data halves the estimation error yet again, and from sixteen to sixty-four year halves it again.

Since the incremental benefit of going further back into history diminishes significantly after a while, the advantage of more historical data soon becomes outweighed by the disadvantage of extending too far back into history to time periods that are not representative of current market conditions. For instance, stock markets have evolved over time to be more liquid and transparent. Investors are now better able to mitigate risk, including through better diversification using various types of funds that didn't exist fifty years ago.

At the very least, these differences in market conditions suggest that using data too far back into history may not be as reliable and can undermine accuracy. These considerations also support why many believe that the market risk premium is

lower now than it was several decades ago. For example, Professor Jeremy Siegel of Wharton, who is frequently cited on the state of U.S. equity markets, states that “the abnormally high equity premium since 1926 is certainly not sustainable.”⁵ In fact, the rationales based on different market conditions have been advanced in the academic literature in response to what has been called the “equity risk premium puzzle,” namely that the difference between historical stock returns and T-Bond returns, that is, the MRP, seems to be unusually high given the level of investors’ risk tolerance.⁶ Required returns should be lower in the presence of higher liquidity, more transparency, and greater investor diversification, and thus the MRP should be lower today than it has been in the past.

Other explanations for the ERP puzzle include the possibility that stock returns have outpaced economic returns (the growth rate in earnings), and that high past stock returns reflect unanticipated gains in earnings, and thus do not properly represent the returns that investors require to invest in stocks in the future. This is substantiated by observations that the differences between stock and bond market returns in other developed countries have been significantly lower than that in the U.S. Furthermore, some suggest that high returns on equity during the past few decades is due to a decline in the cost of equity, producing large unexpected capital gains increases during this period, and that expected future MRPs will thus be less than the historical estimates.

⁵ J. Siegel, *Stocks for the Long Run*, 4th edition, Irwin, 2007.

⁶ R. Mehra and E. Prescott, “The equity premium: A puzzle,” *Journal of Monetary Economics* 15 (1985).

With all these considerations in mind, I recommend that fifty years' worth of historical data be used to arrive at a historical estimate of the MRP. Using the 1964-2013 period, the MRP estimated by Ibbotson based on the arithmetic mean of returns on large-company stocks (currently represented by the S&P 500) and long-term (twenty-year) T-Bonds, is 4.7%.⁷ As will be discussed below, this figure is consistent with, if not somewhat higher than, that currently used by financial professionals.

Estimating the market risk premium using survey-based data

An alternative approach to estimating the future MRP is to survey informed parties, particularly CFOs of major corporations. These CFOs are likely to deliberate carefully on the MRPs that enter their estimates of cost of capital that they use to evaluate large investments made on behalf of their companies' shareholders.

Professors Graham and Harvey (in conjunction with CFO magazine), have surveyed CFOs on a number of issues over the past fifteen years, including their forward-looking estimates (with a ten year future horizon) for the MRP.⁸ The mean MRP from their survey sample, estimated relative to the 10-year Treasury Bond yield, has

⁷ 2014 Ibbotson SBBI Classic Yearbook (Morningstar).

⁸ Graham and Harvey update their data on the MRP on an annual basis, pointing to the importance of their findings to academics and financial professionals. Their most recent white paper on their findings, "The Equity Risk Premium in 2014", can be accessed at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2422008.

fluctuated over the past fifteen years in the 2.43%-4.64% range, with an average across all quarters of 3.54%. The low MRP estimate of 2.43% was during a period of strong economic growth in March 2006. The high of 4.64% (in September 2000) and the more recent high of 4.56% (in February 2009) were at times of considerable unrest in financial markets following large run-ups in stock prices. The most recent MRP average estimate (March 2014) was 3.73%, slightly higher than the long-term average of their survey sample. Since this MRP is based on a 10-year T-Bond yield, one would expect a lower MRP if measured relative to the 20-year T-Bond rate, as currently used by the STB.

In the 2013 AFP survey, the MRPs used by financial professionals are distributed as follows:

MRP less than 3%	17%
3 – 3.9% MRP	21%
4 – 4.9% MRP	21%
5 – 5.9% MRP	22%
MRP is 6% or higher	19%

The average thus appears to be in the 4-4.9% range. The survey does not appear to ask for the MRP relative to a specific (e.g. 10-year) T-Bond yield. However, the survey does separately ask the professionals what maturity Treasury Bond they use to obtain their risk-free rate. More professionals in their survey use the 10-year T-Bond than any other bond to estimate the risk-free rate. Furthermore, those who do

not use the 10-year rate are four times more likely to use a shorter-term rate than a longer-term rate. Since MRPs are higher if measured relative to shorter-term rates, the MRPs shown in the AFP survey are likely to overstate the MRP estimate calculated relative to a 10-year T-Bond yield, and more so relative to a 20-year T-Bond yield.

In a large-scale survey of analysts and managers in both financial and non-financial companies, Fernandez, Aguirreamalloa and Linares (2013) ask respondents for the MRP used to calculate the required return to equity. They report an average MRP of 5.7% for the U.S.⁹ While it is not explicit that this is relative to a 10-year rate, this appears to be the case: respondents are asked for the risk-free rate that they use in their calculation of the required return to equity, and the reported average rate is 2.4%, which is the average 10-year T-Bond rate in 2013. Since the 20-year T-Bond rate in 2013 averaged .77% higher than the 10-year T-Bond rate, the MRP that would be based on a 20-year T-Bond rate would be below 5%. The average required return to equity (total return) for the U.S. market is reported as 8.0% based on the survey responses. The authors also document that these estimated returns were very consistent across the different groups surveyed.

⁹ P. Fernandez, J. Aguirreamalloa and P. Linares, "Market Risk Premium and Risk Free Rate used for 51 countries in 2013: A Survey with 6,237 Answers" (June 2013), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=914160.

Overall, based on these surveys conducted in 2013, the MRP relative to 20-year T-Bonds is likely between 4 to 5%, and perhaps even lower based on the Graham and Harvey survey.

Recommendations regarding the application of the CAPM

I recommend that the CAPM be applied using the commonly adopted Blume-adjusted beta estimate. The market risk premium based on fifty years of historical data is 4.7% according to Morningstar/Ibbotson, and recent surveys of CFOs and other financial professionals are consistent with this estimate, and suggest the expected MRP might be even lower.

Examining the use of Multi-Stage Discount Cash Flow Models

Discounted Cash Flow models are widely used to value all sorts of investments, including investments in new capital by companies, stock purchases by investment funds, and acquisitions of entire companies in M&A deals. The basic methodology requires forecasting future cash flows, and estimating a discount rate to translate future cash flows back into corresponding present values.

A carefully executed DCF analysis typically involves individual yearly forecasts of components of total cash flow from the investment, followed by the computation of a “terminal value” that captures the present value at the terminal date of the

calculation of all the subsequent cash flows. The terminal date is typically either five or ten years from the present date. This terminal value is calculated using “multiples” applied to a particular metric at the terminal date, such as sales or a measure of earnings such as EBITDA, or is based on the simple Gordon growth model that assumes constant growth of cash flows into perpetuity. Using both methods to estimate the terminal value provides a good internal check of how sensible the assumptions are in the analysis.

Since the DCF methodology relies on a large number of assumptions, it is common practice to conduct extensive sensitivity analysis to understand the effects of key variables on the DCF value, and to develop a range of possible values that account for errors in estimating the valuation inputs. This range of values can then be used to gauge the likelihood that an asset purchase made at a specific price will create positive value for the investor.

If one starts with the assumption that market prices correctly capture the value of the asset, and that the model used for valuation is correct, then one can also use a DCF valuation model to back out an estimate of a specific input variable. In other words, one can “reverse engineer” what value of an input variable would produce the asset price observed in the market.

For instance, if an asset that pays \$1 every year for certain, and in perpetuity, were selling in the market for \$20, then one could back out that investors were seeking a

5% return on this investment, since $\$20 = \$1/.05$, based on the simple valuation model for a perpetuity. In this case, there is only a single variable that is not known – the discount rate - so it can be properly inferred.

However, when there are multiple inputs into a valuation that are not known, then backing out a single variable becomes much less reliable. It essentially takes all the errors in the other input variable assumptions – including the growth rate estimates in each period and the critical terminal growth rate estimate - and channels these errors into the estimate of the single variable that is being backed out. For instance, overestimating growth rates, perhaps based on an assumption that high current growth rates in an industry will be sustained for a long period of time, will result in an overestimate of the implied discount rate.

Thus, this procedure should be used only if one is relatively confident with all the other input assumptions that enter into the valuation procedure. An example is the calculation of implied volatility in option markets, where all the inputs into the widely-used Black-Scholes model are directly observable in the market, except for the volatility which is then backed out.

In the case of DCF models, some have used such models to back out a discount rate such as the cost of equity, implicitly assuming that future cash flows and terminal growth rates are accurately estimated. Survey data referenced earlier indicate that this practice has become less common now that the CAPM has become widely

adopted. It is important to note that frequently it is the growth estimates that are backed out, assuming that the discount rate is better known.¹⁰ These implied growth rates are used to understand the market's expectations of future growth, acknowledging that this may be the ingredient in the DCF that is most difficult to estimate properly, or alternatively that market prices may not always correspond closely with the growth estimates of analysts.

Pitfalls of using the three-stage DCF model adopted by the STB

The implied discount rate that emerges from the MSDCF will be highly dependent on the assumptions that are made in setting up the MSDCF, as Prof. Jim Hodder explained in his Verified Statement that WCTL submitted on August 27, 2013. This sensitivity underscores why using such models can be perilous. I fully agree with his criticisms and would like to elaborate on a few issues that strike me as particularly problematic when observing the approach adopted by the STB.

First, rather than using careful forecasts of cash flows for each year in the valuation timeline, the approach takes the short-cut of assuming one growth rate for the first five years, and another for the subsequent five years. While this 3-stage DCF approach of having two stages, followed by a final terminal stage, is taught in

¹⁰ This approach is explained in A. Damodaran, *Investment Valuation 3rd ed.* (Wiley 2012), and is also the underpinning of the arguments presented in A. Rappaport and M. Mauboussin, *Expectations Investing* (Harvard Business Review Press, 2001).

textbooks to simplify the analysis, it is not one that stock analysts or companies would typically use to carefully evaluate an investment.

Second, the first-stage growth rate for a stock is based on the median of five-year EPS growth estimates provided by a few of the stock analysts covering the stock. The fact that these growth estimates typically vary widely across analysts, and that many stock analysts do not even provide long-term growth estimates given the difficulty in estimating them, should give pause when considering the lack of reliability in these estimates.

Third, EPS growth is boosted by the effect of stock repurchases. Prof. Hodder shows in his testimony that this results in an artificially high growth rate, and in turn a cost of equity estimate that overstates the true cost.

Fourth, it appears that the second stage growth rate (for years 6-10) reflects the simple average of the median of the growth rate estimates for the individual carriers from years 1-5. The concept behind the 3-stage DCF model is that a company's cash flow growth should gradually approach the long-term terminal growth rate. High growth rates in earnings are not sustainable for long periods of time, particularly in a mature industry. The approach that is currently used would mean that if all companies in an industry are expected to experience a high growth rate for the next few years – perhaps due to an economic recovery – they would sustain such a high growth rate for the next ten years. This is too long of a period to assume an

abnormally high growth rate, and this in turn leads to an upward biased cost of equity.

Fifth, the type of cash flow earnings metric that is used to calculate the terminal value differs significantly from that used in the first ten years. The approach used implicitly assumes that taxes that were deferred in years 1-10 do not have to ever be paid. It also implicitly assumes that depreciation will equal capital expenditures on an annual basis in perpetuity. A company that is replacing its capital as it depreciates, and that is investing in long-term growth in a sustainable fashion in an economic environment that has positive inflation will typically have annual capital expenditures that will exceed depreciation. When both of these issues are properly accounted for, the terminal cash flow will be significantly lower and thus the cost of equity that is inferred from the MSDCF process will also be lower than what is currently being estimated.

These errors or deficiencies in using the MSDCF model to back out a company's cost of equity highlight the risk in relying on such an approach. While the MSDCF may appear to have the appeal of being able to potentially capture future expectations of the cost of equity, the application of this approach is fraught with error and thus unreliable. The issues raised above help to explain why the cost of equity estimates obtained using the MSDCF in recent years by the STB have been systematically higher than those based on the traditional CAPM approach.

Concluding Recommendations

The STB should use the CAPM as the sole basis for calculating the current cost of equity that goes into the regulatory computations. The CAPM continues to be the standard model for estimating the cost of equity. The MSDCF produces a noisy estimate of discount rates given that future growth rates are estimated with significant error, and particularly given the current approach relied upon by the STB. Combining the CAPM cost of equity estimate together with that inferred from a multi-stage DCF model does not reduce error in the estimation procedure by averaging out estimates. Rather the MSDCF unnecessarily introduces noise into the estimation process. The MSDCF discount rates backed out appear to be erroneously high and inconsistent with those from the CAPM and the belief of CFOs. They are also highly variable over time, which further introduces more risk into the rate setting process.

The STB should return to using the CAPM as the only basis for cost of equity estimation. Furthermore, it should adopt the commonly used practice of using Blume-adjusted beta estimation, which takes into account the mean reversion tendency of betas. It should also use a more realistic market risk premium that is based on fifty years of historical data, rather than going back to 1926. The advantage of basing an estimate on more years of data in order to reduce the statistical estimation error is significantly outweighed by the potential error of introducing data based on very different market circumstances. The historical risk premium for

the last fifty years, which is around 4.7%, appears also to be consistent with, though a little higher, than the cost of equity values used by CFOs who are investing money on behalf of their companies' shareholders.

VERIFICATION

I, ALEXANDER J. TRIANTIS, verify under penalty of perjury that the foregoing Verified Statement is true and correct. Further, I certify that I am qualified and authorized to file this Verified Statement.


Alexander J. Triantis

Dated: August 30, 2014

**CURRICULUM VITAE
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ACADEMIC POSITIONS:

2013-	Dean, Robert H. Smith School of Business, University of Maryland
1996-	Dept. of Finance, Robert H. Smith School of Business, Univ. of Maryland Professor (2008-), Associate Professor (1996-2008) Department Chair (2006-2011)
1989-1996	Dept. of Finance, School of Business, Univ. of Wisconsin-Madison Associate Professor (1995-96) and Assistant Professor (1989-95)
1988-1989	Applied Econ., Finance and Accounting Department M.I.T. Sloan School of Management Visiting Scholar (1988-89)

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1984-1988	Stanford University Ph.D. in Industrial Engineering (Specialization: Finance), 1988 M.S. in Industrial Engineering, 1988 (Department of Industrial Engineering and Engineering Management, now called Management Science and Engineering)
1979-1984	University of Toronto M.Eng. in Industrial Engineering, 1984 (Specialization: Operations Research/Management Science) B.A.Sc. in Engineering Science, conferred with Honours, 1983 (Specialization: Engineering Science/Electrical Engineering)

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- Triantis, A. J. and J. E. Hodder, "Valuing Flexibility as a Complex Option," *Journal of Finance*, Vol. 45, No. 2 (June 1990), 549-565.
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- Mello, A. S., J. E. Parsons and A. J. Triantis, "An Integrated Model of Multinational Flexibility and Financial Hedging," *Journal of International Economics*, Vol. 39, No. 1/2 (1995), 27-52.
- De, S., M. Fedenia, and A. J. Triantis, "Effects of Competition on Bidder Returns," *Journal of Corporate Finance*, Vol. 2, No. 3, 1996, 227-259.
- Childs, P., T. Riddiough, and A. J. Triantis, "Mixed-Uses and the Redevelopment Option," *Real Estate Economics* (formerly, *Journal of the American Real Estate and Urban Economics Association*), Vol. 24, No. 3, 1996, 317-339.
- Triantis, A. J. and G. G. Triantis, "Timing Problems in Contract Breach Decisions," *Journal of Law and Economics*, Vol. 41, No. 1, April 1998, 163-207.
- Childs, P., S. Ott, and A. J. Triantis, "Capital Budgeting for Interrelated Projects: A Real Options Approach," *Journal of Financial and Quantitative Analysis*, Vol. 33, No. 3, September 1998, 305-334. (Lead Article)
This article is reprinted in *Real Options and Investment Under Uncertainty: Classical Readings and Recent Contributions*, ed. E. Schwartz and L. Trigeorgis (MIT Press), 2001, 419-450, and was the lead abstract in the *Contemporary Finance Digest*, Vol. 3(1), 2000.
- Childs, P. and A. J. Triantis, "Dynamic R&D Investment Policies," *Management Science*, Vol. 45, No. 10, October 1999, 1359-1377.

- Triantis, A.J., “Real Options and Corporate Risk Management,” *Journal of Applied Corporate Finance*, Vol. 13 (2), Summer 2000, 64-73. (Invited article, subject to limited peer review and extensive review by editor.)
 This article is reprinted in *Corporate Risk: Strategies and Management*, ed. G. Brown and D. Chew (London: Risk Books), 2000, 105-115.
 A modified/updated version of this article is published as “Corporate Risk Management: Real Options and Financial Hedging”, in *Risk Management*, 2nd edition, ed. M. Frenkel, U. Hommel, and M. Rudolf (Berlin: Springer-Verlag), 2005 (pp. 591-608).
- Triantis, A.J. and A. Borison, “Real Options: State of the Practice,” *Journal of Applied Corporate Finance*, Vol. 14 (2), Summer 2001, 8-24. (*Lead Article*) (Invited article, subject to limited peer review and extensive review by editor.)
 This article is reprinted in *The Revolution in Corporate Finance*, 4th edition, ed. J. Stern and D. Chew (Maiden, MA: Blackwell Publishing), 2003, pp. 106-124. It was also abstracted/reprinted in *The CFA Digest*, Vol. 32, No. 2, May 2002.
- Billington, C., Johnson, B. and Triantis, A.J., “A Real Options Perspective on Supply Chain Management in High Technology,” *Journal of Applied Corporate Finance*, Vol. 15 (2), Winter 2003, 32-43. (Invited article, subject to limited peer review and extensive review by editor.)
- Triantis, A.J., “Realizing the Potential of Real Options: Does Theory Meet Practice?” *Journal of Applied Corporate Finance*, Vol. 17 (2), Spring 2005, 8-16. (*Lead Article; JACF Award for highest number of downloads of a JACF article.*) (Invited article, subject to limited peer review and extensive review by editor.)
- Leuz, C., A.J. Triantis, and Y. Wang, “Why Do Firms Go Dark? Causes and Economic Consequences of Voluntary SEC Deregistrations,” *Journal of Accounting and Economics*, Vol. 45, No. 2 (August 2008), pp. 181-208.
- Gamba, A. and A.J. Triantis, “The Value of Financial Flexibility,” *Journal of Finance*, Vol. 63, No. 5 (October 2008), 2263-2296.
- Gamba, A. and A.J. Triantis, “Corporate Risk Management: Integrating Liquidity, Hedging, and Operating Policies,” *Management Science*, Vol. 60, No. 1 (January 2014), 246-264.

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Smith, K. W. and A. J. Triantis, "The Value of Options in Strategic Acquisitions," in *Real Options in Capital Investment*, ed. L. Trigeorgis (Westport, Ct.: Greenwood Publishing Group, Praeger), 1995, 135-149.

This article is reprinted in *Real Options and Investment Under Uncertainty: Classical Readings and Recent Contributions*, ed. E. Schwartz and L. Trigeorgis (MIT Press), 2001, 405-418.

Modified versions of this article were also reprinted in *Mergers and Acquisitions*, November-December 1994, 17-22 (entitled "Untapped Options for Creating Value in Acquisitions") and *Mercer Management Journal*, 1993 (No. 1), 55-67 (entitled "Acquiring Opportunity: The Value of Options in Strategic Acquisitions,").

Triantis, A. J., "Valuing Flexibility," in *Blackwell's Encyclopedic Dictionary of Finance*, (Oxford: Blackwell Publishers), 1997. Reprinted in *Blackwell's Encyclopedia of Management*, 2nd edition (2005), and *Wiley's Encyclopedia of Management*, 3rd edition (forthcoming 2013).

Stonier, J. and A.J. Triantis, "Natural and Contractual Real Options: The Case of Aircraft Delivery Options," *Real Options Applications*, ed. A. Micalizzi and L. Trigeorgis, (Milan: Bocconi University Press), 1999, 159-195.

Triantis, A.J., "Creating and Managing Shareholder Value: A View Through a Real Options Lens," in *Real Options and Business Strategy: Applications in Decision Making*, ed. L. Trigeorgis (London: Risk Books), 1999, pp. 39-58.

Triantis, A.J., "Real Options," in *Handbook of Modern Finance*, ed. D. Logue and J. Seward (New York: Research Institute of America), 2003, D1-D32.

Senbet, L. and A. J. Triantis, "Strategies for Risk Management and Financial Contract Design," *World Bank Infrastructure Finance Training Manual*, ed. M. Dailami, forthcoming.

Triantis, A.J., "Real Options," *Encyclopedia of Financial Engineering and Risk Management*, ed. P. Moles (London: Fitzroy Dearborn), forthcoming.

4 other book chapters are reprints (or modified versions) of journal publications, as indicated above.

OTHER JOURNAL CONTRIBUTIONS, BOOK REVIEWS, ETC.:

Triantis, A. J., Review of “Cases in Financial Engineering” by S. Mason, R. Merton, A. Perold and P. Tufano, *Journal of Finance*, Vol. 50 (6), 1995, 1780-84.

Mello, A. S., J. E. Parsons, and A. J. Triantis, “Flexibility or Hedging? An Error of Substitution,” *Risk*, Vol. 9, No. 10 (October 1996), 18-19.

Triantis, A.J., Review of “Real Options: Managing Strategic Investment in an Uncertain World” by M. Amram and N. Kulatilaka, *RISK*, September 1999.

Triantis, A.J., “The Hidden World of Real Options,” *Risk*, Vol. 12, No. 10, October 1999, 52-54.

Triantis, A.J., Moderator of “University of Maryland Roundtable on Real Options,” *Journal of Applied Corporate Finance*, Vol. 15 (2), Winter 2003, 8-23.

Triantis, A.J., Video Presentation of Keynote Address to the 7th Annual International Conference on Real Options, *FMA Online*, Fall 2003.

Campello, M., J. R. Graham, C. Harvey and A. J. Triantis, *Amicus Brief for the U.S. Supreme Court*, February 2011, “Brief of finance professors and scholars as Amici Curiae” on the issue of financial constraints (GE vs EPA).

WORKING PAPERS:

“Does Angel Participation Matter? An Analysis of Early Venture Financing” (with Brent Goldfarb, Jerry Hoberg, David Kirsch).

“How Effectively Can Debt Covenants Alleviate Financial Agency Problems” (with Andrea Gamba).

“Valuing Corporate Financing Strategies” (with Andrea Gamba).

“Investing in Human Capital: The Efficiency of Covenants Not To Compete” (with Eric Posner and George Triantis).

