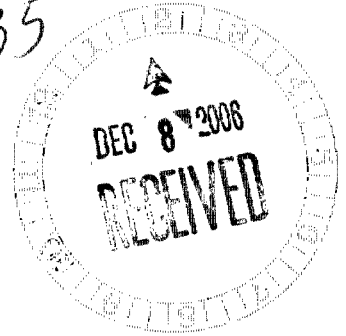


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BEFORE THE
SURFACE TRANSPORTATION BOARD



Ex Parte No. 664

METHODOLOGY TO BE EMPLOYED IN DETERMINING
THE RAILROAD INDUSTRY'S COST OF CAPITAL

COMMENTS OF THE ASSOCIATION OF AMERICAN RAILROADS
ON ADVANCE NOTICE OF PROPOSED RULEMAKING

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I. INTRODUCTION AND SUMMARY

The Association of American Railroads ("AAR") respectfully submits these Comments as a party of record in accordance with the Board's Advance Notice of Proposed Rulemaking in Ex Parte No. 664, *Methodology to Be Employed in Determining the Railroad Industry's Cost of Capital* (served September 20, 2006) (the "ANPR Order"). The AAR is a trade association representing the interests of North America's major freight railroads, and often presents comments and testimony in STB proceedings. The AAR has participated actively in all prior proceedings conducted by the Board and its predecessor, the Interstate Commerce Commission ("ICC"), dealing with the critically important issue of the appropriate methodology for calculating the railroad industry's cost of capital, including the cost of common equity capital.¹

¹ The determination of the industry's cost of capital includes calculations of its current cost of debt capital, cost of common equity capital, cost of preferred equity capital, the capital structure mix, and the composite after-tax cost of capital. See, e.g., Ex Parte No. 558 (Sub-No. 9), *Railroad Cost of Capital – 2005* (Decision served September 20, 2006) ("Ex Parte 558") at 2. It is the appropriate methodology for calculating the cost of common equity capital that has engendered criticism by the Western Coal Traffic League ("WCTL") and is the focus of the Board's request for comments in this proceeding.

AAR has also participated in each of the annual determinations by the Board and the ICC of the industry's cost of capital that have been undertaken since passage of the Staggers Act.

The *ANPR Order* seeks comments both on "the appropriate techniques and methodologies to be used to develop and evaluate the evidence submitted for the cost of capital" and on the question whether there have been "any changes in underlying railroad industry economic conditions that would create the need to change the methodology currently employed by the Board, and how any proposed methodology will overcome the shortcomings, if any, of the currently used DCF model." *ANPR Order* at 2. AAR has a succinct and straightforward response to the second issue posed by the *ANPR Order*: There is nothing in the underlying economics of the railroad industry that warrants or justifies a change from the sound and widely-accepted Discounted Cash Flow ("DCF") methodology that the Board and the ICC before it have used for fully twenty years to make annual cost of capital determinations. Recent improvements in the financial and stock market performance of the railroad industry provide no basis upon which to conclude that there is something fundamentally wrong with the results generated by the DCF methodology. Nor is there any basis upon which to conclude that there are any "shortcomings" in the DCF methodology.

Parties such as WCTL which have argued otherwise, advocating a change to a formulation of the Capital Asset Pricing Model ("CAPM") methodology that has serious implementation problems, bear an extremely heavy burden in demonstrating that the tried-and-true DCF methodology – which is used by numerous other federal and state regulatory bodies, including the Federal Energy Regulatory Commission ("FERC") – should be discarded. As the Board itself observed in *Ex Parte 558*, the presumption in favor of continued use of the DCF methodology "is particularly strong where, as here, a party seeks to replace an established

methodology with one the agency has previously rejected,” not to mention one which reflects “a reversal of the prior position of the shipper community that the ‘CAPM technique was conceptually and technically flawed.’” *Ex Parte 558* at 7 (quoting *Railroad Cost of Capital – 1982*, 367 I.C.C. 662, 670 (1983)).

As the Board is well aware, the issues on which it seeks comments have been explored extensively and repeatedly by the ICC and the Board over the course of the past 25 years, and they are at the core of the Board’s regulatory responsibilities. The Board’s current method of estimating the railroads’ cost of capital constitutes a key input to the Board’s annual revenue adequacy determinations. It also plays an important role in the development of URCS unit costs, since the cost of capital is the primary factor for determining the return on investment (“ROI”) component of those URCS unit costs associated with a railroad’s net investment base. In light of the significant investments that railroads have made in recent years — and must continue to make to meet the demand for rail transportation services that they face today and are projected to face in the future — it is critical both that the assets in which railroads invest are valued accurately and that the ROI that they must be permitted to try to earn on those assets is determined in a reasonable and accurate manner.²

AAR believes that the DCF methodology is sound and remains the most appropriate methodology for the Board to determine the railroad industry’s cost of common equity capital. However, should the Board, following a full and careful analysis of comments received in response to the *ANPR Order*, decide to initiate a formal rulemaking proceeding with respect to this issue, AAR urges the Board to make clear that the mere fact that it may be interested in

² As the Board has acknowledged, the cost of capital determination is also used in other proceedings, including “those involving the prescription of maximum reasonable rate levels, the proposed abandonment of rail lines, and the setting of compensation for disputed trackage rights fees.” *Ex Parte 558* at 1.

further exploration of the underpinnings of the DCF or other methodologies for calculating the cost of equity capital in no way constitutes any sort of prejudgment about the continued efficacy and accuracy of the DCF methodology. Stated differently, if the Board decides to issue a formal NOPR to develop a more complete record on this matter, it should make explicit that it is not thereby concluding that the DCF methodology is flawed, or that it believes that CAPM calculated in the manner suggested by WCTL would be an acceptable methodology for calculating the cost of equity capital, much less that CAPM would be preferable to DCF.

In addition, if the Board decides to issue a NOPR calling for further comments on the methodology for calculating the industry's cost of equity capital, it should also seek comments on an issue that is integrally related to the selection of such a methodology, namely the most appropriate method for establishing the value of the asset base to which the cost of capital is applied in making revenue adequacy determinations. At a time when railroads are making very significant investments in their networks to meet the capacity and service demands of their customers, it is essential that the market-based values of those investments be properly ascertained, so that the Board's determination of the permissible return on those investments is consistent with the expectations of investors for whose capital railroads must compete.

Finally, AAR has several specific observations and suggestions regarding the issue of how most appropriately to evaluate the evidence that is submitted to the Board for its determination of the cost of equity capital. Those observations and suggestions are set forth in these Comments and in the supporting Verified Statement of Professor R. Glenn Hubbard, Dean of the Graduate School of Business of Columbia University and former Chairman of the President's Council of Economic Advisors.

II. ABSENT A COMPELLING SHOWING THAT THE WELL-ESTABLISHED DCF METHODOLOGY FOR DETERMINING THE COST OF COMMON EQUITY CAPITAL IS CONCEPTUALLY FLAWED, THE BOARD SHOULD NOT DISCARD IT.

“There is a norm of regularity in government conduct that presumes an agency’s duties are best carried out by adhering to the settled rule.” *Ex Parte 558* at 7. The Board’s consistent policy has been to follow precedent established in its prior decisions “unless new evidence or different arguments are presented that provide a persuasive reason to depart from that precedent.” Docket No. 42072, *Carolina Power & Light v. Norfolk So. Ry. Co.* (Decision served December 22, 2003) at 8. *See, also* Docket No. 42071, *Otter Tail Power Co. v. BNSF Ry. Co.* (Decision served January 25, 2006) (refusing to revisit issue decided in earlier rate case); Docket No. 42054, *PPL Montana, LLC v. BNSF Ry. Co.* (Decision served November 26, 2001) at *5 (same); *Ex Parte* No. 347 (Sub-No. 3), *General Procedures for Presenting Evidence in Stand-Alone Cost Rate Cases* (Decision served March 12, 2001) at 6. In refusing to adopt WCTL’s proposal to substitute CAPM for the DCF model in determining the rail industry’s 2005 cost of capital, the Board declared that “our default presumption is that we should use the DCF model unless a party provides compelling evidence that it is flawed.” *Ex Parte 558* at 7. The Board should decline even to consider adopting a new standard for determining the cost of equity unless and until it is presented with a compelling reason to discard the DCF methodology.

A. The Board’s Practice of Utilizing the DCF Methodology Is Well-Established.

The Board’s practice of using the DCF methodology to determine the cost of common equity capital is the product of a lengthy and deliberate process by the ICC. Even prior to the Staggers Act, the ICC relied upon DCF-based studies in making its revenue adequacy determinations. For example, in *Ex Parte* No. 353, *Adequacy of Railroad Revenue (1978 Determination)*, 361 I.C.C. 79 (1978) (“*Ex Parte 353*”), the ICC based its revenue adequacy

findings primarily on two DCF-based analyses, as well as one study using the CAPM methodology. *Ex Parte 353*, 361 I.C.C. at 94. While the ICC found that the CAPM study presented in that case “merit[ed] consideration,” it expressed concern regarding certain “weaknesses” in the CAPM methodology. *Id.* at 92.

In *Ex Parte No. 393, Standards for Railroad Revenue Adequacy*, 364 I.C.C. 803 (1981) (“*Ex Parte 393*”), the ICC acknowledged the Staggers Act’s mandate that it seek to promote the ability of railroads to earn adequate revenues, and established new standards for measuring revenue adequacy. Based on extensive evidence submitted by AAR, individual railroads and shipper interests, the ICC concluded that “revenue adequacy standards must be based on a rate of return equal to the current cost of capital.” *Ex Parte 393*, 364 I.C.C. at 807. In so doing, the ICC explicitly endorsed the testimony of AAR witness William J. Baumol, who observed that

any ICC decision which forecloses the opportunity to earn a compensatory rate of return on the railroads’ capital must guarantee deterioration of plant and equipment, neglect of replacement and opportunities for modernization, and more generally, withdrawal in one way or another of railroad services which the market would otherwise show to be valued by customers at amounts that exceed their costs.

