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STB Ex Parte No. 664 (Sub No. 2)

*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*

**COMMENTS OF
NORFOLK SOUTHERN RAILWAY COMPANY**

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Dated: September 5, 2014

**BEFORE THE
SURFACE TRANSPORTATION BOARD**

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Norfolk Southern Railway Company (“NS”) joins the comments of the Association of American Railroads in this proceeding and also files these separate comments. NS respectfully submits these limited comments for consideration.

First, the Board has recognized that the cost of equity (“COE”) is elusive.¹ Nothing has changed or will change that fact.

Second, given that there is no way to know the actual cost of equity with mathematical precision, different models approach the same task—estimating the COE—differently. The Board has already found that “Both CAPM and multi-stage DCF models we propose to use have their own strengths and weaknesses, and both take different paths to estimate the same illusory figure.”²

Third, even when one model is used to estimate the cost of equity, that model can produce different results depending on the assumptions it uses. Professor Brad Cornell notes that the two models provide “perspective that neither approach can provide by

¹ Ex Parte 664 (Sub-No. 1), at 15.

² *Id.*

itself.³ The Board knows this as well: “[I]f our exploration of this issue has revealed nothing else, it has shown that there is no single simple or correct way to estimate the cost of equity for the railroad industry, and countless reasonable options are available.”⁴

Given these three indisputable points, what do academics think is the best way to estimate the cost of equity? They think that using multiple models is the right approach.⁵ So did the Federal Reserve Board.⁶ So did this Board.⁷ Why? Because of the risk that a single model will not produce a reasonable estimate and the use of multiple models minimizes the risk of measurement error.⁸ The Board would be wise to continue to heed this advice.

Fourth, regulatory consistency is something to factor into the conversation. As the Board knows, utility regulation and the STB’s regulation are vastly different.⁹ The Board does not use the COE in any way to determine the level of returns that railroads must be guaranteed. Rather, the COE is a component of the Board’s cost of capital calculation, which is used in the annual determination of health of the railroads as mandated by statute. The statutory purpose of the annual determination for railroads is nothing more than to serve as a gauge for the agency to determine whether it is making

³ Statement of Professor Brad Cornell at 29 (attached hereto and made a part hereof as Exhibit A).

⁴ Ex Parte 664 (Sub-No. 1), at 15.

⁵ See Ex Parte 664 (Sub-No. 1), at n.63 (citing extensive academic literature on the merits of using multiple models); see also Statement of Professor Brad Cornell at 24-25.

⁶ *Id.* at 15.

⁷ *Id.*

⁸ Statement of Professor Brad Cornell at 25.

⁹ See *Adequacy of Railroad Revenue (1978 Determination)*, Ex Parte No. 353, 362 I.C.C. 199, 200-01 (1979) (“We seek to establish clearly that we do not expect to rely on the traditional form of earnings regulation employed for public utilities, where the objective is to equate the overall earnings level to a fair rate of return.”); *Western Coal Traffic League – Petition for Declaratory Order*, Docket FD 35506 (July 25, 2013).

progress in achieving its statutory goal of assisting railroads in becoming and remaining revenue adequate. 49 U.S.C. 10704(a)(2) (“The Board shall make an adequate and continuing effort to assist those carriers in attaining revenue levels prescribed under this paragraph.”); 362 I.C.C. 199, 200-01 (1979) (“[W]e regard the objective of the adequate revenue level provision of the 4R Act to be to establish guideposts by which to evaluate progress in implementing the rate and service flexibility provisions of the act. Those provisions appear to us to represent the very means by which the Commission would assist carriers in attaining adequate revenue levels”).

Accordingly, consistency has a role—particularly absent a showing that there has been a change in economic thought, development of a more workable method to implement what is widely recognized as the better replacement cost approach, or a change in investor demands. The Corp of Engineers cannot determine whether it is making progress in easing the flood waters if it is constantly changing what depth constitutes one foot of water. Although WCTL would like to continue to pursue the flavor of the month year-after-year,¹⁰ constantly chasing the lowest cost of equity estimate possible is not in the public interest. Without guiding principles for when and why the cost of equity methodology should be reconsidered (other than a shipper party complaining that its results are generically too high), this process of chasing the cost of equity tail will continue to be a nearly annual occurrence with no regulatory benefits. Indeed, the Board has

¹⁰ Today, WCTL seeks to jettison a discounted cash flow model, which is ironic given that WCTL long supported a discounted cash flow when its results indicated a lower cost of capital and objected to CAPM when it produced higher results. *Railroad Cost of Capital—2005*, Ex Parte No. 558 (Sub-No. 9), slip op. at 7 (STB served Sept. 20, 2006) (WCTL’s endorsement of CAPM “is a reversal of the prior position of the shipper community that the ‘CAPM technique was conceptually and technically flawed’”) (quoting *Railroad Cost of Capital – 1982*, 367 I.C.C. 662, 670 (1983)).

used three different methodologies for calculating the cost of equity in the last seven years.¹¹ How can the Board know whether it is making progress toward its statutory mission when it is constantly changing the measurement?

Given the recent service hearings and the repeated calls at the April hearing from shippers for more rail capacity, the Board should move cautiously before countenancing the most recent of WCTL's attempts to find the lowest possible way of calculating the COE. Attempts to lower the COE and base regulation on a lower COE¹² are inconsistent with calls by shippers at the recent service hearings for railroads to invest in more capacity.¹³ Constantly chasing a lower cost of equity (and cost of capital) can also adversely affect capacity investment given the non-statutory uses of the cost of capital by the Board in abandonment and rate cases.

¹¹ *Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry's Cost of Capital*, STB Docket No. Ex Parte 664 (Sub-No. 1), at 15 (Jan. 23, 2009) (hereinafter "Ex Parte 664 (Sub-No.1)") (changing from multi-stage DCF to CAPM); *Methodology to Be Employed in Determining the Railroad Industry's Cost of Capital*, STB Docket No. Ex Parte 664, at 3 (Aug. 14, 2007) (changing from CAPM to average of CAPM and multi-state DCF).

¹² The lower COE would affect rate cases and could have broader adverse consequences because the Board's inquiry in *Railroad Revenue Adequacy* (Ex Parte 722) might include the potential use of that threshold in some unwise way related to a revenue adequacy constraint. In *Railroad Revenue Adequacy*, NS demonstrates why any revenue adequacy constraint is misguided and should be eliminated. See STB Docket No. Ex Parte 722, *Railroad Revenue Adequacy*, NS Opening Comments (filed September 5, 2014).

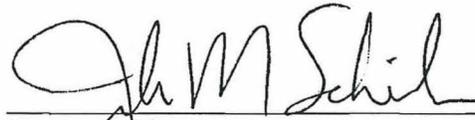
¹³ Testimony of Hal Clemensen, South Dakota Wheat Growers Cooperative, EP 724 United States Rail Service Issues (Apr. 10, 2014) ("We feel that there needs to be a lot more reinvestment in the rail system than what is being planned at this point"); Testimony of Lucas Lentsch, Secretary of Agriculture, State of South Dakota, EP 724 United States Rail Service Issues (Apr. 10, 2014) ("Farmers spent the capital to increase production, grain companies have spent the capital to handle this new production, and now it is up to railroads to spend the capital to get this production to export. . . . *And now is the time to build up the railroad infrastructure to handle this increased production.*") (emphasis added); Comments of Minnesota Grain and Feed Association at 2-3, EP 724 United States Rail Service Issues (Apr. 10, 2014) ("Velocity and Cycle time of cars needs to obviously improve, which means that the railroads will need to put a lot of money into infrastructure improvements over the next few years.").

WCTL is effectively asking the Board to repeat inquiries that it already conducted and revisit decisions it already issued in 2009¹⁴ and in 2008.¹⁵ The Board should decline this invitation. The Board needs to establish its benchmark and start to measure its success at making “an adequate and continuing effort” to ensure that railroads become, are, and remain revenue adequate against that benchmark. Absent some prerequisite showing that investor demands have changed for considering a change to the cost of equity, this cycle of WCTL constantly chasing a lower cost of equity number for railroads will never end. Further, the Board needs to beware not to deter investment in railroad infrastructure because of such calculations or because of using this benchmark for purposes other than its statutory purpose. *See* 49 U.S.C. 10704(a)(2).

¹⁴ *Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry’s Cost of Capital*, STB Docket No. Ex Parte 664 (Sub-No. 1), at 15 (Jan. 23, 2009) (hereinafter “Ex Parte 664 (Sub-No.1)”).

¹⁵ *Methodology to Be Employed in Determining the Railroad Industry’s Cost of Capital*, STB Docket No. Ex Parte 664, at 3 (Aug. 14, 2007).

Respectfully Submitted,

A handwritten signature in black ink, appearing to read "John M. Scheib". The signature is written in a cursive style with a large initial "J" and "S".

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Dated: September 5, 2014

Exhibit A

**BEFORE THE
SURFACE TRANSPORTATION BOARD
Docket No. EP 722**

RAILROAD REVENUE ADEQUACY

&

EP 664 (Sub-No. 2)

**PETITION OF THE WESTERN COAL
TRAFFIC LEAGUE TO INSTITUTE A
RULEMAKING PROCEEDING TO ABOLISH
THE USE OF THE MULTI-STAGE
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INDUSTRY'S COST OF EQUITY CAPITAL**

VERIFIED STATEMENT

OF

BRADFORD CORNELL

September 5, 2014

TABLE OF CONTENTS

	PAGE
I. QUALIFICATIONS	1
II. BACKGROUND.....	2
III. ASSIGNMENT AND SUMMARY OF OPINIONS.....	3
IV. THE STAND-ALONE COST CONSTRAINT IS ECONOMICALLY SOUND AND WELL-SUITED TO MEET THE BOARD'S REGULATORY PURPOSES.....	4
A. Regulation should simulate a competitive result and is only needed in the minority of cases where traffic lacks effective competition.	4
B. The stand-alone cost methodology is economically sound and properly targeted.	5
C. Where the SAC constraint is too complicated and expensive, Simplified-SAC provides an effective tool to protect shippers that may lack effective transportation alternatives.....	8
V. RATE REGULATION BASED ON A RAILROAD'S OVERALL FINANCIAL HEALTH WOULD NOT SERVE THE BOARD'S OBJECTIVES.	10
A. Basing rate regulation on the Board's flawed measurement of revenue adequacy could mistakenly restrain rail rates and, therefore, railroad investment and innovation.....	13
1. By not using economic depreciation and asset replacement values, the Board misstates ROI.....	13
2. The Board is more likely to find revenue adequacy when deferred taxes are deducted from the investment base, potentially restricting railroad investment.....	19
3. Not measuring revenue adequacy over the life of the investment may misguide rate regulation.	23
4. Relying on CAPM alone, rather than averaging the CAPM and MSDCF approaches, would introduce unnecessary measurement error.....	28
B. Even if the Board corrected its method for measuring revenue adequacy, a rate constraint based on system-wide financial returns	

suffers numerous fundamental problems that render it either un-
useful or detrimental to the Board's objectives.29

1. A system-wide measure of a railroad's financial health fails
to inform whether any particular rate is reasonable..... 30
2. Return on investment, a central component of the revenue
adequacy measure, is short term and backward looking. 31
3. Capping returns at the cost of capital would prevent
railroads from earning the cost of capital in the long run,
discouraging investment..... 32
4. Capping returns at the cost of capital would suppress
important market signals and discourage innovation..... 34
5. As only a minority of shippers lack effective transportation
alternatives, improvements in system-wide financial health
are driven largely by greater efficiency and productivity in a
railroad's competitive traffic..... 36

VI. CONCLUSION 37

**BEFORE THE
SURFACE TRANSPORTATION BOARD
Docket No. EP 722 & EP 664 (Sub-No. 2)**

VERIFIED STATEMENT

OF

BRADFORD CORNELL

I. QUALIFICATIONS

My name is Bradford Cornell. I am a Visiting Professor of Financial Economics at the California Institute of Technology and a Professor Emeritus at the Anderson Graduate School of Management at the University of California, Los Angeles.

I earned a master's degree in Statistics from Stanford University in 1974 and a doctorate in Financial Economics from Stanford University in 1975. I have served as an editor of numerous journals relating to business and finance and have authored more than 100 published articles and two books on finance and securities, including *Corporate Valuation: Tools for Effective Appraisal and Decision-Making*, published by McGraw-Hill. I have served as an associate editor of numerous academic journals including the Journal of Finance, the Journal of Financial Economics, the Financial Analysts Journal, and the Journal of Portfolio Management. I am also a Senior Consultant and Advisory Committee member at Compass Lexecon. My background is described more fully in my attached *curriculum vitae*.

II. BACKGROUND

In regulating the railroad industry, Congress charged the Surface Transportation Board (the “Board”) with multifaceted objectives. See 49 U.S.C. § 10101. In general, the Board must allow competition and the demand for services to establish reasonable rates for transportation by rail. It must also minimize the need for federal regulatory control. Where there is an absence of effective competition, the Board must then balance two potentially competing objectives. On one hand, it has a duty to maintain reasonable rates. And on the other hand, it is required to assist, or at least allow, rail carriers to “attract and retain capital in amounts adequate to provide a sound transportation system in the United States.”¹

The Western Coal Traffic League (the “WCTL”) recently petitioned the Board “to institute a rulemaking proceeding to abolish the use of its Multi-Stage Discounted Cash Flow...model in its determination of the railroad cost of equity...and cost of capital...and to instead rely exclusively on the Capital Asset Pricing Model.”² The Board indicated it will receive comments on how it calculates the railroad industry’s cost of capital.³ The Board also sought comments “to explore the Board’s methodology for determining railroad revenue adequacy, as well as the revenue adequacy component used in judging the reasonableness of rail freight rates.”⁴

¹ 49 U.S.C. § 10704.

² Western Coal Traffic League, Petition, *Use of a Multi-Stage Discounted Cash Flow Model in Determining the Railroad Industry’s Cost of Capital*, S.T.B. Ex Parte No. 664 (Sub-No. 2) at 1 (Aug. 27, 2013) (“*Cost of Capital Proceeding*”).

³ *Cost of Capital Proceeding* at 4 (served April 2, 2014).