PRESENTATIONS:

Papers presented at competitive/refereed academic conferences:

American Finance Association Annual Meetings: 1993, 1994, 1996, 2006 (2 papers)
Association of Managerial Economists Annual Meetings: 1992
European Finance Association Annual Meetings: 1992, 1995, 2005
Financial Management Association Annual Meetings: 1995, 2002
Financial Management Association European Meeting: 2005
Society for Financial Studies Cavalcade: 2013
UC-Davis Financial Markets Research Conference, 2008
Western Finance Association Annual Meetings: 1992, 2006 (2 papers)

Invited paper presentations at conferences:

Annual International Conference on Real Options: 2003 (Keynote Address)
Eastern Finance Association Annual Meeting (Special Lecture): 2001
ORSA/TIMS Nat'l Meetings: 1992; RISK 2000 (Annual Congress): 2000

Papers presented at seminars and symposia (invited talks):

American University, 2008; California State University – Fullerton, 2006;
Cambridge University, 2000; Chicago Fed / DePaul University, 2008;
Columbia University, 1997; Drexel University, 2006;
Georgetown University, 1997; George Mason University, 2005;
George Washington University, 1997, 2006; Harvard Business School, 1989;
ITAM (Mexico City), 2004; NIAS (Netherlands), 1999;
Northwestern University, 1998, 2002; MIT, 1989;
SEC, 1997, 2005; Stanford University, 1988, 1997;
Texas A&M (PG&E Distinguished Speaker Series), 2004;
University of Bocconi, 1998; University of Colorado, 2002
University of Illinois, 1992; University of Maryland, 1995, 1997
University of North Carolina, 1994; University of South Carolina, 2008
University of Texas-Austin, 2002; University of Toronto, 1988
University of Virginia, 2004; Virginia Tech, 1996
Washington University, 1994; World Bank, 2005; York University, 1989

Other Invited Talks:

University of Wisconsin-Madison Alumni University, 1991
University of Wisconsin Applied Security Analysis Conference, 1993
University of Wisconsin System Symposium on Finance Education, 1993
Midwest Actuarial Forum, 1994; Strategic Decisions Group (Palo Alto), 1997
Charles River Associates, 1998; Applied Decision Analysis (Menlo Park), 1999
International Quality & Productivity Center (Real Options Valuation), 1999
Manufacturers' Alliance, Strategic Development and Planning Council, 1999
Institute for International Research (New Approaches to Value Analysis), 1999
Washington Area Finance Research Conference (Invited Presentation), 2000
Conference on Valuation, CD Satellite Interview (Thompson Financial), 2000
National Security Agency, 2002; Financial Analysts Seminar (AIMR), 2002

Financial Executives International, 2009; IFC Mining Group, 2012

CONFERENCE ORGANIZATION AND PARTICIPATION

Conference program committees:

Annual International Conference on Real Options, 2002-2012
Columbia University Conference on Real Options, 1997
Darden/CFA/IMF/World Bank International Finance Conference, 2012, 2013
Eastern Finance Association Annual Conference: 2002
European Finance Association Annual Conference: 1996, 1997
Financial Management Association Annual Conference: 1996, 2002-2004
Financial Management Association Conference Track Chair (Derivatives): 2006
Financial Management Association – Asian Conference, 2009-present
Northwestern University Conference on Real Options, 1998
Napa (UC-Davis/FMA) Financial Markets Research Conference, 2009-present
Washington Area Finance Research Conference Committee, 1997
Western Finance Association Annual Conferences: 1999-present

Chairperson at (or of) conferences:

Annual International Conference on Real Options, 2003 (Session and Panel)
Cambridge University Conference on Real Options: 2000
Columbia University Conference on Real Options: 1997
European Finance Association Annual Conference: 1995
Financial Management Association (FMA) Annual Conference: 1995, 2002, 2003
FMA – Asian Conference (China), Doctoral Consortium Organizer, 2009
FMA – Asian Conference (New Zealand), Co-Chair, 2011
Georgetown University Conference on Real Options: 2003
IQPC Summit on Real Options (Chair of 2-day conference): 2000, 2001
Maryland Real Options Symposium (Organizer of 1-day conference): 2002
ORSA/TIMS National Conf.: Chair, Financial Models Cluster (8 sessions): 1992
NIAS (Netherlands) Conference on Real Options: 1999
UCLA Conference on Real Options: 2001
Western Finance Association Annual Conference: 1999, 2000

Discussant/panelist at conferences:

American Finance Association Annual Meeting: 1997, 2006
European Finance Association Annual Meeting: 1995
Financial Management Association Annual Meeting: 1993, 1994, 2003, 2006
NIAS (Netherlands) Conference on Real Options: 1999
Cambridge University Conference on Real Options: 2000
UCLA Conference on Real Options: 2001
University of Virginia Conference on Law and Real Options: 2004
Western Finance Assoc. Annual Meeting: 1989, 1991, 1997, 1998, 2003, 2004
Western Economics Association Annual Meeting: 1989

ELECTED OFFICER APPOINTMENTS

Vice-President, Global Services, Financial Management Assoc. International, 2007-2010

EDITORSHIPS, EDITORIAL BOARDS, AND REVIEWING ACTIVITIES:

Editorships:

Editor, *Financial Management*, 1999-2005

Editorial Boards:

Advisory Board Member, *Journal of Applied Corporate Finance*, 2002 – present

Senior Editor, *Production and Operations Management*, 2003-2013

Associate Editor, *Management Science*, 2001-2003

Associate Editor, *FMA Online*, 2001-2009

Reviewing for Journals:

Accounting Journals: *Journal of Accounting and Economics*, *Journal of Business Finance and Accounting*

Economics Journals: *American Economic Review*, *Econometrica*, *International Economic Review*, *Journal of Economic Studies*, *Journal of Economic Dynamics and Control*, *Journal of International Economics*

Finance Journals: *Advances in Futures and Options Research*, *European Journal of Finance*, *Finance Research Letters*, *Financial Management*, *Financial Practice and Education*, *Financial Services Review*, *International Review of Economics and Finance*, *Journal of Applied Finance*, *Journal of Applied Corporate Finance*, *Journal of Corporate Finance*, *Journal of Finance*, *Journal of Financial Economics*, *Journal of Financial and Quantitative Analysis*, *Journal of International Money and Finance*, *Quantitative Finance*, *Review of Derivatives Research*, *Review of Financial Studies*.

Management Science/OR Journals: *Amer. Journal of Mathematical and Management Sciences*, *Annals of Operations Research*, *European Journal of Operational Research*, *International Transactions in OR*, *Insurance: Mathematics and Economics*, *Management Science*, *Manufacturing and Service Operations Management*, *Naval Logistics Quarterly*, *Operations Research*, *Production and Operations Management*.

Other Business Journals: *Academy of Management Review*, *Journal of Business*, *Journal of International Business Studies*, *Journal of Economics and Business*, *Journal of Economics and Management Strategy*, *Journal of Legal Studies*, *Managerial and Decision Economics*, *MIT Sloan Management Review*, *Real Estate Economics*.

Reviewing for Publishers: *Academic Press, Addison Wesley, Blackwell Publishers, Harvard Business School Press, Oxford University Press.*

RESEARCH FELLOWSHIPS, GRANTS, AWARDS:

Association of Professional Engineers of the Province of Ontario Scholarship, 1979-1980
Ontario Graduate Fellowship, University of Toronto, 1983-1984
W. Grant Ireson Fellowship, Stanford University, 1984-1985
IBM Graduate Predoctoral Fellowship, Stanford University, 1986-1987
Award for Outstanding Academic Performance at the Graduate Level, Stanford Univ, 1988
Postdoctoral Fellowship, Soc. Sci. and Humanities Research Council of Canada, 1988-89
University of Wisconsin-Madison Graduate School Research Grant: 1990, 1991, 1994
University of Wisconsin-Madison Research Service Award, 1994
Univ. of Wisconsin Center for Urban Land Economics Research Grant: 1993, 1994
Nominated for 1994 Smith-Breeden Prize, Best Paper in the *Journal of Finance*
University of Maryland Smith School of Business Summer Research Grant Awards:
1999, 2000 (Distinguished Research Award), 2001, 2002, 2003, 2004, 2005
University of Maryland Graduate Research Board Summer Research Award, 2002
Who's Who in America, Finance and Industry, American Education

BUSINESS PRESS CITATIONS (Quotes or References to my Research):

Asian Wall Street Journal (12/20/04); *Baltimore Sun* (1/12/02; 1/16/02; 12/14/04);
Board Alert (February 2005); *Business Finance Magazine* (March 2002);
Business Week (6/7/99); *CFO* (July 2003); *Chicago Tribune* (12/13/04);
CFO Europe (July 1999); *Financial Times* (12/16/05); *Forbes* (12/13/04);
International Herald Tribune (1/25/05; 1/26/05); *L.A. Times* (12/13/04)
Legal Week (1/20/05); *New York Times* (1/23/05); *Securities Week* (11/29/04)
Traders Magazine (1/03/05); *Wall Street Journal* (12/15/04; 12/17/04)
Washington Post (2/16/09)

CONSULTING EXPERIENCE:

Consulting, in-house training and expert witness work, in the areas of valuation and corporate finance, including derivatives pricing, project evaluation, real options, and risk management.

Companies and organizations include:

Accenture, Airbus, Deloitte, Dupont, EY, Hyatt, Jefferies and Co., Lockheed Martin, Marriott International, Morgan Stanley, Northrop Grumman, PwC, U.S. Department of Energy, and the World Bank.

TEACHING AND STUDENT ADVISING:

Courses:

I have taught courses on Corporate Finance, Investments, Options and Futures, Advanced Derivative Securities and Capital Budgeting for Undergraduates, MBAs, Executive MBAs, customized executive programs, and Ph.Ds.

Teaching Awards and Citations:

Twice awarded the Allen J. Krowe Teaching Award for Teaching Excellence at the Robert H. Smith School of Business, University of Maryland, May 2000 and May 2003 (eligible every three years).

Cited as one of the Outstanding Faculty in *Business Week's* 1992, 1998 and 2000 biannual surveys of top Business Schools.

Awarded the Top 15% Teaching Award (based on student evaluations) at Robert H. Smith School of Business, University of Maryland in **all semesters/years** that eligible for this award (Spring 1997, Spring 1998, Spring 1999, Spring 2000, Spring 2001 and Fall 2003, Academic Year 2005-06, Academic Year 2010-11).

Best Team Teaching Award, GSBA-Zurich Executive MBA Program, 2005.

Advising:

Supervised over 25 MBA Consulting projects (2 teams were awarded the IMC Best Consulting Project Prize, 1999, 2001).

Supervised over 25 Undergraduate and MBA Courses of Independent Research in Finance.

Ph.D. Dissertation Committees: Served on over 20 committees (and Chaired two committees) in the following areas (at Wisconsin, Maryland, and for other universities, including University of British Columbia and George Washington University): Accounting, Civil Engineering, Economics, Finance, Industrial Engineering, International Business, Public Policy, and Real Estate.

Faculty Advisor, Univ. of Wisconsin-Madison Finance and Investment Society, 1992-95

Faculty Advisor, University of Maryland FMA Honor Society, 1999-2004

Mentoring Activities:

Univ. of Wisconsin EMERGE Program (Minority Research Program), 1993

University of Wisconsin-Madison Minority Mentor Program, 1990-91

Business Scholars Program, School of Bus., Univ. of Wisc.-Madison, 1994-95

SERVICE:

PROFESSIONAL SERVICE

Offices and Committee Memberships in Professional Organizations:

Financial Management Association Nominating Committee, 2003
Financial Management Association Publications Cmte. (ex officio), 1999-2005
Officer (VP-Global Services) of Fin. Mgmt. Association International, 2007-2010
Financial Management Editor Search Committee, 2010-11
Financial Management Association International Conference Committee, 2010-13
Chair, Survey and Synthesis Series Editor Search Committee, 2013

Reviewing for Research Foundations:

National Science Foundation (USA)
SSHRC (Canada)
Swiss National Science Foundation

Reviewing for Universities (Promotion & Tenure Cases):

More than twenty-five cases over the past 12 years for promotion to Associate and Full Professor

Reviewing for Government Agencies:

Department of Energy (Energy Information Administration)

UNIVERSITY SERVICE: Awards and Activities

SERVICE AWARDS:

Dean's Award for Service, Stanford University, 1987
University of Wisconsin-Madison Research Service Award, 1994
Univ. of Maryland, Robert H. Smith School of Business, Research Service Award, 1999

SERVICE ACTIVITIES:

University of Toronto:

University Governing Council, Academic Affairs Committee, 1982-83
University Governing Council, Campus and Community Affairs Cmte, 1983-84
Faculty Council, Faculty of Applied Science and Engineering, 1982-84
Engineering Society Council, University of Toronto, 1982-84

Stanford University:

University Advisory Committee on Budget Planning, 1986-87

University of Wisconsin-Madison:**School of Business:**

Undergraduate Studies Committee, 1990-91

Computer Committee, 1991-93

Chair, Database Subcommittee, 1992-93

Academic Planning Council (elected representative), 1994

Finance Department:

Doctoral Committee, 1990-91

Doctoral Prelim Coordinator, 1990

Finance Seminar Series Coordinator, 1990-92

Recruiting Committee: 1989, 1990, 1992

Quantitative and Math. Finance Masters Program Committee, 1992-95

Wisconsin Symposium Committees: 1991 and 1994

University of Maryland:**University Level:**

University of Maryland General Research Board, 1997-2000

Technology Advancement Prog., Engin. Research Center, panelist: 1997-98

President's Medal Selection Committee, 2010

Robert H. Smith School of Business:

Chair, Summer Research Grants Committee, 1996-98; Member 1995-98

Faculty Council (elected representative), 1998-2000

MBA Oversight (& MBA Core Review) Committees, 1998-1999, 2001-2003

Entrepreneurship Faculty Search Committee, 1998-1999

Candidate Review (Tenure) Committees for 12 faculty members in

Accounting, DOIT, Entrepreneurship, Finance and M&O Departments
(1997-present), (Chair of five)

Teaching Enhancement Committee, 1999-2001

Dean's Ad Hoc Cmte. on Teaching Profs & Smith School Constitution, 2000

Co-Chair, Faculty Staff Campaign Committee, 2001

Dean's Global Task Force Committee, 2001

Advisory Board for Executive Education, 2001-2002

MBA Orientation Venture Capitalist, 2001, 2002

Judge, MBA Case Competition (non-core instructor), 1998

Speaker, MBA Visitors Program, 2002

Core Course Coordinator Committee, 2001-2008

MBA Pre-Skills Design Subcommittee, 2002

Chair, Smith School Community Subcommittee, 2002
 Executive MBA Design Committee, Spring 2002
 Executive MBA Oversight Committee, 2002-present
 Executive MBA Curriculum Committee, 2002-2004
 Experiential Learning Modules Redesign Committee, 2002
 MBA Graduate Speaker Selection Panel, 2003
 MBA Case Competition Case Selection Committees (FT and PT), 2002-2003
 Faculty Merit Review Committee, 2005
 Executive Committee, 2006-2011
 Co-organizer, Netcentricity Conference on Electronic Markets, 2007
 EMBA Admissions Committee, 2010-
 Chair, Search Comm. for Assistant Dean of Executive Programs, 2010-11
 Chair, Search Comm. for Assistant Director of Center for Fin. Policy, 2010
 Chair, Search Comm. for Development Director, Leadership Gifts, 2011-12
 Chair, Search Committee for Development Officer, 2012
 Thought Leadership Seminar (DC, November 2011)
 Task Force on Smith School Adjunct and Lecturer Policies, 2012-13
 Leadership Fellow, Center for Leadership, Innovation and Change, 2012-
 Smith School Annual Fund Champion, 2012-13
 Instructor, UMD-Smith Leadership Academy, 2012-13
 Teaching Enhancement Committee, 2012-13
 Online and Blended Learning Committee, 2012-13
 Search Committee for Career Services Finance Industry Specialist, 2013
 EMBA Rankings Task Force, 2013
 EMBA Oversight Committee, 2013

Finance Department:

Department Chair, 2006-2011

 Recruiting Committee, 1997-98, 2004
 Finance Seminar Series Coordinator, 1996-97
 Curriculum Committee, 1996-97
 Financial Engineering Track Committee, 1998
 Co-organizer, 1998 Finance Symposium (Financial Innov. and Technology)
 Finance Technology Committee, 1998
 Finance Strategy Task Force, 1998-present (Chair, 2006-)
 Chair, Teaching Professor Recruitment Committees, 2000, 2001, 2002, 2003
 Faculty Review Committees, 1998-2003, 2005
 Marketing Director, 2002-2006
 Department Coordinator Search Committees, 2005, 2009, 2012
 Chair, Wikler Teaching Initiative Committee, 2005-2008
 Investment Funds Committee, 2008-
 Mentor for Assistant Professor, 2011-13
 Center for Financial Policy Academic Advisory Committee, 2009-
 Senior Academic Advisor, Center for Financial Policy, 2011-
 Research Funds Committee, Center for Financial Policy, 2011-
 Chair, Finance Instructor Adjuncts Committee, 2011-

Team MBA; Team MS; 2012-
Chair, Masters Program Budget Task Force, 2012; Team Admin, 2012-
Chair, Finance Department Faculty Search Committee, 2012-13

SERVICE FOR NON-PROFITS:

National Presbyterian School (Washington DC):

Member, Board of Trustees, 2007-2013
Member, Executive Committee, 2010-13
Secretary of Board, 2010-13
Chair, Finance Committee (Finance, Audit, Investments) 2010-13
Member, Finance Committee, 2007-13
Member, Marketing Committee, 2007-10

Protestant Episcopal Cathedral Foundation (National Cathedral, Washington DC)

Member, Investment Subcommittee of Finance Committee, 2013-

Chevy Chase Presbyterian Church (Washington DC)

Auditor, 2013-

EXHIBIT 1

WCTL Petition in EP 664 (Sub-No. 1), filed on August 27, 2013

BEFORE THE
SURFACE TRANSPORTATION BOARD

PETITION OF THE WESTERN COAL	)	
TRAFFIC LEAGUE TO INSTITUTE A	)	
RULEMAKING PROCEEDING TO	)	
ABOLISH THE USE OF THE MULTI-	)	EP 664 (Sub-No. 2)
STAGE DISCOUNTED CASH FLOW	)	
MODEL IN DETERMINING THE	)	
RAILROAD INDUSTRY'S COST OF	)	
EQUITY CAPITAL	)	

**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**

WESTERN COAL TRAFFIC LEAGUE

Of Counsel:

Slover & Loftus LLP
1224 Seventeenth Street, N.W.
Washington, D.C. 20036
(202) 347-7170

Dated: August 27, 2013

William L. Slover
Robert D. Rosenberg
Slover & Loftus LLP
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Washington, D.C. 20036
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Its Attorneys

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BEFORE THE
SURFACE TRANSPORTATION BOARD

PETITION OF THE WESTERN COAL	)	
TRAFFIC LEAGUE TO INSTITUTE A	)	
RULEMAKING PROCEEDING TO	)	
ABOLISH THE USE OF THE MULTI-	)	EP 664 (Sub-No. 2)
STAGE DISCOUNTED CASH FLOW	)	
MODEL IN DETERMINING THE	)	
RAILROAD INDUSTRY'S COST OF	)	
EQUITY CAPITAL	)	

**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**

Pursuant to 49 C.F.R. § 1110.2(b), the Western Coal Traffic League ("WCTL")¹ hereby petitions the Surface Transportation Board ("STB" or "Board") to institute a rulemaking proceeding to abolish the use of its Multi-Stage Discounted Cash Flow ("MSDCF") model in its determination of the railroad cost of equity ("COE") and cost of capital ("COC") and to instead rely exclusively on the Capital Asset Pricing Model ("CAPM").

¹ WCTL is a voluntary association, whose regular membership consists entirely of shippers of coal mined west of the Mississippi River that is transported by rail. WCTL members currently ship and receive in excess of 175 million tons of coal by rail each year. WCTL's members are: Ameren Energy Fuels and Services, Arizona Electric Power Cooperative, Inc., CLECO Corporation, Austin Energy (City of Austin, Texas), CPS Energy, Entergy Services, Inc., Kansas City Power & Light Company, Lower Colorado River Authority, MidAmerican Energy Company, Minnesota Power, Nebraska Public Power District, Omaha Public Power District, Texas Municipal Power Agency, Western Fuels Association, Inc., and Wisconsin Public Service Corporation.

I.

INTRODUCTION AND SUMMARY

The COC is a critical input for calculating variable costs, the associated jurisdictional threshold, and stand-alone costs. An overstated COC directly exposes captive shippers, including some WCTL members, to unreasonably high rail rates. For the most part, those who pay the railroads for coal transportation are the nation's electricity consumers. The COC also colors the general perception of railroad costs and the Board's view of the railroads' revenue adequacy. An accurate COC is of deep concern to WCTL and its members as well as shippers generally.

The Board substantially improved its COC methodology in 2008 by replacing its defective single-stage discounted cash flow ("SSDCF") model with the CAPM starting with the 2006 COE determination. *Methodology to be Employed in Determining the Railroad Industry's Cost of Capital*, EP 664 (STB served Jan. 17, 2008) ("CAPM"). Regrettably, the Board took a major step backwards, just a year later, by adopting the hybrid CAPM-MSDCF average starting with the 2008 COE. *Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital*, EP 664 (Sub-No. 1) (STB served Jan. 28, 2009) ("MSDCF Case"). Adding the use of the MSDCF model has not improved the accuracy or reliability of the Board's COC. It has instead wrongfully increased the railroads' COC and COE significantly, e.g., the increase in the 2012 COE caused by use of the MSDCF exceeds 300 basis points. Increases of this magnitude were not contemplated when the Board adopted the

average of the MSDCF and CAPM models for the determination of railroad equity capital costs.

As demonstrated in the attached verified statements of Daniel L. Fapp of L.E. Peabody & Associates, Inc. ("Fapp VS") (Exhibit A) and Professor James E. Hodder ("Hodder VS") (Exhibit B), the COE values as indicated by the MSDCF model are consistently erroneous because of internal flaws of the model when it is applied to the railroad industry. Instead, the Board must rely solely on the CAPM values.

When WCTL presented these same points elsewhere, the Board responded that they should be raised in a petition to institute a rulemaking. The instant filing complies with the Board's directive.

II.

BACKGROUND

For many years (1981-2005), the agency determined the COE using the SSDCF model. The SSDCF derives the COE as the sum of the dividend yield and a projected EPS growth rate that is assumed to apply in perpetuity. In *Methodology to be Employed in Determining the Railroad Industry's Cost of Capital*, EP 664, WCTL demonstrated that the SSDCF was flawed as applied to railroads and persuaded the Board to instead use the CAPM model, which was shown by the evidence to more accurately measure the cost of railroad equity capital than the SSDCF model which had consistently overstated the actual cost of railroad equity capital. *CAPM* at 3-4, 6-7.

Subsequently, the AAR proposed, and the Board adopted in the *MSDCF Case*, over WCTL's vigorous objections, the use of a MSDCF model intended to track

the Morningstar/Ibbotson three-stage DCF methodology. The Board believed, at the time, that by using a simple CAPM/MSDCF average to measure rail equity costs a more precise and stable COE would result than by relying on only the CAPM model. *Id.* at 1-2, 15.