Id. at 809-810. The Commission therefore adopted the rail industry’s cost of capital as the sole benchmark of whether a railroad is earning a sufficient return on its assets to achieve revenue adequacy. The ICC rejected other measures – such as financial ratios and funds flow analysis – that “were and are inappropriate as indicators of long-term revenue adequacy . . .” *Id.* at 808. The ICC reasoned that basing revenue adequacy determinations on short-term financial results could result in “denying a railroad the pricing flexibility necessary to obtain long-term revenue adequacy simply because that railroad was making some progress to achieving that goal.” *Id.* The ICC reaffirmed this approach in *Ex Parte No. 393 (Sub-No. 1), Standards for Railroad Revenue Adequacy*, 3 I.C.C. 2d 261 (1986), stating that the revenue adequacy analysis should

“center on the long-term viability and capability of the railroads to provide essential rail service.”

Ex Parte 393 (Sub 1), 3 I.C.C. 2d at 267.

The ICC gave further consideration to the appropriate methodology for determining the common equity component of a railroad’s cost of capital in *Ex Parte No. 436, Railroad Cost of Capital – 1982*, 367 I.C.C. 662 (1982) (“*Ex Parte 436*”). Upon reviewing the evidence presented by railroad and shipper witnesses, the Commission found that “[w]hile there was substantial disagreement among the parties concerning the numerical value of the cost of equity produced by the DCF approach, there was unanimity of opinion that the DCF methodology was an appropriate means of estimating the railroads’ cost of equity capital for 1982.” *Ex Parte 436*, 367 I.C.C. at 670. By contrast, the ICC noted that “shippers, in general objected to the use of the CAPM as a means of determining the cost of capital for the railroad industry” on the grounds that “the CAPM technique was conceptually and technically flawed.” *Id.*

In *Ex Parte No. 466, Railroad Cost of Capital – 1986*, 3 I.C.C. 2d 948 (1987) (“*Ex Parte 466*”), the ICC again requested comments from interested parties regarding the merits of alternatives (including CAPM) to the DCF methodology for determining the cost of equity. As it had in prior revenue adequacy proceedings, AAR proposed a cost of equity based upon the DCF methodology.³ AAR’s submission also included a CAPM-based study, which it proffered as “verification” of the cost of equity produced by the DCF model.⁴ However, noting that it “ha[d] not used the CAPM figure” in prior cost of capital determinations, the ICC once again declined

³ Shipper parties elected not to submit evidence in *Ex Parte 466*.

⁴ It is noteworthy that the CAPM-based studies submitted by AAR during this period generally produced a higher cost of equity than that generated by the DCF model. Nevertheless, recognizing concerns about the accuracy of CAPM, AAR advocated, and the ICC adopted, a DCF-based cost of equity. See *Ex Parte 466*, 3 I.C.C. 2d at 953. Shippers concurred with the use of a DCF-based methodology over CAPM during this period in which the DCF model produced a lower cost of equity capital.

to adopt CAPM. Rather, observing that the DCF methodology “is used by a majority of state regulatory agencies and [that] its use has been accepted by the Commission for many years,” the ICC once again adopted the DCF methodology to determine the industry’s cost of equity capital for 1986. *Ex Parte 466*, 3 I.C.C. 2d at 953. Thus, by 1987, the ICC had as a practical matter abandoned CAPM even as a verification tool in its determination of the railroad industry’s cost of equity capital based upon the DCF methodology.

The STB has consistently followed the precedent established by the ICC by utilizing the DCF approach in making its annual revenue adequacy determinations.⁵ Shipper interests largely concurred with the Board’s approach until the recent *Ex Parte 558* proceeding, in which WCTL recommended that the Board discard the established DCF model in favor of a form of CAPM methodology. *Ex Parte 558* at 6-8. Upon reviewing WCTL’s submission, the Board (correctly) concluded that “there is not enough evidence that our longstanding DCF model must be replaced” (*Ex Parte 558* at 6). Accordingly, the Board calculated the 2005 cost of capital using a DCF-based cost of equity component.

In light of these repeated findings – over more than two decades – supporting use of a DCF-based methodology to determine the railroads’ cost of common equity capital, and the longstanding policy favoring adherence to precedent, the Board should apply a presumption in favor of retaining the DCF model. Indeed, the Board should decline even to consider replacing the DCF methodology unless the record in this proceeding discloses compelling reasons why continued use of that model would be inconsistent with the Board’s statutory duties – a record

⁵ See, e.g., *Ex Parte 552* (Sub-No. 10), *Railroad Revenue Adequacy – 2005 Determination* (served Oct. 17, 2006) at 1; *Ex Parte 552* (Sub-No. 9), *Railroad Revenue Adequacy – 2004 Determination* (served Nov. 17, 2005) at 1; *Ex Parte 552* (Sub-No. 8), *Railroad Revenue Adequacy – 2003 Determination* (served Aug. 11, 2004) at 1; *Ex Parte 552* (Sub-No. 7), *Railroad Revenue Adequacy – 2002 Determination* (served June 20, 2003) at 1; *Ex Parte 552* (Sub-No. 6), *Railroad Revenue Adequacy – 2001 Determination* (served July 19, 2002) at 1.

that most certainly does not exist now. To do otherwise – e.g., by issuing a NOPR that proceeded from the assumption that the Board will, in fact, adopt a new methodology for determining the cost of equity – would be inconsistent with sound administrative rulemaking procedures and this Board’s prior pronouncements. Indeed, as Professor Hubbard observes:

It would be poor public policy in terms of regulatory consistency to abandon a method which has been used successfully for a number of years based on careful analysis, particularly when adjustments can be made to cure perceived problems.

V.S. Hubbard at 13.

B. Any Analysis of Possible Alternatives to the DCF Methodology Would Have To Include Careful Consideration of the Statutory Mandate to Promote Long-Term Revenue Adequacy, and the Regulatory Impacts of Adopting An Alternate Methodology.

If the Board concludes, on the basis of evidence submitted in response to the *ANPR Order*, that there exist sound reasons for exploring alternatives to the DCF methodology, it should engage in the same type of broad-ranging inquiry that the ICC conducted prior to settling on the DCF model as the preferred methodology for estimating the cost of equity capital. In particular, the Board must consider the full range of possible alternatives, including retaining the DCF methodology with appropriate modifications to correct any demonstrated “shortcomings” in the current form of the DCF model, or adopting a different version of the DCF model.⁶

Likewise, the Board must scrutinize carefully any methodology (e.g., CAPM, Fama-French or Arbitrage Pricing) that may be proposed as a replacement for the DCF model. In particular, in addition to evaluating the “theoretical” merits of each alternate methodology, the Board must take into account any practical difficulties likely to be encountered in implementing it, as well as

⁶ Indeed, in evaluating the parties’ submissions in this proceeding, the Board should keep in mind that methodologies such as “DCF” and “CAPM” have multiple formulations that can affect the validity and accuracy of their outputs. Because CAPM relies on more variables that require subjective judgment, it is inherently more susceptible to manipulation.

the question whether that methodology is fundamentally more suitable than the DCF model for the specific regulatory purposes for which it would be employed.

The Board's ultimate decision whether to retain or replace the DCF methodology must also be guided by certain fundamental principles:

First, the Board's regulations (including its methodology for determining the cost of common equity) must be consistent with the statutory goal of promoting long-term revenue adequacy. Revenue adequacy standards based upon short-term financial considerations would unlawfully penalize railroads for making the very progress toward long-term revenue adequacy that the Staggers Act intended to promote. *See Ex Parte 393* at 808. Moreover, as the Board recognized in its recent decision in *Ex Parte 558* (at 7), it would be inappropriate to "swing back and forth" between methodologies on the basis of the carriers' short-term earnings or the results likely to be produced by a particular methodology during a given time period. Such a results-oriented approach would be contrary to both the Board's statutory duties and sound regulatory policy.

The rail industry's ability to have a meaningful opportunity to achieve long-term revenue adequacy is especially critical in the current capacity-constrained environment. As the Board is well aware, railroads and their customers are currently facing significant capacity shortages in a number of important rail corridors.⁷ The demand for rail freight transportation is projected to grow rapidly for the foreseeable future. USDOT has predicted that demand for rail freight transportation will increase 55 percent by the year 2020, and the American Association of State Highway and Transportation Officials ("AASHTO") projects that freight tonnage will grow by

⁷ *See, e.g., "Traffic Jam on the Tracks," The Wall Street Journal*, April 4, 2006, A18.

almost 57 percent by that time.⁸ Most Class I railroads have undertaken substantial capacity expansion and improvement projects in response to this growth in demand for rail service, and they will be called upon to make increasing investments in facilities in the coming years.⁹ Moreover, the increasing volume of rail traffic is resulting in more rapid deterioration of, and need to replace, existing rail facilities.

Second, given the daunting investment challenges that carriers face to keep pace with the needs of their customers, the Board's revenue adequacy standards (including its methodology for determining the industry's cost of capital) must be "forward looking" – that is, they must accurately reflect the returns that will be required to support ongoing investments in the rail network.¹⁰ The DCF model currently employed by the Board provides such a forward-looking approach to the common equity component of the cost of capital determination.

Finally, the Board should keep in mind that any change it makes in the methodology for calculating the cost of common equity will have other far-reaching regulatory effects. As the *ANPR Order* recognized, the Board's annual cost of capital finding is used not only in making revenue adequacy determinations, but for other regulatory purposes as well. *See ANPR Order* at 1. The methodology employed by the Board to calculate the railroads' cost of common equity will impact not only each railroad's revenue adequacy determination, but also its URCS costs

⁸ Federal Highway Administration, *Freight Analysis Framework* (Oct. 2002), FHWA-OP-03-006(R), available at www.ops.fhwa.dot.gov/freight/documents/faf/overview.pdf; American Association of State Highway and Transportation Officials, *Freight-Rail Bottom Line Report*, at 2 (2003).

⁹ *See, e.g.*, "Rails Say Capital on Track," *Traffic World*, March 27, 2006, at 31 ("The nation's biggest rail carriers will expand their capital spending 21 percent [in 2006], investing \$8 billion on rail cars, track and facilities to keep up record volume growth and improve service.").