⁴ *Railroad Revenue Adequacy*, S.T.B Ex Parte No. 722, at 1 (served April 2, 2014) (“*Revenue Adequacy*”).

III. ASSIGNMENT AND SUMMARY OF OPINIONS

Norfolk Southern requested that I address issues raised by the Board's notices in EP 664 (Sub-No. 2) and EP 722, including an economic and financial assessment of the effectiveness of certain regulatory tools available to the Board. Specifically, I address (i) whether the stand-alone cost constraint ("SAC" or "the SAC constraint") and the simplified stand-alone cost constraint ("Simplified-SAC" or "the Simplified-SAC constraint") are economically sound and effective methods for meeting the Board's objectives, and (ii) whether a revenue adequacy rate constraint based on the overall financial health of a railroad would also be an economically sound and effective method for meeting the Board's objectives.

As detailed below, it is my opinion that:

- 1) The SAC and Simplified-SAC are economically sound and well suited to meet the Board's regulatory purposes.
- 2) The annual revenue adequacy calculation is useful only as a gauge of a railroad's overall financial health; it informs the agency whether the industry's health is improving or deteriorating.
- 3) Basing rate regulation on the Board's flawed measurement of revenue adequacy could mistakenly restrain railroad investment and innovation.
- 4) Even if errors in measuring revenue adequacy could be corrected, a rate constraint based on system-wide financial health would have fundamental problems, including:
 - i. A system-wide measure of a railroad's financial health would fail to inform whether any *particular* rate is reasonable;
 - ii. A rate constraint based on historical performance would be backward looking and would fail to suggest optimal responses to current and future scenarios; and
 - iii. The cost of capital is the *minimum* return needed to attract capital investment; treating it as a ceiling on

returns would discourage investment, productivity, and innovation.

IV. THE STAND-ALONE COST CONSTRAINT IS ECONOMICALLY SOUND AND WELL-SUITED TO MEET THE BOARD'S REGULATORY PURPOSES.

A. Regulation should simulate a competitive result and is only needed in the minority of cases where traffic lacks effective competition.

The Board has described its jurisdiction concerning freight rail pricing as covering instances “[w]here there is no competitive freight rail transportation market.”⁵ In such instances, Congress has charged the Board with protecting the public from the possibility of unreasonable pricing by freight railroads. The Board has undertaken to meet this charge by simulating what competitive price would prevail if shippers had effective transportation alternatives.⁶ When shippers do have these alternatives, rate regulation is unnecessary because prices are already constrained by natural market forces. Congress has determined that rate regulation is also unnecessary for traffic where a carrier’s revenues are less than 180 percent of its variable costs.⁷

I understand that Michael R. Baranowski is submitting to the Board comments that identify the amount of Norfolk Southern’s traffic that (i) is

⁵ *Rate Regulation Reforms*, S.T.B Ex Parte No. 715, at 1 (served July 18, 2013) (“*Rate Regulation Reforms*”).

⁶ “[R]ailroads functioning in a noncompetitive market will be required to price as if alternatives to their services were available. That is, their rates will be judged against simulated competitive prices. As a result, the efficiencies of a contestable market will serve as the guide for establishing maximum rates on captive coal traffic.” *Coal Rate Guidelines – Nationwide*, 1 I.C.C.2d 520, 542 (1985) (“*Coal Rate Guidelines*”).

⁷ *BNSF Ry. Co. v. Surface Transp. Bd.*, No. 12-1042, at 7 (D.C. Cir. May 23, 2014).

exempt from rate review because the Board determined this traffic had sufficient competitive alternatives to make rate regulation unnecessary or (ii) for which Norfolk Southern's revenues are less than 180% of its variable costs, in which case Congress says that traffic has effective competition.⁸ I understand that Mr. Baranowski determined that 78% of Norfolk Southern's traffic meets these criteria. In other words, the Board's regulation of rates is not necessary for the vast majority of Norfolk Southern's traffic.

B. The stand-alone cost methodology is economically sound and properly targeted.

The SAC constraint is intended to simulate a competitive rate, which the Board specifies as “the rate a hypothetical efficient railroad would need to charge to serve the complaining shipper, while fully covering all of its costs, including a reasonable return on investment.”⁹ This competitive rate is precisely the sort of protection that the Board has been charged with making available to shippers for movements where effective competition is absent. The Coal Rate Guidelines, which set forth guiding principles and concepts that remain relevant to the Board's objectives, explain:

The purpose of a SAC analysis is to determine the least cost at which an efficient competitor could provide the service, because by so doing we are simulating the competitive price for the market.¹⁰

In 2014, the U.S. Court of Appeals for the District of Columbia reaffirmed the intent of the SAC constraint, commenting:

The ultimate aim of the Stand-Alone-Cost test is to require that ‘railroads functioning in a noncompetitive market . . . price as if

⁸ See NS Opening Comments, V.S. of Baranowski.

⁹ *Rate Regulation Reforms*, at 2.

¹⁰ *Coal Rate Guidelines*, 1 I.C.C.2d at 542.

alternatives to their services were available' to the captive shipper.¹¹

The SAC constraint allows a complaining shipper to propose pricing based on a hypothetical, efficient stand-alone competing carrier. The constraint is economically sound because it simulates—not some arbitrarily determined price—but the competitive market price, equal to “the least cost at which an efficient competitor could provide the service.”¹² A firm that faces no competition maximizes profits by setting a price that is above the competitive market price. In contrast, when a firm faces a competitor or multiple competitors that offer substitutable goods, they compete for market share, undercutting each other’s prices so that each firm earns only a reasonable rate of return. The Coal Rate Guidelines state that this constraint allows “a captive shipper [to] have its rates based on the lower costs of an alternate, ‘stand-alone’ system in which the plant size and traffic base are designed to maximize the efficiencies and production economies.”¹³ The Coal Rate Guidelines explain the SAC constraint further:

We recognize that a stand-alone facility would, in reality, seldom, if ever, be constructed. However, by identifying the costs that would be incurred if it were, an appropriate rate cap can be determined. In this way, railroads functioning in a noncompetitive market will be required to price as if alternatives to their services were available. That is, their rates will be judged against simulated competitive prices. As a result, the efficiencies of a contestable market will serve as the guide for establishing maximum rates on captive coal traffic.¹⁴

While the primary objective of the SAC constraint “is to restrain a railroad from exploiting market power over a captive shipper,” the Board

¹¹ *BNSF Ry. Co. v. Surface Transp. Bd.*, No. 12-1042 at 4 (D.C. Cir. May 23, 2014) (citing *Coal Rate Guidelines*).

¹² *Coal Rate Guidelines*, 1 I.C.C.2d at 542.

¹³ *Id.*

¹⁴ *Id.*

explains that a “second objective of the SAC constraint is to detect and eliminate the costs of inefficiencies in a carrier’s investments or operations.”¹⁵ The SAC constraint gives the railroad a powerful incentive to operate efficiently. Since the railroad must essentially compete with a hypothetical and efficient carrier, the railroad seeks to eliminate inefficiencies that reduce its profitability.

Additionally, the SAC constraint is economically sound because it considers the full life of the necessary investments as part of the process used to simulate competitive rates.

In this proceeding, the railroads have proposed (and the shippers agree with) a more sophisticated, multiple-period analysis. Under their approach, one would project the stream of earnings which can be expected (based on the economic life of the assets in the investment base and the demand for service), then discount it at the current cost of capital to derive the present value of the stand-alone system. The SAC for each year would equal the difference between (1) the earnings already collected, together with those expected in future years, and (2) the total earnings stream required to cover the SAC.¹⁶

Finally, the SAC constraint is targeted. The SAC constraint applies to complaints from shippers that lack effective transportation alternatives—a minority of Norfolk Southern’s traffic base—on a case-by-case basis. By addressing such shipper complaints individually, the Board is able to provide those shippers with price protection without discouraging railroads from making further investments. This targeted regulation allows the majority of rail traffic to operate consistent with the competitive market forces it faces, enabling railroads to reap rewards for innovation and efficiency. Such rewards are essential for a railroad to attract investors. The Board has made similar observations regarding the targeted nature of SAC, commenting:

¹⁵ *Rate Regulation Reforms*, at 9.

¹⁶ *Coal Rate Guidelines*, 1 I.C.C.2d. at 545.

As railroads enjoy increasing market power with rising demand for their services, the SAC test (in either its full or simplified form) would provide a critical restraint on their pricing of captive traffic, without deterring railroads from making the investments in their rail networks that are needed to meet rising demand.¹⁷

Based on the foregoing, I conclude that the SAC constraint is an economically sound and effective tool that allows the Board to meet its potentially competing objectives: to maintain reasonable rates where there is an absence of effective competition, and to allow or even assist railroads in “fostering a sound, safe, and efficient rail transportation system.”¹⁸

C. Where the SAC constraint is too complicated and expensive, Simplified-SAC provides an effective tool to protect shippers that may lack effective transportation alternatives.

The Board has declared that “the stand-alone cost (SAC) test is central to our rate regulation rules.”¹⁹ Yet a full SAC presentation can be expensive and infeasible where the amount of money at issue is not large enough to justify the expense. To address this concern, the Board has adopted simplified guidelines for smaller cases.²⁰

The Board created the Simplified-SAC constraint for litigants who cannot justify the expense of the more detailed full SAC analysis. The Board summarized the Simplified-SAC approach as follows:

The Simplified-SAC presentation will differ from a Full-SAC presentation by eliminating or restricting the evidence parties can submit on certain issues. The core analysis in a Simplified-SAC proceeding will address the replacement cost of the existing facilities

¹⁷ *Rate Regulation Reforms*, at 9.

¹⁸ *Id.* at 1.

¹⁹ *Id.* at 2.

²⁰ *Simplified Standards For Rail Rate Cases*, S.T.B. Ex Parte No. 646 (Sub-No. 1) (STB served Sept. 5, 2007) (“*Simplified Standards*”).

used to serve the captive shipper and the return on investment a hypothetical SARR would require to replicate those facilities. We will then seek to determine whether the traffic using those facilities is paying more than needed to cover operating expenses and a reasonable return on the replacement value of those facilities.²¹

The Board remarked that “this simplified approach has numerous positive features,” including:

- Unlike SAC, Simplified-SAC does not require shippers to design hypothetical railroads. Rather, Simplified-SAC focuses on the operations of the defendant railroad to determine if the railroad is exploiting its market power to charge monopoly prices;
- Because Simplified-SAC does not require the complainant to design a hypothetical railroad, the Board expects it to be a far simpler and less costly approach; and
- Simplified-SAC uses replacement cost to determine the maximum lawful rates a carrier may charge.

The Board reasoned that “[t]he Simplified-SAC test can provide a critical restraint on the railroad’s pricing of captive traffic by allowing the Board to determine whether a captive shipper is being forced to cross-subsidize parts of the defendant’s existing rail network the shipper does not use.”²²

Like full SAC, this simplified approach is an attempt to simulate a competitive market rate using a targeted approach that gauges the replacement costs of the facilities used to serve the complaining shipper. Also like full SAC, Simplified-SAC incepts railroads to operate efficiently since they must compete with the rate Simplified-SAC indicates. Importantly, the Simplified-SAC constraint, like the full SAC constraint, is targeted: it addresses *particular* complaints from individual shippers without involving the competitive majority of rail traffic that does not use the lines and facilities needed to serve the complaining shippers. When offered together

²¹ *Id.* at 15.

²² Notice of Proposed Rule Making, *Rate Regulation Reforms*, STB Ex Parte No 715 at 13 (Released July 25, 2012).

with the more robust SAC intended for large disputes, this simplified version allows the agency to meet its dual objectives of protecting shippers that may lack effective transportation alternatives while permitting or even assisting railroads to earn adequate revenues needed to foster a sound, safe, and efficient rail transportation system. Other tools the Board wishes to consider are appropriately measured against the merits of the SAC and Simplified-SAC constraints.²³

V. RATE REGULATION BASED ON A RAILROAD'S OVERALL FINANCIAL HEALTH WOULD NOT SERVE THE BOARD'S OBJECTIVES.

By statute, the Board determines annually whether a railroad is “revenue adequate.”²⁴ The Board judges a railroad to be revenue adequate in a particular year if it has generated a return on the book value of its investment (less deferred taxes) that exceeds the industry average cost of capital. I refer to these calculations as the annual revenue adequacy findings.

Measuring revenue adequacy each year is useful for meeting the Congressional mandate to assist in ensuring the industry’s financial health.²⁵ Nevertheless, the Board's method for measuring revenue adequacy has flaws, discussed below, that make it more likely that the Board will mistakenly

²³ I understand that the STB also has an alternative rate constraint called the Three Benchmark approach. Under this approach, the reasonableness of a particular rate is gauged by comparing the challenged rates to other rates for similarly-situated movements. Apparently this test provides limited relief; the STB concluded that the approach is far cruder than either SAC or Simplified-SAC, acknowledging that the Three Benchmark approach requires “a crude adjustment” and noting that “precision must be sacrificed for simplicity, and any simplified procedures will necessarily be very rough and imprecise.” See *Simplified Standards* at 73.

²⁴ “[T]he Board shall annually determine which rail carriers are earning adequate revenues.” 49 U.S.C. §10704.

²⁵ “...to promote a safe and efficient rail transportation system by allowing rail carriers to earn adequate revenues, as determined by the Board.” 49 U.S.C. §10101.

conclude revenue adequacy. Because of such measurement flaws, the annual revenue adequacy findings are less informative as an absolute measure (*i.e.*, determining whether a particular railroad was revenue adequate in a given year) and more informative in terms of monitoring gains or declines in industry health from one year to the next.