The MSDCF implementation mandated by the Board focuses on firm-wide cashflows (“CF”) rather than the dividend yield employed in the discredited SSDCF approach. Cash flows during the model’s first two five-year stages are calculated from an initial CF estimate reflecting “income before extraordinary items (IBEI) minus capital expenditures (CAPEX), plus depreciation (DEP) and deferred taxes (DT),” based on the total sales for the previous year multiplied by the average cashflow/sales ratio for the past five years. Third-stage CF reflects only IBEI. First-stage growth rates reflect “the firm’s annual earnings growth rate” defined as “the median value of the qualifying railroad’s 3- to 5-year growth estimates as determined by railroad industry analysts and published by Institutional Brokers Estimate System (IBES).” The second stage uses “the average of all growth rates in stage 1.” The third stage uses “the long-run nominal growth rate of the average U.S. economy.” *Id.* at 5-6.

The first two stages of the MSDCF use much the same procedure for forecasting EPS growth rates as the flawed SSDCF, but apply the EPS growth rates to firm-wide cash flows rather than individual share dividends. The COE is the discount rate that causes the estimated firm cash flows to match the market value of its shares.

III.

USE OF THE MSDCF MODEL HAS INCREASED THE COE VALUES SUBSTANTIALLY

Averaging CAPM values with MSDCF values has increased the COE substantially over the 2008-2012 period. The following table compares the CAPM and MSDCF values for 2008-2012, the period during which the Board has utilized the average of the MSDCF and CAPM models:

Table 1 Comparison of CAPM and MSDCF COE Values for 2008-2012			
Year	CAPM COE	MSDCF COE	Difference
2008	10.39%	15.95%	5.56%
2009	11.39%	13.34%	1.95%
2010	11.84%	14.13%	2.29%
2011	11.31%	15.83%	4.52%
2012	10.27%	16.53%	6.26%
Average	11.04%	15.16%	4.12%
Source: Hodder VS at 3.			

The use of the MSDCF raised the 2008-2012 average COE by over 200 basis points and the average COC by over 156 basis percentage points, equating to an increase in the overall COC of 16%.²

The Board adopted the CAPM/MSDCF average to help stabilize the COE values. *MSDCF Case* at 3, 4, 8. The MSDCF's contribution to stability has been minor. The CAPM COE values for 2008-2012 have varied from a low of 10.39% (2008) to a

² The MSDCF comprises 50% of the COE, the average CAPM has exceeded the average MSDCF by 412 basis points, and $50\% \times 412 = 206$. During 2008-2012, equity averaged 76.51% of the capital structure, and 76.51% of 206 basis points equals 157.6 basis points. The COC for 2008-2012 averaged 11.18%, but would have been below 9.61% without the MSDCF ($11.18\% - 1.57\% = 9.61\%$), and $11.18\% \div 9.61\% = 1.16$. The impact on the before-tax COC and COE, utilized under URCS, is greater.

high of 11.84% (2010), a range of 157 basis points. The CAPM/MSDCF average COE has varied from a low of 12.37% (2009) to a high of 13.57% (2011), a range of 120 basis points. A 120-point range is lower than a 157-point range, but a difference of only 37 basis points is minor, especially compared to the large COE and COC increases caused by including the MSDCF.³ Furthermore, stability by itself does not establish increased accuracy or reliability, especially in light of the substantial flux in underlying economic conditions since 2008. In any event, the MSDCF's contribution to stability pales in comparison to the way in which it has increased overall COE/COC values.

IV.

THE MSDCF COE VALUES ARE UNREALISTICALLY HIGH

The key question is not whether the MSDCF has contributed to a more stable COE, but whether the MSDCF has contributed to a more accurate COE. Setting the COE in a regulatory context consists in large part of measuring the reasonable expectations of investors. Indeed, a DCF model purports to infer the COE “on the basis of the return expectations embodied in the prices investors are willing to pay for stocks.” *Methodology to be Employed in Determining the Railroad Industry's Cost of Capital*, EP 664 (STB served Sept. 20, 2006), at 2. Furthermore, the issue is not merely whether a particular method is sound in theory, but whether the results are accurate or at least credible. *E.g.*, *FPC v. Hope Natural Gas Co.*, 320 U.S. 591, 602 (1944). In particular, a

³ The MSDCF COE values have been far more variable, but they have still contributed modestly to a more stable average, as the CAPM and MSDCF changes have tended to offset each other. Whether and how long this pattern will continue is an open question.

Board-derived COE that exceeds those derived from mainstream analyses will likely provide the railroads and their investors with a return exceeding that required to attract or retain capital, yield excessive rail rates, and misallocate resources.

To test the reasonableness of the Board's COE figures, Mr. Fapp reviewed numerous analyses of CSX, NS, and UP prepared by brokerage and financial reporting firms. Two such firms, Standard & Poor's and Marketgrader, provide explicit COE values as part of their reports. The COE values of these respected firms are far lower than both the MSDCF and MSDCF/CAPM average COE values developed by the STB, and are even generally below the level of the Board's CAPM COE values. Fapp VS at 1-3. Mr. Fapp found no stock analysis report that supported the reasonableness of the Board's MSDCF or MSDCF/CAPM COE figures. (A third firm, Morningstar, does not disclose COC or COE values, but states that the three railroads are outearning their COC on a long-term basis.) The Fapp data shows that the MSDCF values are unrealistically high and that their inclusion undermines the accuracy of the Board's COE values.

V.

THE BOARD'S MSDCF IS SUBSTANTIVELY FLAWED

WCTL asked Professor Hodder, an authority on finance and capital, to review the Board's MSDCF methodology and to examine the disparity between the MSDCF and CAPM COEs. Professor Hodder explains that the deviations are too large to be dismissed and attributes them to several flaws in the Board's application of the Morningstar/Ibbotson "one-size-fits-all" MSDCF methodology to the railroad data. Hodder VS at 3-4.

First, the second stage of the model fails to implement a smooth transition from the first stage to the third stage because only three railroads are included and all have high projected growth rates.⁴ Instead of a smooth transition, the third-stage produces an abrupt reduction as its growth rates are approximately one-third of those of the first two stages. The absence of a reasonable transition in the second stage creates a substantial upwards bias in the COE. Hodder VS at 4-5.

Second, the third stage of the model also fails to achieve a smooth reduction in cashflows. Instead, there is actually a sharp surge in cashflows -- exceeding 40% for CSX and NS in 2012 -- at the start of the third stage. The increase again has an upward bias. Such large increases over a very short time frame (literally overnight) ten years and a day after the start of the model are inherently implausible and indicate a modeling flaw. Hodder VS at 5-6.

Third, the MSDCF bases growth in firm-wide cashflow on EPS. However, the railroads have conducted stock buybacks that have significantly reduced their net number of shares outstanding during 2008-2012. The share reductions cause EPS to increase faster than firm-wide earnings. Using EPS to project firm cashflows under such conditions will overstate growth in firm-wide earnings, and the mismatch again produces an overstated COE. Hodder VS at 6-9.

⁴ Where the second stage growth rate reflects a broader industry segment with more firms and more types of firms, the high growth rates of some members may be balanced by lower growth rates of others, and the second stage may effectuate a reasonable transition.

Professor Hodder concludes that the problems noted are not inherent to multi-stage discounted cash flow models generally, but arise from the particular assumptions made in the Morningstar/Ibbotson MSDCF model and the Board's application of the model to the railroad industry. Significantly, all have been present since the Board began using the MSDCF in 2008. Dr. Hodder concludes that MSDCF COE estimates "are not reliable and are biased upward" and have "substantial" problems, whereas "the CAPM estimates during that period are apt to be far more accurate and credible." Hodder VS at 11.

VI.

CONCLUSION

As demonstrated above, the Board's MSDCF methodology is flawed; produces an overstated COE/COC for the railroads; and its utilization should cease.

Respectfully submitted,

WESTERN COAL TRAFFIC LEAGUE

Of Counsel:

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Dated: August 27, 2013

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Its Attorneys

EXHIBIT A

VERIFIED STATEMENT OF DANIEL L. FAPP

VERIFIED STATEMENT OF DANIEL L. FAPP

I am Daniel L. Fapp, an economist and a Vice President of L. E. Peabody & Associates, Inc., an economic consulting firm. A copy of my credentials is included as Exhibit No. 1 to this verified statement. My consulting assignments regularly involve railroad financial issues, including cost of capital determinations. In these assignments, I have calculated railroad capital structures, market values, cost of railroad debt, cost of preferred railroad equity and cost of common railroad equity. I am also well acquainted with and have used the commonly accepted models for determining a firm's cost of equity, including Single-Stage Discounted Cash Flow Models, Multi-Stage Discounted Cash Flow Models ("MS-DCF"), and the Capital Asset Pricing Model ("CAPM"). I have developed railroad industry average cost of capital and company specific cost of capital for use in litigation and for use in general business management.

I have been requested by Counsel for the Western Coal Traffic League ("WCTL") to review the railroad cost of equity developed by independent investment firms and financial reporting firms and to present the costs of equity produced by these independent companies.

In performing my assignment, I have reviewed the railroad research reports produced by several equity research firms, and I have reviewed valuation reports from investment banking firms to determine which of these firms listed their cost of equity ("COE") assumptions for the railroads included in the STB's annual cost of capital determination. My review included research and valuation reports from nine (9) large brokerage and investment banking firms,¹ six (6) financial reporting firms,² and ten (10) smaller research firms.³ My review found two different research firms, S&P and MarketGrader, that included their railroad cost of equity

¹ Deutsche Bank, Smith Barney, Goldman Sachs, Merrill Lynch, J. P Morgan, Credit Suisse, Edward Jones, UBS and Wells Fargo.

² Standard & Poor's ("S&P"), Reuters, Morningstar Equity Analysis Reports, Thompson's, Compustat and First Call.

³ New Constructs, MarketGrader, EVA Dimensions, Market Edge Research, Columbine Capital Services, Ativo Research, Ford Equity Research, Jefferson Research, Ned Davis Research and Zack's Investment Research.

estimates in their railroad company research reports.⁴ In every case where the railroad cost of equity was reported, the cost of equity estimate used by the research firm was lower than the MS-DCF and CAPM costs of equity determined and used by the STB.

S&P included its railroad company cost of equity estimates in its stock reports for the three current companies included in the STB's cost of capital determination. Table 1 below compares the S&P costs of equity to the STB's MS-DCF cost of equity estimates.

Table 1 STB Multi-Stage Discounted Cash Flow Cost of Equity and Standard & Poor's Railroad Cost of Equity						
Year	CSX		NSC		UNP	
	STB MS-DCF	S&P COE ^{1/}	STB MS-DCF	S&P COE ^{1/}	STB MS-DCF	S&P COE ^{1/}
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. 2008	17.0%	1/	16.5%	1/	15.5%	1/
2. 2009	13.6%	10.9%	14.8%	11.2%	13.0%	10.5%
3. 2010	14.0%	10.9%	15.1%	10.8%	13.8%	10.5%
4. 2011	16.7%	10.9%	16.8%	10.8%	15.0%	10.5%
5. 2012	18.3%	10.9%	17.7%	10.8%	15.5%	10.5%

Source: Exhibit No. 2
1/ Not reported in S&P reports.

MarketGrader, an independent equity research firm, also estimated the railroad companies' cost of equity. Table 2 below provides MarketGrader's current estimates of the railroads' cost of equity.

⁴ While in some cases the research and valuation reports I reviewed included the railroad company's estimated cost of capital (these firms included Credit Suisse, Goldman Sachs, EVA Dimensions, MarketGrader, S&P, New Construction and Ativo Research), in most instances the reports were silent on their cost of capital and cost of equity assumptions. Firms that do not public disclose their cost of equity estimates for railroads may still develop or use estimates in their financial analysis.

Table 2
MarketGrader Railroad Costs of Equity - July 2013

Item (1)	CSX (2)	NSC (3)	UNP (4)
1. MarketGrader Unweighted Cost of Equity	9.80%	10.34%	9.27%
2. STB 2012 MS-DCF Cost of Equity	18.32%	17.65%	15.53%
3. % STB exceeds MarketGrader ^{1/}	87%	71%	68%

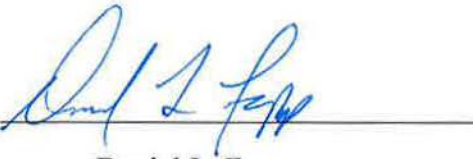
Source: Exhibit No. 3
1/ (Line 2 ÷ Line 1) – 1.0.

Equity research and investment banking firms can be presumed to be using accurate information in their analyses. Based on the examples above, it appears that the equity research and investment banking firms believe that the railroad companies' costs of equity range between roughly 9.2 and 11.2 percent, depending upon the railroad and the time period. The STB's CAPM cost of equity estimates are generally in-line with these independent cost of equity estimates, although the Board's CAPM figures tend to be a slightly higher when compared on an annual basis.⁵ However, the cost of equity figures produced by the independent firms are substantially lower than the STB's MS-DCF determinations. I believe the STB's MS-DCF costs of equity to be significantly overstated.

⁵ Between 2008 and 2012, the STB's CAPM costs equity ranged from 10.4 to 11.8 percent

VERIFICATION

I, Daniel L. Fapp, declare under penalty of perjury, that the foregoing Statement is true and correct, and that I am qualified and authorized to file this Statement.



Daniel L. Fapp

Executed on
August 26, 2013

STATEMENT OF QUALIFICATIONS

My name is Daniel L. Fapp. I am Vice President of the economic consulting firm of L. E. Peabody & Associates, Inc. The firm's offices are located at 1501 Duke Street, Suite 200, Alexandria, VA 22314; 760 E. Pusch View Lane, Suite 150, Tucson, Arizona 85737; and 21 Founders Way, Queensbury, New York 85737.

I received a Bachelor of Science degree in Business Administration with an option in Marketing (cum laude) from the California State University, Northridge in 1987, and a Master of Business Administration degree from the University of Arizona's Eller College of Management in 1993, specializing in finance and operations management. I am also a member of Beta Gamma Sigma, the national honor society for collegiate schools of business.

I have been employed by L. E. Peabody & Associates, Inc. since December 1997. Prior to joining L. E. Peabody & Associates, Inc., I was employed by BHP Copper Inc. in the role of Transportation Manager - Finance and Administration, and where I also served as an officer and treasurer of the three BHP Copper Inc. subsidiary railroads, The San Manuel Arizona Railroad, the Magma Arizona Railroad (also known as the BHP Arizona Railroad) and the BHP Nevada Railroad. I have also held operations management positions with Arizona Lithographers in Tucson, AZ and MCA-Universal Studios in Universal City, CA.

While at BHP Copper Inc., I was responsible for all financial and administrative functions of the company's transportation group. I also directed the BHP Copper Inc. subsidiary railroads' cost and revenue accounting staff, and managed the San Manuel Arizona Railroad's and BHP Arizona Railroad's dispatchers and the railroad dispatching functions. I served on the company's Commercial and Transportation Management Team and the company's Railroad Acquisition Team where I was responsible for evaluating the acquisition of new railroads,

STATEMENT OF QUALIFICATIONS

including developing financial and economic assessment models. While with MCA-Universal Studios, I held several operations management positions, including Tour Operations Manager, where my duties included vehicle routing and scheduling, personnel scheduling, forecasting facilities utilization, and designing and performing queuing analyses.

As part of my work for L. E. Peabody & Associates, Inc., I have performed and directed numerous projects and analyses undertaken on behalf of utility companies, short line railroads, bulk shippers, and industry and trade associations. Examples of studies which I have participated in organizing and directing include, traffic, operational and cost analyses in connection with the rail movement of coal, metallic ores, pulp and paper products, and other commodities. I have also analyzed multiple car movements, unit train operations, divisions of through rail rates and switching operations throughout the United States. The nature of these studies enabled me to become familiar with the operating procedures utilized by railroads in the normal course of business.

Since 1997, I have participated in the development of cost of service analyses for the movement of coal over the major eastern and western coal-hauling railroads. I have conducted on-site studies of switching, detention and line-haul activities relating to the handling of coal. I have also participated in and managed several projects assisting short-line railroads. In these engagements, I assisted short-line railroads in their negotiations with connecting Class I carriers, performed railroad property and business evaluations, and worked on rail line abandonment projects.

I have been frequently called upon to perform financial analyses and assessments of Class I, Class II and Class III railroad companies. I have determined the Going Concern Value of privately held freight and passenger railroads, including developing company specific costs of

STATEMENT OF QUALIFICATIONS

debt and equity for use in discounting future company cash flows. My consulting assignments regularly involve working with and determining various facets of railroad financial issues, including cost of capital determinations. In these assignments, I have calculated railroad capital structures, market values, cost of railroad debt, cost of preferred railroad equity and common railroad equity. I am also well acquainted with and have used financial industry accepted models for determining a firm's cost of equity, including Discounted Cash Flow Model ("DCF") models, Capital Asset Pricing Model ("CAPM"), Farma-French Three Factor Model and Arbitrage Pricing Models. I have also lectured in graduate level finance and economics classes discussing corporate capital theory and costs of equity determination, and am a member of the Professional Advisory Council for the Eller School of Management Finance Department at the University of Arizona.

In my tenure with L. E. Peabody & Associates, Inc., I have presented stand-alone cost evidence, including discounted cash-flow models and cost of capital determinations, in numerous proceedings before the STB, and presented evidence on railroad fuel surcharges in STB in Ex Parte No. 661, *Rail Fuel Surcharges*. I have submitted evidence on cost of capital determinations and related issues in Ex Parte No. 558 (Sub-No. 10), *Railroad Cost of Capital – 2006*, Ex Parte No. 558 (Sub-No. 11), *Railroad Cost of Capital – 2007*, Ex Parte No. 558 (Sub-No. 12), *Railroad Cost of Capital – 2008*, Ex Parte No. 558 (Sub-No. 13), *Railroad Cost of Capital – 2009*, Ex Parte No. 558 (Sub-No. 14), *Railroad Cost of Capital – 2010*, Ex Parte No. 664, *Methodology To Be Employed In Determining The Railroad Industry Cost Of Capital*, and Ex Parte No. 664 (Sub-No.1), *Use Of A Multi-Stage Discounted Cash Flow Model In Determining The Railroad Industry's Cost Of Capital*. In addition, my reports on railroad valuations have been used as evidence before the Nevada State Tax Commission.

STB Multi-Stage Discounted Cash Flow
Cost of Equity and Standard & Poor's Railroad Cost of Equity

<u>Year</u>	<u>CSX</u>		<u>NSC</u>		<u>UNP</u>	
	<u>STB</u>	<u>S&P</u>	<u>STB</u>	<u>S&P</u>	<u>STB</u>	<u>S&P</u>
	<u>MSDCF</u>	<u>COE 1/</u>	<u>MSDCF</u>	<u>COE 1/</u>	<u>MSDCF</u>	<u>COE 1/</u>
(1)	(2)	(3)	(4)	(5)	(6)	(7)
1. 2008	17.0%	<u>2/</u>	16.5%	<u>2/</u>	15.5%	<u>2/</u>
2. 2009	13.6%	10.9%	14.8%	11.2%	13.0%	10.5%
3. 2010	14.0%	10.9%	15.1%	10.8%	13.8%	10.5%
4. 2011	16.7%	10.9%	16.8%	10.8%	15.0%	10.5%
5. 2012	18.3%	10.9%	17.7%	10.8%	15.5%	10.5%

1/ Standard & Poor's reported cost of equity in their equity research reports for the year after the STB MSDCF cost of equity; e.g., the CSX 2012 value of 10.9% was taken from a 2013 S&P Report. The lag is necessary to account for Standard & Poor's accounting for year-end railroad information.

2/ Standard and Poor's did not report a cost of equity for these periods in its Stock Report.

Note: Standard and Poor's did not report its cost of equity for the BNSF for the years 2008 and 2009, the last full years the BNSF's stock was publicly traded.

MarketGrader Railroad Costs of Equity - July 2013

<u>Item</u> (1)	<u>Source</u> (2)	<u>MarketGrader Costs of Equity</u>		
		<u>CSX</u> (3)	<u>NSC</u> (4)	<u>UNP</u> (5)
1. Weighted Cost of Equity	MarketGrader Report	4.97%	5.62%	6.34%
2. Debt Weight	MarketGrader Report	49.30%	45.63%	31.61%
3. Equity Weight	100% - Line 2	50.70%	54.37%	68.39%
4. Unweighted Cost of Equity	Line 1 ÷ Line 3	9.80%	10.34%	9.27%
5. STB 2012 MS-DCF Cost of Equity	EP 558 (Sub-No. 16)	18.32%	17.65%	15.53%
6. % STB exceeds MarketGrader	(Line 5 ÷ Line 4) - 1 x 100	87%	71%	68%

Sources: MarketGrader.com StockGrader Reports

EXHIBIT B

VERIFIED STATEMENT OF PROFESSOR JAMES E. HODDER

VERIFIED STATEMENT

OF

JAMES E. HODDER

My name is James E. Hodder. I am an Emeritus Professor at the University of Wisconsin-Madison, where I was the Charles and Laura Albright Professor of Finance in the Wisconsin School of Business from 1992-2012. I am also the Principal of a consulting firm, 5 Lakes Financial Research, LLC. My address is 100 E. Huron #4904, Chicago, Illinois, 60611. While I have retired from my teaching post, I remain active in research and consulting and am preparing to begin serving as an Economic Fellow at the Securities and Exchange Commission starting in the fall.

While at the Wisconsin School of Business, I also served as Chair of its Finance Department during 2004-2008 and 2011-2012. From 1978 to 1992, I served on the faculty of Stanford University, where I received my Ph.D. in Economics in 1979. My other academic degrees are a Bachelor of Science in Industrial Engineering from Stanford University, a Masters of Business Administration from the University of Michigan, and a Masters of Arts in Economics from the University of California (Berkeley).

At Wisconsin, I taught Corporate Finance at the graduate level as well as corporate-oriented courses on Financial Policy and on Multinational Business Finance at both graduate and undergraduate levels. In addition, I have taught several courses on options and other derivative securities. At Stanford, most of my teaching was in corporate finance with a particular focus on valuing manufacturing and technology investments.

A substantial portion of my research and publications has addressed the subjects of investment evaluation and discounting. A key aspect of those subjects is the firm or project cost of capital, including appropriate risk and inflation adjustments. Another substantial portion of my research has addressed corporate capital structure.

I previously have submitted testimony to the Surface Transportation Board ("Board") in several coal rate cases: on behalf of Wisconsin Power & Light in its case against Union Pacific Railroad Company, on behalf of PPL Montana in its case against the Burlington Northern and Santa Fe Railway Company, on behalf of the Western Fuels Association and the Basin Electric Power Cooperative in their case against the Burlington Northern and Santa Fe Railway Company, and on behalf of AEP Texas North Company in its case against BNSF Railway Company. I also provided testimony to the Board on several occasions on behalf of the Western Coal Traffic League ("WCTL") in connection with Ex Parte No. 664, Methodology to be Employed in Determining the Railroad Industry's Cost of Capital as well as with Ex Parte No. 664 (Sub-No. 1), Use of a Multi-Stage Discounted Cash Flow Methodology In Determining the Railroad Industry's Cost of Capital. My participation included a Verified Statement in December 2006, a Public Hearing in February 2007, a Verified Statement in September 2007, a Reply Verified Statement in October 2007, a Public Hearing in December 2007, and a Verified Statement in April 2008. A copy of my detailed curriculum vitae is included herewith as Appendix A.

In the current instance, I have been asked by counsel for WCTL to provide comments regarding the particular multi-stage discounted cash flow ("MSDCF") procedure mandated by the Board in Ex Parte No. 664 (Sub-No. 1), Use of a Multi-Stage Discounted Cash Flow Methodology In Determining the Railroad Industry's Cost of Capital.