¹⁰ In comments recently filed in Ex Parte No. 646, *Simplified Standards for Rail Rate Cases*, USDOT warned that the Board's rate regulations "must avoid undercutting railroad incentives to increase productivity, expand capacity, and improve service." *See Comments of USDOT*, filed October 24, 2006 at 2.

and, potentially, the results in individual rate proceedings, particularly if the Board adopts its current proposal in *Ex Parte 646* to base SARR operating and equipment expenses on URCS system-average costs in cases under the proposed SSAC methodology.

III. WCTL'S CRITICISMS OF DCF ARE UNPERSUASIVE.

In its Reply Comments in *Ex Parte 558*, WCTL contended that AAR's DCF-based cost of capital analysis "is entirely too high and devoid of rational support." WCTL Reply Comments at 2.¹¹ In particular, WCTL contended that "the weight assigned to equity has increased substantially" and "the cost of equity has increased even more." *Id.* at 3 WCTL further postulated that "the underlying cause" of such changes is "the dramatic increase in railroad earnings and associated stock prices," and that this is the "complete (but entirely tacit) explanation" for such "unacceptable" results. *Id.* at 4-5.

WCTL proposed that the Board respond to the short-term increase in the cost of common equity under the DCF methodology by discarding DCF altogether, and replacing it with a version of the CAPM approach calculated by Mr. Crowley. According to WCTL, CAPM has become the preferred alternative to the DCF method, and "is not so utterly dependent on projections that railroads will continue to achieve growth in revenues and stock prices that exceeds market levels." WCTL Reply Comments at 7. In addition, Mr. Crowley asserted that the economic literature widely supports the CAPM over the DCF approach. As set forth below, none of these contentions withstands scrutiny. Indeed, Professor Hubbard's analysis of WCTL's presentation

¹¹ AAR filed a brief rebuttal to WCTL's Reply Comments, noting that the fundamental change proposed by WCTL "cannot adequately be analyzed in the context of the annual determination being made in the proceeding," and should not be analyzed in that context in light of the ICC's and STB's long acceptance of the DCF methodology, which came only after careful deliberation and the agency's repeated rejection of CAPM – in large part at the behest of shippers.

to date led him to conclude that “I have seen nothing from the WCTL that would warrant abandoning the DCF method in favor of using the CAPM in isolation.” V.S. Hubbard at 3.

A. That the Calculation of Railroad Cost of Common Equity Capital As Determined Under the DCF Methodology Has Increased Recently Provides No Basis for Questioning the Continued Validity of That Methodology.

The DCF approach has, in one year (2005) out of many, produced results which represent an apparently significant increase in the railroads’ cost of common equity capital for that year. Any claim that this, by itself, renders the DCF approach suspect is totally unprincipled and, in effect, blames the ruler for the measurement. This claim should be rejected by the Board. As one of the leading authorities relied upon by Mr. Crowley points out, “[s]ometimes growth is high in the short run not because the firm is unusually profitable, but because it is recovering from an episode of low profitability.” Brealey, R., Myers, S. and Allen, F., *Principles of Corporate Finance*, 8th ed. (2006) (“Brealey, et al.”) at 71. As the Board is well aware, that is precisely the situation of the railroads, whose stock prices have lagged the broader market for most of the past 25 years.

Moreover, as explained above, one of the principal reasons why the ICC adopted the cost of capital as the benchmark for revenue adequacy in the first place was to work from a long-run perspective, so as to provide the ratemaking flexibility necessary to encourage investment in railroad infrastructure in light of alternative opportunities available to investors in capital markets. Changing the rule for making such determinations merely because railroad revenues, profits and share prices have recently increased would have precisely the undesirable consequences that led the ICC to abandon the short-term measures that had been used prior to the ICC’s implementation of the revenue adequacy provisions of the Staggers Act in 1981. As the ICC warned, reliance on such standards would improperly deny railroads the pricing flexibility they need to achieve long-term revenue adequacy simply because they were making progress

toward achieving that goal. *Ex Parte* 393, 364 I.C.C. at 808.¹² That same concern must surely be present here as well.

B. The Alleged “Upward Bias” in Analysts’ Forecasts That Would Justify Abandoning the DCF Methodology Is Insignificant If It Is Even Present.

The possibility of “upward bias” in analysts’ earnings forecasts is a potential issue inherent in any forward looking approach to determining the cost of capital. However, as Professor Hubbard explains:

The primary critique of the DCF model raised by the WCTL and its expert Mr. Crowley is that the model relies upon forecasts that are prone to be upwardly biased. However, there is no consensus in financial economics research as to whether such upward bias exists. Even where found, such bias is not of economic significance.

V.S. Hubbard at 3. Indeed, as Professor Hubbard observes, “[o]ther studies have found evidence that analysts’ forecasts may be biased downward, to allow for positive earnings ‘surprises’ [footnote omitted].” *Id.* at 6. Such claims also disregard analysts’ self-interest in maintaining their reputations and other factors. *Id.* Certainly, it is difficult to believe that investment analysts are less objective with regard to projected growth insofar as it would affect the determinations of the Board on cost of capital matters than advocates for the parties in those regulatory proceedings. In any case, as Professor Hubbard suggests, the issue of possible bias can be addressed by using median growth rates, perhaps after truncating the highest and lowest estimates.¹³ *Id.* at 7.

¹² As the ICC concluded, “we would be assigning the railroads the Sisphyean task of working toward revenue adequacy, and every time it came close robbing it of the very means it had used to get there. We do not believe this is desirable, nor do we believe it was intended by Congress.” *Id.*

¹³ Mr. Crowley expressly acknowledges that the Board in fact uses such truncated growth rates in its cost of capital determinations. Mr. Crowley contends that “[e]ven with the truncation, the remaining estimates can still be considered overly optimistic” (Crowley V.S. at 6-7), but he

C. Reliance On the DCF Methodology Will Not Produce an Endless Upward Spiral.

Another supposed problem identified by Mr. Crowley with the DCF methodology is that in an era of improving railroad earnings and profitability, the investment analysts' forecasts relied upon by that methodology will produce an endless upward spiral. That is, according to WCTL, "simply because the railroads are making greater revenues and profits, investment analysts expect the growth in railroad revenues and earnings to continue." WCTL Reply Comments at 4-5. WCTL provides no support whatsoever for this assertion. Furthermore, as explained by Professor Hubbard, if and to the extent that this poses a problem – *e.g.*, for industries that have relatively volatile patterns of growth – it can be solved by using multi-stage growth forecasts. That is the approach which the FERC and other regulatory agencies have taken for a number of years. V.S. Hubbard at 7-8.

There is a critical fallacy underlying WCTL's analysis – *i.e.*, that there is a single DCF methodology and a single CAPM methodology and that the Board is faced with a choice between the two. There simply is no single DCF or CAPM methodology that must or should be followed uncritically.

D. Mr. Crowley's Analysis of the Economic Literature on DCF and CAPM Is Superficial, Selective and Demonstrably Biased.

Not purporting to rely on his own credentials as an economist, Mr. Crowley attempts to find criticism of the DCF methodology and support for CAPM in various published authorities. However, Mr. Crowley's use of those authorities is flawed and highly superficial.

First, Mr. Crowley's universe of authorities is very small in light of what the Board characterized as "thousands of articles and treatises by members of the financial economic, and

offers no explanation of why this would be so or why this problem could not be cured by the techniques such as those suggested by Professor Hubbard.

regulatory communities” (*Ex Parte* 558 at 6), not to mention the numerous decisions and reports to legislative bodies of other federal and state regulatory agencies. Mr. Crowley has been highly selective in his choice not to discuss “relevant” literature which is highly critical of CAPM, as Professor Hubbard points out. V.S. Hubbard at 8-11.

Second, Mr. Crowley’s discussion of even the few authorities he cites is so highly selective that it must be regarded as unfairly biased. For example, he quotes Pratt, S. *Cost of Capital, Estimations and Application*, 2d ed. (2000) (“*Pratt*”), for the proposition that “it is theoretically impossible for the sustainable [perpetual] growth rate for a company to significantly exceed the growth rate in the economy” and that “[a]nything over a 6-7% perpetual growth rate should be questioned carefully.” Crowley V.S. at 8 (quoting *Pratt* at 113). However, in another passage from the same source, Dr. Pratt makes clear that his point is merely that short term growth estimates should not be used in perpetuity and that “any use of these forecasts in a single-stage DCF model must be tempered with a longer-term forecast.” *Id.* at 6 (quoting *Pratt* at 113).

Similarly, Mr. Crowley quotes *Brealey, et al.* for the proposition that care must be taken in applying the DCF formula “to firms having high current rates of growth. Such growth can rarely be sustained indefinitely, but the constant-growth DCF formula assumes it can.” V.S. Crowley at 8 (quoting *Brealey, et al.* at 69). Putting aside for the moment whether the recent improved financial performance of the railroad industry can fairly be characterized as “unsustainable,” *Brealey et al.* also note – in a passage omitted by Mr. Crowley – that where “near-term growth is unsustainably high,” the solution may be “to use a two-stage DCF formula, where near-term dividends are forecasted and valued, and the constant-growth DCF formula is used to forecast the value of the shares at the start of the long run.” *Brealey, et al.* at 77. *Brealey, et al.* most certainly do not suggest that the solution is to adopt a CAPM approach.

IV. CAPM HAS NOT BECOME THE “PREFERRED ALTERNATIVE” FOR REGULATORY PURPOSES.

In his verified statement on behalf of the AAR in *Ex Parte* 558, Mr. Rockey noted that “[t]he DCF method is recognized as a valid approach to measuring the cost of equity by the overwhelming majority of financial experts in the country, and among federal and state regulatory agencies it is the most widely used method for determining the cost of equity.” V.S. Rockey at 8. WCTL does not dispute Mr. Rockey’s observation. Rather, WCTL suggests only that, in the years since the ICC rejected reliance on the CAPM methodology in 1987, “CAPM has attracted a significantly broader following,” and “[i]ndeed, there is abundant evidence that outside the regulatory context, ‘CAPM is the dominant model for estimating the cost of equity.’” WCTL Reply Comments at 8 (emphasis added), *quoting* R. Bruner, K. Eades, R. Harris, and R. Higgins, “Best Practices in Estimating the Cost of Capital: Survey And Synthesis,” *Financial Practice and Education* (Spring/Summer 1998) at 15.¹⁴ Even if this statement is correct, neither WCTL nor Mr. Crowley make any effort to explain the continued prevalent use of DCF by a variety of regulatory agencies, including the FERC and many state commissions.¹⁵ Such agencies’ statutory responsibilities require that they be far more regularly and intensively

¹⁴ Moreover, as Professor Hubbard points out, the article cited by WCTL shows “how reasonable alternative methods of calculating beta and the market premium — as well as reasonable alternative choices for the risk-free rate — can lead to dramatic variation in estimates of the cost of equity.” V.S. Hubbard at 9.