The Constrained Market Pricing guidelines discuss a “revenue adequacy constraint” that appears to be based on, but remains distinct from, the Board's annual measurement of revenue adequacy.²⁶ The scope and boundaries of this constraint are vague because it has never been applied to railroads. And the Board recently indicated only that it seeks comments “to explore...the revenue adequacy component used in judging the reasonableness of rail freight rates” without offering any details to define this component or explain how it would be implemented.²⁷

The Board's predecessor, the ICC, suggested that revenue adequacy might serve as a trigger that signals a need for greater scrutiny of the railroads. For instance, the ICC proposed in 1983 that “where a consistent pattern of returns substantially in excess of carrier’s revenue needs has been established, we would, upon complaint, consider the reasonableness of rates on captive coal traffic and prescribe lower rates in appropriate circumstances.”²⁸ The ICC also appeared to suggest in the Coal Rate Guidelines that revenue adequacy should constrain railroad revenues, stating:

Our “revenue adequacy” standard represents a reasonable level of profitability for a healthy carrier. It fairly rewards the rail company's investors and assures shippers that the carrier will be able to meet

²⁶ The ICC adopted these guidelines and summarized their principles in Coal Rate Guidelines. *Coal Rate Guidelines*, 1 I.C.C.2d at 520.

²⁷ *Revenue Adequacy*, at 1; *Cost of Capital Proceeding*, at 1.

²⁸ Notice of Proposed Rulemaking, *Coal Rate Guidelines – Nationwide*, Ex Parte 347 (Sub-No. 1), at 16 (ICC served Feb. 8, 1983) (“*Coal Rate Guidelines NPRM*”)

their service needs for the long term. Carriers do not need greater revenues than this standard permits, and we believe that, in a regulated setting, they are not entitled to any higher revenues. Therefore, the logical first constraint on a carrier's pricing is that its rates not be designed to earn greater revenues than needed to achieve and maintain this revenue adequacy level.²⁹

Yet in the same paragraph the ICC then goes on to suggest that a revenue adequacy constraint would only be concerned with reducing “differentially higher rates” charged where there is an absence of effective competition and doing so only when railroads are revenue adequate, stating:

In other words, captive shippers should not be required to continue to pay differentially higher rates than other shippers when some or all of that differential is no longer necessary to ensure a financially sound carrier capable of meeting its current and future service needs.³⁰

Other statements complicate the picture of what form a revenue adequacy constraint might take. For instance, the ICC determined in 1981 that the appropriate measure for determining on an annual basis whether a railroad was earning adequate revenues “should be a rate of return equal to the cost of capital.”³¹ In doing so, the ICC acknowledged that “[s]uch a standard is widely agreed to be the minimum necessary to attract and maintain capital in the railroad, or any other, industry.”³²

The “revenue adequacy constraint” is a difficult concept to address given this lack of clarity. For purposes of this statement, I assume that the Board is seeking public input on whether it should use the annual revenue adequacy findings to gauge the reasonableness of a *particular* rate. I also assume that the constraint might be “triggered” if the railroad earns a

²⁹ *Coal Rate Guidelines*, 1 I.C.C.2d. at 535.

³⁰ *Id.* at 535-36.

³¹ *Standards for Railroad Revenue Adequacy*, 364 I.C.C. 803, 809 (1981) (*Standards D*).

³² *Id.*

system-wide return substantially in excess of the industry average cost of capital over some undefined period of time.

As detailed below, any revenue adequacy constraint that relies on annual revenue adequacy findings is not economically sound both because of substantial measurement error in the annual revenue adequacy findings and because, even when measured accurately, revenue adequacy reflects a railroad's *overall* financial health without informing how particular rates for specific traffic should be regulated.

A. Basing rate regulation on the Board's flawed measurement of revenue adequacy could mistakenly restrain rail rates and, therefore, railroad investment and innovation.

In this section, I detail three existing measurement errors in the annual revenue adequacy findings. These errors would affect the reliability of any kind of rate reasonableness standard that is based on measures of revenue adequacy. They include: 1) the failure to measure economic depreciation and replacement cost, 2) the exclusion of deferred taxes from the investment base, and 3) the failure to measure returns over the lifetime of rail assets. In addition to these three existing errors, if the Board changes its current approach to estimating the cost of equity by dropping the multi-stage discounted cash flows model, it would introduce even more measurement error into its annual revenue adequacy findings, rendering any associated rate reasonableness standard even less sound.

1. *By not using economic depreciation and asset replacement values, the Board misstates ROI.*

The annual revenue adequacy findings compare a railroad's ROI against the industry average cost of capital. ROI is calculated as return (*i.e.*, net income) divided by the value of investments in place. The Board's

particular calculation of ROI uses book values to estimate the value of investments in place, and it uses straight line depreciation to calculate those book values.

Using straight line depreciation and asset book values to calculate ROI as a measure to be compared with cost of capital is conceptually wrong: investors are concerned with how economic returns—not accounting returns—compare to the cost of capital when making investment decisions. Regulation based on a comparison that is inconsistent with how investment opportunities are assessed may dissuade railroad investment. Accurate assessments of a railroad’s profitability use economic depreciation.³³

A pair of examples developed in Exhibits 1a and 1b demonstrates that misleading results can ensue when calculating ROI on the basis of book values that are calculated using straight line depreciation. The examples assume that the cost of capital is 10% and that new investments all earn exactly the cost of capital.³⁴ They also assume the investment costs \$1,000,

³³ “If book depreciation and economic depreciation are different (they are rarely the same), then the book profitability measures will be wrong; that is, they will not measure true profitability.” BREALEY, MYERS, ALLEN, PRINCIPLES OF CORPORATE FINANCE, 317 (8th ed. 2005). “Of course, any accounting measure of profitability, such as EVA or the book return on investment (ROI), depends on accurate accounting measures of earnings and capital employed. Unless adjustments are made to accounting data, these measures may underestimate the true profitability of new assets and overestimate that of old assets. In principle the solution is easy. EVA and ROI should be calculated using true or economic income. Economic income is equal to the cash flow less economic depreciation (that is, the decline in the present value of the asset). Unfortunately, we can’t ask accountants to recalculate each asset’s present value each time income is calculated. But it does seem fair to ask why they don’t at least try to match book depreciation schedules to typical patterns of economic depreciation.” *Id.* at 322.

³⁴ I realize that the 10 percent figure that I use in this example is lower than the cost of capital that the ICC and the Board have determined in most prior years, as set forth in Exhibit 4. I am using a 10 percent figure to simplify the example. However, the point that the example illustrates – the bias produced by the Board’s current methodology – would be the same even if I used a higher figure, such as 12 percent or 15 percent.

the purchased asset has a life of 20 years, and the investment produces a constant cash flow stream of \$117.46 annually so that the internal rate of return on the investment over its full life equals the 10% cost of capital.

Exhibit 1a shows that applying straight-line depreciation to this \$1,000 asset over twenty years results in yearly depreciation of \$50 and annual net income of \$67.46 (cash flow of \$117.46 minus \$50 of depreciation). Under this construction, return on investment is not constant and never equal to the overall internal rate of return or the cost of capital of 10%. Instead ROI starts at 6.75% in the first year and increases to over 100% in the investment's final year. In any given year, the Board would conclude that this hypothetical railroad either falls short of revenue adequacy or surpasses revenue adequacy, often by large margins, but would never come to the right conclusion: the railroad is just revenue adequate. Such a mismatched comparison of cost of capital and ROI based on straight line depreciation would have the Board believe that railroads are struggling in some years and in need of greater regulation in other years; yet in the example the railroad's return just meets its cost of capital in all years.

In contrast, calculating ROI using *economic* depreciation yields the right conclusion: the railroad is just revenue adequate over the full life of the asset and during each year of its life. Exhibit 1b demonstrates this. It shows that ROI is always 10%, an expected result because, by construction, the example assumes the asset would just earn its cost of capital. The result is also a sensible comparison of ROI and cost of capital: it conveys correct information to the Board, in contrast to the mismatched comparison of cost of capital and ROI calculated using straight line depreciation.

Economic depreciation is the decline in the market value of an asset attributable to its usage in the current year.³⁵ For a single year, it equals the difference between the discounted cash flows at the beginning of the year and the discounted cash flow value at the end of the year. The value of the asset declines during this period because the future cash flow stream becomes one year shorter. Economic depreciation is not constant but tends to increase as the asset ages, a result of the discounting process. Additionally, asset value calculated using economic depreciation equals replacement (*i.e.*, market) value; if the assets trade in a competitive marketplace where buyers and sellers value assets based on the cash flows they are expected to generate, price will equal the present value of expected cash flows. By contrast, asset values calculated using straight-line depreciation would equal the asset's replacement value only by rare coincidence.

One might contend that the above example is not applicable to an actual railroad because it involves only one asset. In response to this potential criticism, Exhibits 2a and 2b extend the example by assuming that the modeled railroad has many assets, one of each vintage (*i.e.*, one asset is brand new, a second asset is one year old, and so on up to the twentieth asset which is nineteen years old at the beginning of the period). The income and cash flow data are all for a single year. At the end of the year, the oldest asset is scrapped and replaced by a new one, so that at the start of the next year the mix of assets is identical to the mix at the beginning of the year. By this construction, the railroad is in equilibrium and does not change over time, so results from one year would be the same as results from any other year. This extended example still assumes that each investment costs \$1,000 and earns precisely its cost of capital.

³⁵ "Any reduction in present value represents economic depreciation; any increase in present value represents negative economic depreciation. Therefore economic depreciation = reduction in present value." BREALEY at 316.

Exhibits 2a (using straight line depreciation) and 2b (using economic depreciation) show that total depreciation each year is \$1,000, equal to the cost of buying a new asset.³⁶ Net income is also the same under both approaches at \$1,349.20 per year. However, as with the one asset example, the time paths of the depreciation are quite different for the two methods and result in different estimates of asset value. The method based on straight-line depreciation indicates beginning of period book value of \$10,500 (an ROI of 12.85%), while the measure using economic depreciation is \$13,492 (an ROI of 10.0%).³⁷ This estimate of ROI based on straight-line depreciation is 2.85 percentage points in excess of the cost of capital, mistakenly suggesting that the railroad is earning returns well beyond its 10% cost of capital. Using economic depreciation instead indicates ROI of 10%, equal to the true economic return and equal to the cost of capital.

The ROI bias that results from failing to use economic depreciation increases with the average life of a company's assets; this is clear from Exhibit 1a which shows ROI greater than 100% by its final year. If an asset has a life of only one year, then economic and straight-line depreciation both equal the cost of the asset because it is fully depreciated in a single measurement period. Of course, railroad assets have much longer lives. Because railroads have such long-lived assets, it is particularly important to properly measure depreciation to get an accurate estimate of a railroad's return on investment.

These examples identify a straightforward test to determine whether an upward bias exists in the measurement of ROI. The key question is

³⁶ If there were inflation or technological improvements then it would no longer necessarily be true that total depreciation equals replacement cost. This example does not incorporate those complications.

³⁷ ROI is calculated as net income divided by beginning of period book value. In the straight-line depreciation example, this is $\$1,349/\$10,500=12.85\%$. In this economic depreciation example, this is $\$1,349/\$13,492=10.0\%$.

whether the reported book value of railroad assets based on straight-line depreciation is less than the replacement cost of those assets. If it is, then the Board's approach will overestimate a railroad's true ROI. As a result, a railroad that appears revenue adequate according to the Board's measurement may not in fact be earning its cost of capital. Price regulation based on such misguided conclusions would likely make it more difficult for railroads to attract and retain capital investment on account of not being able to realize economically required rates of return.³⁸

The example calculations in Exhibits 1a, 1b, 2a, and 2b do not include the impact of inflation. Because the United States has experienced consistent and sometimes substantial inflation (as in the early 1980s), it is important to ask whether the results of the example calculations are affected by inflation. For straight line depreciation, the answer is yes, although the effect is not dramatic for low to moderate inflation rates. The greater the rate of inflation, the greater the upward bias in ROI because inflation increases the gap between replacement cost and book value.³⁹ This effect would reinforce the tendency to mistakenly conclude that railroads are revenue adequate.

³⁸ I do not stand alone in reaching this conclusion. In 1985, dozens of the leading economists of the day—including several Nobel laureates—submitted a joint statement of basic principles to guide the ICC in its rate setting duties. In particular, they urged the ICC that: “The appropriate standard for determining the adequacy of railroad revenues is a rate of return equal to the current cost of capital on the replacement value of all rail assets that are required to meet the demands for railroad service, regardless of the source of funds used in investing in those assets.” See Economist’s Statement in Support of Staggers Act, Feb 25, 1985.

³⁹ This assumes that replacement cost exceeds accounting book value in the first place. If it does, a rising rate of inflation tends to increase the gap.

2. *The Board is more likely to find revenue adequacy when deferred taxes are deducted from the investment base, potentially restricting railroad investment.*

The Board calculates ROI by dividing Net Railway Operating Income (NROI) by railroad assets net of deferred taxes. Removing deferred taxes from the base substantially increases ROI, making it more likely that the Board will conclude a railroad is revenue adequate. Because deferred taxes currently constitute a substantial fraction of total railroad assets, the effect of removing them is significant.⁴⁰

It appears that the ICC struggled with how to handle deferred taxes as part of its annual revenue adequacy findings. Initially, the ICC concluded that it would be appropriate to deduct the deferred tax account from the net investment rate base prior to any calculation of rate or return. It reasoned that the capital funds arising from deferred taxes have been contributed by the ratepayers rather than by investors in the company.⁴¹

After more careful consideration of the consequences of that policy, the ICC changed course and decided not to exclude the deferred taxes from the investment base. It reasoned as follows:

The deferred tax account can be considered a source of funds freed up for reinvestment. These funds constitute a substantial part—up to 20 percent in some cases—of the total capital available to individual railroads for this purpose. To the extent that the railroads are not allowed to earn a return on investments made with these funds, the incentive to undertake

⁴⁰ For instance, the Board's Railroad Revenue Adequacy—2012 Determination showed that Norfolk Southern had a Tax Adjusted Net Investment Base of \$16,578,622 after removing \$8,033,436 in Average Accumulated Deferred Income Tax Credits, resulting in a Tax Adjusted Return on Investment of 11.48%. The same calculation without removing the \$8,033,436 in Average Accumulated Deferred Income Tax Credits would equal 7.74%. See STB Updated Decision, Docket No. EP 552 (Sub-No. 17) (served January 2, 2014).