As a starting point, the MSDCF estimate for the railroad cost of equity has exceeded the estimate using the Capital Asset Pricing Model (“CAPM”) by a substantial amount in every year since the MSDCF procedure was adopted by the Board. This is illustrated in Table 1 below, where the estimates for 2008 – 2012 are based on the Board decisions for those years.

Table 1						
Cost of Equity Estimates						
	STB Decision 2008	STB Decision 2009	STB Decision 2010	STB Decision 2011	STB Decision 2012	Average
MSDCF Estimate	15.95%	13.34%	14.13%	15.83%	16.53%	15.16%
CAPM Estimate	10.39%	11.39%	11.84%	11.31%	10.27%	11.04%
Difference (MSDCF - CAPM)	5.56%	1.95%	2.29%	4.52%	6.26%	4.12%

Note that the MSDCF estimates have exceeded the CAPM estimates by an average of 4.12%, which is a very substantial deviation. Moreover, this does not seem to be a purely random occurrence. If the chance of the MSDCF estimate exceeding the CAPM estimate in any year were like a coin flip with a 50% probability of occurring, the probability of observing 5 years in a row with the MSDCF higher would be $(.5)(.5)(.5)(.5)(.5) = .03125$. Such a systematic and substantial deviation warrants investigation.

The particular MSDCF procedure mandated by the Board is a minor modification of an approach used by Morningstar/Ibbotson to estimate the cost of equity for a wide range of firms. The Morningstar/Ibbotson approach is a particular implementation of the general concept of finding the discount rate (cost of equity) that equates the Present Value from a stream of forecasted future cash flows to a firm’s shareholders with the current market value of that firm’s shares. Their implementation attempts a “one-size-fits-all” approach that turns out to be a poor

fit for the Class I Railroads used to estimate the Railroad Cost of Equity during the 2008-2012 period.

The Morningstar/Ibbotson approach uses a 3-stage model with a set of additional assumptions on how to estimate the annual cash flow available to shareholders during those 3 stages. The basic logic of a three stage model is as follows:

- a) During the first stage, the firm is allowed to grow faster or slower than its long-run growth rate.
- b) In the third stage, the firm grows at its long-run growth rate, which is usually chosen to match a forecast for long-run growth of the economy as a whole.
- c) The middle (second) stage provides a transition period during which the growth rate from the first period can be gradually adjusted to the level of long-run growth in the final stage.

The Morningstar/Ibbotson approach corresponds to the above logic for the first and third stages; but the “transition” during the second stage is problematic for the set of large railroads studied. The Morningstar/Ibbotson approach uses the industry average growth rate for its second stage growth rate. This might be reasonable if the industry in question were expected to grow at roughly the same rate as the economy. However in the implementation adopted by the Board, the railroads whose cost of equity is being estimated have their first-stage growth rates averaged to obtain the “industry” average for stage two; and those (currently three) railroads are all forecast to grow substantially faster than the postulated long-run growth rate for the U.S. economy of 5.48%. To illustrate this point, consider the 2012 data in Table 2 below, which is taken from Table 11 in the Board’s 2012 Decision. In what follows, I will frequently use the stock symbols give in that table as an abbreviated way to refer to specific railroads.

Table 2 2012 First Stage Growth Rate Estimates		
Company	Stock Symbol	Growth Rate
CSX Corporation	CSX	14.70%
Norfolk Southern Corporation	NSC	12.10%
Union Pacific Corporation	UNP	15.40%
Simple Average		14.07%

The lack of a gradual transition during the second stage of the model results in the estimated cash flows available to shareholders of all three railroads growing rapidly for 10 years then suddenly dropping from a growth rate of 14.07% to 5.48% annual growth thereafter. That is a drop approaching two-thirds in the annual growth rate for all three firms. From an economic perspective, this is not a reasonable transition. Moreover, it will result in a substantial upward bias of the cost of equity estimate from that model for each of the three railroads.

There is another problem with the transition structure between stages 2 and 3 in the Morningstar/Ibbotson approach as it applies to these three railroads. One has to dig into the calculations a bit in order to see this, but there is a massive upward jump in the estimated cash flow available to investors between the end of year 10 and the beginning of year 11 -- in effect, an “overnight” jump. Consider for example the 2012 MSDCF cost of equity estimate for CSX. Looking in Table 11 of the Board’s 2012 Decision, one can see that the estimated cash flow value for the end of year 10 is 4,608 (million \$). Using the formula for $IBEI_{10}$ from Appendix J of the AAR 2012 Opening Statement, one can work out that the cash flow to shareholders at the beginning of year 11 is \$6,507 million. That represents a jump of 41.20% (or \$1.899 billion) between the end of a year and the next day (beginning of the following year). Furthermore, as

indicated below in Table 3, there are similarly massive increases in the cash flow estimates for NSC and UNP.¹

Table 3 Jump in 2012 MSDCF Cash Flow Estimates (\$ millions)			
Company	CSX	NSC	UNP
	\$	\$	\$
Input for Terminal C.F.	1,697	1,734	3,327
Stage One Growth	14.70%	12.10%	15.40%
Stage Two Growth	14.07%	14.07%	14.07%
	\$	\$	\$
Cash Flow End Year 10	4,608	3,965	10,343
	\$	\$	\$
Cash Flow Beginning Year 11	6,507	5,928	13,150
	\$	\$	\$
Dollar Increase (millions)	1,899	1,963	2,807
Percentage Jump	41.20%	49.52%	27.14%

These are not only large percentage increases but involve billions of dollars. This is not plausible and indicates another substantial flaw in the Morningstar/Ibbotson approach as it applies to these three railroads. Again, the result is to bias upward the cost of equity estimates for all three railroads.

There is a third major problem with the Morningstar/Ibbotson approach as it applies to these three railroads. The first stage growth rate for each firm is based on the median 3-5 year Earnings Per Share (“EPS”) forecast for that firm by analysts contributing to the Institutional Brokers Estimate System (“IBES”).² A key issue here is that forecast is for earnings per share rather than a firm-wide earnings forecast.³ However, those growth rates are being applied to

¹ Input values are from Table 11 of the Board’s 2012 Decision. The cash flows at the beginning of year 11 are calculated using the formula for $IBEI_{10}$ from Appendix J of the AAR 2012 Opening Statement.

² The IBES forecast is distributed by Thomson Financial.

³ That the forecasts are for EPS is very clearly indicated on the computer screen shots from Thomson that are included as pages 2-4 of Appendix L of the AAR 2012 Opening Statement.

cash flow estimates based on firm-wide earnings, i.e., Income Before Extraordinary Items (“IBEI”) plus some adjustments. The problem with this implementation arises because these three railroads have been engaged in major share buybacks (also called share repurchases) during the last several years. Such share buybacks serve to inflate EPS growth relative to firm-wide earnings growth.⁴ Indeed, net share reductions will increase EPS even if the firm’s earnings are not increasing. One could suggest that this aspect of the Morningstar/Ibbotson approach would not be a problem for firms that have not engaged in substantial share buybacks, but that has definitely not been the case for these three railroads as indicated in Table 4 below.⁵ Thus, we have another major problem with the Morningstar/Ibbotson approach as applied to these three railroads.

Table 4			
Annual Net Share Reduction Rates a/o Q3 over the previous year Q3			
	CSX	NSC	UNP
2008Q3	6.16%	4.36%	3.58%
2009Q3	0.48%	0.65%	0.38%
2010Q3	4.69%	1.22%	2.26%
2011Q3	6.47%	7.51%	2.03%
2012Q3	1.77%	5.98%	2.63%
5 Year Ave	3.91%	3.95%	2.17%
2010-2012 Ave	4.31%	4.91%	2.31%

⁴ As a point of clarification, the buyback rates calculated below are based on shares outstanding and thus are net of any share issuance (e.g. in connection with the exercise of employee stock options). Hence, the term buyback or buyback rate should be interpreted in the sense of a net reduction in shares outstanding.

⁵ In this table, I calculated buyback rates based on shares outstanding from firm 10-Q reports as of the third quarter for each year. The third quarter was utilized since the market value input to the MSDCF calculation uses that share amount.

If we consider the last 3 years, average buyback rates range from 2.31% to almost 5%. Buybacks were relatively small in 2009; but if we go back to 2008 and calculate a 5-year average, the rates are still large (2.17% to almost 4%). How did share buybacks affect analysts' EPS forecasts? We don't know unless each analyst tells us the particulars for their forecast. We do know that these share buyback programs are public information (e.g., discussed in firm annual reports) and have been going on at these three railroads for several years. So analysts should certainly be aware of the buybacks and take them into consideration when providing EPS estimates. If for example, an analyst projecting NSC's growth assumed an annual share buyback rate of 5% (using a round number for simplicity), the effect would be to add slightly more than 5% to the EPS growth forecast. The math is that each \$1.00 of EPS without that share buyback becomes $\$1.00 / .95 = \1.0526 of EPS when the buyback is considered. So if the analyst anticipates share buybacks, their EPS forecast would be increased by slightly more than the expected buyback rate; and thus, using an otherwise accurate EPS forecast in the MSDCF would over-estimate firm-wide earnings growth by slightly more than the buyback rate. Since the buyback rates have been quite substantial, this is a serious problem.

There could be some analysts that have been acting like Rip Van Winkle and are unaware of the buyback programs. If so, their EPS estimates would not be inflated by anticipated buybacks. One suspects this group is a small minority, since analysts presumably try to be accurate in their forecasts; but we don't actually know. It seems reasonable to think that the median analyst estimate has been inflated by anticipated buybacks.⁶ Indeed, the median could be affected by a single analyst considering share buybacks for that firm. However, we don't

⁶ The AAR seems to agree, or at least states that "WCTL has not demonstrated that the analysts who predict growth rates do not take into account the effects of stock issuances or repurchases on earnings per share in the future." See page 7 of the AAR Rebuttal Comments dated May 31, 2013 in connection with STB Ex Parte No. 558 (Sub-No. 16) Railroad Cost of Capital – 2012.

know which analysts considered buybacks; and we don't know what anticipated buyback rates they may have used in their forecasts.

If one wanted to adjust the first-stage growth rates for this problem, it would entail identifying the source of the median forecast and guessing at how much to reduce that forecast in order to get a growth rate that applies to firm-wide earnings. A reasonable basis for that guess is far from clear. Should we use the previous year's buyback rate, a 3-year average, a 5-year average, an average that gives more weight to recent years, or what? In fact, we ideally want a forward-looking estimate; and past history may not be that helpful. Moreover, it is likely there are different buyback rates buried in different analyst forecasts. If we somehow came up with analyst-specific adjustments to eliminate the buyback effects, a comparison of the adjusted forecasts could well result in a different median forecaster. This is a mess, and one with substantial implications for the cost of equity estimates generated by the Morningstar/Ibbotson approach for these three railroads.

Since the Board's MSDCF methodology effectively assigns great weight to the median forecast, the behavior of one or two analysts can have a major impact. Consequently, it seems appropriate to also comment on the general quality of the forecasts, in addition to the share buyback issue identified above. There are a limited number of forecasts (no more than five or six for each railroad in 2012), and there are large differences among them. For example in 2012, there are five estimates for CSX; and they range from a low of 4.6% to a high of 15%. Moreover, one of the two 15% forecasts has not been adjusted since July 2008, despite the substantial disruption that the economy has experienced since then. Indeed, that same analyst is depicted as also having a 15% forecast for NSC that has remained unchanged since September

2002, a period of over ten years. Thus, there are additional reasons to be concerned about this aspect of the MSDCF methodology.

There is also an issue with how the Morningstar/Ibbotson approach estimates the long-run growth rate for the U.S. economy that is used in stage 3 of the MSDCF estimates. That growth rate (currently estimated at 5.48%) uses a current long-run inflation forecast (2.26%) but an historic estimate for real GDP growth (3.22%).⁷ Using history to predict the future is always a potential problem; and in the current economic environment, real GDP growth of 3.22% seems quite optimistic. For example, a June 2012 report from the Congressional Budget Office (“CBO”) projects real GDP out to 2087.⁸ Their 2087 projection of \$85,300 billion (in 2012 dollars) compared with their estimate for 2022 (10 years beyond 2012) implies an annual growth rate over that 65-year period of 2.19%. PWC has a real GDP projection for 2050 with the U.S. at \$37,998 billion (in 2011 dollars), which compared with their 2011 GDP figure of \$15,094 billion implies an annual growth rate of 2.40%.⁹ The OECD has published a projected real growth rate for the U.S. economy for 2011 – 2060 of 2.1%.¹⁰ The Conference Board has an annual real GDP growth projection for the U.S. economy during 2019-2025 (a substantially shorter period) of 2.0% in its Base Scenario and 2.4% in its Optimistic Scenario.¹¹ Since the MSDCF Terminal Value calculation is quite sensitive to the assumed long-run growth rate, this is another aspect of the Morningstar/Ibbotson approach that warrants re-examination.

⁷ See page 40 of the VS of Witness Gray in the ARR 2012 Opening Statement.

⁸ See Appendix B: Long-Term Projections Through 2087 in *CBO: The 2012 Long-Term Budget Outlook*, June 2012. That document as well as data for the appendix is available at <http://cbo.gov/publication/43288>. The real GDP projections can be found in the worksheet named “Economic Vars and Population”.

⁹ See Table 1 of *World in 2050: The BRICs and Beyond*, January 2013, available at <http://www.pwc.com/gx/en/world-2050/the-brics-and-beyond-prospects-challenges-and-opportunities.jhtml>

¹⁰ See Table A.1 of “Looking to 2060: Long-term global growth prospects,” OECD Economic Policy Papers, No. 3, November 2012, available at <http://www.oecd.org/eco/outlook/lookingto2060.htm>

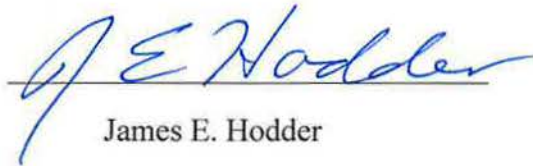
¹¹ See *Global Economic Outlook 2013, May 2013 Update*, available at <http://www.conference-board.org/data/globaloutlook.cfm>

In summary, there are several substantial problems with using the Morningstar/Ibbotson MSDCF model for estimating a railroad industry cost of capital. These problems are not inherent characteristics of MSDCF models generally, but rather results of particular assumptions made by Morningstar/Ibbotson in implementing their version of the more general model. Their assumptions may be ok for some firms in other industries but are clearly inappropriate for the three railroads whose costs of equity are being estimated. Moreover, the problems with their assumptions are individually substantial and all result in upward biases to the estimated cost of equity. Collectively, they should explain much of the difference between the CAPM estimate and the Morningstar/Ibbotson MSDCF estimate.

It is important to note that these problems with the Morningstar/Ibbotson approach have affected the MSDCF cost of equity estimates since 2008, when that approach was adopted by the Board. In other words, the Morningstar/Ibbotson MSDCF cost of equity estimates during that period are not reliable and are biased upward. Hence, the CAPM estimates during that period are apt to be far more accurate and credible than the MSDCF estimates. To the extent that investment decisions by the railroads were influenced by those MSDCF estimates, there has been a misallocation of capital. The problems with the Morningstar/Ibbotson approach are substantial and have important implications. This issue has been going on for too long and warrants immediate attention by the Board.

VERIFICATION

I, James E. Hodder, declare under penalty of perjury, that the foregoing Statement is true and correct, and that I am qualified and authorized to file this Statement.



James E. Hodder

Executed on
August 26, 2013

Appendix A: Curriculum Vitae

JAMES E. HODDER

5 Lakes Financial Research
100 E. Huron #4904
Chicago, IL 60611

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Areas of Specialization: Corporate Finance, Derivative Securities, and International Finance

Education:

1967	B.S.	Industrial Engineering, Stanford University
1968	M.B.A.	Business Administration, University of Michigan
1976	M.A.	Economics, University of California (Berkeley)
1979	Ph.D.	Economics, Stanford University

Dissertation: The Hedging of Exposure to Exchange-Rate Movements

Employment:

1968-69	Sylvania Electronic Systems: Project Administrative Engineer
1969-73	U.S. Navy: Engineering Duty Officer
1974-76	Department of Economics, University of California (Berkeley): Research and Teaching Assistant
1976-78	Department of Economics, Stanford University: Teaching Assistant and Instructor
1978-92	Department of Industrial Engineering and Engineering Management, Stanford University: Assistant Professor and Associate Professor, Associate Chairman 1987-1988, Ph.D. Program Director 1987-1992
1992-2012	School of Business, University of Wisconsin - Madison: Charles and Laura Albright Professor of Finance 1992-2012, Director of Quantitative Masters in Finance (QMF) Program 1995-2004, Department Chair 2004-2008 and 2011- 2012, Emeritus Professor since 2012
2012-	5 Lakes Financial Research: Principal

Visiting Appointments:

- 1986 Visiting Scholar, Department of Economics, Osaka University -- funded by a fellowship from the Japan Society for the Promotion of Science
- 1990-91 Visiting Associate Professor, School of Business, University of Wisconsin - Madison

Teaching:

Derivative Securities
 Advanced Derivatives
 Contemporary Topics – Hedge Funds
 Corporate Finance
 Fixed Income and Derivative Securities
 Options and Financial Futures
 Ph.D. Seminar: Interest Rate and Credit Risk Models
 Ph.D. Seminar: Risk Management in Financial Institutions
 Multinational Business Finance
 Financial Policy
 Doctoral Seminar in Financial Decisions
 Engineering Economy
 International Economics

Awards:

Outstanding Teacher, Department of Industrial Engineering and Engineering Management, Stanford University, 1981-82 and 1986-87

Lawrence J. Larson Award for Excellence in Teaching, School of Business, University of Wisconsin-Madison, 1999

Wisconsin Idea Fellow, in recognition of extraordinary public service on behalf of the University of Wisconsin, 2004-2005

University Service:

- Stanford: Affiliate Faculty Department of Economics, 1979–1992.
 Fellow of the Northeast Asia – U.S. Forum on International Policy, 1980-1992.
 Faculty Liaison for IEEM Industrial Affiliates Program, 1982-1992.
 School of Engineering Undergraduate Council, 1984-1991.
- Wisconsin: Business School, Subcommittee of the Executive Committee, 1993-1996, 1999-2001 and 2002-2003, Chair 1994-1995.
 Business School Academic Planning Council, 1994 -1998.
 East Asian Studies Faculty, 1994-2012.
 Center for World Affairs and the Global Economy, 1995-2002 and 2008-2012.
 University Social Sciences Divisional Committee, 2002-2004.
 Global Studies Faculty, 2004-2012.
 Business School Operations Committee, 2005-2008.
 University Faculty Senate, 2009-2012.

Publications:

1. "Foreign Investment from the Firm's Perspective," in D. Bonham-Yeaman, ed., Developing Global Corporate Strategies, Academy of International Business and European International Business Association Joint Conference, Barcelona, Spain, December, 1981.
2. "Exposure to Exchange Rate Movements," Journal of International Economics, November, 1982.
3. "Plant Location Modeling for the Multinational Firm," with J. V. Jucker, Proceedings of the Academy of International Business Conference on the Asia-Pacific Dimension of International Business, Honolulu, Hawaii, December, 1982.
4. "Financial Market Approaches to Facility Location Under Uncertainty," Operations Research, November-December, 1984.
5. "Pitfalls in Evaluating Risky Projects," with H. E. Riggs, Harvard Business Review, January-February, 1985. This article has also been reprinted in Managing Projects and Programs, Harvard Business School Press, 1989 and as Chapter 3 in Kim B. Clark and Steven C. Wheelwright, eds., The Product Development Challenge, Harvard Business School Press, 1995.
6. "Pricing to Reduce Investment When Costs Follow an Experience Curve: Constrained Dynamic Programming as well as Heuristic Rules," with Y. A. Ilan, Proceedings of the American Institute for Decision Sciences Fourteenth Annual Meeting, Western Regional Conference, Monterey, California, March, 1985.
7. "International Plant Location Under Price and Exchange Rate Uncertainty," with J. V. Jucker, Engineering Costs and Production Economics, April, 1985.
8. "Some Aspects of Japanese Corporate Finance," with A. E. Tschoegl, Journal of Financial and Quantitative Analysis, June, 1985. This article is also reprinted as Chapter 3 in Edwin J. Elton and Martin J. Gruber, eds., Japanese Capital Markets, Harper-Row, 1990.
9. "A Simple Plant Location Model for Quantity-Setting Firms Subject to Price Uncertainty," with J. V. Jucker, European Journal of Operational Research, July, 1985.
10. "Evaluation of Manufacturing Investments: A Comparison of U.S. and Japanese Practices," Financial Management, Spring, 1986. This article has also been reprinted in Stephen H. Archer and Halbert S. Kerr, eds., Readings and Cases in Corporate Finance, McGraw-Hill, 1988.
11. "Capital Cost: Difference Between U.S. and Japan Shrinks" (in Japanese), Nihon Keizai Shimbun, August 30, 1986.
12. "A Multifactor Model for International Facility Location and Financing Under Uncertainty," with M. C. Dincer, Computers and Operations Research, 1986.
13. "Declining Prices and Optimality When Costs Follow an Experience Curve," with Y. A. Ilan, Managerial and Decision Economics, December, 1986.
14. "Technology Transfer and Second Sourcing when Production Costs Follow an Experience Curve," with Y. A. Ilan, IEEE Transactions on Engineering Management, February, 1987.

15. "Simple Solution Procedures for Nonlinear Programming Problems that are Derivative Decomposable," with R. C. Carlson and J. V. Jucker, European Journal of Operational Research, July, 1987.
16. "Corporate capital structure in the United States and Japan: financial intermediation and implications of financial deregulation," in John B. Shoven, ed., Government Policy Towards Industry in the USA and Japan, Cambridge University Press, 1988.
17. "On Dumping at Less than Marginal Cost," in Developments in Pacific-Asian Business: Education and Research, Volume 2, Pacific Asian Management Institute, 1989.
18. "A Commentary on 'Japanese Capital Exports through Portfolio Investment in Foreign Securities,'" in Charles A. E. Goodhart and George Sutija, eds., Japanese Financial Growth, Macmillan (London), 1990.
19. "Agency Problems and International Capital Structure," with L. W. Senbet, in S. Ghon Rhee and Rosita P. Chang, eds., Pacific Basin Capital Markets Research, Elsevier, 1990.
20. "Valuing Flexibility as a Complex Option," with A. J. Triantis, Journal of Finance, June, 1990.
21. "International Capital Structure Equilibrium," with L. W. Senbet, Journal of Finance, December, 1990.
22. "Is the Cost of Capital Lower in Japan?", Journal of the Japanese and International Economies, March, 1991.
23. "The Cost of Capital for Industrial Firms in the U.S. and Japan," in William T. Ziemba, Warren Bailey, and Yasushi Hamao, eds., Japanese Financial Market Research, Elsevier, 1991.
24. "Corporate Finance in Japan," with A. E. Tschoegl, in Shinji Takagi, ed., Handbook of Japanese Capital Markets, Basil Blackwell, 1993.
25. "Valuing Flexibility: An Impulse Control Framework," with A. J. Triantis, Annals of Operations Research, vol. 45, 1993.
26. "Cross-holdings: Estimation Issues, Biases and Distortions," with M. Fedenia and A. J. Triantis, Review of Financial Studies, Spring, 1994.
27. "Risk Management and Assessment," in Richard C. Dorf, ed., Handbook of Technology Management, CRC Press, 1998.
28. "Pricing Models with Transaction Fees," with T. Zariphopoulou, in W. M. McEneaney, G. Yin, and Q. Zhang, eds., Stochastic Analysis, Control, Optimization and Applications: A Volume in Honor of W. H. Fleming, Birkhauser Boston, 1999.
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30. "Numerical Schemes for Variational Inequalities Arising in International Asset Pricing," with A. Tourin and T. Zariphopoulou, Computational Economics, February, 2001.