¹⁵ See, e.g., *Williston Basin Interstate Pipeline Co.*, 87 FERC ¶ 61,264 (1999). In that proceeding, the FERC stated that “[t]he DCF method is the most widely used procedure relied on by regulatory bodies in the United States for determining rate of return, and it has been the favored methodology of this Commission for many years.” The FERC also stated that “[a]lthough no methodology is perfect, the Commission, having given consideration to the merits of all the methodologies proffered, finds the DCF method remains the most reasonable methodology generally, as well as for the circumstances of this case.” *Id.* at 62,009. See, also *Florida Power & Light Co.*, 73 FERC ¶ 63,018 at 61,188-189 (1995) (initial decision), (concluding that “risk premium analyses are suspect because of . . . ‘participants’ ability to choose any time period to support a particular hypothesis,” and “the lack of correlation between past rates of return and future investor-required rates of return”).

engaged in cost of service ratemaking issues than the Board, and their conclusions on the most appropriate methodology for determining cost of capital should be given considerable weight.

CAPM is clearly not new to the regulatory process, as the long experience of the Board and its predecessor with that model shows. As noted above, CAPM was used by the ICC before the passage of the Staggers Act and, for a time, enjoyed some favorable regard at least as a corroboration device, notwithstanding that shippers declined even to submit revenue adequacy estimates based on the CAPM model and strenuously opposed the use of that methodology. WCTL does not even attempt to explain how the purported "significantly broader following" that it claims CAPM is now supposed to enjoy reflects any cure of the "serious conceptual and technical flaws" in the methodology that shippers pointed to in the 1980s, and which ultimately led the ICC to abandon CAPM. Nor does WCTL offer any explanation (except for its dissatisfaction with recent results) why it is now eager to jettison DCF in favor of that model.

As Professor Hubbard explains, "[t]he CAPM is not theoretically superior to the DCF approach, and poses a number of difficulties in its practical implementation." V.S. Hubbard at 4. To the contrary, "[t]here is . . . a well established body of research in financial economics highlighting the shortcomings of the CAPM approach to estimating the cost of capital." *Id.* at 8. Indeed, shippers have for many years objected to the use of the CAPM to determine the cost of equity capital on the grounds that the CAPM technique was "conceptually and technically flawed." *Ex Parte* 436, 367 I.C.C. at 670.

V. EVEN IF THE BOARD WERE TO BE PERSUADED THAT THE DCF METHODOLOGY SHOULD BE REPLACED RATHER THAN MODIFIED, IT SHOULD NOT CONCLUDE THAT A CAPM APPROACH IS THE ONLY VIABLE ALTERNATIVE AVAILABLE.

Although WCTL's witness Crowley professes familiarity with other potential alternatives to the DCF methodology, his statement is completely devoid of any reference to, let alone

discussion of, such alternatives. As the *ANPR Order* clearly reflects, there are a variety of alternate methodologies for calculating the cost of equity capital. While AAR supports the Board's continued use of the DCF methodology, it recognizes that there may be adjustments to that methodology as it is currently applied by the Board that could be explored. If the Board nonetheless decides to initiate a more widely ranging NOPR to revisit the issue of the most appropriate methodology for determining the cost of equity capital, it should not limit its inquiry exclusively to the DCF methodology currently used by the Board, or to Mr. Crowley's version of implementing CAPM.

Other available methodologies include not only "risk premium methods other than CAPM, earnings-price ratios, and the comparable earnings method" (*ANPR Order* at 2), but also the Fama-French and Arbitrage Pricing Models, neither of which was recognized or in wide use when the ICC last examined the DCF and CAPM models in any depth. The Fama-French Model, like CAPM, is based upon a risk premium methodology. But, unlike CAPM's consideration of a single risk factor, the Fama-French Model takes into account multiple systematic risk factors such as excess market return, relative firm sizes, and book-to-market ratios. The Model was developed in response to the views of Professors Fama and French – reiterated as recently as 2004 – that "despite its seductive simplicity, the CAPM's empirical problems probably invalidate its use in applications."¹⁶ E. Fama and K. French, "The Capital Asset Pricing Model: Theory and Evidence," *Journal of Economic Perspectives* (2004) pp. 43-44. The Arbitrage Pricing Model, while preserving the fundamental underpinnings of CAPM,

¹⁶ As noted above, the FERC has also recognized a number of difficulties with CAPM, and it has expressly cited criticisms of it by Fama and French, including their conclusion that "tests do not support the central prediction of the [CAPM] model, that average stock returns are positively related to market beta." *Florida Power & Light Co.*, 73 FERC at 61,188. (citing E. Fama and K. French, "The Cross Section of Expected Stock Returns", *Journal of Finance*, June 1992.)

also reflects multiple risk factors in a manner analogous to Fama-French, incorporating such items as changes in the rate of inflation and the rate of real economic growth. See, e.g., R. Roll and S. Ross, "An Empirical Investigation of the Arbitrage Pricing Theory," *Journal of Finance* (1980) at 1073-1103.

In short, should the Board decide to issue a NOPR to examine alternatives to the DCF methodology, it should make clear that it in no way is endorsing any particular methodology for calculating the cost of common equity capital, and most especially that it is not inclining towards the WCTL-sponsored version of CAPM advocated by Mr. Crowley. Rather it should afford all interested parties notice of its inquiry or proposal and allow ample time and opportunity for parties to submit comments and replies in order to develop a fully adequate record upon which to base such an important decision. As the Board noted in *Ex Parte 558* (at 7), the ICC "settled upon the DCF model to derive its cost-of-equity component" only "[a]fter considerable public discourse", and the ICC and the Board have proceeded to use it for more than 20 years. Any determination to revise or significantly modify that model – much less to replace it with another methodology – should only come (if at all) after a similarly full and careful "public discourse."

VI. IF THE BOARD DECIDES TO CONSIDER ALTERNATIVES TO THE DCF METHODOLOGY, IT SHOULD ALSO CONSIDER OTHER COMPONENTS OF ITS REVENUE ADEQUACY DETERMINATION, INCLUDING THE APPROPRIATE VALUATION OF THE RAILROADS' ASSET BASES.

For the reasons explained above, AAR urges the Board not to discard the DCF methodology that it has employed for decades to calculate the industry's cost of equity capital. However, should the Board for whatever reason question the continued validity of the DCF methodology and initiate a rulemaking to consider alternative methodologies, it must recognize the potential impact of its ruling on annual revenue adequacy determinations. In those circumstances AAR strongly urges the Board to look as well at the other central component of

those revenue adequacy determinations – namely, the appropriate valuation of the railroads' asset bases. As the Board is well aware, for some time now, rather than being in the posture of downsizing their networks to shed excess and underutilized assets, most railroads have been investing at very high levels in their assets as they wear out (which is occurring more rapidly as those assets are subject to heightened use in connection with the increasing demand for rail transportation services). Indeed, the railroad industry is investing in new assets at rates not seen in recent times. In such an environment, basing the industry's allowable return on book values is inappropriate and can make it more difficult to attract needed scarce capital from investors.

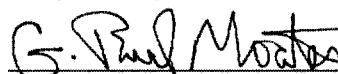
The Board should apply the cost of capital that it derives from whatever methodology it may ultimately settle upon – whether the current DCF, a DCF that is modified in one or more respects, or even an alternative methodology such as Fama-French – to a market-based valuation of railroads' assets. This means adoption of a valuation method such as replacement cost new less depreciation (“RCNLD”) or a similar current-value method that recognizes the significant investments that the railroads have made to their networks in recent years and must continue making in order to satisfy the capacity and service demands facing the industry. The superiority of a market-based assessment of a railroad's asset base in determining revenue adequacy has long been recognized.¹⁷ Any NOPR that the Board may decide to serve in this proceeding should expressly include a request for comments on this important issue.

¹⁷ See, e.g., *RAPB Final Report on Railroad Accounting Principles* (September 1987) Vol. 2, at 60 (“current market valuation is preferable to historic valuation from a theoretical viewpoint. In revenue adequacy applications, current market value represents the value upon which competitive returns must be earned to attract and retain capital”); *Ex Parte* 393 at 818 (noting that replacement costs better mirror the “true economic costs associated with an investment” and more accurately reflect depreciation and inflation); *Ex Parte* No. 483, *Railroad Revenue Adequacy - 1988 Determination*, 6 I.C.C.2d 933 (July 30, 1990) at 940 (favoring the use of acquisition costs over predecessor costs as closer approximations of current market values).

VII. CONCLUSION

Nothing has been presented to the Board to date that provides any sound reason to reconsider the continued use of the DCF methodology in determining the rail industry cost of common equity capital. However, if the Board elects to go forward in this matter, it should provide all interested parties a full and fair opportunity to submit comments and evidence without framing the issues in any way that would prejudice their outcome.