⁴¹ *Standards & Procedures for the Establishment of Adequate Railroad Revenue Levels*, 358 I.C.C. 844 (1978).

railroad investments with such funds is substantially reduced. *Instead, an environment is created in which there is an incentive to take funds generated within the railroad industry and invest them elsewhere, where market-determined rates of return are available.* We are concerned that this may thwart the intent of Congress . . . to provide business enterprise with tax benefits as a means of spurring capital spending.

While we are not considering ratemaking *per se* here, the economic principle is the same. If we exclude internally generated funds, whether stemming from accelerated depreciation or any other railroad activity, from the investment base, the effect will be to establish a rate of return below the cost of capital. This, in turn, will result in incentives to railroads to invest these funds in nonrail operations.⁴²

On appeal, the U.S. Court of Appeals for the Third Circuit affirmed this economic analysis as reasonable. The federal court explained:

The simple fact remains, however, that for all businesses accelerated depreciation is a source of funds which may be reinvested. If the railroad industry were to be put in the position that unlike unregulated industries it could not earn a rate of return on investment of such funds, it would be at a competitive disadvantage in seeking equity capital, and it would be encouraged to invest the funds generated from accelerated depreciation elsewhere than in the railroad business. . . . It would, moreover, produce a rate of return below the cost of capital, since capital markets act with knowledge of the availability of accelerated depreciation as a source of funds.⁴³

Then—somewhat puzzling given the detailed and proper analysis undertaken by the ICC on this issue—the ICC reversed course again. In 1981, Congress bestowed certain tax benefits on the railroads with the Economic Recovery Tax Act of 1981 (ERTA). As railroads were investing and reaping the benefits of this Act, the ICC concluded that its failure to exclude deferred taxes from the investment base was rendering its findings

⁴² *Standards I*, 364 I.C.C. at 813-14 (emphasis added).

⁴³ *Bessemer & Lake Erie R.R. Co. v. Interstate Commerce Comm'n*, 691 F.2d 1104, 1116 (1983) (“*Bessemer*”).

imprecise. So it excluded deferred taxes from the investment base when calculating the return on investment.⁴⁴ It reasoned as follows:

Deferred tax reserves are clearly a no-cost source of capital. To assume that the railroads need a return on that capital in order to achieve revenue adequacy is especially inappropriate, given the huge increases in deferred tax reserves resulting from the passage of ERTA. ERTA allowed the railroads accelerated write-offs of additions and betterments to road property made through 1984. These provisions increased the deferred tax accounts of the railroads by several billion dollars. Given this situation, we can no longer justify not adjusting for deferred taxes in the revenue adequacy process.⁴⁵

The ICC rejected argument by the railroad industry that this decision would conflict with the purpose of the ERTA because it would create powerful disincentives for railroad investments. “Even with a deferred tax adjustment,” the ICC asserted, “the railroads will still be able to take full advantage of the tax law which allows them to defer the payment of some income taxes. The adjustment in no way requires the railroads to forfeit any cash flow benefits which they are entitled to under the tax law and allows them to invest the proceeds as they see fit.”⁴⁶ The ICC stated that:

In our view, when we allowed railroads to treat deferred taxes as an expense without a corresponding reduction in the net investment base we allowed the railroads a double benefit: they were allowed to demand rates sufficient to cover tax liabilities not yet paid and also to collect additional profits on the funds held on reserve to pay such deferred taxes. We now view this as the unfair distortion of the railroads’ revenue adequacy that shippers have long argued.⁴⁷

On appeal, the Court of Appeals cautioned the ICC that it was generating a powerful disincentive for future investment in the railroad

⁴⁴ *Standards I*, 3 I.C.C.2d at 261.

⁴⁵ *Id.* at 272.

⁴⁶ *Id.* at 273.

⁴⁷ *Id.* at 272.

industry.⁴⁸ The Court explained that the ICC was taking away half of the benefits bestowed on the railroads with the Economic Recovery Tax Act of 1981: the ability to earn a return on investments from the tax savings. The ICC argued that depriving railroads of the ability to earn a return on these investment would not completely abolish the desired incentive to invest in railroads. The Court observed, however, that “this argument ignores the fact, emphasized by the railroads, that they have to *compete* for capital with unregulated firms which do retain the second benefit of an opportunity to earn a return on those funds.”⁴⁹ The Court reasoned that “Given the competition between the railroads and unregulated firms for capital, the railroads are substantially disadvantaged by being deprived of the opportunity to earn a return on the funds in comparison to the unregulated firms, and therefore the incentive to all investors, including the railroads, is to invest in the unregulated firms where the advantage of the ‘double benefit’ is retained.”⁵⁰

But the Court stopped short of rejecting the ICC’s change in position. The federal court instead chose to “reject the railroads’ challenge to the change in the standard for revenue adequacy which excludes deferred taxes from their rate base.”⁵¹

To my knowledge, the Board has never reexamined the ICC’s conflicting positions on the treatment of deferred taxes. And as the industry has only recently approached revenue adequacy (as measured by the Board), the ICC’s seesawing positions on this issue likely had no practical effect because there were no policy implications related to the exclusion of deferred

⁴⁸ *Consolidated Rail Corp. v. United States*, 855 F.2d 78 (3d Cir. 1988).

⁴⁹ *Id.* at 90 (emphasis in original)

⁵⁰ *Id.*

⁵¹ *Id.* at 93.

taxes from the investment base. This will change if the Board uses this potentially biased measurement of revenue adequacy to constrain rates and if the railroads are judged to be revenue adequate.

The Board is more likely to determine that a railroad is revenue adequate when using an ROI calculation that backs deferred taxes out of invested capital. If the Board uses such a determination to restrict shipping rates, railroads will not be able to either attract or retain as much equity capital as they otherwise would, leading to the environment of which the ICC spoke wherein “there is an incentive to take funds generated within the railroad industry and invest them elsewhere, where market-determined rates of return are available.”⁵² In my opinion, the federal court’s rationale was correct on the economics, despite the court’s choice to affirm the ICC’s flawed thinking. Accelerated depreciation and the associated deferred taxes create a source of funds that may be (i) reinvested if the railroads are permitted to realize sufficiently high returns or (ii) distributed to shareholders if they are not so permitted. Restricting the level of returns leads to the latter scenario where funds are returned for investment in other industries. Less capital investment would restrict the scope of projects railroads can undertake.

3. *Not measuring revenue adequacy over the life of the investment may misguide rate regulation.*

An investment has positive value when the return on investment exceeds the cost of capital *over the life of the investment* (i.e., when the present value of all cash flows from an investment exceeds the present value of all its costs). Leaving out some portion of cash flows can result in the wrong conclusion regarding the existence of “excess” returns. As such, rate regulation—whether based on SAC, Simplified-SAC, or revenue adequacy measures—may be misguided if the underlying measures consider anything

⁵² *Standards I*, 364 I.C.C. at 813-14.

less than the full life of the investment. Certainly single year snapshots of railroad performance (*i.e.*, annual revenue adequacy measures) will not provide rate regulators with consistently accurate guidance.⁵³

The average life of railroad assets is among the longest in all of American industry. For example, Mr. Baranowski explains that, based on economic depreciation, Norfolk Southern's assets have an average life of 27.6 years when new and an average remaining life of almost 20 years. Single year snapshots are at best unhelpful when trying to assess the performance of such long lived assets.⁵⁴

Railroad performance is also volatile, characterized by stretches of performance that fall short followed by periods when return on investment exceeds cost of capital. In order to have ROI just equal the cost of capital, periods of deficient performance must be offset by periods when railroad ROI exceeds the cost of capital. Exhibit 3 shows that, on average, over the last 32 years Norfolk Southern's return on investment was less than its cost of capital as estimated by the ICC and the Board. For that time period, the mean difference between the ROI for Norfolk Southern and the cost of capital, called the margin, is negative 1.89%. Even if the sample is limited to

⁵³ "Anyone using accounting measures of performance had better hope that the accounting numbers are accurate. Unfortunately, they are often not accurate, but biased. Applying EVA [Economic Value Added] or any other accounting measure of performance therefore requires major adjustments to the income statements and balance sheets. For example, think of the difficulties in measuring the profitability of a pharmaceutical research program, where it typically takes 10 to 12 years to bring a new drug from discovery to final regulatory approval and the drug's first revenues. That means 10 to 12 years of guaranteed losses, even if the managers in charge do everything right. Similar problems occur in startup ventures, where there may be heavy capital outlays but low or negative earnings the first years of operation. This does not imply negative NPV, so long as operating earnings and cash flows are sufficiently high later on. But EVA and ROI would be negative in the startup years, even if the project were on track to a strong positive NPV." BREALEY at 314.

⁵⁴ NS Opening Comments, V.S. Baranowski.

the most recent 20 years—which excludes the early 1980’s when Norfolk Southern was highly revenue inadequate—the mean difference is still negative 0.20%.

In the longer 32-year sample period, the standard deviation of the margin is 4.02%.⁵⁵ This standard deviation implies that a railroad that is just revenue adequate will earn more than 4.02 percentage points in excess of its cost of capital in about 16% of its years of operation.⁵⁶ 2006 was the only year when the Board's revenue adequacy calculation indicated that Norfolk Southern's ROI exceeded the cost of capital by more than 4.02%. Statistically, the railroad would require several more years of this “excess” performance simply to balance the years of deficient performance and to meet its cost of capital in the long run. Yet this single year of “excess” performance, taken in isolation and without understanding the volatility of railroad returns, would mistakenly suggest a need for rate regulation. Elementary mathematics tells us that if a railroad is required to adjust rates whenever it is deemed to be revenue adequate for a single year, the railroad will never be able to produce long run returns that meet its cost of capital.

Norfolk Southern's lack of long-term revenue adequacy is not unique. Exhibit 4 reports revenue adequacy findings for all available major railroads during the period from 1981 to 2012. For many railroads, only a limited sample of years is available because those companies either went bankrupt or were merged, often due to financial distress.⁵⁷ Nonetheless, the data reveal

⁵⁵ For the twenty year period, the standard deviation is 2.46%.

⁵⁶ It is a property of the normal distribution that 16% of the observations are more than one standard deviation above the mean, and 16% of the observations are more than one standard deviation below the mean. *See, e.g.,* ACZEL, AMIR AND JAYAVEL SOUNDERPANDIAN, COMPLETE BUSINESS STATISTICS 776 (6th ed. 2005).

⁵⁷ “By 1997, only ten Class I carriers remained. As a result of bankruptcy, merger, or a changing classification threshold, some sixty-three systems had disappeared from the Class I category. Because of the economic malaise surrounding the industry in the 1970s, several carriers, including the Chicago, Rock Island & Pacific (Rock

that not one railroad has been revenue adequate, on average, over a significant period of time, let alone over a term approximately equal to the life of a railroads' assets. In fact, most railroads were significantly revenue inadequate. As with Norfolk Southern, stretches of "excess" returns are needed to offset these long stretches of deficient returns. Suddenly instituting new rate regulations in response to brief or even lengthy periods of "excess" returns, should they occur, would prevent railroads from achieving long run revenue adequacy. The ICC made similar observations about the need to assess financial performance over long stretches of time, commenting:

[T]hat revenue adequacy is a *long-term concept* that calls for a company, *over time*, to average return on investment equal to its cost of capital. In any industry there are business cycles producing years during which earnings exceed projections, and years when they fall short of the target.⁵⁸

The question of the period over which to assess financial performance also arises with the Board's use of SAC and Simplified-SAC. Under these methods as well, not considering financial performance over the full life of the investment can yield misleading results. The Board proposed that SAC analysis be performed over a ten year period, reasoning as follows:

And a 20-year analysis period is twice what is needed to incorporate the effects of a business cycle. There have been 32 business cycles between 1854 and 2001, with an average cycle of 55 months (4.5 years). Since 1960, the average length of a business cycle was 82 months (about 7 years). Although business cycles have become longer (July 1981 – July 1991, July 1991 – March 2001), a 10-year analysis should still capture a full business cycle.⁵⁹

Yet the average length of business cycles is not the right standard for assessing revenue adequacy. Foremost, the average length of a business cycle

Island) were either divided, sold, or left to rust." JAMES B. BURNS, RAILROAD MERGERS AND THE LANGUAGE OF UNIFICATION 6 (1998).

⁵⁸ *Coal Rate Guidelines*, 1 I.C.C.2d. at 536.

⁵⁹ *Major Issues in Rail Rate Cases*, S.T.B. Ex Parte No. 657 (Sub-No. 1), at 62 (served October 30, 2006).

has no economically meaningful relationship to the life of railroad assets. The value of an investment (*i.e.*, the determination whether return on investment exceeds or falls short of the cost of capital) is assessed over the life of the investment, not over the length of a business cycle.⁶⁰ In addition to this lack of economic justification, using business cycles has other problems. Despite the name, business cycles are not cyclical; rather, they are largely random as to how long they last and in the magnitudes of their peaks and valleys.⁶¹ Exhibit 5a illustrates these random time spans by charting the number of years in each of the seven business cycles from 1961 through 2009, which range in length from 28 months to 128 months. Exhibit 5b shows that the cumulative change in GDP during a business cycle is also not consistent. The smallest amount of net growth during a business cycle since 1960 was 1.15% (1980 to 1982) and the greatest was 50.63% (1961-1970).

As a result, the decision to use the length of a business cycle is arbitrary and results in cutting short the period of analysis. Leaving out

⁶⁰ Financial managers use net present value (“NPV”) analysis to assess the value of an investment. This is performed by projecting all future cash flows from an investment and discounting them to present value. The life of an investment and its cash flows are not tied to either the length of a particular business cycle or the average length of historical business cycles. For instance, assume you had two investments, a short-term IT investment with an expected life of three years and a long-term rail tunnel investment with an expected life of one-hundred years. The value of the short-term investment will be calculated based on cash flows that occur over three years and the value of the long-term investment will be calculated based on cash flows that occur over one-hundred years. The value of neither investment, however, would be calculated over the length of a business cycle. Such a period would be too long a horizon for the IT investment and therefore include years during which no cash flows occur. And it would be too short a horizon for the tunnel, and it would therefore lop off the majority of years during which cash flows are expected to occur. NPV calculations that do not consider all cash flows from an investment will indicate the wrong value and may even provide the wrong general conclusion (*e.g.*, indicate negative NPV when the investment is actually positive NPV or *vice versa*).