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32. "Corporate Finance," in Allan Bird, ed., Encyclopedia of Japanese Business and Management, Routledge, 2002.
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34. "Incentive Contracts and Hedge Fund Management," with J. C. Jackwerth, Journal of Financial and Quantitative Analysis, December, 2007 (Lead Article).
35. "Managerial Responses to Incentives: Control of Firm Risk, Derivative Pricing Implications, and Outside Wealth Management," with J. C. Jackwerth, Journal of Banking and Finance, June, 2011.
36. "Recovering Delisting Returns of Hedge Funds," with J. C. Jackwerth and O. Kolokolova, Journal of Financial and Quantitative Analysis, forthcoming.

Published Book Reviews:

"Review of The Economic Analysis of Industrial Projects by Lynn E. Bussey," James E. Hodder and James V. Jucker in The Engineering Economist, Winter, 1980.

"Review of Investment Analysis and Management by Anthony J. Curley and Robert M. Bear," in The Engineering Economist, Spring, 1980.

Research in Progress:

"Hedge Fund Performance: Attribution, Time Variation, and Persistence," with J. C. Jackwerth and O. Kolokolova.

"Improved Portfolio Choice Using Second Order Stochastic Dominance," with J. C. Jackwerth and O. Kolokolova.

Testimony:

Wisconsin Power and Light Company vs. Union Pacific Railroad Company, Surface Transportation Board, Verified Rebuttal Statement, September 2000.

PPL Montana, LLC vs. Burlington Northern and Santa Fe Railway Company, Surface Transportation Board, Verified Rebuttal Statement, April 2001.

Xcel Energy vs. United States Government, Expert Report (March), Rebuttal Report (May), Deposition (June), 2006.

Surface Transportation Board, Methodology to be Employed in Determining the Railroad Industry's Cost of Capital, Verified Statement (December 2006), Public Hearing (February

2007), Verified Statement (September 2007), Reply Verified Statement (October 2007), Public Hearing (December 2007).

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Western Fuels Association, Inc. and Basin Electric Power Cooperative, Inc. vs. BNSF Railway Co, Surface Transportation Board, Verified Statement, August 2008.

AEP Texas North Company vs. BNSF Railway Co, Surface Transportation Board, Verified Statement (September 2008); Remand from U.S. Appeals Court, DC Circuit, Verified Statement (January 2011).

Westpac Banking Corporation vs. New Zealand Commissioner of Inland Revenue, Witness Statement (November 2008), Supplementary Statement in Reply (March 2009), Testimony New Zealand High Court (July 2009).

Blum vs. Commissioner of Internal Revenue, Expert Report (January 2011), Testimony U.S. Tax Court Los Angeles (February 2011).

Professional Societies:

American Finance Association
Global Association of Risk Professionals
Professional Risk Managers' International Association
Western Finance Association

EXHIBIT 2

**Stangle Appendix (from AAR Reply Comments
in EP 664 (Sub-No. 1) filed October 14, 2008)**

APPENDIX

The table below shows the derivation of the railroad industry WACC estimates that are plotted in Exhibit 1.

WACC Estimates Using STB CAPM and Average of CAPM and MSDCF										
	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007 Ave.
Cost of Common Equity										
CAPM Only ¹	11.80%	11.34%	10.89%	10.48%	9.83%	9.74%	10.19%	10.43%	11.13%	12.68%
MSDCF Only ²	12.31%	13.80%	12.41%	11.64%	12.73%	13.51%	12.55%	13.48%	14.57%	14.10%
Average of CAPM, MSDCF	12.05%	12.57%	11.65%	11.06%	11.28%	11.62%	11.37%	11.96%	12.85%	13.39%
Cost of Preferred Equity³										
Cost of Debt ¹	6.19%	6.30%	6.30%	6.30%	6.30%	0.00%	0.00%	0.00%	0.00%	0.00%
Cost of Debt ¹	6.64%	7.20%	8.00%	6.90%	6.00%	5.00%	5.25%	5.36%	5.97%	6.15%
Weights³										
Common Equity	0.6264	0.6272	0.5210	0.5600	0.5670	0.5720	0.6149	0.6959	0.7695	0.7932
Preferred Equity	0.0135	0.0182	0.0250	0.0220	0.0210	0.0000	0.0000	0.0000	0.0000	0.0000
Debt	0.3601	0.3546	0.4540	0.4180	0.4120	0.4280	0.3851	0.3041	0.2305	0.2068
WACC										
CAPM Only	9.87%	9.78%	9.46%	8.89%	8.18%	7.71%	8.29%	8.89%	9.94%	11.33%
Average of CAPM, MSDCF	10.03%	10.55%	9.86%	9.22%	9.00%	8.79%	9.01%	9.95%	11.26%	11.89%
Analyst Benchmarks										
UBS	9.50%	9.50%	9.50%	9.50%	9.50%	9.50%	9.50%	9.50%	9.50%	9.50%
Bear Stearns	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%	10.00%

Sources

- 1 1998-2005 Exhibit 3, Stangle Verified Statement, April 14, 2008,
2006-2007 Final STB decision in Ex Parte No. 558 (Sub-No. 10-11)
- 2 Exhibit 3, Stangle Verified Statement, April 14, 2008
- 3 Final STB decisions in Ex Parte No. 558 (Sub-No. 3-11)

EXHIBIT 3

**Patrick Cusatis and J. Randall Woolridge, *The Accuracy of
Analysts' Long-Term Earnings Per Share Growth Rate Forecasts*
(January 24, 2008)**

The Accuracy of Analysts' Long-Term Earnings Per Share Growth Rate Forecasts

January 24, 2008

Patrick Cusatis, CFA and J.Randall Woolridge
The Pennsylvania State University

ABSTRACT: In this study we examine the accuracy of analyst long-term and one-year earnings per share growth rate forecasts over the last 20 years. We find that analysts' earnings growth rate estimates are consistently overly-optimistic and are about two times the level of GDP growth. Analyst predictions of earnings are better for one-year projections than for long-term projections, but are still overly-optimistic. We find that analyst coverage does not have a significant impact on the optimistic bias in analysts' EPS growth rate forecasts. We do find that a contributing factor for the bias in analysts' earnings estimates is the resistance of analysts to project negative earnings growth. Furthermore, we find that earnings estimates have a continued bias after the 2003 Global Analyst Research Settlements.

Introduction

The expected growth rate of long-term earnings plays a critical role in investment management and corporate finance. An essential element in valuation modeling and cost of capital estimation, long-term earnings growth is periodically forecasted by Wall Street analysts to provide investors with a better understanding of the current and future cash flows likely to be generated by a firm's operations. Periods of high earnings growth rates are usually accompanied with bull markets, and periods of low or negative earnings growth rates tend to produce bear markets. In addition, companies with high earnings growth rates usually sell at high price-to-earnings (P/E) ratios, and stocks with low earnings growth rates trade at low P/E ratios.

A number of studies have indicated that analysts' forecasts of earnings are upwardly biased. For example, Barefield and Comiskey (1975), DeBondt and Thaler (1990), Butler and Lang (1991), Abarbanall (1991), and Brown (1997) find an overall optimism in analysts' earnings forecasts. Becchetti, Hasan, Santoro, and Anandarajan (2007) find evidence that an over-optimism bias is highest during bull markets. Hong and Kubik (2003) find that brokerage houses reward optimistic analysts who promote stocks. In addition, the popular press occasionally highlights evidence of analysts forecast bias.¹

However, these studies assessing the accuracy of analysts' earnings estimates are based on forecasts of quarterly earnings. That is, these studies evaluate the accuracy of analysts' earnings forecasts for periods up to one quarter before a quarterly EPS figure is released. Our study examines analysts' long-term (three- to five- year) and one-year

¹ See for example, Brown (2003) and Smith (2003).

ahead EPS growth rate forecasts. According to financial theory, long-term expected earnings growth drives the valuation of the overall stock market and individual common stocks. As such, long-term EPS growth rate forecasts are an essential component of cash flow valuation models for firms and the market and are used in estimating the cost of capital.

We begin by evaluating historic EPS growth. Many have argued that there is an upward limit on EPS growth as determined by sustainable GDP growth. Bernstein and Arnott (2003) and Arnott (2004) indicate that EPS growth must be below sustainable growth in economic productivity. We show that the historic growth rate in EPS and GDP in the U. S. is in the 7.0% range. As an initial indication of accuracy of analysts' forecasts, we find that analysts' estimates of long-term EPS growth are substantially above this level.

We examine the accuracy of analysts' long-term earnings and one-year ahead EPS growth rate estimates over the last 20 years. We find that analysts' earnings growth rate estimates are consistently overly-optimistic. Analyst predictions of earnings growth are better for one-year growth rate projections than for long-term growth rate projections, but are still significantly overly-optimistic. Analysts only underestimate EPS growth following periods of economic recession which are associated with EPS recovery after large declines in earnings. We also evaluate whether the number of analysts covering a company is associated with the overly-optimistic bias in projected EPS growth rates. We find that analyst coverage does not have a significant impact on the bias in projected EPS growth rates. We do find that a contributing reason for the bias in analysts' long-term and one-year EPS growth rate estimates is the resistance of analysts to project negative earnings growth. We find that analysts rarely project negative EPS growth, despite the fact that companies commonly experience negative earning growth over three- to –five-

year time periods. Based on the research of others, we suggest three explanations for the upward bias in analysts' earnings estimates. The first explanation is based on career concerns or conflicts of interest. Analysts are rewarded for biased forecasts by their employers (brokerage houses) who want them to hype stocks so that the brokerage house can garner trading commissions and win underwriting deals. The second explanation is based on selection bias. Analysts only follow stocks that they recommend and do not issue forecasts on those that they do not like. The third explanation is a cognitive or behavioral bias. Analysts become attached to the companies that they cover and lose objectivity. This would imply that analysts are systematically biased. Since they are only projecting the companies they follow, and not the market, the end result is a strong upward bias on earnings projections.

Finally, we assess the optimistic bias in analysts' EPS growth rate estimates for the period after the Global Analyst Research Settlements in 2003. Presumably, any bias in the research of Wall Street investment firms should have been impacted by New York Attorney General (now Governor) Elliot Spitzer's investigation and the \$1.5B payment made by nine major brokerage firms. Nonetheless, we find a continued optimistic bias in long-term earnings growth rate estimates after the Settlements.

This study is organized as follows. Initially, the historic growth of earnings on S&P 500 companies is compared to the growth in GDP to establish the historic relationship between corporate earnings growth and economic growth. Then, analysts' forecasts of earnings growth for long-term and one-year time horizons are compared to actual earnings growth. We also evaluate analyst coverage as a possible contributing factor in earnings forecast bias. Next, negative earnings growth projections are examined as a possible explanation for the earnings estimate bias. Finally we investigate analysts'

earnings estimates following the Global Research Regulatory Settlement to see if analysts have adjusted their bias.

Data and Methodology

One of the most common approaches to estimating the long-term earnings growth rates for companies is to use the mean estimates of the forecasts of Wall Street securities' analysts as published by such services as Zack's Investment Research, Thomson First Call Research, or the Institutional Brokers' Estimate System (I/B/E/S). I/B/E/S has a more comprehensive coverage of brokerage firms and financial analysts than the other databases. It includes many more analysts from smaller brokerage firms, and also includes important brokerage firms such as Merrill Lynch, Goldman Sachs, and Donaldson, Lufkin & Jenrette that are not included in Zack's Investment Research.

Using the I/B/E/S database, we collect long-term and one-year ahead annual growth rate estimates for all firms from 1984 to 2006, inclusive. We require that companies not only have projected EPS growth rate estimates, but also have EPS figures for the four-year ahead period (for the long-term forecasts) and the one-year ahead period (for the one-year forecasts) so that forecasted and actual EPS growth rates can be compared. Based on projected and actual earnings per share, we calculate implied geometric growth rates. We compare analysts' projected and actual EPS growth rates for long-term EPS growth rate forecasts and one-year EPS growth rate estimates. The data result in an average of 1,383 firms and 1,275 firms per year, for one-year and long-term growth rates, respectively. The descriptive statistics for the data are reported by year in Table 1.

Table 1
Number of Companies and Average Number of Analysts:
One-Year and Long-Term Analyst Forecast Data

	One-Year Forecasts		Long-Term Forecasts	
Year	Number of Companies	Average Number of Analysts	Number of Companies	Average Number of Analysts
1984	1,245	8.61	--	--
1985	1,154	10.30	--	--
1986	1,140	10.44	--	--
1987	1,047	11.02	--	--
1988	1,095	10.70	808	6.09
1989	1,245	10.64	899	6.29
1990	1,260	10.78	892	6.49
1991	1,138	10.01	921	6.34
1992	1,192	9.60	1,003	5.49
1993	1,314	9.55	1,125	5.90
1994	1,475	9.71	1,175	5.69
1995	1,557	9.11	1,148	5.86
1996	1,652	8.74	1,158	5.68
1997	1,489	8.33	1,218	5.51
1998	1,375	7.75	1,466	4.99
1999	1,258	8.54	1,490	4.95
2000	1,176	8.26	1,503	5.08
2001	1,469	7.68	1,467	5.26
2002	1,367	7.13	1,518	5.39
2003	1,464	7.78	1,577	5.56
2004	1,565	8.60	1,663	5.24
2005	1,620	8.73	1,578	5.07
2006	2,502	6.92	1,628	5.59
Mean	1,383	9.08	1,275	5.61
Median	1,314	8.74	1,218	5.56

Source: I/B/E/S. Long-term numbers are based on the average of quarterly numbers for each year.

Analysts Long-Term EPS Growth Rate Forecasts

For the analysts' long-term growth rate estimates, I/B/E/S reports the number of analysts as well as the mean and median EPS growth rate estimates for a 'three-to-five' year period. Given that I/B/E/S projected EPS growth rate is for a 'three-to-five' year period, the projected EPS growth rate is assumed to be four years. For each company in the I/B/E/S database with long-term analysts' EPS growth rate forecasts, as of the end of

each quarter we obtain the annual EPS, EPS_t , as the sum of the trailing four quarters' EPS and the mean projected three-to-five year projected EPS growth rate, g . As an example, assume that EPS_t for a particular company as of the end of the fourth quarter of 2000 is \$1.00 and g is 10%, as shown in Table 2. The projected EPS in four years, EPS_{t+4} , for this company is calculated as:

$$EPS_{t+4} = (EPS_t)(1 + g)^4$$

Table 2
Example: EPS and Projected Growth for a Hypothetical Company

Actual Quarterly EPS					
First Quarter 2000	Second Quarter 2000	Third Quarter 2000	Fourth Quarter 2000	Actual Annual EPS	I/B/E/S Projected EPS Growth
0.25	0.35	0.25	0.15	1.00	10.0%

In this example, the company's projected EPS is calculated as:

$$EPS_{t+4} = (1.00)(1.10)^4 = \$1.46.$$

This figure is compared to the company's actual annual EPS growth rate from the end of 2000 to the end of 2004. The actual EPS growth rate is calculated as the compound annual growth rate in earnings over the time period, g_a , as shown below:

$$g_a = 1 - \left(\frac{EPS_{t+4}}{EPS_t} \right)^{.25}$$

As an example, if the company's actual annual EPS as of the fourth quarter of 2004 is \$1.25; the company's actual four-year EPS growth rate is calculated as 5.74%. This is shown in Table 3. In this example, analysts projected this company to grow EPS at 10% over the four-year time period, and the company had an actual EPS growth rate of 5.74%. This procedure is repeated on a quarterly basis for each company in the I/B/E/S database.

Table 3
Example: Actual Long-Term EPS
Growth Rate Calculation for a Hypothetical Company

Actual Quarterly EPS					
First Quarter 2004	Second Quarter 2004	Third Quarter 2004	Fourth Quarter 2004	Actual Annual EPS	Actual EPS Growth (2000 – 2004)
0.30	0.35	0.25	0.35	1.25	5.74%

Analysts' One-Year EPS Growth Rate Estimates

For one-year EPS estimates, I/B/E/S reports the number of analysts as well as the mean and median one-year EPS estimates. We compare the growth rates associated with the one-year projected EPS estimates with the actual EPS as of the end of the calendar year. For this reason, we limit this analysis to firms with December 31st fiscal year-ends.

As an example, using the hypothetical company in Table 4, of the end of the fourth quarter of 2004, the company's EPS_t is \$1.00. If the analysts' projected one-year growth in EPS, EPS_{t+1} , is \$1.15, the company's projected one-year EPS growth rate is calculated as 15.0%. This figure is compared to the company's actual EPS growth rate based on quarterly earnings in 2005. In the example in Table 4, the company's actual one-year EPS growth rate is 10.0%. This procedure is then repeated on an annual basis for each company in the I/B/E/S database

Table 4
Example: Actual Annual EPS Growth
Rate Calculation for a Hypothetical Company

Actual EPS						
First Quarter 2004	Second Quarter 2004	Third Quarter 2004	Fourth Quarter 2004	2004 Actual Annual EPS	2005 Actual Annual EPS	Projected One-Year EPS Growth (2004 – 2005)
0.30	0.30	0.20	0.20	1.00	1.10	15.0%

We calculate forecast errors, FE , based on the ratio of the forecasted and actual estimated growth rates, as follows:

$$FE = \frac{g}{g_a} - 1$$

Based on this calculation, a positive forecast error indicates an upward bias in forecasted earnings and a negative forecast error indicates a downward bias in forecasted earnings.

The tabulated growth rates are based only on firms who survive for the following one or four years, for one-year and long-term growth rates, respectively. The survivorship bias may induce an upward bias in actual earnings growth rates. Moreover, we do not calculate growth rates when the base-year value is negative.

Historic Growth Rate in Earnings

The historic record for EPS and GDP growth provides a benchmark for long term growth estimates. Ibbotson and Cheng (2003) show that growth in earnings is in line with overall growth in economic productivity. Bernstein and Arnott (2003) and Arnott (2004) make the point that corporate earnings growth rates cannot exceed sustainable GDP growth, even though analysts consistently forecast growth rates that indicate the opposite.

We begin by examining the actual five-year earning per share (EPS) growth for the S&P 500 and five-year Gross Domestic Product (GDP) growth from 1960 to 2006. EPS for the S&P 500 has averaged 7.02% with a median of 7.08%. GDP has averaged 7.42% with median of 7.40%. The results are presented in Figure 1.

Historically, EPS growth has been is more volatile than GDP growth. EPS growth rates range from -2.71% to 16.89% with a standard deviation of 4.51%. Growth rates for GDP range from 4.62% to 11.38% with a standard deviation of 2.03%. In addition, average GDP growth has exceeded EPS growth. This result corresponds with

previous research.

Figure 1
Five-Year S&P 500 EPS Growth Versus Five-Year GDP Growth

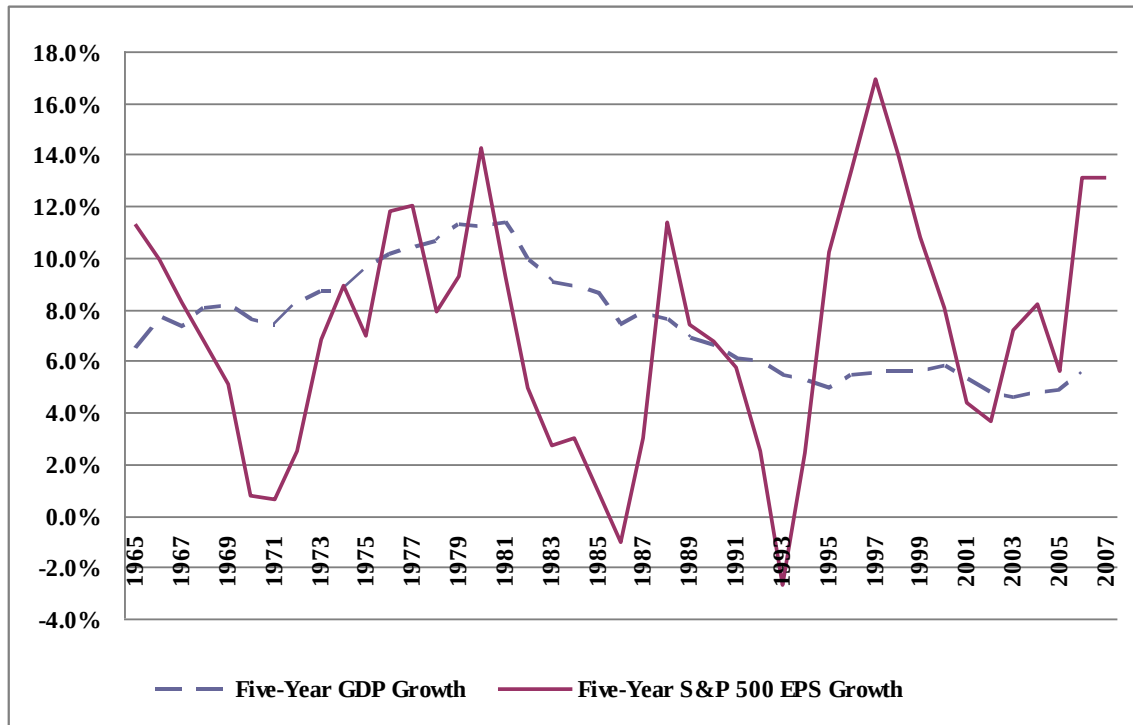


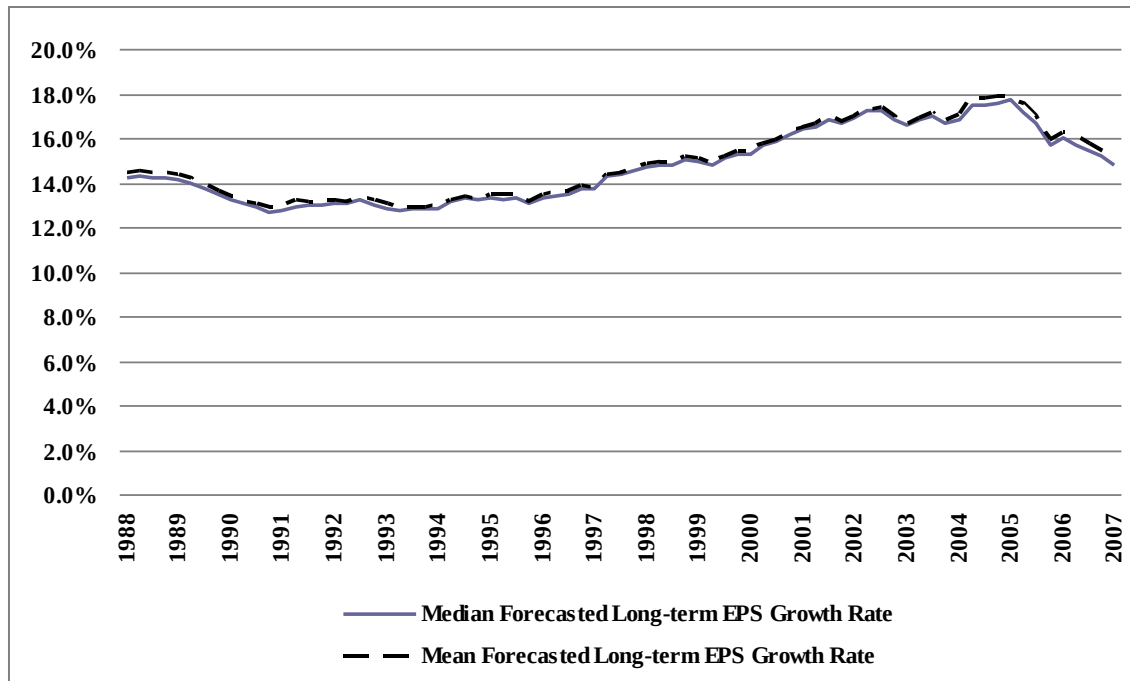
Figure 2 shows the mean and median long-term analysts EPS forecasts from 1988 through the first quarter of 2007. Although GDP growth has averaged 7.42% with median of 7.40% over the last 40 years, analysts over our sample period project long-term growth at an average rate of 14.71%. This suggests that analysts consistently forecast long-term EPS growth at a level that is two times that of historic GDP growth.