Respectfully submitted,



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Dated: December 8, 2006

Verified Statement of Professor R. Glenn Hubbard

I. INTRODUCTION

A. Qualifications

1. My name is R. Glenn Hubbard. I am the Dean of the Graduate School of Business of Columbia University, where I hold the Russell L. Carson Professorship in Finance and Economics. In addition, I am a Professor of Economics in the Department of Economics of the Faculty of Arts and Sciences. At the National Bureau of Economic Research, I am a research associate in programs on corporate finance, public economics, industrial organization, monetary economics, and economic fluctuations and growth. I am also a visiting scholar at the American Enterprise Institute in programs on tax policy and financial markets. Prior to joining the Columbia faculty as Professor of Economics and Finance in 1988, I taught in the Department of Economics at Northwestern University. I have also served as Visiting Professor of Business Administration at Harvard Business School, John M. Olin Visiting Professor at the University of Chicago, Visiting Professor and Research Fellow of the Energy and Environmental Policy Center at the John F. Kennedy School of Government and John M. Olin Fellow at the National Bureau of Economic Research. I hold A.M. and Ph.D. degrees in economics from Harvard University, and B.A. and B.S. degrees in economics from the University of Central Florida, *summa cum laude*.
2. My professional work has centered on problems in corporate finance, public economics, industrial organization, monetary economics, and natural resource economics. I have authored more than 100 research articles, edited a number of books, and authored a leading textbook on money and financial markets and a new textbook on principles of economics. In my own work, I have used various methodologies for calculating the cost of capital of firms and industries, including the Discounted Cash Flow ("DCF") model, the Capital Asset Pricing Model ("CAPM") and variations of each of these models.
3. I have been an advisor or consultant to the Board of Governors of the Federal Reserve System, Congressional Budget Office, Federal Reserve Bank of New

York, Internal Revenue Service, International Trade Commission, National Science Foundation, U.S. Department of Energy, and U.S. Department of the Treasury. From 1991 to 1993, I served as Deputy Assistant Secretary (Tax Analysis) of the U.S. Department of the Treasury, where I was responsible for economic analysis of tax policy, the administration's revenue estimates, and health care policy issues. From 2001 to 2003, I served as Chairman of the President's Council of Economic Advisers; over that time period, I also served as Chair of the Economic Policy Committee for the Organization for Economic Co-operation and Development (OECD) in Paris.

4. My *curriculum vitae*, which is attached as Appendix A, gives more biographical details, lists my writings, and specifies the testimony that I have given in the past four years as an expert witness.

B. Assignment

5. I have been asked by the Association of American Railroads ("AAR") to comment on "the appropriate methodology to be employed in determining the railroad industry's estimated cost of capital to be used in future annual cost-of-capital determinations."¹ As the Board notes, "cost of capital is used in evaluating the adequacy of railroad revenues each year," and "may also be used in other Board proceedings, including, but not necessarily limited to, those involving the prescription of maximum reasonable rate levels."²

II. SUMMARY OF CONCLUSIONS

6. One of the primary concerns in regulating an industry is to ensure that the regulation does not create inefficient investment incentives. This objective is particularly important in an industry as capital-intensive as the railroads. If the estimated regulated cost of capital is set too low, investment will be deterred, and both the quantity and quality of rail service provided will suffer. Adverse and inefficient consequences may also arise if the estimated regulated cost of capital is set too high.

¹ Surface Transportation Board Decision STB Ex Parte 664, "Methodology to be Employed in Determining the Railroad Industry's Cost of Capital," September 20, 2006.

² *Id.*

7. The DCF approach has been used for over two decades in ICC/STB revenue-adequacy determinations. Other regulatory agencies, including the Federal Energy Regulatory Commission ("FERC"), have also used the DCF approach to apparently good effect.
8. I understand that in April 2006, in a prior proceeding, the Western Coal Traffic League (the "WCTL") advocated that the STB switch to the CAPM to calculate the railroad industry cost of equity capital, arguing that the DCF method produces a cost of capital that is too high. (I have been advised that the WCTL previously opposed the use of the CAPM in favor of the DCF.) I have seen nothing from the WCTL that would warrant abandoning the DCF method in favor of using the CAPM in isolation. If after careful consideration of the costs and benefits of a new approach, the STB decides to modify the DCF approach or even to augment the DCF approach, it could do so by using, for example, the CAPM or Fama-French model to check its results. Implementation of any revisions to the existing methodology would require careful study before a new approach is adopted.
9. DCF and CAPM are among the techniques most widely used by regulators. A constant-growth DCF model may be most appropriate for industries with stable growth rates, where current expectations of future growth should be reasonably close to historical growth.³ However, there is nothing intrinsic to the theory underlying DCF modeling that requires an assumption of constant growth. Variations and refinements of the DCF can be used to tailor it to specific industries and economic conditions. FERC, for example, uses a two-stage DCF model in the regulation of natural gas pipelines.
10. The primary critique of the DCF model raised by the WCTL and its expert Mr. Crowley is that the model relies upon analysts' earnings forecasts that are prone to be upwardly biased. However, there is no consensus in financial economics research as to whether such upward bias exists. Even where found, such bias is not of economic significance. Moreover, while theoretically attractive, the CAPM

³ See, for example, R. Brealey, S. Myers, and F. Allen, *Principles of Corporate Finance*, 8th Edition, p. 66: "Utilities are mature, stable companies which ought to offer tailor-made cases for application of the constant-growth DCF formula" (Hereafter cited as Brealey, Myers, and Allen, 8th Edition).

approach advocated by the WCTL and Mr. Crowley has been shown to have numerous shortcomings in its implementation, which WCTL and Mr. Crowley ignore.

11. Both the DCF and the CAPM models require the exercise of judgment regarding key inputs to the model. The CAPM is not theoretically superior to the DCF approach, and poses a number of difficulties in its practical implementation.

III. ASSUMPTIONS REQUIRED BY THE DCF AND CAPM METHODS

12. Both DCF and CAPM require a number of judgments in the selection of the particular form of the model to be used as well as the inputs. For example, application of the DCF model requires judgment as to:
 - Model type (e.g., single-stage versus multi-stage);
 - Source and type of inputs (e.g., I/B/E/S median versus average versus consensus analyst estimates);
 - Expected dividends;
 - Expected growth rates and pattern of growth;
 - Peer group.
13. Likewise, application of the CAPM requires judgment regarding:
 - Model type (e.g., single-factor versus multi-factor);
 - Risk-free rate (e.g., short-term versus long-term);
 - Market risk premium (e.g., the appropriate market index, period of measurement over which it is calculated, method of measurement [arithmetic versus geometric mean]);
 - Beta estimate (estimation period, frequency of data);
 - Peer group.
14. I do not believe that the CAPM can be favored over the DCF by claiming that it is more straightforward or more reliant on objective facts. Both models require judgment in order to be properly applied. Neither method should produce consistently higher or lower estimates of the cost of equity than the other. Objective and reasonable estimates of input parameters may produce a wide range of cost of equity estimates, as described below with respect to the CAPM.

IV. ADVANTAGES AND DISADVANTAGES OF DCF AND CAPM

A. DCF Approach

15. DCF is a forward-looking approach that is focused on investor expectations, which determine the cost of capital. DCF has been widely used in estimating the cost of equity capital and is a generally accepted model for valuing securities.⁴ It is based on readily available data, simple to implement, and subject to straightforward adjustments to adapt to specific circumstances.
16. Like other approaches, DCF can be subject to error. When properly applied, however, the impact of such error on the estimated cost of equity can be minimized. For example, in the constant-growth version of the model, if an unrealistically high growth rate (g) is assumed to last in perpetuity, the estimated cost of equity will be too high. The two principal concerns, both expressed by WCTL's Mr. Crowley, are that the analyst reports used to estimate the growth rate may be biased upward, and that the model may improperly identify a high transitory growth rate as a high permanent growth rate. As I will explain, these concerns can be exaggerated.

1. Use of Biased Analyst Estimates

17. Compilations of analysts' earnings and growth projections have been widely used in applying the DCF methodology.⁵ For example, Pratt states:

A common approach to deriving a perpetual growth rate is to obtain stock analysts' estimates of earnings growth rates. The advantage of using these growth estimates is that they are prepared by people who follow these companies on an ongoing basis. These professional stock analysts develop a great deal more insight on these companies than a casual investor or valuation analyst not specializing in the industry is likely to achieve.⁶

⁴ See, for example, Brealey, Myers, and Allen, 8th Edition, p. 65; A. Kahn, *The Economics of Regulation*, The MIT Press, 1988, pp. 58-60; and S. Pratt, *Cost of Capital, Estimations and Applications*, 2nd Edition, Wiley and Sons, 2002, p.112.

⁵ The Institutional Brokers' Estimate System is a service provided by I/B/E/S that assembles analysts' estimates of future earnings for thousands of publicly traded companies. I/B/E/S data are available through Bloomberg and Thomson First Call.

⁶ S. Pratt, *Cost of Capital, Estimations and Applications*, 2nd Edition, Wiley and Sons, 2002, p. 113.

18. There is conflicting evidence in research in financial economics as to the existence of upward bias in analysts' estimates. A number of studies have reported evidence consistent with analysts' forecasts being optimistic,⁷ which could result in too high an estimate of the cost of equity under the DCF methodology. For example, Brealey, Myers, and Allen state:

Estimates of this kind are only as good as the long-term forecasts on which they are based. For example, several studies have observed that security analysts are subject to behavioral biases and their forecasts tend to be overly optimistic. If so, such DCF estimates of the cost of equity should be regarded as upper estimates of the true figure.⁸

19. Other studies have found evidence that analysts' forecasts may be biased downward, to allow for positive earnings 'surprises'.⁹ To the extent that there may be upward bias, there is also evidence that such bias is not of economic significance. In estimating bias, it is critical to consider the distribution of the forecast errors as the mean forecast error may indicate bias when the median forecast error does not. Kothari noted, "In most studies [suggesting the presence of bias] the median forecast bias is quite small (e.g., 0.01% in Lim, 1998)."¹⁰ The incentive for sell-side analysts to issue optimistic earnings forecasts is deterred by the fact that "a portion of their annual compensation and their reputation, and thus human capital, are an increasing function of forecast accuracy and a decreasing function of forecast bias."¹¹ Another study examined the optimism of analysts who had an investment-banking relationship with a company relative to those with no

⁷ See, for example, S.P. Kothari, "Capital Markets Research in Accounting," *Journal of Accounting and Economics* 31 (2001), pp. 153-154.

⁸ Brealey, Myers, and Allen, 8th Edition, p. 67.

⁹ See, for example, K. Louis *et al.*, "Analysts' Conflict of Interest and Biases in Earnings Forecasts," March 2003, NBER Working Paper 9544, which found "evidence that analysts manipulate forecasts downward so that firms are positioned for positive earnings surprises at announcement dates." As cited in Federal Reserve System [Docket No. OP-1229] Federal Reserve Bank Services Private Sector Adjustment Factor, Notice, Federal Register Vol. 70, No. 98, May 23, 2005, p. 29517.