⁶¹ For instance, one macroeconomist describes business cycles as “the irregular and largely unpredictable fluctuations in economic activity, as measured by the production of goods and services or the number of people employed.” N. GREGORY MANKIW, *PRINCIPLES OF MACROECONOMICS* 13 (4th ed., 2007).

information that would otherwise inform the revenue adequacy determination can cause one to improperly conclude that a financially unhealthy railroad is healthy or *vice versa*. Financial assessments based on a ten-year period are more informed measures of performance than those based on a single year, but any period short of the full life of railroad assets is too short to make a fully informed assessment.

4. *Relying on CAPM alone, rather than averaging the CAPM and MSDCF approaches, would introduce unnecessary measurement error.*

The cost of capital is a central component of the Board's annual revenue adequacy findings. The cost of capital is an average of a company's cost of debt and its cost of equity, each weighted by its relative portion of the company's capital structure. The cost of investment grade debt is readily identifiable by the interest rate that a company pays on recently issued debt; its measurement is straightforward and relatively uncontroversial. Cost of equity, by contrast, is not readily identifiable and subject to substantial measurement error. Numerous methods exist for estimating the cost of equity, and experts disagree on which methods are most effective. Experts also disagree regarding the proper inputs into each of the competing models.⁶² And the results from the competing finance models will vary based on the assumptions used by the modeler.

⁶² For instance, one valuation textbook provides an overview of various methods for estimating the market risk premium, including the historical approach (which itself varies in the historical period considered), estimates from Chief Financial Officers, and estimates from implied cost of capital measures. See ROBERT W. HOLTHAUSEN AND MARK E. ZMIJEWSKI, *CORPORATE VALUATION: THEORY, EVIDENCE, & PRACTICE*, 313-14 (1st ed., 2014). The Board has itself noted the difficulty in measuring the cost of equity. It remarked: "While the cost of debt is observable and readily available, the cost of equity (the expected return that equity investors require) can only be estimated. How best to calculate the cost of equity is the subject of a vast amount of literature covering the fields of finance, economics, and regulation. In each case, however, because the cost of equity cannot be directly observed, estimating the cost of equity requires adopting a financial model and making a variety of simplifying

Given the degree of uncertainty that surrounds estimating the cost of capital, using two largely independent approaches is better than relying upon only one approach. As the U.S. Department of Transportation properly observed: “no single methodology has a monopoly on producing reasonable, real-world estimates.”⁶³ In my opinion, using one approach would throw away valuable information. Furthermore, using the capital asset pricing model, which is based on stock returns, and the multi-stage discounted cash flows model, which is based on projected cash flows, provides perspective that neither approach can provide by itself. Both the CAPM and MSDCF models that the Board uses to estimate the cost of equity capital are widely employed in the finance industry. The Board’s approach of averaging the two is also reasonable because it reduces the possible measurement error associated with using only one method. I see no reason to alter this approach by ignoring the information provided by the MSDCF.

B. Even if the Board corrected its method for measuring revenue adequacy, a rate constraint based on system-wide financial returns suffers numerous fundamental problems that render it either un-useful or detrimental to the Board's objectives.

A constraint that is based on the annual revenue adequacy findings would suffer from the measurement errors just discussed. Even if these measurement errors are corrected, there remain five fundamental problems with any kind of rate constraint that is premised on the system-wide financial health of a railroad.

assumptions. The Board currently uses a Discounted Cash Flow (DCF) methodology to calculate the cost of equity, which in turn is used to calculate the cost of capital.” *Methodology to be Employed in Determining the Railroad Industry's Cost of Capital*, STB Ex Parte No. 664, at 2 (served October 24, 2007).

⁶³ Hearing Statement of the U.S. Department of Transportation, *Methodology to be Employed in Determining the Railroad Industry's Cost of Capital*, Ex Parte No. 664, at 2-3 (filed Nov. 26, 2007).

1. *A system-wide measure of a railroad's financial health fails to inform whether any particular rate is reasonable.*

One of the Board's objectives is to protect an individual shipper that may lack effective transportation alternatives, a minority of Norfolk Southern's traffic. At its best, properly measured revenue adequacy indicates only how a railroad's historical overall return on investment compares to its cost of capital. Such a system-wide measure would not serve the regulator's need to identify the appropriate rate that should be charged for *particular* traffic. More basic, a constraint based on this measure would not even convey whether a railroad is overcharging or undercharging any *particular* shipper.

Simple solutions tend to serve simple scenarios. The revenue adequacy constraint's problem is that it is a facially simple concept but one that is intended to address a highly complex scenario. A properly implemented revenue adequacy constraint might prove informative in the simplistic scenario that has a railroad offering only one service to only one shipper. In this unrealistic case, a constraint based on the railroad's revenue adequacy status might indicate whether a rate should be adjusted up or down. But complicating this scenario at all (*e.g.*, introducing a second customer or varying the customer's competitive landscape along its shipping route) quickly reduces such a constraint's usefulness. With their highly complex operations and numerous customers that face widely varied competitive circumstances, railroads represent the extreme opposite of a railroad with only one shipper. Knowing how a railroad's returns compare with its cost of capital says nothing about the reasonableness of any individual rate it charges. In contrast to rate regulation based on a system-wide measure of financial health, SAC and Simplified-SAC are targeted. They meet the Board's objectives by indicating specific rates for particular routes.

2. *Return on investment, a central component of the revenue adequacy measure, is short term and backward looking.*

ROI is short term and backward looking, an unhelpful vantage point for regulation intended to be long-term and forward looking. When either general economic or industry specific conditions change, backward looking measures can become highly misleading. For instance, if the railroad industry suffers another sharp downturn as it did during the Great Recession, the backward-looking ROI could be suggesting regulation that is consistent with healthy railroads because it considers only the economically favorable past; meanwhile, a forward looking measure would be sounding an alarm that railroads need assistance. Only after significant time passes will backward-looking measures reflect the economic downturn. Regulatory decisions made prior to this realization will constrain the railroads at precisely the time when the depressed economic environment should have the Board assisting railroad recovery.

For investors to be willing to finance railroad operations, they must expect that they will be able to earn their cost of capital, on average, over the life of the investment. This means that, in the case of Norfolk Southern, investors must expect to earn their cost of capital, on average, over the next 20 years.⁶⁴ Consequently, the relevant question for determining revenue adequacy from a financial perspective is not whether Norfolk Southern has earned its cost of capital during a snapshot of any given year in the past or by how much its ROI exceeded its cost of capital in a given year, but whether it is reasonable to expect it to earn its cost of capital over the next 20 years. In contrast to the annual revenue adequacy measure, the SAC constraint avoids this backward looking vantage point.⁶⁵

⁶⁴ See V.S. Baranowski.

⁶⁵ I understand the Board has not yet applied the Simplified SAC methodology. But this methodology is not as forward looking as SAC because it rests on a single test

3. *Capping returns at the cost of capital would prevent railroads from earning the cost of capital in the long run, discouraging investment.*

Railroads must be able to attract capital that can be invested to expand infrastructure and realize greater levels of efficiency. The Board has observed that a railroad’s ability to earn “adequate revenues” should include being able to “attract and retain capital in amounts adequate to provide a sound transportation system in the United States.”⁶⁶

Capping a railroad’s returns at the cost of capital undermines a railroad’s ability to attract capital because the cost of capital is the *minimum* return investors require to forego competing investment opportunities.⁶⁷

year of historical data. Errors may result from applying this new test based on a single snapshot year that might not be representative of current circumstances. There is a possibility that an upwards adjustment may be needed to assure the railroad the ability to earn the cost of capital. Constraining rates at the cost of capital based on a single year of data will create the same kind of asymmetric risk discussed above. Nonetheless, the Simplified SAC approach is more current and responsive than a revenue adequacy constraint that might consider data from the distant past and does not use true economic depreciation and forward-looking replacement costs.

⁶⁶ See 49 U.S.C. § 10704.

⁶⁷ “*Cost of capital is the expected rate of return that the market requires in order to attract funds to a particular investment.* In economic terms, the cost of capital for a particular investment is an *opportunity cost*—the cost of forgoing the next best alternative investment. In this sense, it relates to the economic *principle of substitution*—that is, an investor will not invest in a particular asset if there is a more attractive substitute.” SHANNON P. PRATT, *COST OF CAPITAL: ESTIMATION AND APPLICATION* 3 (2d ed., 2002) (emphasis in original). “When a company uses the cost of capital to evaluate a commitment of capital to an investment or project, it often refers to that cost of capital as the ‘hurdle rate.’ The ‘hurdle rate’ means the minimum expected rate of return that the company would be willing to accept to justify making the investment...The most popular theme of contemporary corporate finance is that companies should be making investments, either capital investments or acquisitions, from which the returns will exceed the cost of capital for that investment. Doing so creates *economic value added, economic profit, or shareholder value added.*” *Id.* at 5 (emphasis in original). “Here, then, we have two equivalent decision rules for capital investment: *Net present value rule.* Accept investments that have positive net present values. *Rate of return rule.* Accept investments that offer rates of return in excess of their opportunity costs of capital.” BREALEY at 18.

Exhibit 6a is a hypothetical illustration of how return on investment fluctuates around the cost of capital over time and may equal its cost of capital only if this fluctuation is allowed. The exhibit plots, for a hypothetical railroad, the 20-year average return on investment against the cost of capital.⁶⁸ If, as soon as that average ROI reaches the cost of capital, refunds and reparations are required, then the cost of capital becomes an upper bound that the railroad's return on investment can never exceed, as shown in Exhibit 6b. If that upper bound is binding, investors will opt for competing investments that offer greater returns for the same level of investment risk.⁶⁹ Deprived of the proper scale of investment, railroads will fail to be optimally sound, safe, and efficient.

The ICC expressed similar reasoning, noting that a railroad will be disadvantaged when competing for equity capital if it cannot achieve its cost of capital. It remarked:

We have previously determined...that "adequate" revenues are those which provide a rate of return on net investment equal to the current cost of capital (i.e., the level of return available on alternative investments). This is the revenue level necessary for a railroad to compete equally with other firms for available financing in order to maintain, replace, modernize, and, where appropriate, expand its facilities and services. If railroads cannot earn the fair market rate of return, their ability both to retain existing investments and obtain new capital will be impaired, because both the existing and prospective funds could be invested elsewhere at a more attractive rate of return.⁷⁰

Thus, the ICC was historically correct when it repeatedly and accurately observed that the cost of capital was the minimum needed. However, the ICC

⁶⁸ The exhibit assumes that the cost of capital is constant to allow for a simpler illustration. The twenty-year analysis period is also hypothetical. The conclusions in no way depend upon these assumptions.

⁶⁹ "Adequate' means returns at least equal to the returns that stockholders could earn by investing in financial markets. If your firm's projects consistently generate inadequate returns, your shareholders will want their money back." BREALEY at 7.

⁷⁰ *Coal Rate Guidelines*, 1 I.C.C.2d at 535

erred in *Coal Rate Guidelines* when it suggested that the cost of capital could be a cap on railroad returns.⁷¹

To the contrary, the cost of capital is the *minimum* level of return needed to attract investment. An investor faced with two equally risky investments—one with a maximum possible return equal to the cost of capital and one with no cap on returns—will opt for the investment that has potential upside.⁷² An investment that is capped has an asymmetric payout: the investor earns returns less than the cost of capital in bad times but has no chance at earning returns in excess of the cost of capital in good times. The capped investment exposes the investor to downside risk without providing potential upside.

4. *Capping returns at the cost of capital would suppress important market signals and discourage innovation.*

Earning returns in excess of the cost of capital is not a sign of market failure. Indeed it is the potential for these temporary excess returns that gives carriers the incentive to invest and to become more efficient in response to rising demand for rail services.⁷³ Depriving carriers of potentially earning

⁷¹ As quoted above, the ICC stated, “Our revenue adequacy standard represents a reasonable level of profitability for a healthy carrier. It fairly rewards the rail company’s investors and assures shippers that the carrier will be able to meet their service needs for the long term. Carriers do not need greater revenues than this standard permits, and we believe that, in a regulated setting, they are not entitled to any higher revenues. Therefore, the logical first constraint on a carrier’s pricing is that its rates not be designed to earn greater revenues than needed to achieve and maintain this ‘revenue adequacy’ level.” *Id.*, at 535.

⁷² “In economic terms, the cost of capital for a particular investment is an *opportunity cost*—the cost of forgoing the next best alternative investment. In this sense, it relates to the economic *principle of substitution*—that is, an investor will not invest in a particular asset if there is a more attractive substitute.” PRATT at 3 (emphasis in original).

⁷³ “When an investment opportunity or ‘project’ is identified, the financial manager first asks whether the project is worth *more* than the capital required to undertake it.” BREALEY, at 7 (emphasis added). “An investment should be made if it has a

excess returns would dissuade investment and lead to suboptimal development of railway infrastructure, retarding economic growth and energy efficiency.

Markets reward railroads with higher revenues when railroads innovate in ways the market favors or when the market demands that railroads grow. Railroads are not utilities with stable demand; they depend on a properly functioning market to signal when participants must grow beyond existing infrastructure or innovate to improve their services. I have reviewed the verified statement submitted in support of Norfolk Southern's Opening Comments by Deborah H. Butler, Executive Vice President of Planning and Chief Information Officer for Norfolk Southern. The innovations described by Ms. Butler to improve services require effort and capital investment that only the promise of sufficient returns can attract. In my opinion, a rate constraint based on the overall financial health of the railroads would dampen the incentive for railroads to take these kinds of innovative risks to improve service if they are not permitted to reap the benefits from investments that pay off.

Higher revenues and increased profitability function as an important market signal, indicating to both the railroad and its competitors and potential competitors (which includes other railroads, trucks, pipelines, barges, etc.) that demand has increased and the market justifies further investment in carrier infrastructure.⁷⁴ Limiting returns to the cost of capital

positive NPV. If an investment's NPV is negative, it should be rejected." ROSS, WESTERFIELD, JAFFE, CORPORATE FINANCE 60 (6th ed., 2003).