Several observations can be made from Figure 2. First, analysts consistently project long-term growth rates in a range of 13% to 18%. Second, mean and median observations are practically identical suggesting that these results are not driven by outliers. Finally, analysts' forecasts have increased over time, even though GDP growth has decreased over time.

In the sections that follow, we examine analysts' long-term and one- year ahead

forecasts relative to actual EPS growth rates.

Figure 2
Long-Term IBES Forecasted EPS Growth Rates
1988-2006



Analysts IBES Forecast Versus Actual EPS Growth Rates: Long-Term Projections

We examine forecasted long-term EPS growth versus actual three-to-five-year EPS growth based on IBES data from 1984 to 2006. The results are presented by quarter in Table 5 and Figure 3.

Over the entire time period, analysts continually forecast long-term EPS growth for the sample between 13% and 18%. Actual EPS growth for the sample ranges between 1.23% and 19.93%. Firm's meet or exceed analysts' expectations in periods around 1996 and 2006, both of which followed a large decline in corporate earnings. This is the most likely scenario for corporations to attain the lofty growth rates projected by analysts. This pattern is seen clearly in Figure 3.

Over the entire period analysts' long-term forecasted EPS growth averaged

14.71% per year, but companies only averaged long-term EPS growth of 9.10%. The analyst bias is obvious and clearly significant. A test for a difference in means--the null hypothesis is the difference in the mean actual EPS growth is equal to the mean projected EPS growth--has a t-stat of -10.68 which is significant at the .005 level (n=77).

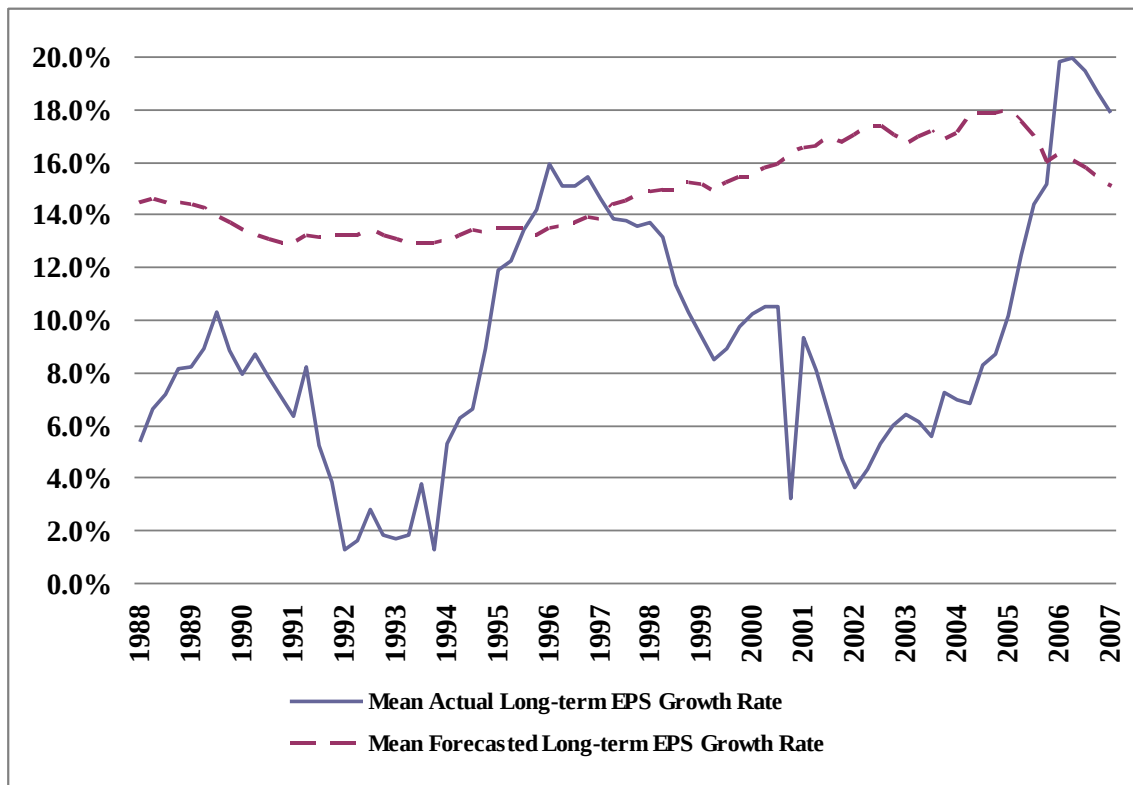
Table 5
Summary of Forecasted and Actual Long-Term EPS Growth Rates by Quarter

Year	Quarter Ended	Mean Actual Long-term EPS Growth Rate	Mean Forecasted Long-term EPS Growth Rate	Forecast Error for Mean (%)	Number of Companies	Average Number of Analyst Estimates
1988	Mar-88	5.36%	14.47%	170.07%	768	6.24
	Jun-88	6.61%	14.55%	120.32%	797	6.26
	Sep-88	7.12%	14.45%	102.96%	817	5.96
	Dec-88	8.12%	14.46%	78.13%	850	5.88
1989	Mar-89	8.20%	14.35%	75.08%	910	6.09
	Jun-89	8.92%	14.21%	59.34%	892	6.36
	Sep-89	10.28%	13.88%	35.03%	889	6.57
	Dec-89	8.81%	13.65%	55.00%	905	6.15
1990	Mar-90	7.94%	13.41%	68.98%	907	6.42
	Jun-90	8.66%	13.23%	52.76%	863	6.46
	Sep-90	7.84%	13.05%	66.44%	880	6.48
	Dec-90	7.10%	12.89%	81.48%	916	6.62
1991	Mar-91	6.35%	12.89%	103.13%	939	6.70
	Jun-91	8.21%	13.19%	60.63%	914	6.68
	Sep-91	5.20%	13.14%	152.80%	897	6.07
	Dec-91	3.84%	13.18%	243.60%	932	5.90
1992	Mar-92	1.25%	13.22%	955.21%	950	5.58
	Jun-92	1.57%	13.18%	737.49%	986	5.41
	Sep-92	2.75%	13.40%	387.75%	1008	5.47
	Dec-92	1.83%	13.22%	621.01%	1068	5.52
1993	Mar-93	1.64%	13.04%	697.33%	1062	5.79
	Jun-93	1.81%	12.90%	612.01%	1183	5.93
	Sep-93	3.76%	12.89%	243.17%	1115	5.98
	Dec-93	1.23%	12.92%	951.11%	1140	5.90
1994	Mar-94	5.31%	12.98%	144.61%	1143	5.66
	Jun-94	6.27%	13.21%	110.79%	1158	5.56
	Sep-94	6.61%	13.42%	103.17%	1207	5.75
	Dec-94	8.89%	13.34%	49.99%	1192	5.81
1995	Mar-95	11.88%	13.47%	13.39%	1166	5.88
	Jun-95	12.20%	13.44%	10.21%	1144	5.84
	Sep-95	13.37%	13.45%	0.61%	1147	5.87

	Dec-95	14.14%	13.18%	-6.78%	1134	5.87
1996	Mar-96	15.88%	13.47%	-15.20%	1115	5.76
	Jun-96	15.05%	13.59%	-9.74%	1154	5.62
	Sep-96	15.07%	13.65%	-9.38%	1177	5.70
	Dec-96	15.42%	13.87%	-10.04%	1185	5.63
1997	Mar-97	14.62%	13.83%	-5.37%	1213	5.55
	Jun-97	13.82%	14.36%	3.92%	1223	5.55
	Sep-97	13.72%	14.49%	5.61%	1260	5.48
	Dec-97	13.52%	14.69%	8.67%	1174	5.45
1998	Mar-98	13.67%	14.88%	8.85%	1477	5.14
	Jun-98	13.13%	14.95%	13.85%	1448	4.92
	Sep-98	11.33%	14.91%	31.68%	1475	4.98
	Dec-98	10.27%	15.22%	48.16%	1462	4.93
1999	Mar-99	9.37%	15.13%	61.49%	1510	4.88
	Jun-99	8.50%	14.90%	75.28%	1480	4.96
	Sep-99	8.89%	15.20%	70.90%	1490	4.89
	Dec-99	9.70%	15.39%	58.64%	1481	5.06
2000	Mar-00	10.21%	15.45%	51.25%	1491	5.00
	Jun-00	10.48%	15.78%	50.53%	1515	4.94
	Sep-00	10.48%	15.93%	51.96%	1503	5.12
	Dec-00	3.19%	16.31%	412.19%	1502	5.25
2001	Mar-01	9.30%	16.53%	77.61%	1502	5.26
	Jun-01	8.09%	16.63%	105.58%	1485	5.26
	Sep-01	6.36%	16.97%	166.79%	1465	5.33
	Dec-01	4.72%	16.76%	255.42%	1414	5.18
2002	Mar-02	3.63%	17.02%	369.17%	1461	5.37
	Jun-02	4.28%	17.35%	305.30%	1517	5.26
	Sep-02	5.27%	17.38%	229.93%	1541	5.45
	Dec-02	5.98%	16.98%	183.88%	1553	5.50
2003	Mar-03	6.37%	16.68%	161.92%	1537	5.55
	Jun-03	6.11%	16.92%	177.12%	1566	5.46
	Sep-03	5.52%	17.15%	210.57%	1598	5.58
	Dec-03	7.25%	16.85%	132.37%	1605	5.65
2004	Mar-04	6.93%	17.08%	146.39%	1629	5.70
	Jun-04	6.80%	17.76%	161.30%	1664	5.18
	Sep-04	8.28%	17.81%	115.12%	1687	5.23
	Dec-04	8.70%	17.84%	104.95%	1670	4.87
2005	Mar-05	10.11%	17.92%	77.23%	1616	4.93
	Jun-05	12.45%	17.53%	40.74%	1578	4.87
	Sep-05	14.39%	16.96%	17.82%	1599	5.16
	Dec-05	15.15%	15.95%	5.32%	1517	5.33
2006	Mar-06	19.82%	16.22%	-18.18%	1563	5.33
	Jun-06	19.93%	16.07%	-19.40%	1580	5.65
	Sep-06	19.45%	15.75%	-19.05%	1644	5.83
	Dec-06	18.60%	15.41%	-17.14%	1723	5.57
2007	Mar-07	17.81%	15.07%	-15.39%	1734	5.25
	Mean	9.10%	14.89%	143.06%	1,281	5.60
	Median	8.50%	14.55%	75.08%	1,223	5.56

Also presented in Table 5 are forecast errors. Previous studies based on quarterly estimates (see, for example, Kwag and Shrieves (2006)) find that forecast errors are mixed. Our findings indicate that forecast errors for long-term estimates are predominantly positive, which indicates an upward bias in growth estimates. The mean and median forecast errors over the observation period are 143.06% and 75.08%, respectively. They are only negative for 11 time periods: five consecutive quarters starting at the end of 1995 and six consecutive quarters starting in 2006. As can be seen in Figure 3, the negative forecast errors clearly follow periods of declined earnings growth when higher growth rates can be attained. Overall, there is evidence of a persistent upward bias in long-term EPS growth forecasts.

Figure 3
Long-Term Forecasted Versus Actual EPS Growth Rates
1988-2006



Long-Term EPS Forecasts: Breakdown by Number of Analysts

It is possible that the results from the previous section are affected by the level of analyst coverage. Smaller and newly-traded companies tend to have less analyst coverage. It is possible that companies with fewer analysts would bias the results. Earnings for small or newly-traded companies are more difficult to forecast and would be expected to lead to higher forecasted earnings growth rates. For this reason we divide the sample into two groups: companies with three or fewer analysts and companies with more than three analysts.

While our data averages 5.61 analysts per company, many companies have three or fewer analysts. The two groups evenly divide the data. On average, of 1,273 companies, 628 have three or fewer analysts and 645 have more than three analysts. The data is described in Table 6 and displayed in Figure 4.

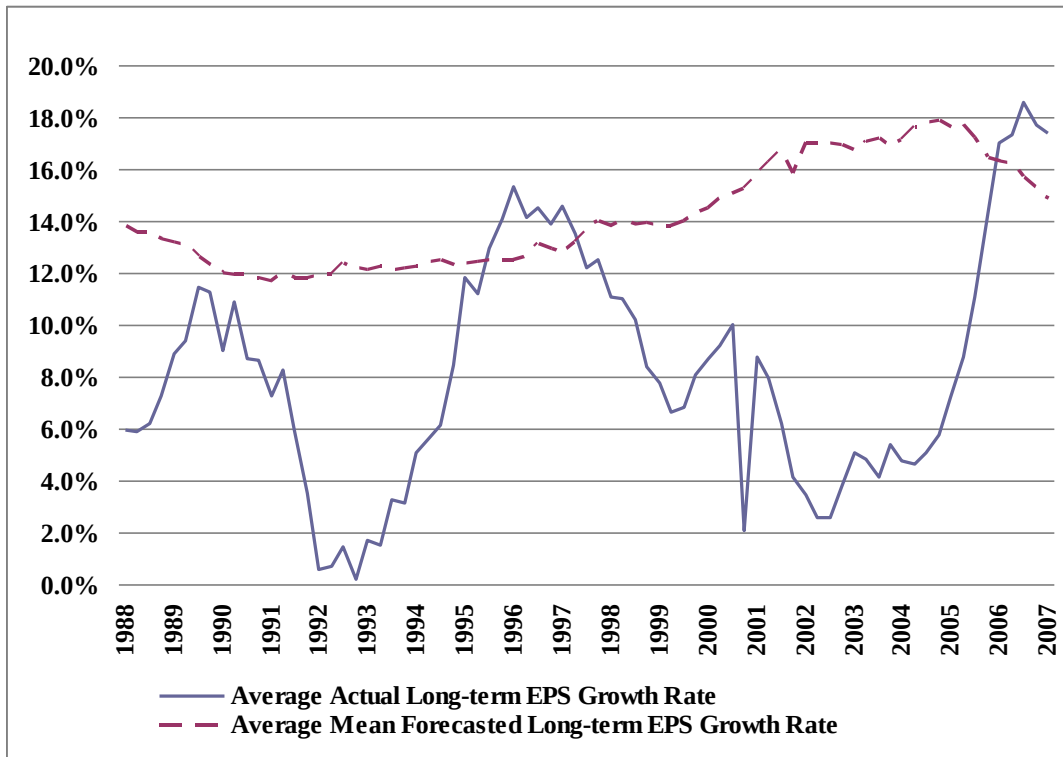
The results indicate that the group of companies with more than three analysts has lower long-term earnings growth rate forecasts. However, that group also has significantly lower actual growth in earnings, as indicated by a difference in means test ($t\text{-stat} = -5.77$, $n = 77$). Furthermore, while there is no significant difference between the forecasted growth rates by group since 2002, actual earnings continue to be lower for the group with more than three analysts. Overall, the forecast errors by group are very close. The median forecast error for the group with fewer than three analysts is 48.65%. For the group with more than three analysts the median forecast error is 48.68%.

Table 6
Number of Companies by
Analyst Coverage for Long-Term IBES Data

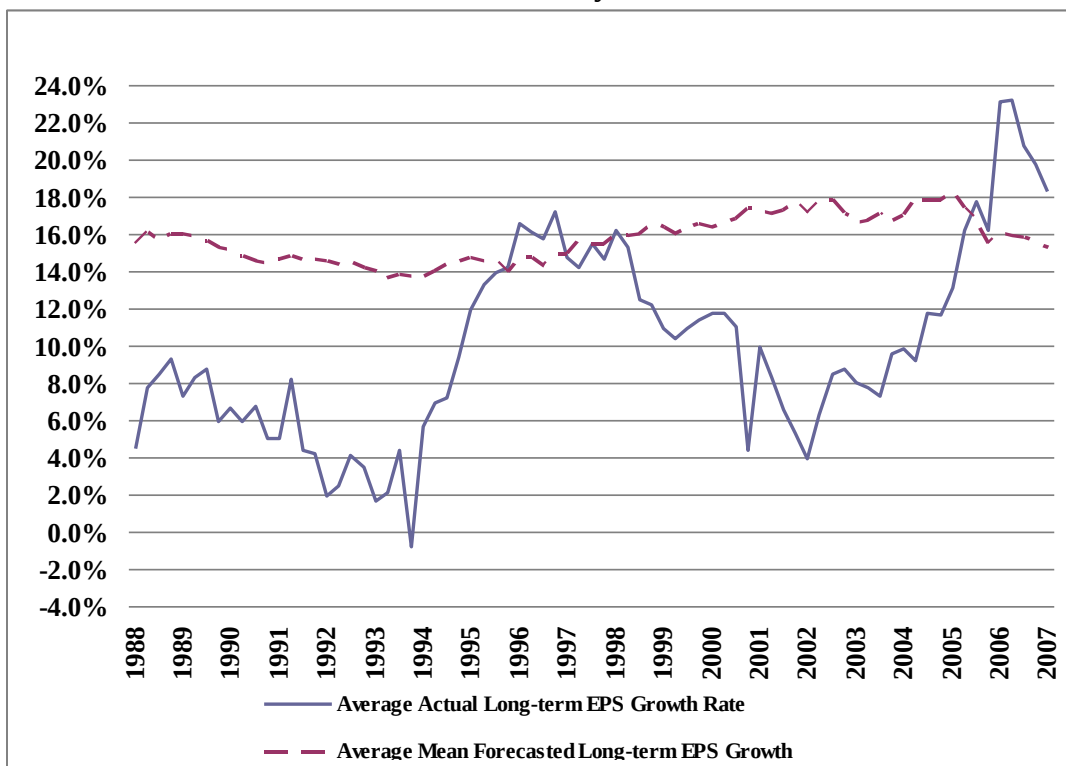
Year	Total Number of Companies	Companies with 3 and fewer Analysts	Companies with more than 3 Analysts
1988	808	325	485
1989	899	379	522
1990	892	389	508
1991	921	410	511
1992	1,003	502	505
1993	1,125	535	577
1994	1,175	561	615
1995	1,148	533	616
1996	1,158	530	633
1997	1,218	576	646
1998	1,466	731	735
1999	1,490	735	756
2000	1,503	747	756
2001	1,467	759	707
2002	1,518	825	693
2003	1,577	871	705
2004	1,663	875	788
2005	1,578	809	769
2006	1,628	898	730
Mean	1,273	628	645
Median	1,218	576	646

Source: I/B/E/S. Based on the average of quarterly numbers for each year.

Figure 4
Long-Term IBES Forecasted EPS Growth Rates by Analysts Coverage
Panel A: Greater Than Three Analysts



Panel B: Three Analysts or Fewer



Analysts IBES Forecast Versus Actual EPS Growth Rates: One-Year Projections

Although we have shown a significant bias in growth rate forecasts, we realize that long-term growth is difficult to forecast. Over longer forecast periods, analysts face a greater probability of unexpected events that will lead to inaccurate estimates. One possible explanation for the persistent bias is that analysts consistently project long-term growth estimates higher than short-term estimates to allow for the possibility of unforeseen events. For this reason, we extend the analysis to one-year EPS growth rate forecasts, expecting that analysts' estimates will be more accurate over a shorter period of time with less event risk.

We collect forecasted and actual one-year EPS growth rate data for firms from 1984 to 2006. We compare the analysts' forecasted EPS growth rates to the actual annual growth rates over the year. The results are presented by year in Table 7.

Analysts consistently project upwardly biased growth rates, even for shorter time horizons. Analysts forecasted one-year EPS growth at an average rate of 13.80% while the actual EPS growth rate over the time period averaged 9.77%. These growth rates are significantly different as indicated by a difference in means test ($t\text{-stat} = -4.91, n=23$).

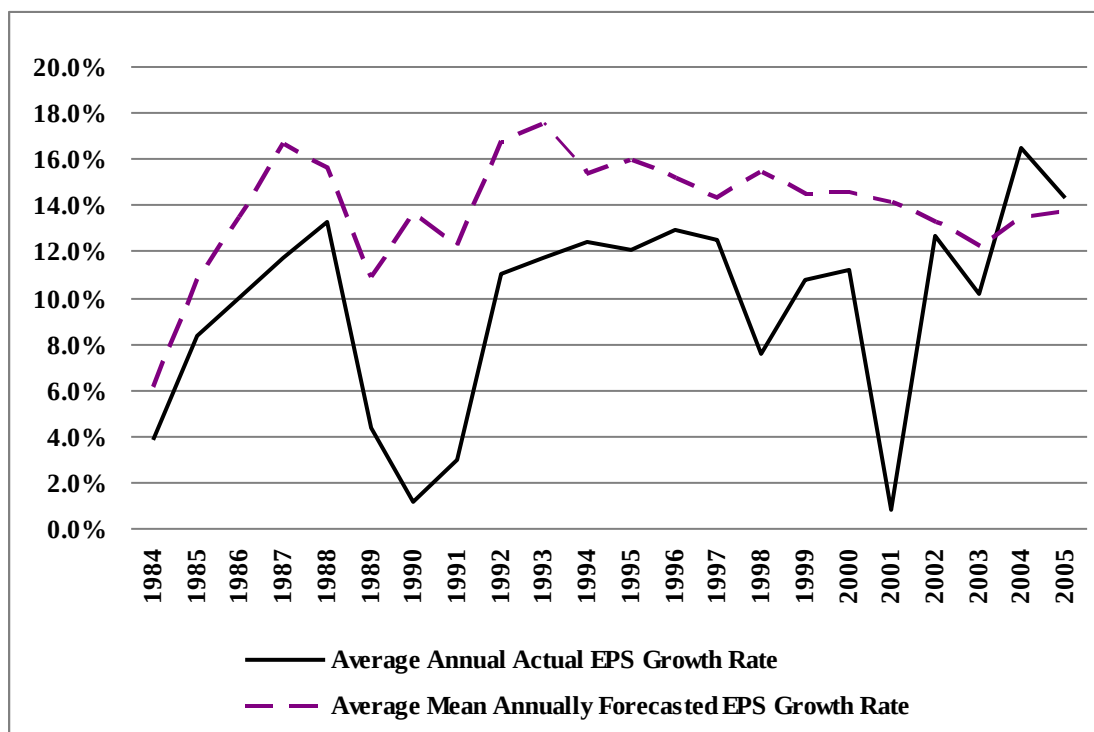
Although the one-year forecast errors are lower, they are still large and predominantly positive. The mean and median forecast errors over the observation period are 165.94% and 32.51%, respectively. Forecast errors are only negative for the last three years, indicating an overall negative bias to earnings estimates.