¹⁰ S.P. Kothari, "Capital Markets Research in Accounting," *Journal of Accounting and Economics* 31 (2001), p. 155. That is, the difference between median forecast earnings and actual earnings expressed as a percentage of stock price is 0.01 percent. Kothari's reference was to a working paper by Lim. In Lim's subsequent published article, the median forecast bias was zero. T. Lim, "Rationality and Analysts' Forecast Bias," *The Journal of Finance*, vol. LVI, No. 1, February 2001.

¹¹ S.P. Kothari, "Capital Markets Research in Accounting," *Journal of Accounting and Economics* 31 (2001), p. 156.

relationship and found that the median forecast error for both groups was close to zero.¹²

20. Abarbanell and Lehavy state that “the extensive literature that investigates whether analysts’ earnings forecasts are biased and/or inefficient has produced conflicting evidence and no definitive answers to either question.”¹³ They suggest that apparent analyst bias may actually be attributable to firms’ own accounting practices. That is, the reporting choices of firms in a given quarter may “play an important role in determining analysts’ forecast errors.”¹⁴ In an earlier study, Hassell *et al.* (1988) found that management forecasts were related to subsequent analysts’ revisions.¹⁵ This result is consistent with management guiding analysts’ forecasts so that companies beat expectations.
21. There is little research in financial economics to suggest that upward bias in analysts’ forecasts would warrant abandoning the DCF method in favor of the CAPM. To offset potential bias that may remain, practitioners often use the median growth rate (or the median after eliminating the highest and lowest rate) to produce better long-term estimates of the cost of equity.¹⁶

2. Unrealistically High Temporary Growth Rate

22. The second primary concern with the DCF approach is that the near-term growth rate (g) from I/B/E/S may not be a perpetual, constant growth rate. In theory, however, there is nothing in the DCF approach that precludes using multiple growth rates. For example, a multi-stage DCF may be used, in which the current growth rate is assumed to continue for only a limited period, followed by a period

¹² A. Dugar and S. Nathan, “The Effect of Investment Banking Relationships on Financial Analysts’ Earnings Forecasts and Investment Recommendations,” *Contemporary Accounting Research*, Vol. 12, No. 1 (Fall 1995), p. 143.

¹³ J. Abarbanell and R. Lehavy, “Biased Forecasts or Biased Earnings? The Role of Reported Earnings in Explaining Apparent Bias and Over/Underreaction in Analysts’ Earnings Forecasts,” *Journal of Accounting and Economics* 36 (2003), p. 105.

¹⁴ *Id.*, p. 105.

¹⁵ J. Hassell *et al.*, “Management Earnings Forecasts: Their Usefulness as a Source of Firm-Specific Information to Security Analysts,” *Journal of Financial Research*, Winter 1988, pp. 303-319.

¹⁶ S.P. Kothari, “Capital Markets Research in Accounting,” *Journal of Accounting and Economics* 31 (2001), p. 158.

of “normal” growth.¹⁷ For example, since 1994, a two-stage DCF model has been used by the Federal Energy Regulatory Commission (“FERC”) in natural gas pipeline rate cases to take into consideration both short-run and long-run growth expectations.¹⁸ In fact, analysts rarely project “perpetual” growth rates; rather, they forecast growth over the near/middle term, which, when combined with an assumption of “normal” growth at the rate of overall economic growth thereafter, provides a basis for applying a two-stage DCF model:

Analysts are rarely prepared to stick their necks out by forecasting dividends to kingdom come, but they often forecast growth rates over the next five years, and these estimates may provide an indication of the expected long-run growth path.¹⁹

B. CAPM Approach

23. The CAPM model has been used in a number of contexts, including regulation, to estimate the cost of equity capital. It is grounded in economic theory and may appear straightforward to implement. There is, however, a well established body of research in financial economics highlighting the shortcomings of the CAPM approach to estimating the cost of capital; alternative models have been proposed by Fama-French and by Ross (Arbitrage Pricing Theory [“APT”]).²⁰ In fact, while calling CAPM a “theoretical tour de force,” Fama and French also state that “despite its seductive simplicity, the CAPM’s empirical problems probably invalidate its use in applications.”²¹ They state further:

The version of the CAPM developed by Sharpe (1964) and Lintner (1965) has never been an empirical success...in the late 1970s, research begins to uncover variables like size,

¹⁷ See, for example, Brealey, Myers, and Allen, 8th Edition, pp. 70-71.

¹⁸ See, for example, Federal Energy Regulatory Commission, *Cost-of-Service Rates Manual*, Washington, D.C., June 1999; 68 FERC ¶ 61,032, Order Affirming in Part and Reversing in Part Initial Decision, Ozark Gas Transmission System, Docket Nos. RP94-105-002 (Phase I) and RP94-105-003, July 7, 1994; and 117 FERC ¶ 61,077, Opinion No. 486, Kern River Gas Transmission Company, Docket RP04-274-000, Opinion and Order on Initial Decision, October 19, 2006.

¹⁹ Brealey, Myers, and Allen, 8th Edition, p. 66.

²⁰ S. Ross, “The Arbitrage Theory of Capital Asset Pricing,” *Journal of Economic Theory*, Vol. 13, No. 3, 1976.

²¹ E. Fama and K. French, “The Capital Asset Pricing Model: Theory and Evidence,” *Journal of Economic Perspectives*, Vol. 18, No. 3, Summer 2004, p. 44.

various price ratios and momentum that add to the explanation of average returns provided by beta. The problems are serious enough to invalidate most applications of the CAPM.²²

24. The most basic form of the CAPM includes only three components, the risk-free rate, beta, and the market risk premium. However, there are judgments to be made with respect to each of these, as well as with respect to what additional factors should be included, such as a firm size component. The choice of risk-free rate is typically between a 90-day Treasury bill yield and a long-term Treasury bond yield. While finance theory calls for a forward-looking beta, empirical implementation of the CAPM requires estimation of beta using historical data, and thereby requires judgment as to the estimation period and frequency of data. The market risk premium varies depending on the risk-free rate, the market index used (for example, the S&P 500, the NYSE composite, or some other index), the period over which market returns are measured and the use of arithmetic or geometric mean returns over that period.
25. The fact that the CAPM is highly sensitive to alternative reasonable assumptions about the risk-free rate, beta, and the market risk premium is well-recognized. In fact, this sensitivity was illustrated in an article by Bruner *et al.* that the WCTL cited in its comments on the 2005 cost-of-capital proceeding (at p. 8). In that article, the authors examine how reasonable alternative methods of calculating beta and the market premium—as well as reasonable alternative choices for the risk-free rate—can lead to dramatic variation in estimates of the cost of equity.²³ Below I reproduce this article's calculation of the cost of equity for Black & Decker, which demonstrates how betas drawn from three reputable sources (Bloomberg, Value Line, and S&P) can lead to cost of equity estimates that vary by 585 basis points.

²² E. Fama and K. French, "The Capital Asset Pricing Model: Theory and Evidence," *Journal of Economic Perspectives*, Vol. 18, No. 3, Summer 2004, p. 43

²³ R.F. Bruner *et al.*, "Best Practices in Estimating the Cost of Capital: Survey and Synthesis," *Financial Practice and Education*, Spring/Summer 1998, p. 24.

Estimates of Black & Decker Cost of Equity in 1995
(Adapted from Exhibit 9, Panel A of Bruner *et al.*)

Risk Free Rate: 5.36%, 90-Day Treasury Bill Yield

Market Risk Premium: 8.50%, Ibbotson arithmetic average since 1926

<u>Beta Service</u>	<u>Beta Estimate</u>	<u>Cost of Equity</u>
Bloomberg	1.06	14.40%
Value Line	1.65	19.40%
S&P	1.78	20.25%

26. Of course, this table demonstrates the sensitivity of the CAPM only to alternative calculations of beta. It thereby understates the full range of estimates that can be produced by reasonable assumptions regarding not only beta, but also the market premium and risk-free rate. Choice of the appropriate market risk premium has been the subject of much debate in financial economics, as noted by the source for the above table:

Even wider variations in market risk premiums can arise when one changes the historical period for averaging. Extending US stock experience back to 1802, Siegel (1992) shows that historical market premia have changed over time and were typically lower in the pre-1926 period. Carleton and Lakonishok (1985) illustrate considerable variation in historical premia using different time periods and methods of calculation even with data since 1926.²⁴

As noted above, in choosing a risk-free rate, the key question relates to the appropriate maturity of the Treasury bill or bond. While less significant in periods with a flat yield curve (such as today), this choice can have substantial consequences for the estimated cost of equity in periods where there are significant differences between short-term and long-term interest rates. For example, just three years ago this month, the spread between 90-day and 20-year Treasuries was 420 basis points.²⁵

²⁴ *Id.*, p. 22.

²⁵ In December 2003, the yield on the 3-month nominal constant maturity Treasury was 0.91 percent, while the yield on the 20-year nominal constant maturity Treasury was 5.11 percent. Board of Governors of the Federal Reserve System, Statistical Release H.15: Selected Interest Rates. Available at <http://www.federalreserve.gov/releases/h15/data.htm>.

27. While reasonable alternative implementations of the CAPM can lead to substantial variation in cost-of-equity estimates, research has also found that the three parameters of the CAPM do not fully explain the tradeoff between risk and return. The addition of other factors, such as size and book-to-market ratio, appears to explain the risk/return tradeoff more fully than relying on beta alone.²⁶ The CAPM also does not capture the relationship between the risk of a given firm's stock price and that of many other important assets apart from the overall market return (e.g., real estate and human capital) that also influence the required return.²⁷
28. These shortcomings and the need to consider other methodologies have been recognized by research in financial economics. For example:

... [the CAPM] has several unsatisfactory features, and we will look at some alternative theories. Nobody knows whether one of these alternative theories is eventually going to come out on top or whether there are other, better models of risk and return that have not yet seen the light of day.²⁸

... evidence on the CAPM is less convincing than scholars once thought. But it will be hard to reject the CAPM beyond all reasonable doubt. Since data and statistics are unlikely to give final answers, the plausibility of the CAPM theory will have to be weighed along with the empirical 'facts.'²⁹

29. Thus, while the CAPM is grounded in economic theory and may appear straightforward to implement, researchers have found that it does not fully explain the risk/return tradeoff, and that its implementation requires substantial judgment, which can have a significant effect on the resulting cost of equity.