⁷⁴ "If consumers show an increasing preference for some particular commodity by buying more of it, the increase in demand will cause the price of the goods to rise. Entrepreneurs managing firms producing this commodity will be encouraged to expand supply, with the prospect of a higher selling price, increased sales revenue and higher profits. In turn the increased profits being made by firms in this industry will attract new firms into the industry, which will further increase the supply of goods on to the market. More resources will be attracted into the industry because

would stymie this signal, resulting in less than optimal investment and disrupting the mission to foster a “sound, safe, and efficient rail transportation system.”⁷⁵

5. *As only a minority of shippers lack effective transportation alternatives, improvements in system-wide financial health are driven largely by greater efficiency and productivity in a railroad's competitive traffic.*

Another failing of any revenue adequacy constraint is that it is a system-wide measure for an industry where rate regulation applies to only a minority of traffic. Improvement in the overall financial health of a railroad, even if driven entirely by the majority competitive portion of its business, can trigger this constraint. Triggering by competitive traffic does nothing to promote the Board's stated objective to protect shippers that may lack effective transportation alternatives; it instead confuses matters by sending a false signal that railroads need new price regulation. Such a false signal could be damaging to railroads and those they serve.

The ICC observed that a railroad's overall financial performance does not indicate whether shippers without effective transportation alternatives are being fairly treated in each case, stating:

[I]t should be noted that a rate may be unreasonable even if the carrier is far short of revenue adequacy. Besides the constraints discussed in these guidelines, there may be factors brought to light in an individual case which under the circumstances peculiar to that case may render the challenged rate unreasonable.⁷⁶

The opposite is also true. Just as being “revenue inadequate” does not mean all shippers are receiving reasonable rates, being “revenue adequate”

higher rewards are offered.” SAMPAT MUKHERJEE, MODERN ECONOMIC THEORY 560 (4th ed., 2005).

⁷⁵ *Rate Regulation Reforms*, at 1.

⁷⁶ *Coal Rate Guidelines*, 1 I.C.C.2d at 536-37.

does not mean that shippers that lack effective transportation alternatives are suffering unreasonable rates. This is because Norfolk Southern's overall returns are likely driven far more by its competitive traffic (the vast majority of its traffic) than by traffic that lacks effective competition. Moreover, even if a carrier's improving financial returns were attributable to improper exercise of market power (and I am aware of no facts that would support that conclusion at this time), a revenue adequacy constraint would neither identify market power as the cause nor identify the affected customers.

In sum, the revenue adequacy constraint would not serve the Board's stated objectives. It could be triggered by increased earnings from competitive traffic, new innovative service, or greater productivity. And once triggered, it would provide no guidance on how to properly adjust rates for particular shippers that may lack effective transportation alternatives.

VI. CONCLUSION

The Board is required by Congress to monitor the financial health of the railroad industry. The Board is well aware, for example, that its annual revenue adequacy findings are not premised on replacement costs and fail to capture the true economic depreciation of railroad assets. Although the measurement is flawed, the simple metric can serve as a useful indicator of the overall direction of the financial health of the railroad industry. However, the Board should not permit these annual findings—which were designed to comply with a statutory requirement—to spread unnecessarily into rate setting where the nature of the inquiry demands a more targeted and precise measurement.

Even if the measurement errors could be corrected, there are major fundamental problems with *any* rate constraint that is based on the overall financial health of the railroads. *First*, the cost of capital is the *minimum*

return needed to attract investment. The Board should not transform that minimum into a maximum. *Second*, the approach would create counterproductive incentives that will deter innovation and investment and distort important market signals. *Finally*, and perhaps most fundamentally, the overall returns fail to inform about the reasonableness of a particular rate charged to an individual shipper.

In my opinion, the SAC and Simplified-SAC constraints are sound and well suited to meet the Board's objectives with regard to rate setting. These approaches properly gauge the reasonableness of a challenged rate against the replacement costs of the facilities used to serve the complaining shipper. Moreover, because SAC and Simplified-SAC are targeted, they do not interfere with market incentives to grow earnings from the competitive traffic that generates the bulk of Norfolk Southern's overall revenues. As such, these approaches neither deprive investors of returns to which they are appropriately entitled nor prevent important signals that the market should invest more in railroad infrastructure. The Board observed, "As railroads enjoy increasing market power with rising demand for their services, the SAC test (in either its full or simplified form) would provide a critical restraint on their pricing of captive traffic, without deterring railroads from making the investments in their rail networks that are needed to meet rising demand."⁷⁷ This targeted constraint achieves the desired goal while avoiding the pitfalls that would surround any kind of revenue adequacy constraint.

My analysis implies that railroads and those they serve could suffer under a rate standard that calls for regulation when railroad system-wide financial health improves. This unintended consequence would likely undermine efforts to establish "a sound transportation system in the United

⁷⁷ *Rate Regulation Reforms*, at 9.

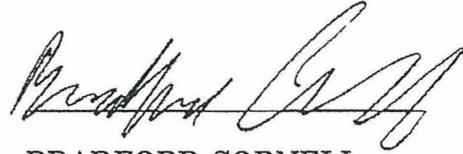
States”⁷⁸—a system that will invest, innovate, and grow to improve rail service and meet the Nation’s growing appetite for environmentally friendly rail transportation.

⁷⁸ 49 U.S.C. § 10704.

VERIFICATION

I, BRADFORD CORNELL, declare under penalty of perjury, that the foregoing statement is true and correct and that I am qualified and authorized to file this statement.

Executed: 9/5/2014

A handwritten signature in black ink, appearing to read "Bradford Cornell", written over a horizontal line.

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AWARDS AND HONORS

Graham and Dodd G&D Scroll Award for research on securities analysis and valuation, 2011

Bernstein Fabozzi/Jacobs Levy Award for outstanding research from *The Journal of Portfolio Management*, 2010

Graham and Dodd G&D Scroll Award for research on securities analysis and valuation (with Richard Roll), 2006

I/B/E/S award for research in empirical finance (with W. Landsman and J. Conrad), 1999

Cited as one of the 10 most prolific research authors in the field of finance in “Most Frequent Contributors to the Finance Literature” by Jean Louis Heck and Phillip L. Cooley, *Financial Management*, Autumn 1988

Financial Management Association Prize for Applied Research, 1987

Institute for Quantitative Research in Finance, Research Grant, 1984

Center for the Study of Futures Markets, Research Grant, 1983

Center for the Study of Futures Markets, Research Grant, 1981

Chicago Mercantile Exchange, Research Grant, 1979

Phi Beta Kappa, Stanford University, 1970

MEMBERSHIPS IN PROFESSIONAL SOCIETIES

American Finance Association 1973-Present

Western Finance Association 1973-Present

Member of Board of Directors 1982-1985

Vice-President 1987

American Economic Association 1973-Present

American Statistical Association 1992-Present

SELECTED BOARD AND COMMITTEE MEMBERSHIPS

Board of Advisors: Research Affiliates LLC 2013-

Chairman, Mayor Riordan’s Blue Ribbon Commission on Los Angeles Municipal Investments

Pension Policy Board, The Aerospace Corporation 1985-2002

Board of Directors, Forms Engineering Corporation 1976-1989

Trustee, Kellow Trust 1982-1991

SPECIAL EDUCATION PROGRAMS

The U.S. Business School in Prague – Special Finance Program Summer 1991

The Nissan Program for Historically Black Colleges, Director Summer 1989

The Lead Program for Business Education of Minority High
School Students 1987-2004

Exhibit 1

Exhibit 1a

**Illustration of ROI from a Single Asset in each Year of its Life
Calculated using Straight-Line Depreciation**

<u>Year</u>	<i>A</i> <u>Cash Flows</u> (1000.00)	<i>B</i> <u>Straight-Line Depreciation</u>	<i>C = A - B</i> <u>Net Income</u>	<i>D = PrevD - PrevB</i> <u>Book Value</u> (Beg. of Period)	<i>E = C / D</i> <u>ROI</u>
1	\$117.46	\$50.00	\$67.46	\$1,000.00	6.75%
2	117.46	50.00	67.46	950.00	7.10%
3	117.46	50.00	67.46	900.00	7.50%
4	117.46	50.00	67.46	850.00	7.94%
5	117.46	50.00	67.46	800.00	8.43%
6	117.46	50.00	67.46	750.00	8.99%
7	117.46	50.00	67.46	700.00	9.64%
8	117.46	50.00	67.46	650.00	10.38%
9	117.46	50.00	67.46	600.00	11.24%
10	117.46	50.00	67.46	550.00	12.27%
11	117.46	50.00	67.46	500.00	13.49%
12	117.46	50.00	67.46	450.00	14.99%
13	117.46	50.00	67.46	400.00	16.87%
14	117.46	50.00	67.46	350.00	19.27%
15	117.46	50.00	67.46	300.00	22.49%
16	117.46	50.00	67.46	250.00	26.98%
17	117.46	50.00	67.46	200.00	33.73%
18	117.46	50.00	67.46	150.00	44.97%
19	117.46	50.00	67.46	100.00	67.46%
20	117.46	50.00	67.46	50.00	134.92%

Exhibit 1b

**Illustration of ROI from a Single Asset in each Year of its Life
Calculated using Economic Depreciation**

Year	<i>A</i> Cash Flows (1000.00)	<i>B</i> Economic Depreciation [1]	<i>C = A - B</i> Net Income	<i>D = PrevD - PrevB</i> Book Value (Beg. of Period)	<i>E = C / D</i> ROI
1	\$117.46	\$17.46	\$100.00	\$1,000.00	10.00%
2	117.46	19.21	98.25	982.54	10.00%
3	117.46	21.13	96.33	963.33	10.00%
4	117.46	23.24	94.22	942.21	10.00%
5	117.46	25.56	91.90	918.97	10.00%
6	117.46	28.12	89.34	893.41	10.00%
7	117.46	30.93	86.53	865.29	10.00%
8	117.46	34.02	83.44	834.36	10.00%
9	117.46	37.43	80.03	800.33	10.00%
10	117.46	41.17	76.29	762.91	10.00%
11	117.46	45.29	72.17	721.74	10.00%
12	117.46	49.81	67.65	676.45	10.00%
13	117.46	54.80	62.66	626.64	10.00%
14	117.46	60.28	57.18	571.84	10.00%
15	117.46	66.30	51.16	511.57	10.00%
16	117.46	72.93	44.53	445.26	10.00%
17	117.46	80.23	37.23	372.33	10.00%
18	117.46	88.25	29.21	292.10	10.00%
19	117.46	97.07	20.39	203.85	10.00%
20	117.46	106.78	10.68	106.78	10.00%

Calculation of Economic Depreciation [1]		
Discount Rate	Discount Periods	Present Value of Cash Flows
10%	1	106.78
10%	2	97.07
10%	3	88.25
10%	4	80.23
10%	5	72.93
10%	6	66.30
10%	7	60.28
10%	8	54.80
10%	9	49.81
10%	10	45.29
10%	11	41.17
10%	12	37.43
10%	13	34.02
10%	14	30.93
10%	15	28.12
10%	16	25.56
10%	17	23.24
10%	18	21.13
10%	19	19.21
10%	20	17.46
Present Value		1000.0

[1] Economic depreciation equals the change in the present value of remaining cash flows from one year to the next. Since this example has equal cash flows in each year, economic depreciation in the first year is equal to the present value of the last year's cash flows, economic depreciation in the second year is equal to the present value of the second to last year's cash flows, and so on.

Exhibit 2

Exhibit 2a

**Illustration of ROI for a Single Year from a Set of Twenty Assets of Different Vintages
Calculated using Straight-Line Depreciation**

<u>Asset Age (Beg. Of Period)</u>	<i>A</i> <u>Cash Flows</u> (1000.00)	<i>B</i> <u>Straight-Line Depreciation</u>	<i>C = A - B</i> <u>Net Income</u>	<i>D = PrevD - PrevB</i> <u>Book Value (Beg. of Period)</u>	<i>E = C/D</i> <u>ROI</u>
1	\$117.46	\$50.00	\$67.46	\$1,000.00	6.75%
2	117.46	50.00	67.46	950.00	7.10%
3	117.46	50.00	67.46	900.00	7.50%
4	117.46	50.00	67.46	850.00	7.94%
5	117.46	50.00	67.46	800.00	8.43%
6	117.46	50.00	67.46	750.00	8.99%
7	117.46	50.00	67.46	700.00	9.64%
8	117.46	50.00	67.46	650.00	10.38%
9	117.46	50.00	67.46	600.00	11.24%
10	117.46	50.00	67.46	550.00	12.27%
11	117.46	50.00	67.46	500.00	13.49%
12	117.46	50.00	67.46	450.00	14.99%
13	117.46	50.00	67.46	400.00	16.87%
14	117.46	50.00	67.46	350.00	19.27%
15	117.46	50.00	67.46	300.00	22.49%
16	117.46	50.00	67.46	250.00	26.98%
17	117.46	50.00	67.46	200.00	33.73%
18	117.46	50.00	67.46	150.00	44.97%
19	117.46	50.00	67.46	100.00	67.46%
20	117.46	50.00	67.46	50.00	134.92%
Current Year Total for All Assets			\$1,349.20	\$10,500.00	12.85%

Exhibit 2b

Illustration of ROI for a Single Year from a Set of Twenty Assets of Different Vintages
Calculated using Economic Depreciation

Asset Vintage (Beg. Of Period)	<i>A</i> Cash Flows (1000.00)	<i>B</i> Economic Depreciation [1]	<i>C = A - B</i> Net Income	<i>D = PrevD - PrevB</i> Book Value (Beg. of Period)	<i>E = C / D</i> ROI
1	\$117.46	\$17.46	\$100.00	\$1,000.00	10.0%
2	117.46	19.21	98.25	982.54	10.0%
3	117.46	21.13	96.33	963.33	10.0%
4	117.46	23.24	94.22	942.21	10.0%
5	117.46	25.56	91.90	918.97	10.0%
6	117.46	28.12	89.34	893.41	10.0%
7	117.46	30.93	86.53	865.29	10.0%
8	117.46	34.02	83.44	834.36	10.0%
9	117.46	37.43	80.03	800.33	10.0%
10	117.46	41.17	76.29	762.91	10.0%
11	117.46	45.29	72.17	721.74	10.0%
12	117.46	49.81	67.65	676.45	10.0%
13	117.46	54.80	62.66	626.64	10.0%
14	117.46	60.28	57.18	571.84	10.0%
15	117.46	66.30	51.16	511.57	10.0%
16	117.46	72.93	44.53	445.26	10.0%
17	117.46	80.23	37.23	372.33	10.0%
18	117.46	88.25	29.21	292.10	10.0%
19	117.46	97.07	20.39	203.85	10.0%
20	117.46	106.78	10.68	106.78	10.0%
Current Year Total for All Assets			\$1,349.20	\$13,491.90	10.0%

[1] Economic depreciation equals the change in the present value of remaining cash flows from one year to the next. Since this example has equal cash flows in each year, economic depreciation in the first year is equal to the present value of the last year's cash flows, economic depreciation in the second year is equal to the present value of the second to last year's cash flows, and so on.