Table 7
Summary of IBES Forecasted and Actual One-Year Growth Rates by Year

Year	Mean Annual Actual EPS Growth Rate	Mean Annual Forecasted EPS Growth Rate	Forecast Error for Mean Growth Rate	Number of Companies	Average Number of Analyst Estimates
1984	3.79%	6.10%	61.24%	1245	8.61
1985	8.33%	10.77%	29.40%	1154	10.30
1986	9.96%	13.43%	34.84%	1140	10.44
1987	11.68%	16.67%	42.71%	1047	11.02
1988	13.22%	15.62%	18.16%	1095	10.70
1989	4.32%	10.81%	150.19%	1245	10.64
1990	1.15%	13.60%	1082.97%	1260	10.78
1991	2.97%	12.20%	311.26%	1138	10.01
1992	10.98%	16.72%	52.24%	1192	9.60
1993	11.66%	17.49%	50.09%	1314	9.55
1994	12.42%	15.31%	23.34%	1475	9.71
1995	12.05%	15.97%	32.51%	1557	9.11
1996	12.88%	15.15%	17.63%	1652	8.74
1997	12.50%	14.26%	14.11%	1489	8.33
1998	7.52%	15.38%	104.62%	1375	7.75
1999	10.76%	14.46%	34.32%	1258	8.54
2000	11.20%	14.51%	29.55%	1176	8.26
2001	0.77%	14.08%	1730.98%	1469	7.68
2002	12.64%	13.27%	5.04%	1367	7.13
2003	10.16%	12.23%	20.37%	1464	7.78
2004	16.46%	13.40%	-18.62%	1565	8.60
2005	14.25%	13.79%	-3.20%	1620	8.73
2006	13.10%	12.17%	-7.09%	2502	6.92
Mean	9.77%	13.80%	165.94%	1383	9.08
Median	11.20%	14.08%	32.51%	1314	8.74

The one-year analysts' forecasts and actual EPS growth rates are presented in Figure 5. The persistent upward bias is evident from the graph. As with long-term analyst forecasts, the only negative forecast errors follow a period of lower actual EPS growth. Higher growth is most likely to be attained after such a period.

Figure 5
One-Year Forecasted versus Actual EPS Growth Rates



Negative Earnings Growth Rate Forecasts

One explanation of the persistent bias of analysts' projections is a resistance to report negative earnings growth rates. A resistance to report negative earnings growth could be linked to the investment banking influences addressed by the Global Analyst Research Settlements. It could also be caused by a cognitive bias often called familiarity. Familiarity is a behavioral flaw common to investors. Investors have a tendency to favor investments they know, such as the common stock of their employer. Similarly, analysts

may become attached to companies they follow and lose objectivity.

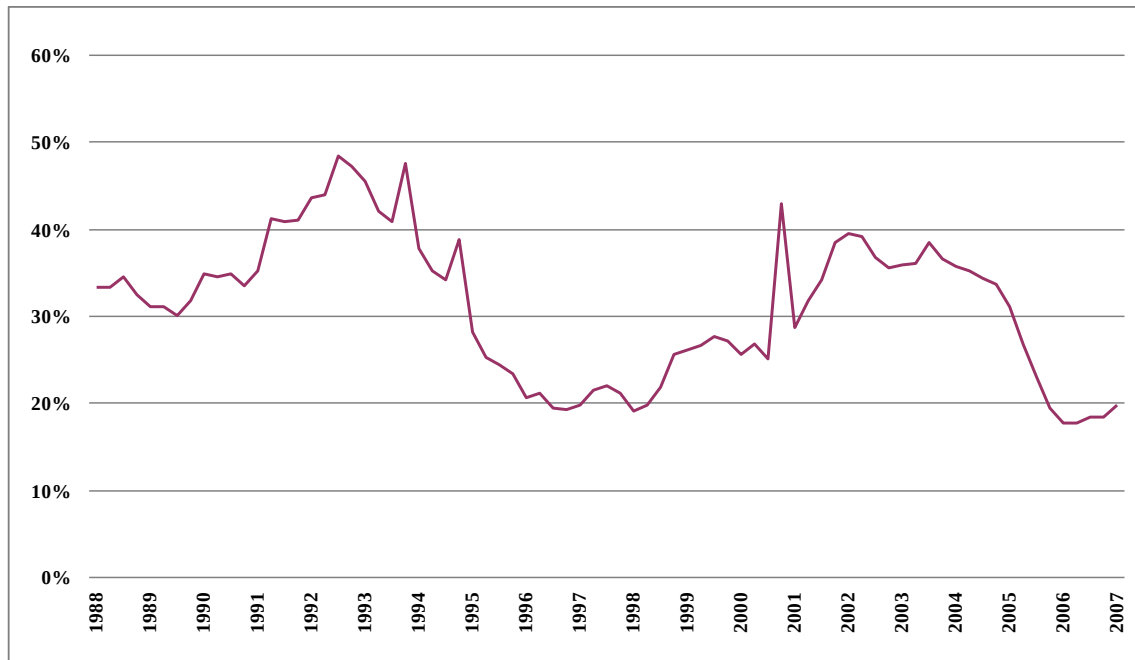
Using long-term growth projections, we begin by comparing the number of companies with projected negative EPS growth rates to those with actual negative EPS growth rates in each time period. The differences are striking. The results are summarized in Panel A and Panel B of Figure 6.

Panel A shows the percent of companies with actual negative EPS growth. The average number of companies with actual negative EPS growth is 391 with a minimum of 227 and a maximum of 644. An average of 31.12% of all companies had negative earnings growth in each quarter.

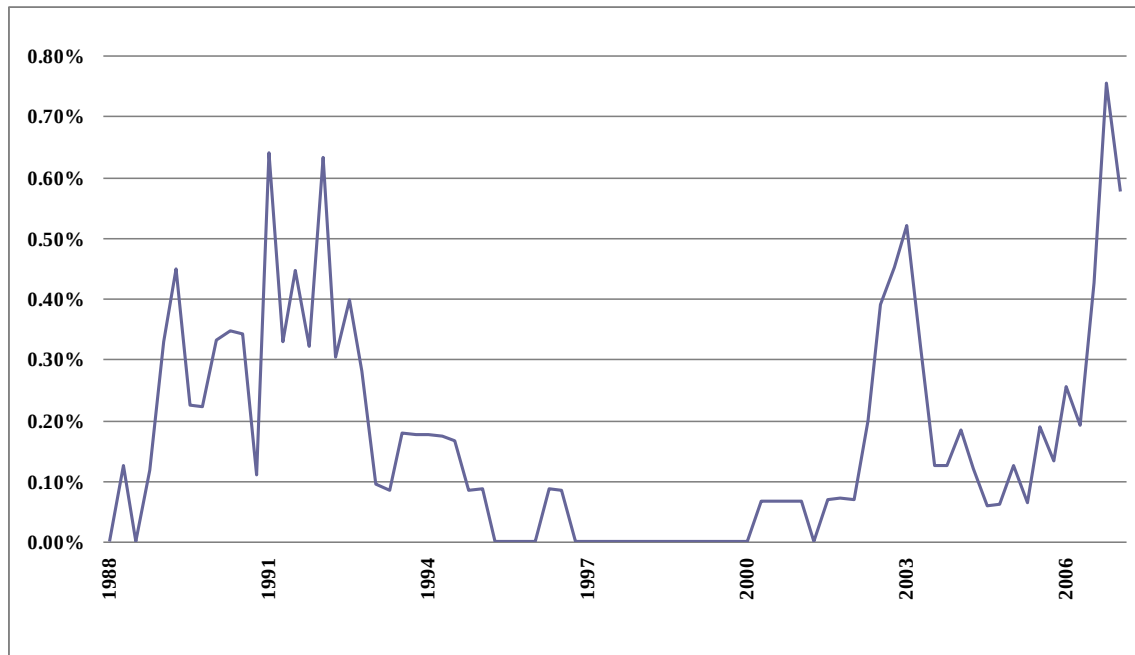
Shown in Panel B is the percent of companies with forecasted negative EPS growth. The average number of companies with forecasted negative EPS growth by quarter is only 2.10 with a minimum of 0 and a maximum of 13. Only 0.17% of all companies were projected to have negative earnings growth.²

² We also examine the percentage of negative earnings growth that is captured by analysts' projections. We begin by collecting all companies that experienced negative long-term growth in each time period. Then we calculate the percentage of those companies that were project to have long-term negative EPS growth. An average of 0.55% of companies that reported negative EPS growth was captured by analysts' estimates. The average number of companies with negative earnings growth that were missed by analysts was 389 out of an average 391 companies that reported an actual decline in earnings. There is clear resistance by analysts to project negative growth.

Figure 6
Comparison of Companies with
Actual and Forecasted Negative EPS Growth
Panel A: Percent of Companies with Actual Negative EPS Growth



Panel B: Percent of Companies with Forecasted Negative EPS Growth



Results after the Global Analyst Research Settlements

The Global Analysts Research Settlements (GARS) is a set of agreements reached on April 23, 2003 between the SEC, NASD, NYSE and ten of the largest U.S. investment firms. GARS, as outlined by the Securities and Exchange Commission (2003), addresses conflicts of interest within firms that have investment banking and analysts operations. A conflict of interest can exist between the investment banking and analysis departments of the large investment firms. The investment firms involved in the settlement had engaged in practices involving the influence by investment bankers seeking favorable analysts' projections within their firm.

As part of the settlement decision several regulations were introduced to prevent investment bankers from pressuring analysts to provide favorable projections. These regulations include (1) firms must separate their investment banking and analysis departments with firewalls; (2) budget allocation to management in research departments must be independent of investment departments; (3) research analysts are prohibited from attending pitches with investment bankers during advertising and promotion of IPOs; and (4) historical analysts' ratings must be made available to investors.

One possible explanation for the upward bias in analysts' forecasts is the conflict of interest that exists between analysts and investment bankers. This presumably would have been removed by the GARS. For this reason, we compare long-term actual and forecasted growth rates for the periods prior to and following the GARS. The persistence of a bias following the GARS would indicate another explanation for the bias.

Table 8 shows descriptive statistics for long-term analysts' earnings growth rates

estimates before and after the GARS. Actual and forecasted growth rate estimates are higher since the GARS and forecast errors have decreased. While forecast errors have decreased, they are still significantly positive.

It is evident that analysts' growth rate forecasts have remained around their historic levels of about 15%. Growth rates remain at levels that are unattainable given historic and expected GDP growth. Hence, there is no evidence that analyst behavior has changed since the GARS.

Table 8
Comparison of Long-Term Analysts' EPS
Growth Rate Forecasts Before and After GARS

1988 – 2002(1)			
	Actual	Forecasted	FE
Mean	8.25%	14.40%	141.65%
Median	8.20%	13.88%	65.29%
SD	4.06%	1.36%	197.57%
n	61	61	61
2003 – 2007(2)			
Mean	12.33%	16.77%	66.94%
Median	11.28%	16.94%	51.60%
SD	5.49%	0.92%	61.70%
n	16	16	16

(1) Based on data beginning in 1984. (2) From April 2003 to and including the first quarter of 2007.

Possible Explanations for the Upward Bias

There are three suggested explanations for the upward bias. The first, as suggested by previous research, is based on career concerns or conflicts of interest. Analysts are rewarded for biased forecasts by their employers who want them to hype stocks so that the brokerage house can garner trading commissions and win underwriting deals. However, the scrutiny of the GARS should have removed this influence. We find little evidence of a change in forecast bias following the GARS. Therefore another

explanation is likely.

A second explanation is based on selection bias. Analysts only follow stocks that they recommend and do not issue forecasts on those that they do not like. A third explanation is a cognitive or behavioral bias commonly called familiarity. Analysts become attached to the companies that they follow and lose objectivity.

The second and third explanations imply that analysts are systematically biased. If analysts systematically believe that they follow companies that are superior to others, they will be reluctant to issue negative earnings forecasts. Since they are only projecting the companies they follow, and not the market, the end result is a strong upward bias on earnings projections.

Summary

In this study we examine the accuracy of analysts' long-term and one-year ahead EPS growth rate forecasts over the last 20 years. Unlike previous studies, we examine long-term and one-year analysts' earnings growth rate forecasts and not quarterly EPS forecasts. Long-term EPS growth rate projections are consistently overly-optimistic. Analysts' growth rate forecasts of earnings are better for one-year than for three- to five-years, but are still over-optimistic. We discover that analysts only underestimate EPS growth rates for periods of earnings recoveries after economic recession. We find that analyst coverage does not have an impact on the overly-optimistic bias in projected EPS growth rates. We do discover that a contributing factor in the bias in analysts' long-term and one-year EPS growth rate estimates is the resistance of analysts to project negative earnings growth rates. We show that analysts' projections fail to capture the majority of negative earnings growth realized by corporations they follow. Finally, we examine the

level of long-term analysts' EPS growth rate forecasts following the GARS. We find that analysts' forecasts have not significantly changed and continue to be overly-optimistic. Analysts' long-term EPS growth rate forecasts before and after the GARS, are about two times the level of historic GDP growth.

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EXHIBIT 4

**Association for Financial Professionals,
Estimating and Applying Cost of Capital (2013)**



2013AFP Estimating and Applying Cost of Capital

Report of Survey Results

2013 AFP
Estimating and Applying
Cost of Capital
Report of Survey Results

October 2013



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Introduction

In 2010, the Association for Financial Professionals® (AFP) issued its *Estimating and Applying Cost of Capital Survey Report*. In the three years since, there have been significant changes suggesting that another look at the cost of capital is worthwhile for financial professionals. Among those changes is the fact that financial planning and analysis (FP&A) has become a more visible strategic function over the past several years.

Finance departments regularly need to analyze how the present value of an organization's cash flow generated from any investment opportunities—projects, investment in personnel, etc.—is likely to exceed the costs of those projects. Effective project selection can set the stage for long-term advantages including revenue growth, cost savings, productivity enhancements and product innovations. Conversely, investing in projects that do not generate economic value can quickly and materially erode the competitiveness and profitability of a company.

Because new capital projects often help define organizational future performance, they are crucial to the implementation of strategy. However, the gap between planning and execution remains a significant problem at many companies as they struggle to achieve their strategic goals. That helps explain why FP&A professionals' involvement in capital budgeting and planning is even more critical today in analyzing a company's cost of capital. When effective, their input can help narrow any gap between strategic planning and execution.

Fortunately, organizations and their FP&A professionals now have access to modern planning systems that allow for advanced analytics and the implementation of flexible and dynamic planning processes. Traditional capital project appraisal techniques are based on discounted cash flow (DCF) analysis in which weighted average cost of capital (WACC) is a key factor. Small fluctuations in cost of capital can create huge swings in discounted cash flow figures strongly affecting strategic decisions about future capital investments and acquisitions.

The 2010 AFP *Estimating and Applying Cost of Capital Survey* report revealed that the methods used to estimate the viability of projects and strategic investments are complex and involve many factors that can dramatically affect the outcome of analysis. Even seemingly small variations in such inputs can lead to pronounced differences in DCF results and, therefore, can influence a company's strategic decision making. Among the key variables companies must estimate are forecasted cash flows and the weights of debt and equity used to fund any project. Each of those variables is derived from yet other estimates, adding layers of complexity to the analysis.

Determining the “right” method of estimating each of these variables remains a difficult task. However, many finance departments want to ensure that their processes are at least in line with commonly accepted practices. Given the strategic nature of this data and their application, companies are often hesitant to share their approaches openly with others. Indeed, more than four in five restrict this information even within their own organizations.

To provide FP&A and other financial professionals with information about current trends in project and investment valuation and estimating the cost of capital, in July 2013 the Research Department of AFP conducted a survey to update findings of its 2010 industry-leading report on the topic of estimating and applying the cost of capital. More than 400 financial professionals representing a wide profile of organizations responded to the survey. Their responses are the basis of this report. We hope this analysis provides insight into practices currently being used in the profession to deploy corporate capital.



Survey Findings

Project and Investment Valuation Techniques

The overwhelming majority of project and investment valuation is done using discounted cash flow (DCF). Eighty-five percent of organizations use DCF techniques to evaluate projects and investments, a figure up slightly from the 79 percent reported in the *2010 AFP Estimating and Applying the Cost of Capital Survey*. Large organizations—those with annual revenues of at least \$1 billion (USD)—and publicly traded ones continue to show an even stronger preference for DCF techniques (93 percent and 90 percent, respectively). Survey respondents from organizations that do not use DCF techniques typically cite a more generic cost-benefit analysis or expected return on investment (ROI) as the techniques most commonly used.

Technique Used for Project and Investment Valuation

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Use DCF techniques	85%	71%	93%	90%	79%	79%
Do not use DCF techniques	15	29	7	10	21	21

Cash Flow Estimation

Slightly more than half of organizations that use DCF techniques to evaluate projects and investment opportunities (51 percent) are most likely to discount explicit forecasted cash flows over the first five years of a project, after which they discount a calculated terminal or continuing value of the project. Another quarter of organizations use a ten-year explicit cash flow forecast instead, while a minority of respondents look at a shorter three-year forecast (11 percent), and just three percent use a 15-year explicit forecast. Typically, the length of the evaluation period depends on the nature of the project and the market. The fact that more than 80 percent of organizations generate cash flow forecasts over at least five years is consistent with the long-term nature of project finance.

Typical Length of Explicit Cash Flow Forecast Used for Valuations

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
3 years	12%	14%	11%	12%	12%	*
5 years	51	51	49	48	51	46
10 years	26	27	24	28	25	34
15 years	3	2	6	4	4	6
Other	8	6	10	8	8	14

*This response was not an option in 2010 survey

There are several methods organizations commonly use when estimating the terminal or continuing value of a project or investment opportunity for the years following the explicit forecasted cash flows. A perpetuity growth model is used by 42 percent of all organizations with large companies more likely to use this method than smaller ones (53 percent versus 32 percent). Just over one-third of organizations uses a long explicit cash flow forecast (37 percent), an increase from the 27 percent of respondents reporting use of this method in 2010. An explicit cash flow forecast is most popular among smaller and privately held companies. Fifteen percent of financial professionals report their organizations use the value driver model to estimate the terminal or continuing value of a project or investment opportunity.

Method Most Commonly Used to Estimate Terminal/Continuing Value of a Project/Investment Opportunity
(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Perpetuity growth model	42%	32%	53%	55%	38%	46%
Long explicit cash flow forecast	37	48	26	29	41	27
Value driver model	15	15	13	13	13	12
Other	6	5	8	3	8	15

Similar to results found in the *2010 AFP Estimating and Applying Cost of Capital Survey*, most organizations (72 percent) continue to consider a number of scenarios—such as “best case,” “expected case” and “worst case”—when modeling cash flow for a project or investment opportunity. This is consistent with the current trend in FP&A of using multiple scenarios in planning and forecasting and is considered good practice in the current unstable and risky business environment. Only 28 percent rely on single cash-flow scenarios when modeling cash flows for a project and/or investment opportunity.

Number of Scenarios Organizations Use When Modeling Cash Flows for a Project/Investment Opportunity
(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Use single cash flow scenario	28%	31%	26%	24%	32%	28%
Use multiple cash flow scenarios	72	69	74	76	68	72

Estimating the Cost of Equity

The cost of equity can be calculated using several approaches including the Arbitrage Pricing Model (APM) and Dividend Discount Model (DDM). However, a large majority of organizations (85 percent) continue to use the Capital Asset Pricing Model (CAPM) for estimating their cost of equity.

According to the CAPM model, the cost of equity is a function of the following three parameters:

1. Risk-free rate
2. Volatility or beta factor
3. Market risk premium

The survey results show a significant preference for applying CAPM to estimate the cost of equity. This result is not surprising considering the long-running debate within the financial community about the best method of estimation for all three parameters of CAPM.

In theory, each of these three parameters should be forward-looking. But the reality is different: estimation involves a blend of judgment and extrapolations from historical experience.

Models/Techniques Used to Estimate Cost of Equity

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Capital Asset Pricing Model (CAPM)	85%	83%	84%	87%	82%	87%
Dividend Discount Model (DDM)	4	3	6	4	5	3
Arbitrage Pricing Model (APM)	2	3	2	2	3	1
Other	9	11	8	7	10	9

1. Determining the Risk-Free Rate

The selection of a financial instrument for estimating risk-free rates is critical in calculating the cost of equity using CAPM. The 10-year Treasury note (or other sovereign instrument) is the most commonly used instrument across organizations (cited by 39 percent of respondents). Nearly half—47 percent—of large companies with over \$1 billion in annual revenue use 10-year Treasuries, as do a majority (54 percent) of publicly traded companies. Eleven percent of all organizations use a financial instrument with a longer maturity (i.e., a 20-year or 30-year Treasury bond). Another quarter of organizations opt for either a one-year or five-year Treasury security. A surprising 17 percent continue to use the far-shorter 90-day Treasury bill—a result consistent with the 16 percent that did so in 2010. Large organizations are more likely than smaller ones to use such shorter-term Treasuries or sovereigns when estimating the risk-free rate.

The broad variation in the choice of instruments used to estimate the risk-free rate is not surprising. The concept of a risk-free rate is not a defined measure. And there is currently no one reliable and recommended method in the capital markets. That is why judgment plays such a critical role in the selection of a financial instrument to use when estimating the risk-free rate.

Finance theory recommends matching the life span of a project with the duration of the financial instrument used for risk-free rate estimation. A majority of the survey participants (71 percent) follows this recommendation and has adopted a long-term view, using instruments with maturities of five years or longer.

But short-term maturity instruments are also being used more commonly. One underlying factor for this development could be the increased perceived risk of long-term U.S. financial instruments after the S&P downgrade of U.S. sovereign debt from an AAA rating to an AA+ rating in August 2011. This change in “risk perspective” may explain the eight-percentage point increase in “short-term” instrument usage—from 21 percent to 29 percent—since 2010.

The interest rate spread between 90-day and 10-year U.S. Treasuries has averaged 150-basis points over the long run, and the anticipated value differential could be 200 basis points and higher. Therefore, the choice of instruments can have a material effect on cost of capital.

Financial Instrument Most Commonly Used to Estimate Risk-Free Rates

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
90-day Treasury/other sovereign	17%	21%	11%	15%	17%	16%
52-week Treasury/other sovereign	12	14	7	9	11	5
5-year Treasury/other sovereign	14	16	12	4	21	12
10-year Treasury/other sovereign	39	34	47	54	32	46
20-year Treasury/other sovereign	4	4	5	7	2	4
30-year Treasury/other sovereign	7	6	9	7	7	11
Other	7	5	9	4	10	6

Finance theory advocates the use of current and/or forward-looking rates when estimating a risk-free interest rate. Two-thirds of survey respondents indicate their organizations follow this advice. Nearly half of the organizations (47 percent) use the current interest rate on their preferred benchmark financial instrument to determine the risk-free rate, a figure unchanged from that reported in 2010. Just under a third of organizations remove some of the volatility from the interest rate by using the average rate of the selected instrument over some period of time instead of the current rate. Eighteen percent of organizations, however, use forward curves to forecast the rate on their preferred financial instrument.