V. RELEVANCE OF THE DECISION BY THE FEDERAL RESERVE BOARD TO ADOPT CAPM

30. In some circumstances, other regulatory authorities have decided to adopt the CAPM. In evaluating these decisions, however, the STB should carefully consider

²⁶ Brealey, Myers, and Allen, 8th Edition, pp. 194-195.

²⁷ Brealey, Myers, and Allen, 8th Edition, p. 196.

²⁸ Brealey, Myers, and Allen, 8th Edition, pp. 192-193.

²⁹ Brealey, Myers, and Allen, 8th Edition, p. 197.

the rationale for the decision and the context within which the resulting cost of equity is used. For example, a recent decision by the Board of Governors of the Federal Reserve System ("FRB") changed its methodology for estimating the cost of equity in favor of adopting a simplified version of the CAPM methodology. The FRB's previous approach was to average estimates produced by three separate models: DCF, CAPM, and Comparable Accounting Earnings ("CAE"). Given significant differences in the context in which the cost of equity is used by the FRB compared to how it is used by the STB, I do not believe that the FRB's decision should have any effect on the STB's choice of methodology. I also note that much of the commentary offered to the FRB by interested parties indicated that there is substantial disagreement regarding implementation of the CAPM. Notwithstanding its decision to adopt the CAPM, the FRB has acknowledged that the use of the CAPM in the past would have led to increased volatility in cost of equity estimates (at least partially due to fluctuations in interest rates).

31. Moreover, the FRB's decision to adopt the CAPM is not analogous to the choice facing the STB. The FRB calculates a target return on equity as part of the private-sector adjustment factor. That factor is used by the FRB to impute "the costs that would have been incurred and profits that would have been earned had the Federal Reserve Banks' priced services been provided by a private firm"³⁰ in order to set the fees for the "priced services" it provides to depository institutions. Because the cost of equity selected by the FRB does not affect its investment in the priced services it provides, it makes sense for the FRB to focus on methods that are "simple to understand, administer, and monitor"³¹ even if they may not be the best available methods. The STB's decisions, on the other hand, directly influence railroads' investment decisions, with potentially significant consequences. Thus, the stakes (relative to the value of the regulated firm) associated with the estimation process are fundamentally different in the case of the FRB and the STB.

Furthermore, the FRB faced another problem that may have influenced its choice of

³⁰ Federal Reserve System, Federal Reserve Bank Services Private Sector Adjustment Factor, Notice with request for comments, Federal Register Vol. 70, No. 98, May 23, 2005, p. 29512.

³¹ Federal Reserve System, Federal Reserve Bank Services Private Sector Adjustment Factor, Notice, Federal Register Vol. 70, No. 199, October 17, 2005, p. 60346.

the CAPM, and yet is not significant in the STB proceeding—that of identifying a relevant peer group. In implementing the CAPM, the FRB *assumes* a beta of 1.0, allowing it to avoid having to choose a peer group and calculate the historical beta specific to that group.

VI. PUBLIC POLICY CONSIDERATIONS

32. It would be poor public policy in terms of regulatory consistency to abandon a method which has been used successfully for a number of years based on careful analysis, particularly when adjustments can be made to cure perceived problems (for example, the above cited FERC approach to adjusting DCF).
33. If the STB were to abandon DCF, it must find a clearly superior alternative. But, even within the CAPM approach, there is no unanimous agreement on implementation, as noted above as well as in a number of the papers cited by the WCTL's expert, Mr. Crowley.³² Furthermore, academic researchers have put forward several alternatives to the CAPM.
34. As noted at the outset, one of the primary concerns in regulating an industry is to ensure efficient investment. Allowing greater ratemaking flexibility to railroads that are found to be revenue inadequate provides incentives for investment in new and enhanced infrastructure.
35. In the absence of compelling evidence to the contrary, I see no reason for the STB to abandon DCF in favor of the CAPM methodology for determining the cost of equity capital. If, after careful study, the STB decides to investigate alternatives to its current implementation of the DCF methodology, I would recommend that it solicit comments and proposals regarding possible further adjustments to the DCF methodology, and perhaps utilization of one or more alternatives. These could include models such as Fama-French, APT, or the CAPM, which might be used to verify the long term results generated by the DCF model.

³² See, for example, Bruner *et al.*, and Brealey, Myers, and Allen, 8th Edition.

VERIFICATION

I, R. Glenn Hubbard, hereby declare under penalty of perjury that I have read the foregoing Verified Statement, that I am familiar with the contents thereof, and that the same is true and correct to the best of my knowledge and belief.

R. Glenn Hubbard
R. Glenn Hubbard

Dated: December 06, 2006

Appendix A

ROBERT GLENN HUBBARD

Curriculum Vitae

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e-mail: rg h1@columbia.edu
<http://www.gsb.columbia.edu/faculty/ghubbard>

PERSONAL DATA

Born: September 4, 1958, in Orlando, Florida.
Marital Status: Married to Constance Pond Hubbard.
Two children, Robert Andrew Pond Hubbard
and William Charles Pond Hubbard.

FIELDS OF SPECIALIZATION

Public Economics, Corporate Finance and Financial Institutions, Macroeconomics, Industrial Organization, Natural Resource Economics, Public Policy.

EDUCATION

Ph.D., Economics, Harvard University, May 1983.
Dissertation: *Three Essays on Government Debt and Asset Markets*, supervised by Benjamin M. Friedman, Jerry A. Hausman, and Martin S. Feldstein.

A.M., Economics, Harvard University, May 1981.

B.A., B.S., Economics, University of Central Florida, June 1979, *summa cum laude*.

HONORS AND AWARDS

Fellow of the National Association of Business Economists, 2005.

William F. Butler Memorial Award, New York Association of Business Economists Award, 2005.

Exceptional Service Award, The White House, 2002.

Michelle Akers Award for Distinguished Service, University of Central Florida, 2001.

Alumni Hall of Fame, University of Central Florida, 2000.

Best Paper Award for Corporate Finance, Western Finance Association, 1998.

Exceptional Service Award, U.S. Department of the Treasury, 1992.

Distinguished Alumnus Award, University of Central Florida, 1991.

John M. Olin Fellowship, National Bureau of Economic Research, 1987-1988.

Teaching Commendations, Graduate School of Business, Columbia University.

Northwestern University Associated Student Government Teaching Awards, announced in 1985, 1986, and 1987.

Graduate Distinctions: National Science Foundation Fellowship, Alfred P. Sloan Foundation Fellowship.

Undergraduate Distinctions: National Merit Scholarship, National Society of Professional Engineers Award, Florida Society of Professional Engineers Award, National Council of Teachers of English Award, Omicron Delta Kappa, Financial Management Association Honor Society.

POSITIONS HELD

2004-present	Dean, Graduate School of Business, Columbia University
1994-present	Russell L. Carson Professor of Economics and Finance, Graduate School of Business, Columbia University
1997-present	Professor of Economics, Faculty of Arts and Sciences, Columbia University
1999-present	Co-Director, Columbia Business School Entrepreneurship Program
2004-present	Viewpoint Columnist, <i>Business Week</i>
2004-2006	Member, Panel of Economic Advisors, Congressional Budget Office
2003-present	Featured commentator, <i>Nightly Business Report</i>
2003-present	Featured commentator, <i>Marketplace</i>
2001-2003	Chairman, President's Council of Economic Advisers
2001-2003	Chairman, Economic Policy Committee, Organization for Economic Cooperation and Development
2001-2003	Member, White House National Economic Council and National Security Council
2001-2003	Member, President's Council on Science and Technology
1997-1998	Visiting Professor of Business Administration, Harvard Business School
1995-present	Visiting Scholar and Director of Tax Policy Program, American Enterprise Institute
1994-1997	Senior Vice Dean, Graduate School of Business, Columbia University
1994	MCI Fellow, American Council for Capital Formation
1994	John M. Olin Visiting Professor, Center for the Study of Economy and the State, University of Chicago
1991-1993	Deputy Assistant Secretary (Tax Analysis), U.S. Department of the Treasury
1988-present	Professor of Economics and Finance, Graduate School of Business, Columbia University
1987-1988	John M. Olin Fellow in residence at the National Bureau of Economic Research
1983-1988	Assistant Professor of Economics, Northwestern University, with half-time research appointment in the Center for Urban Affairs and Policy Research

1985	Visiting Scholar, Center for Business and Government, John F. Kennedy School of Government, Harvard University
1981-1983	Teaching Fellow (Department of Economics) and Resident Tutor in Economics (Dunster House), Harvard University

DIRECTORSHIPS AND BUSINESS ADVISORY BOARDS

2006-	Capmark Financial Corporation
2005-	Arcapita (Advisor); Chart Venture Partners (Advisor); Nomura Securities (Senior Advisor)
2004-	ADP, Inc.; Capmark; KKR Financial Corporation; BlackRock Closed-End Funds; Duke Realty Corporation; R.H. Donnelley, Inc.
2003-	ITU Ventures; Ripplewood Holdings
2000-2001	Angel Society, LLC; Information Technology University, LLC

POSTS IN NON-PROFIT ORGANIZATIONS

2006-present	Member, Board of Directors, Resources for the Future
2004-present	Trustee, Economic Club of New York
2004-present	Trustee, Fifth Avenue Presbyterian Church, New York
2004-present	Member, Advisory Board, National Center on Addiction and Substance Abuse
2003-present	Member, Manhattan District Council Board, Boy Scouts of America
2003-present	Trustee, Tax Foundation