Calculation of Economic Depreciation [1]		
Discount Rate	Discount Periods	Present Value of Cash Flows
10%	1	106.78
10%	2	97.07
10%	3	88.25
10%	4	80.23
10%	5	72.93
10%	6	66.30
10%	7	60.28
10%	8	54.80
10%	9	49.81
10%	10	45.29
10%	11	41.17
10%	12	37.43
10%	13	34.02
10%	14	30.93
10%	15	28.12
10%	16	25.56
10%	17	23.24
10%	18	21.13
10%	19	19.21
10%	20	17.46
Present Value		1000.0

Exhibit 3

Exhibit 3
ICC'S and The Board's Revenue Adequacy Calculation
for Norfolk Southern

Year	Cost of Capital	NS ROI	Margin
1981	16.46%	9.24%	-7.22%
1982	17.70%	6.20%	-11.50%
1983	15.30%	4.67%	-10.63%
1984	15.78%	5.40%	-10.38%
1985	13.60%	8.56%	-5.04%
1986	11.70%	7.44%	-4.26%
1987	11.60%	7.39%	-4.21%
1988	11.70%	13.06%	1.36%
1989	11.50%	11.90%	0.40%
1990	11.80%	11.70%	-0.10%
1991	11.60%	6.00%	-5.60%
1992	11.40%	12.10%	0.70%
1993	11.40%	9.30%	-2.10%
1994	12.20%	11.50%	-0.70%
1995	11.70%	12.10%	0.40%
1996	11.90%	13.00%	1.10%
1997	11.80%	13.10%	1.30%
1998	10.70%	10.50%	-0.20%
1999	10.80%	5.20%	-5.60%
2000	11.00%	5.50%	-5.50%
2001	10.20%	8.30%	-1.90%
2002	9.80%	9.10%	-0.70%
2003	9.40%	9.10%	-0.30%
2004	10.10%	11.60%	1.50%
2005	12.20%	13.20%	1.00%
2006	9.90%	14.40%	4.50%
2007	11.30%	13.60%	2.30%
2008	11.75%	13.75%	2.00%
2009	10.43%	7.69%	-2.74%
2010	11.03%	10.96%	-0.07%
2011	11.57%	12.87%	1.30%
2012	11.12%	11.48%	0.36%

1981 through 2012 (Full Period, 32 years)

Mean	11.89%	10.00%	-1.89%
St dev	1.91%	2.93%	4.02%

1993 through 2012 (Most Recent 20 years)

Mean	11.02%	10.81%	-0.20%
St dev	0.83%	2.68%	2.46%

Note: Calculated as the average of N&W and NS for 1981 through 1985.

Exhibit 4

Exhibit 4
Railroad Industry Revenue Adequacy, 1981-2012

Year	A Cost of Capital	B		C = B - A		NS		CSXT		BNSF		UPRR		KCS		C&O	
		C = B - A		ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin
		ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin
1981	16.46%	9.24%	-7.22%									7.41%	-9.05%	7.61%	-8.85%	5.38%	-11.08%
1982	17.70%	6.20%	-11.50%									4.43%	-13.27%	7.25%	-10.45%	5.33%	-12.37%
1983	15.30%	4.67%	-10.63%									4.66%	-10.64%	7.40%	-7.90%	4.08%	-11.22%
1984	15.80%	5.40%	-10.40%									4.30%	-11.50%	9.00%	-6.80%	4.30%	-11.50%
1985	13.60%	8.56%	-5.04%									7.34%	-6.26%	9.23%	-4.37%	11.10%	-2.50%
1986	11.70%	7.44%	-4.26%			5.46%	-6.24%					8.61%	-3.09%	8.95%	-2.75%		
1987	11.60%	7.39%	-4.21%			5.89%	-5.71%					9.99%	-1.61%	11.03%	-0.57%		
1988	11.70%	13.06%	1.36%			0.92%	-10.78%					11.19%	-0.51%	11.54%	-0.16%		
1989	11.50%	11.90%	0.40%			6.10%	-5.40%					10.30%	-1.20%	10.70%	-0.80%		
1990	11.80%	11.70%	-0.10%			6.80%	-5.00%					10.40%	-1.40%	10.80%	-1.00%		
1991	11.60%	6.00%	-5.60%			NM						1.70%	-9.90%	9.30%	-2.30%		
1992	11.40%	12.10%	0.70%			0.10%	-11.30%					11.10%	-0.30%	9.00%	-2.40%		
1993	11.40%	9.30%	-2.10%			5.20%	-6.20%					9.70%	-1.70%	13.10%	1.70%		
1994	12.20%	11.50%	-0.70%			8.10%	-4.10%					12.00%	-0.20%	8.90%	-3.30%		
1995	11.70%	12.10%	0.40%			6.50%	-5.20%					11.70%	0.00%	7.90%	-3.80%		
1996	11.90%	13.00%	1.10%			8.90%	-3.00%	8.60%	-3.30%			8.30%	-3.60%	7.20%	-4.70%		
1997	11.80%	13.10%	1.30%			9.80%	-2.00%	8.40%	-3.40%			5.20%	-6.60%	3.60%	-8.20%		
1998	10.70%	10.50%	-0.20%			8.10%	-2.60%	9.70%	-1.00%			2.90%	-7.80%	9.10%	-1.60%		
1999	10.80%	5.20%	-5.60%			3.80%	-7.00%	9.50%	-1.30%			6.80%	-4.00%	6.40%	-4.40%		
2000	11.00%	5.50%	-5.50%			3.60%	-7.40%	8.80%	-2.20%			6.90%	-4.10%	6.30%	-4.70%		
2001	10.20%	8.30%	-1.90%			4.60%	-5.60%	7.10%	-3.10%			7.60%	-2.60%	7.00%	-3.20%		
2002	9.80%	9.10%	-0.70%			5.20%	-4.60%	6.40%	-3.40%			8.60%	-1.20%	6.50%	-3.30%		
2003	9.40%	9.10%	-0.30%			4.00%	-5.40%	6.20%	-3.20%			7.30%	-2.10%	3.70%	-5.70%		
2004	10.10%	11.64%	1.54%			4.51%	-5.59%	7.43%	-2.67%			5.27%	-4.83%	8.30%	-1.80%		
2005	12.20%	13.21%	1.01%			6.23%	-5.97%	10.32%	-1.88%			6.34%	-5.86%	5.89%	-6.31%		
2006	9.94%	14.36%	4.42%			8.15%	-1.79%	11.43%	1.49%			8.21%	-1.73%	9.31%	-0.63%		
2007	11.33%	13.55%	2.22%			7.61%	-3.72%	9.97%	-1.36%			8.90%	-2.43%	9.37%	-1.96%		
2008	11.75%	13.75%	2.00%			9.34%	-2.41%	10.51%	-1.24%			10.46%	-1.29%	7.72%	-4.03%		
2009	10.43%	7.69%	-2.74%			7.30%	-3.13%	8.67%	-1.76%			8.62%	-1.81%	6.51%	-3.92%		
2010	11.03%	10.96%	-0.07%			10.85%	-0.18%	10.28%	-0.75%			11.54%	0.51%	9.77%	-1.26%		
2011	11.57%	12.87%	1.30%			11.54%	-0.03%	12.39%	0.82%			13.11%	1.54%	10.76%	-0.81%		
2012	11.12%	11.48%	0.36%			10.81%	-0.31%	13.47%	2.35%			14.69%	3.57%	9.54%	-1.58%		
Mean			-1.90%				-4.64%		-1.52%				-3.59%		-3.50%		-9.73%

Notes

"NM" means "not meaningful" and indicates that the railroad incurred operating losses.
NS is calculated as the average of N&W and NS for 1981 through 1985.

Exhibit 4 (Cont.)

Year	<i>A</i>	<i>B C = B - A</i>											
	Cost of Capital	Conrail		N&W		WEST MD.		AGS		Cent. of GA		CNOTP	
		ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin
1981	16.46%	0.00%	-16.46%	10.77%	-5.69%	5.72%	-10.74%	8.65%	-7.81%	9.74%	-6.72%	10.26%	-6.20%
1982	17.70%	0.00%	-17.70%	8.03%	-9.67%	5.84%	-11.86%	4.34%	-13.36%	6.24%	-11.46%	7.56%	-10.14%
1983	15.30%	3.71%	-11.59%	5.32%	-9.98%			4.79%	-10.51%	8.14%	-7.16%	9.71%	-5.59%
1984	15.80%	6.60%	-9.20%	5.20%	-10.60%			8.90%	-6.90%	10.70%	-5.10%	12.20%	-3.60%
1985	13.60%	4.88%	-8.72%	9.05%	-4.55%								
1986	11.70%	4.29%	-7.41%										
1987	11.60%	4.26%	-7.34%										
1988	11.70%	5.93%	-5.77%										
1989	11.50%	2.60%	-8.90%										
1990	11.80%	5.60%	-6.20%										
1991	11.60%	NM											
1992	11.40%	6.50%	-4.90%										
1993	11.40%	7.00%	-4.40%										
1994	12.20%	8.00%	-4.20%										
1995	11.70%	6.80%	-4.90%										
1996	11.90%	8.40%	-3.50%										
1997	11.80%	1.90%	-9.90%										
1998	10.70%	6.90%	-3.80%										
1999	10.80%												
2000	11.00%												
2001	10.20%												
2002	9.80%												
2003	9.40%												
2004	10.10%												
2005	12.20%												
2006	9.94%												
2007	11.33%												
2008	11.75%												
2009	10.43%												
2010	11.03%												
2011	11.57%												
2012	11.12%												
Mean			-7.93%		-8.10%		-11.30%		-9.65%		-7.61%		-6.38%

Exhibit 4 (Cont.)

Year	<i>A</i>	<i>B C = B - A</i>		L&N		Seaboard		SR		ATSF		BN	
	Cost of Capital	Clinchfield		ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin
		ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin
1981	16.46%	18.06%	1.60%	7.04%	-9.42%	2.10%	-14.36%	7.71%	-8.75%	4.99%	-11.47%	4.29%	-12.17%
1982	17.70%	8.02%	-9.68%	4.87%	-12.83%	1.38%	-16.32%	4.36%	-13.34%	2.66%	-15.04%	4.49%	-13.21%
1983	15.30%					4.24%	-11.06%	4.01%	-11.29%	3.29%	-12.01%	8.21%	-7.09%
1984	15.80%					5.60%	-10.20%	5.00%	-10.80%	2.80%	-13.00%	11.00%	-4.80%
1985	13.60%					7.95%	-5.65%	8.06%	-5.54%	4.29%	-9.31%	10.29%	-3.31%
1986	11.70%									4.21%	-7.49%	5.67%	-6.03%
1987	11.60%									3.58%	-8.02%	9.48%	-2.12%
1988	11.70%									5.65%	-6.05%	11.62%	-0.08%
1989	11.50%									NM		12.40%	0.90%
1990	11.80%									5.00%	-6.80%	10.90%	-0.90%
1991	11.60%									6.50%	-5.10%	NM	
1992	11.40%									1.90%	-9.50%	9.40%	-2.00%
1993	11.40%									4.70%	-6.70%	9.20%	-2.20%
1994	12.20%									7.40%	-4.80%	11.80%	-0.40%
1995	11.70%									5.30%	-6.40%	6.30%	-5.40%
1996	11.90%												
1997	11.80%												
1998	10.70%												
1999	10.80%												
2000	11.00%												
2001	10.20%												
2002	9.80%												
2003	9.40%												
2004	10.10%												
2005	12.20%												
2006	9.94%												
2007	11.33%												
2008	11.75%												
2009	10.43%												
2010	11.03%												
2011	11.57%												
2012	11.12%												
Mean			-4.04%		-11.13%		-11.52%		-9.94%		-8.69%		-4.20%

Exhibit 4 (Cont.)

Year	<i>A</i>	<i>B</i> <i>C = B - A</i>		MILW		D&RG		B&O		MKT		MP	
	Cost of Capital	CNW		ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin
		ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin	ROI	Margin
1981	16.46%	2.16%	-14.30%	0.00%	-16.46%	8.09%	-8.37%	2.37%	-14.09%	11.81%	-4.65%	7.98%	-8.48%
1982	17.70%	0.00%	-17.70%	0.00%	-17.70%	4.53%	-13.17%	0.35%	-17.35%	6.96%	-10.74%	6.03%	-11.67%
1983	15.30%	4.74%	-10.56%	-1.05%	-16.35%	2.91%	-12.39%	0.02%	-15.28%	6.53%	-8.77%	4.88%	-10.42%
1984	15.80%	3.10%	-12.70%	5.20%	-10.60%	0.80%	-15.00%	2.90%	-12.90%	5.40%	-10.40%	3.60%	-12.20%
1985	13.60%	1.96%	-11.64%			5.62%	-7.98%	4.28%	-9.32%	2.17%	-11.43%	6.21%	-7.39%
1986	11.70%	2.10%	-9.60%			4.45%	-7.25%			1.85%	-9.85%		
1987	11.60%	3.22%	-8.38%			2.34%	-9.26%			6.83%	-4.77%		
1988	11.70%	10.45%	-1.25%			6.87%	-4.83%						
1989	11.50%	8.20%	-3.30%										
1990	11.80%	7.20%	-4.60%										
1991	11.60%	7.10%	-4.50%										
1992	11.40%	10.30%	-1.10%										
1993	11.40%	10.50%	-0.90%										
1994	12.20%	10.70%	-1.50%										
1995	11.70%												
1996	11.90%												
1997	11.80%												
1998	10.70%												
1999	10.80%												
2000	11.00%												
2001	10.20%												
2002	9.80%												
2003	9.40%												
2004	10.10%												
2005	12.20%												
2006	9.94%												
2007	11.33%												
2008	11.75%												
2009	10.43%												
2010	11.03%												
2011	11.57%												
2012	11.12%												
Mean			-7.29%		-15.28%		-9.78%		-13.79%		-8.66%		-10.03%

Exhibit 4 (Cont.)