Interest Rate Used to Estimate the Risk-Free Rate

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
The current rate on the selected instrument	47%	50%	50%	50%	50%	47%
The average rate on the selected instrument over some period of time	31	31	27	29	29	35
The forecasted rate on the selected instrument based on forward curves	18	18	16	16	17	14
Other	4	1	7	5	4	4

Although still a minority, more organizations than in the recent past are imposing a cap (i.e., maximum rate) or floor (i.e., minimum rate) on the risk-free rate used to evaluate projects and investments. This shift to utilizing floors and caps on the risk-free rate is a reflection of a perceived riskier environment as organizations try to lower the risk of financial instruments' fluctuations.

Two-thirds of organizations do not impose either a cap or floor on the risk-free rate used to evaluate projects and investments, a decrease from the 77 percent in 2010. Thirty-one percent of organizations impose a floor while 17 percent impose a cap. In addition, smaller organizations are more likely than large ones to impose caps/floors on the risk-free rate they use to evaluate projects and investments.

Interest Rate Used to Estimate the Risk-Free Rate

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
No floor or cap	66%	55%	80%	74%	65%	77%
Floor, but no cap	17	23	11	12	20	10
Both a floor and a cap	14	16	8	13	10	11
Cap, but no floor	3	6	1	1	5	2

Among organizations that do impose a floor and/or cap on the risk-free rate, the typical cap is set at eight percent and the typical floor at four percent. The difference between the cap and floor value typically narrows at large organizations and those that are publicly traded.

Organizations' Average Risk-Free Rate Floor and Caps (Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held
Cap	8%	10%	7%	8%	8%
Floor	4	4	4	4	4

2. Determining the Beta Factor

Determining a “beta factor” is an important step in estimating cost of equity. Beta is derived from historical data and different providers of such information use their own unique analytical extrapolation techniques in order to calculate this factor. Variations in company-specific beta estimates from different published sources can result in large differences in estimated cost of capital.

Nearly two-thirds of organizations use Bloomberg as their source for determining their beta factor. Estimation of beta from Bloomberg is popular because of the flexibility that the Bloomberg offers. For instance, by using Bloomberg one can estimate beta over many different time periods and market indices and observe both adjusted and raw betas.

Alternative sources for beta include:

- Ibbotson (cited by nine percent of respondents)
- Barra (two percent)
- Value Line (four percent)
- Thompson ONE (four percent)
- Capital IQ (three percent)

Source for Organizations' Beta Factor (Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Bloomberg	65%	67%	62%	69%	61%	59%
Ibbotson	9	11	9	4	14	10
Value Line	4	5	4	5	3	5
Thomson ONE	4	5	3	5	3	2
Capital IQ	3	5	3	3	5	3

Those organizations using Bloomberg consider different tenures for their estimations of the beta factor. That is because beta changes over time and may be different depending on the direction of the market and, therefore, is not a complete and absolute measure of risk. The tradeoff between the tenure used to estimate beta may include the following considerations:

- Increasing the tenure can improve statistical reliability of data but may also include some irrelevant data.
- Conversely, shortening the tenure increases size of the sample, but may introduce unwanted random noise.

Thirty-five percent of organizations use a five-year tenure for their beta factor estimations, down from the 41 percent in 2010. Twenty-eight percent use a one-year estimation period, while 36 percent use either a two- or three-year estimation period.

Source for Organizations' Beta Factor

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
One-year estimation period	28%	27%	28%	23%	30%	29%
Two-year estimation period	10	12	11	16	7	13
Three-year estimation period	26	28	23	26	26	15
Five-year estimation period	35	33	35	34	36	41
Other	1	*	3	1	1	2

**less than one percent*

In most cases, monthly returns are used in estimating the beta factor. For three- and five-year estimation periods, nearly four in five organizations use monthly returns to determine the beta. Weekly returns are relatively more common for one- and two-year beta estimation periods while use of bi-weekly returns is rare.

Tenure and Periodic Returns Used in Estimating the Beta Factor

(Percentage Distribution)

	One-year estimation period	Two-year estimation period	Three-year estimation period	Five-year estimation period
Monthly returns	65%	40%	79%	79%
Weekly returns	33	53	14	21
Bi-weekly returns	2	7	7	*

**less than one percent*

Differences between raw and adjusted beta can be significant and thus could have a major impact on WACC (weighted average cost of capital) calculations. Raw beta is historical. Adjusted beta or future beta is derived from historical beta but modified with the assumption that securities' true beta will move towards the market average of one over time. Using an adjusted beta is considered good practice as it introduces a desirable forward-looking approach to the estimation.

The use of adjusted or raw beta factors is evenly divided among all organizations, although the share of companies using raw beta has increased since 2010. There are only minor differences in the use of raw or adjusted beta across organizational demographics.

Use of Raw Versus Adjusted Beta

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Raw	50%	51%	48%	43%	54%	43%
Adjusted	50	49	52	57	46	57

Beta is typically calculated through a peer group or “bottoms up” approach, or through a direct comparison. Private companies tend to favor a peer group while publicly traded companies are more likely to rely on direct comparison.

Method of Calculating Beta

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held
Peer group or “bottoms up”	47%	55%	41%	32%	59%
Direct comparison	50	44	54	63	40
Other	3	1	5	5	1

An organization's beta is affected by debt in its capital structure. Since betas are derived from a group of comparable companies, they do not reflect a specific capital structure of a company or project. Therefore they need to be adjusted appropriately—either unlevered or relevered. Unlevered beta reflects how much risk the organization's equity alone is exposed to compared to the market overall. Unlevering beta from the source and then relevering it with the organization's own capital structure can improve the quality of the results.

Just under four in ten companies uses a method of unlevering or relevering betas, and doing so is more common at large organizations and publicly traded ones. Interestingly, almost a fifth of survey respondents—18 percent—is not sure if their organizations use a method of unlevering or relevering betas.

Use of Method of Unlevering or Relevering Betas

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held
Uses	37%	27%	44%	46%	30%
Do not use	45	55	39	36	52
Does not know	18	18	17	18	18

3. Determining the Market Risk Premium

Market risk premium is the difference between the expected future return on a market portfolio and the risk-free rate. The choice of the appropriate level of market risk premium to use is, at present, the subject of considerable discussion and controversy. There is significant variation in the premium ranges used by organizations, and that variation is not surprising considering the lack of agreement on how market risk is calculated. Due to the lack of information on expected future returns, practitioners often use their own judgments when extrapolating historical trends into the future.

As a result, organizations' use of market risk premium ranges varies considerably. Forty-one percent of companies use a market risk premium of five percent or more while 38 percent use a risk premium of below four percent. Smaller companies and those that are privately held are least likely to use a risk premium of six percent or greater.

Market Risk Premium Range Used by Organizations

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held
Less than 3% market risk premium	17%	18%	13%	13%	17%
3 - 3.9% market risk premium	21	24	19	17	24
4 - 4.9% market risk premium	21	22	2	20	22
5 - 5.9% market risk premium	22	22	23	23	23
6% or greater market risk premium	19	14	24	27	14

Most organizations review their market risk premium estimates on a regular basis to evaluate the impact of significant changes in business and market conditions. The decision whether and how often to review the premiums is based on a number of practical tradeoffs (cost-benefit analysis): size of the project, size of risk differences, administration cost, etc.

Thirty-six percent of organizations re-evaluate their market risk premium on an annual basis while 19 percent do so quarterly. Twenty-three percent review their market risk premium estimate each time that they estimate their cost of equity; more than one in five companies rarely review their estimation of the market risk premium.

Frequency of Organizations' Re-evaluation of Market Risk Premium

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Once a year	36%	36%	36%	37%	35%	40%
Every time we estimate our cost of equity	23	21	24	21	24	20
Rarely	21	22	20	21	22	22
Once a quarter	19	21	19	20	19	16
Other	1	0	1	1	0	2

Estimating the Cost of Debt

Organizations can choose from among a number of methods to determine the cost-of-debt component of their weighted average cost of capital (WACC). Nearly two-thirds of companies (64 percent) use current and forward-looking approaches when determining the cost of debt (an approach consistent with finance theory). Specifically, 43 percent of organizations simply use the current rate on their outstanding debt, while about one in five forecast the rate for new debt issuance.

Other approaches include using historical and average rates on outstanding debt. Such methods can be justified in a stable environment and are used by a third of organizations. Twenty-one percent of companies use the average rate on outstanding debt over a defined period of time while 12 percent consider the historical rate on outstanding debt.

Rate Used to Determine Cost of Debt (Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Current rate on outstanding debt	43%	45%	42%	39%	46%	37%
Forecasted rate for new debt issuance	21	16	25	28	16	34
Average rate on outstanding debt over a defined period of time	21	26	17	17	24	22
Historical rate on outstanding debt	12	11	12	14	10	7
Other	3	2	4	2	4	*

**less than one percent*

In order to capture tax benefits of debt financing, finance theory advocates using forward-looking marginal tax rates to calculate the cost of debt. When determining their after-tax cost of debt, three in five organizations use the effective tax rate for such calculations. Twenty-seven percent of organizations use the marginal tax rate.

Tax Rate Applied in Calculating After-Tax Cost of Debt (Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Effective tax rate	60%	64%	55%	59%	60%	64%
Marginal tax rate	27	23	31	30	25	29
Target tax rate	7	4	9	8	6	7
Average tax rate	4	7	2	3	5	*
Other	2	2	3	0	4	*

**This response was not an option in 2010 survey*

Weighting Debt and Equity in Calculation of WACC

Finance theory urges against the use of historical weights and book values when calculating weights for WACC analysis. Rather, the weights should be based on market values and be current or forward-looking in nature.

The selection of weighting factors for the debt and equity components of WACC varies widely among organizations. Fifty-three percent of the survey respondents indicate that their organizations continue to use book values or a combination of book/market values. Thirty-six percent of companies use the current book debt-to-equity ratio to determine weighting factors for debt-to-equity in their cost of capital estimations while 17 percent use the ratio of current book debt-to-current-market equity. Forty-two percent use current or target market values for weight calculations—arguably a better approach for weighting factor *application*. Twenty-four percent of organizations use the current market debt-to-equity ratio while 18 percent use the target debt-to-equity ratio.

Weighting Factors Used for Debt and Equity in Calculation of Weighted Average Cost of Capital (WACC)

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Current book debt/equity ratio	36%	42%	30%	26%	44%	30%
Current market debt/equity ratio	24	21	27	31	20	23
Target debt/equity ratio	18	18	19	21	17	28
Current book debt/current market equity ratio	17	16	19	20	14	19
Other	5	3	5	2	5	*

*This response was not an option in 2010 survey

Review of Calculated Cost of Capital

The choice of capital structure will depend on the purpose of valuation. Two-thirds of companies rely on their current capital structure in determining calculations for the cost of capital. The second most widely-used method is the company's target capital structure.

Method for Determining Capital Structure for Purposes of Calculating the Cost of Capital

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held
Company's current capital structure	68%	71%	65%	62%	73%
Company's target capital structure	26	24	29	35	21
Capital structure estimation from a peer group	3	2	3	2	3
Other	3	3	3	1	3

A plurality of organizations (36 percent) review and/or update estimates of WACC on an as-needed basis. One-third of organizations review the WACC on an annual basis and there is little difference across organization demographics. Twenty-one percent do so on a quarterly or semi-annual basis while six percent of organizations conduct their review on a monthly basis. All these figures have changed little from those reported in the 2010 survey. Smaller organizations and those that are privately held are more likely to review estimates on an as-needed basis than are large and publicly traded organizations.

Frequency Organizations Review and/or Update Estimates of Weighted Average Cost of Capital (WACC)

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
As needed	36%	43%	30%	29%	41%	38%
Monthly	6	7	5	8	5	8
Quarterly	16	13	19	19	13	19
Semi-annually	5	3	6	8	3	3
Annually	33	32	35	33	34	31
Other	4	2	5	3	4	1

Variations in Cost of Capital Used

The weighted average cost of capital (WACC) is a historical measure and a suitable benchmark for a firm's average risk investments. WACC should be adjusted to specific risk profiles of different projects. Therefore, using a hurdle rate above the cost of capital is a forward-looking measure and a better practice than using the calculated cost of capital as the standard hurdle rate.

A majority of organizations—58 percent—use their calculated cost of capital as the standard hurdle rate for evaluating a project or investment. This is an increase of five percentage points from that reported in the 2010 survey. However, large organizations are more apt to use a rate above the calculated cost of capital as their standard hurdle rate than are small organizations.

Method for Determining the Hurdle Rate in Evaluating a Project or Investment

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Uses the calculated cost of capital as the standard hurdle rate	58%	68%	52%	50%	64%	53%
Uses a standard hurdle rate above the calculated cost of capital	42	32	48	50	36	47

Organizations may adjust the hurdle rate for project/investment evaluation based on a number of factors. Among the most widely cited factors include:

- Unique project risk (cited by 55 percent of survey respondents)
- New business (47 percent)
- Large investment (38 percent)
- Changes in market conditions (27 percent)
- International investment (25 percent).

None of these possible risk factors is considered to be “average” risks for the company. That is why WACC, which is estimated for average conditions, is often adjusted to more closely reflect real world conditions. It should be noted, however, that adjustments for any of these risks may not be very straightforward as there is lack of good market proxies for different risk profiles. This complexity often leads to significant differences in calculating cost of capital.

Conditions that Result in an Adjustment to the Standard Hurdle Rate Used in Evaluating a Project or Investment

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Unique project risk	55%	49%	61%	63%	51%	68%
New business	47	47	46	44	49	43
Large investment	38	40	35	34	39	35
Planning uncertainty	35	33	35	40	31	*
Changes in market conditions	27	29	26	29	27	27
International investment	25	19	30	31	22	31
Small investment	19	19	19	15	22	18
Insolvency risk	9	12	7	10	9	*
Other	7	6	7	7	7	8

* This response was not an option in 2010 survey

When evaluating an international project or investment, many organizations adjust their cost-of-capital estimates. Over one-third use the country-risk rating model, significantly less than the nearly one-half that reported doing so in the 2010 survey. Twenty-two percent use the sovereign-yield spread model and 20 percent use the country-spread model. More than three out of five smaller organizations use a country-risk rating model to adjust their cost-of-capital estimates for international investments, well above the percentages reported for large and publicly traded organizations (23 percent and 32 percent, respectively). Large and publicly traded organizations continue to be more likely than other organizations to use a sovereign-yield spread.

Method Used to Adjust Cost-of-Capital Estimates for International Investments (Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Country-risk rating model	36%	63%	23%	32%	39%	48%
Sovereign-yield spread	22	8	29	30	14	30
Country-spread model	20	8	27	24	17	12
Ibbotson model	3	4	2	*	5	5
Other	19	17	19	14	25	5

**less than one percent*

Valuing Acquisitions

Nearly half of organizations use a cost of capital derived from their own company's weighted average cost of capital (WACC) when valuing a proposed acquisition target. One quarter uses a group of comparable companies. Sixteen percent use the target company's own cost of capital in their valuation calculations.

Cost of Capital Used When Valuing a Proposed Acquisition Target (Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
Company's weighted average cost of capital (WACC)	49%	44%	53%	57%	43%	*
Group of comparable companies	25	24	26	26	25	51
Target company's own cost of capital	17	24	12	11	21	37
Other	9	8	9	6	11	12

** This response was not an option in 2010 survey*

Accuracy of Cost of Capital Estimate

Accurate estimation of the cost of capital is critical. Over- or underestimating the cost of capital can lead organizations to pursue unprofitable initiatives or fail to pursue projects that could add value to them. Despite the critical role accurate estimates play, few companies believe that their cost-of-capital estimates reflect the actual cost-of-capital. In fact, only 22 percent of survey respondents believe that their companies' cost-of-capital estimates accurately reflect their organizations' true cost of capital within 25-basis points, a percentage that is up slightly from the 17 percent that held this view in 2010.

In addition, one quarter of survey respondents believes their organizations' estimates are only accurate within 100 basis points of the *actual* cost-of-capital, with one in ten indicating their companies' cost-of-capital estimates are off to an even greater degree. Financial professionals from smaller organizations typically have more confidence in their companies' cost-of-capital estimates than do those from large organizations; more than half of small organization respondents indicating that their cost of capital estimates are within 50-basis points of their actual values.

Perceived Accuracy of Cost-of-Capital Estimates

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
0 bps - Estimates accurately reflect actual cost of capital	8%	6%	8%	6%	7%	2%
Within +/- 25 bps	14	19	11	14	14	15
Within +/- 50 bps	34	36	32	31	38	28
Within +/- 75 bps	8	8	9	10	7	7
Within +/- 100 bps	25	26	25	28	23	38
Greater than +/- 100 bps	11	5	15	11	11	10

Visibility of Cost of Capital Estimates

Most organizations continue to keep their cost-of-capital estimates “close to the vest,” communicating on a need-to-know basis only. Only 17 percent of organizations communicate the cost of capital company-wide. These figures are comparable to those reported in the 2010 survey.

Internal Visibility of Organizations’ Cost of Capital

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held	All 2010
The cost of capital is communicated on a need-to-know basis	83%	87%	79%	80%	85%	85%
The cost of capital is communicated company-wide	17	13	21	20	15	15

The FP&A function may be the most regular consumer of the WACC calculation, but it is not the operational area most frequently charged with performing the calculation. For more than three quarters of companies, either their treasury or finance departments are responsible for providing estimates of WACC. At large organizations and those that are publicly traded, treasury is the function most likely responsible for WACC calculations while finance is more commonly responsible for such calculations at smaller organizations and those that are privately held.

Department Responsible for Weighted Average Cost of Capital (WACC) Calculation

(Percentage Distribution)

	All	Under \$1 Billion Revenue	At Least \$1Billion Revenue	Publicly Traded	Privately Held
Treasury	46%	35%	56%	57%	40%
Finance	32	46	20	19	40
FP&A	18	16	19	18	18
Other	4	3	5	6	2



Conclusion

The data presented in this report highlight the contours of typical project evaluation for finance departments. For example, the typical organization uses discounted cash flow (DCF) analysis to evaluate the uses of its capital, develops an explicit cash flow forecast for the first five years of the project or investment, with an estimated terminal value to all cash flows thereafter. The perpetuity growth model is commonly used to estimate terminal value, with multiple cash flow scenarios, including best case, expected case and worst case forecasts.

But the report also shows that the estimation of the cost of capital remains one based partially on human judgment and does not include well-defined methods. The calculations reflect a combination of art and science and, as a result, can lead to outcomes that vary across companies.

Among the key takeaways from this report:

- Small fluctuations in cost of capital can create huge swings in discounted cash flow figures strongly affecting strategic decisions about future capital investments and acquisitions. That is why an understanding of trends and best practices in estimating/applying cost of capital has become more critical to the FP&A function today.
- Most organizations consider a number of scenarios when modeling cash flow for a project or investment opportunity. This is consistent with current trends in FP&A of using multiple scenarios in planning and forecasting and is considered good practice in the current unstable and risky business environment.
- The majority of organizations continue to use the Capital Asset Pricing Model (CAPM) for estimating their cost of equity. But there is significant variability in applying CAPM to estimate the cost of equity. This result is not surprising given the ongoing debate in the market regarding the best method for the estimation of all three parameters of CAPM. In theory, each of these parameters should be forward-looking. However, the reality is different: the estimation involves a lot of judgment and extrapolation from the company's history.
- Finance theory recommends matching the life span of a project with the duration of the financial instrument used for risk-free rate estimation. Most organizations follow this recommendation, adopting a long-term view and using instruments with maturities of five years and longer. Nevertheless, there has been a greater usage of short-term instruments which may be explained by an increase in perceived risk resulting from the S&P downgrade of U.S. sovereign debt during the summer of 2011.
- A number of different sources are used for beta information. Variations in company-specific beta estimates from different published sources can create large differences in the estimates of cost of capital. Bloomberg is the most popular source for determining beta factor.

- More organizations, albeit still a minority, are imposing a cap or floor on the risk-free rate used to evaluate projects and investment than they were in 2010. This is a reflection of the riskier environment under which companies now operate.
- Organizations vary considerably in their use of market risk premium ranges, the result of a lack of agreement on the appropriate method to calculate this parameter. Because information on expected future returns do not exist, practitioners often use their own judgment in extrapolating historical data into the future in order to calculate market risk premiums.
- Finance theory does not recommend using historical weights and book values for calculating weights for WACC analysis. Rather, the weights should be based on market values and should be current or forward-looking. Yet, just two out of five organizations that use current or target market values for calculations of weights follow this recommendation.
- Only 22 percent of FP&A professionals believe that their cost-of-capital estimates accurately reflects the actual cost of capital or that the estimate is within 25 basis points of the actual cost of capital.
- Most organizations continue to keep their cost of capital estimates close to the vest, communicating on a need-to-know basis only. Only 17 percent of organizations communicate the cost-of-capital company-wide.
- While the FP&A function may be the most regular consumer of the WACC calculation, the actual calculation is most likely the responsibility of an organization's treasury or finance department. At large organizations and those that are publicly traded, treasury is the function most likely responsible for WACC calculation while finance is more commonly responsible for the calculation at smaller organizations and those that are privately held.

About the Survey

In July 2013, the Research Department of the Association for Financial Professionals® (AFP) sent a 35-question survey to senior-level corporate practitioner members and prospects with job titles including CFO, Treasurer, and Director of Finance. When the survey closed, AFP had received 424 responses. The modified response rate from AFP corporate practitioner members only (after adjusting for bad e-mail addresses) was approximately six percent. The following tables provide a demographic summary of the survey respondents.

Ownership Type

(Percentage Distribution of Organizations)

Publicly owned	61%
Privately held	39%

Annual Revenues (USD)

(Percentage Distribution of Organizations)

Under \$50 million	12%
\$50-99.9 million	5
\$100-249.9 million	11
\$250-499.9 million	8
\$500-999.9 million	14
\$1-4.9 billion	27
\$5-9.9 billion	9
\$10-20 billion	7
Over \$20 billion	7

Industry

(Percentage Distribution of Organizations)

Banking/Financial Services	10%
Business services/Consulting	7
Construction	3
Energy (including Utilities)	7
Government	5
Health services	4
Hospitality/Travel	1
Insurance	3
Manufacturing	23
Non-profit (including education)	6
Real estate	4
Retail (including wholesale/distribution)	12
Software/Technology	5
Telecommunications/Media	6
Transportation	3

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Headquartered outside Washington, D.C., the Association for Financial Professionals (AFP) is the professional society that represents finance executives globally. AFP established and administers the Certified Treasury Professional and Certified Corporate FP&A Professional credentials, which set standards of excellence in finance. The quarterly AFP Corporate Cash Indicators serve as a bellwether of economic growth. The AFP Annual Conference is the largest networking event for corporate finance professionals in the world.

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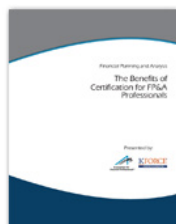
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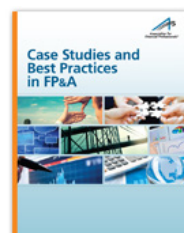
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