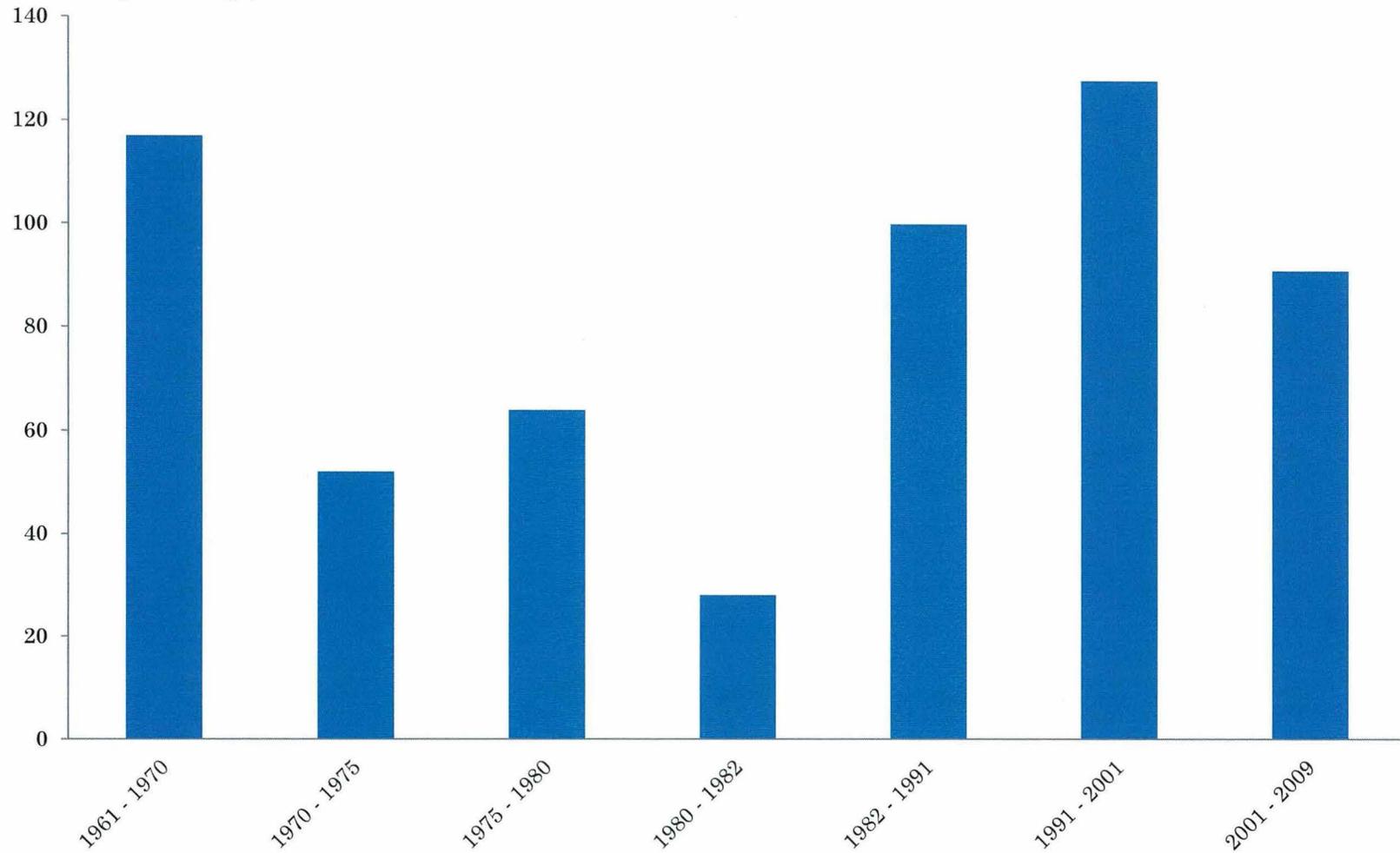
Year	A Cost of Capital	B C = B - A		SP		WP	
		ST.L.-SW		ROI	Margin	ROI	Margin
		ROI	Margin				
1981	16.46%	3.93%	-12.53%	0.50%	-15.96%	0.00%	-16.46%
1982	17.70%	4.20%	-13.50%	0.00%	-17.70%	0.00%	-17.70%
1983	15.30%	3.33%	-11.97%	-1.68%	-16.98%	-10.16%	-25.46%
1984	15.80%	1.60%	-14.20%	-0.70%	-16.50%	0.20%	-15.60%
1985	13.60%	3.19%	-10.41%	0.67%	-12.93%	NM	
1986	11.70%	4.31%	-7.39%	NM			
1987	11.60%	6.34%		0.97%	-10.63%		
1988	11.70%			NM			
1989	11.50%			0.90%	-10.60%		
1990	11.80%			5.70%	-6.10%		
1991	11.60%			NM			
1992	11.40%			3.50%	-7.90%		
1993	11.40%			0.70%	-10.70%		
1994	12.20%			7.20%	-5.00%		
1995	11.70%			1.30%	-10.40%		
1996	11.90%						
1997	11.80%						
1998	10.70%						
1999	10.80%						
2000	11.00%						
2001	10.20%						
2002	9.80%						
2003	9.40%						
2004	10.10%						
2005	12.20%						
2006	9.94%						
2007	11.33%						
2008	11.75%						
2009	10.43%						
2010	11.03%						
2011	11.57%						
2012	11.12%						
Mean			-11.67%		-11.78%		-18.81%

Exhibit 5

Exhibit 5a

The duration of a business cycle is random

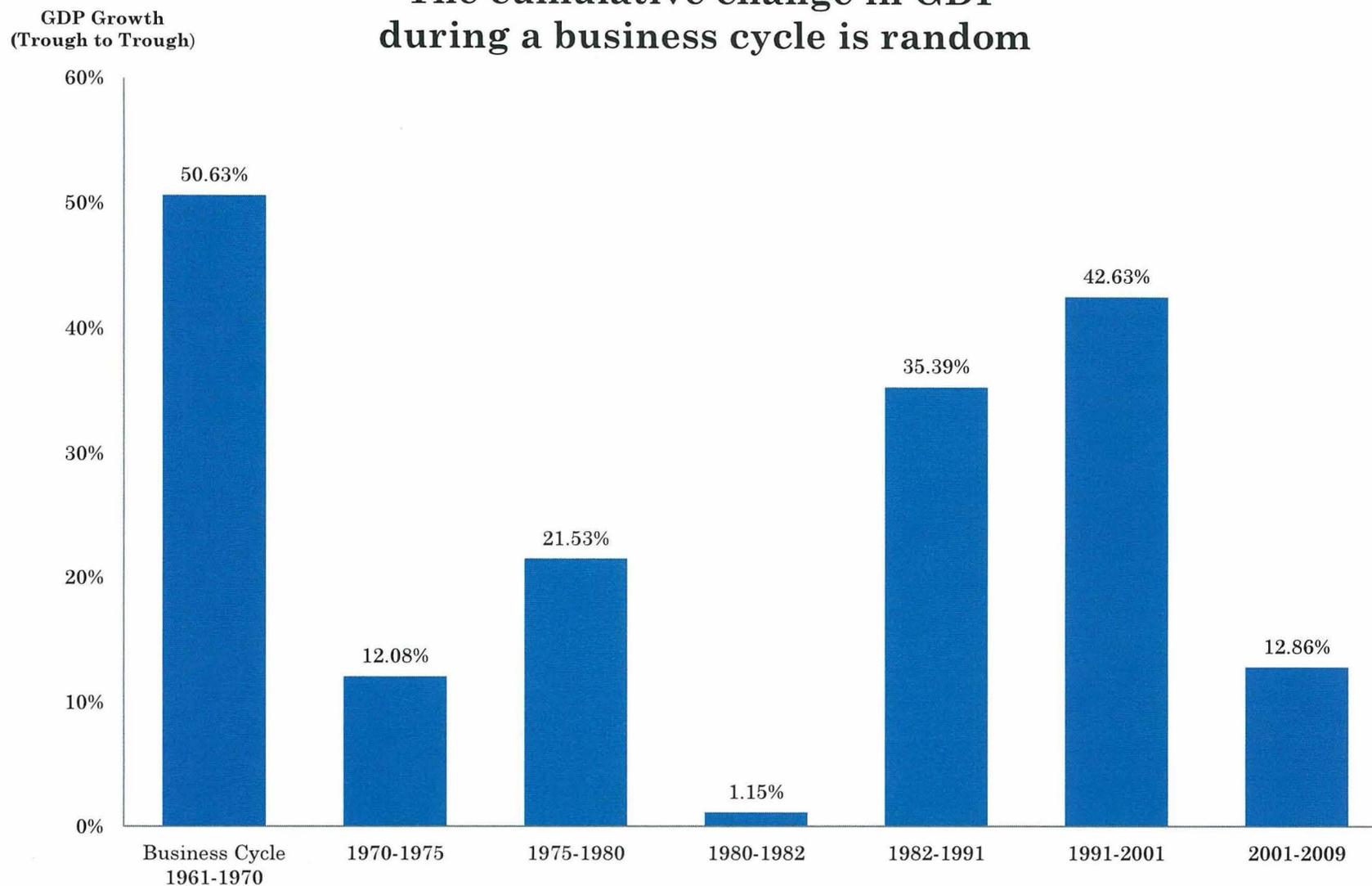
Length of Business Cycle
(Months - Trough to Trough)



Source: NBER

Exhibit 5b

The cumulative change in GDP during a business cycle is random



Source: NBER

Exhibit 6

Exhibit 6a

Average long-run ROI may equal the cost of capital only when ROI is allowed to fluctuate above the cost of capital

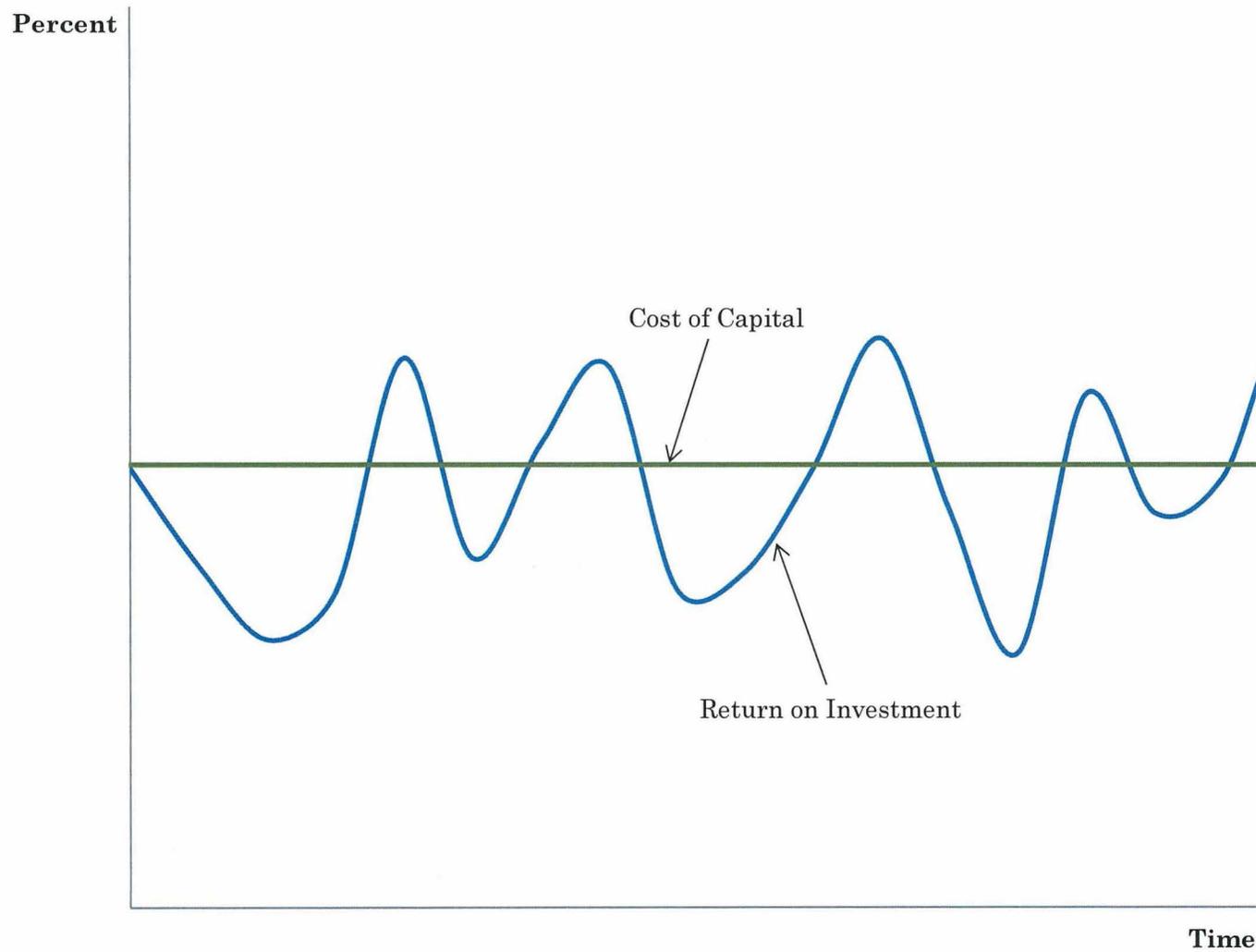


Exhibit 6b

Average long-run ROI will fall below cost of capital when it is capped at the cost of capital