PROFESSIONAL ACTIVITIES

1987-present	Research Associate, National Bureau of Economic Research (Monetary Economics, Corporate Finance, Public Economics, Economic Fluctuations, Industrial Organization)
2005-present	Chairman, Panel of Academic Advisors, Alliance for Competitive Taxation
2003-present	Chairman, Panel of Academic Advisors, International Tax Policy Forum
2003-present	Member, Panel of Academic Advisors, Tax Foundation
2003-present	Member, Panel of Academic Advisors, American Council for Capital Formation
2003-present	Member, Committee of Visitors, National Science Foundation
2000	Panelist, Graduate Fellowship Selection Committee, National Science Foundation
1999-2001	Director, Project on Nonprofit Organizations, National Bureau of Economic Research
1997-2001	Member, COSSA-Liaison Committee, American Economic Association
1995-2001, 2003	Visiting Scholar, American Enterprise Institute

1993-2001	Panel of Economic Advisors, Federal Reserve Bank of New York
1993-2001	Board of Advisors, Institutional Investor Project, School of Law, Columbia University
1995-1999	Member, Board of Academic Consultants, American Law Institute
1997	Member, Grants Panel for Integrative Graduate Education and Research Training Program, National Science Foundation
1994-1996	Member, Economics Grants Panel, National Science Foundation
1993-1996	Member, Federal Taxation and Finance Committee, National Tax Association
1990-1995	Co-organized research program on International Aspects of Taxation at the National Bureau of Economic Research, Cambridge, Massachusetts
1995	Member, Program Committee, American Economic Association Meeting
1983-1987	Faculty Research Fellow, National Bureau of Economic Research
1983-1986	Adjunct Faculty Research Fellow, Energy and Environmental Policy Center, John F. Kennedy School of Government, Harvard University, Cambridge, Massachusetts
1986, 1988, 1994	Member of the Brookings Panel on Economic Activity
1985, 1987	Special guest of the Brookings Panel on Economic Activity
1990-1991	Organized research program on Environmental Economics and Public Policy at the National Bureau of Economic Research, Cambridge, Massachusetts
1988-1990	Co-organized research program on Dynamic Models of Firms and Industries at the National Bureau of Economic Research, Cambridge, Massachusetts
1985-1989	Organized research program and workshops on contracting in financial markets at the Summer Institute, National Bureau of Economic Research, Cambridge, Massachusetts
1988	Organized Economic Fluctuations program on Industrial Economics and Macroeconomics, National Bureau of Economic Research, Stanford, California
1986-1988	Organized research program and workshop on links between macroeconomics and industrial organization at the Summer Institute, National Bureau of Economic Research, Cambridge, Massachusetts
1991	Member, Program Committee, Econometric Society Winter Meetings
1982-1983	Member, Energy Modeling Forum VII Study Group, Stanford University, Stanford, California
1981-present	Consultant on research projects with private corporations and government and international agencies, including the Internal Revenue Service, Social Security Administration, U.S. Department of Energy, U.S. Department of State, U.S. Department of Treasury, and U.S. International Trade Commission; National Science Foundation; The World Bank; Board of Governors of the Federal Reserve System; Federal Reserve Bank of New York; Congressional Budget Office
Member:	American Economic Association, American Finance Association, Association for Public Policy and Management, Econometric Society, International Association of Energy Economists, National Tax Association, the Royal Economic Society, and the Institute for Management Science

- Referee:** *American Economic Review; Canadian Journal of Economics; Columbia Journal of World Business; Econometrica; Economic Journal; Energy Economics; Energy Journal; International Finance; International Tax and Public Finance; Journal of Business; Journal of Business and Economic Statistics; Journal of Economic History; Journal of Economic Literature; Journal of Finance; Journal of Financial Economics; Journal of Financial Intermediation; Journal of Financial and Quantitative Analysis; Journal of Financial Services Research; Journal of Industrial Economics; Journal of International Money and Finance; Journal of Law and Economics; Journal of Macroeconomics; Journal of Money, Credit, and Banking; Journal of Monetary Economics; Journal of Political Economy; Journal of Public Economics; Journal of Regulatory Economics; Journal of Small Business Finance; Management Science; National Tax Journal; Quarterly Journal of Economics; Quarterly Review of Economics and Finance; RAND Journal of Economics; Review of Economic Dynamics; Review of Economic Studies; Review of Economics and Statistics; Review of Financial Economics; Scandinavian Journal of Economics; Southern Economic Journal; National Science Foundation; C.V. Starr Center for Applied Economics (New York University); Addison-Wesley Publishing Company; Ballinger Press; Cambridge University Press; Harvard Business School Press; MIT Press; W.W. Norton; Oxford University Press*
- Associate Editor:** *Journal of Macroeconomics; Journal of Small Business Finance; International Finance*
- Former Associate Editor:** *Journal of Industrial Economics, Federal Reserve Bank of New York Economic Policy Review; International Tax and Public Finance; National Tax Journal*

PUBLICATIONS AND PAPERS

Edited Volumes

- Transition Costs of Fundamental Tax Reform* (with K.A. Hassett), Washington, DC: AED Press, 2001
- Inequality and Tax Policy* (with K.A. Hassett), Washington, DC: AEI Press, 2001
- Effects of Taxation on Multinational Corporations* (with M. Feldstein and J.R. Hines), Chicago: University of Chicago Press, 1995.
- Taxing Multinational Corporations* (with M. Feldstein and J. R. Hines), Chicago: University of Chicago Press, 1995.
- Studies in International Taxation* (with A. Giovannini and J. B. Slemrod), Chicago: University of Chicago Press, 1993.
- Financial Markets and Financial Crises*, Chicago: University of Chicago Press, 1991.
- Asymmetric Information, Corporate Finance, and Investment*, Chicago: University of Chicago Press, 1990.

Books

- Healthy, Wealthy, and Wise* (with J.F. Cogan and D.P. Kessler), Washington AEI Press, 2005.

Textbooks

- Principles of Economics* (with A.P. O'Brien), Prentice Hall, 2006.
- Money, the Financial System, and the Economy*, Reading: Addison-Wesley Publishing Company, 1st ed., 1994; 2nd ed., 1997; 3rd ed., 2000; 4th ed., 2002; 5th ed., 2004; 6th ed., 2007, forthcoming.

Publications**Articles**

- "To Bundle or Not to Bundle: Froms' Chorus Under Pine Building" (with A. Saha and J. Lee), *International Journal of the Economics of Business*, forthcoming.
- "Entrepreneurship and Household Saving." (with W.M. Gentry), *Advances in Economic Analysis and Policy*, forthcoming.
- "The Effects of Progressive Income Taxation on Job Turnover." (with W.M. Gentry), *Journal of Public Economics*, forthcoming.
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- "The Effect of the Tax Reform Act of 1986 on the Location of Assets in Financial Services Firms" (with R. Altshuler), *Journal of Public Economics*, 87 (January 2003):109-127.
- "The Role of Nonprofit Endowments" (with R. Fisman), in E. Glaeser, ed., *The Governance of Not-For-Profit Organizations*, Chicago: University of Chicago Press, 2003.
- "Are There Bank Effects in Borrowers' Costs of Funds?: Evidence from a Matched Sample of Borrowers and Banks" (with K.N. Kuttner and D.N. Palia), *Journal of Business* 75 (October 2002): 559-581.
- "Are Dividend Taxes and Imputation Credits Capitalized in Share Values?" (with T.S. Harris and D. Kemsley), *Journal of Public Economics* 79 (March 2001): 569-596.
- "Tax Policy and Entrepreneurial Entry" (with W.M. Gentry), *American Economic Review* 90 (May 2000): 283-287.
- "Understanding the Determinants of Managerial Ownership and the Link Between Ownership and Performance" (with C.P. Himmelberg and D. Palia), *Journal of Financial Economics* 53 (1999): 353-384.
- "A Reexamination of the Conglomerate Merger Wave in the 1960s" (with D. Palia), *Journal of Finance* 54 (June 1999): 1131-1152.
- "Inflation and the User Cost of Capital: Does Inflation Still Matter?" (with D. Cohen and K.A. Hassett), in M. Feldstein, ed., *The Costs and Benefits of Achieving Price Stability*, Chicago: University of Chicago Press, 1999.
- "Are Investment Incentives Blunted by Changes in Prices of Capital Goods?: International Evidence" (with K.A. Hassett), *International Finance* 1 (October 1998): 103-125.
- "Capital-Market Imperfections and Investment," *Journal of Economic Literature* 36 (March 1998): 193-225.
- "Fundamental Tax Reform and Corporate Financial Policy" (with W.M. Gentry), in J.M. Poterba, ed., *Tax Policy and the Economy*, volume 12, Cambridge: MIT Press, 1998.
- "Distributional Implications of Introducing a Broad-Based Consumption Tax" (with W.M. Gentry), in J.M. Poterba, ed., *Tax Policy and the Economy*, volume 11, Cambridge: MIT Press, 1997.
- "How Different Are Income and Consumption Taxes?," *American Economic Review* 87 (May 1997): 138-142.

- "Tax Policy and Investment," (with K.A. Hassett), in A.J. Auerbach, ed., *Fiscal Policy: Lessons from Economic Research*, Cambridge: MIT Press, 1997.
- "Assessing the Effectiveness of Saving Incentives" (with J. Skinner), *Journal of Economic Perspectives* 10 (Fall 1996): 73-90.
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- "Tax Reforms and Investment: A Cross-Country Comparison" (with J.G. Cummins and K.A. Hassett), *Journal of Public Economics* 62 (1996): 237-273.
- "Benefits of Control, Managerial Ownership, and the Stock Returns of Acquiring Firms" (with D. Palia), *RAND Journal of Economics* 26 (Winter 1995): 782-792.
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- "A Reconsideration of Investment Behavior Using Tax Reforms as Natural Experiments" (with J.G. Cummins and K.A. Hassett), *Brookings Papers on Economic Activity* (1994:2): 1-59.
- "Precautionary Saving and Social Insurance" (with J. Skinner and S. Zeldes), *Journal of Political Economy* 105 (April 1995): 360-399.
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- "Corporate Financial Policy, Taxation, and Macroeconomic Risk" (with M. Gertler), *RAND Journal of Economics* 24 (Summer 1993): 286-303.
- "Internal Net Worth and the Investment Process: An Application to U.S. Agriculture" (with A. Kashyap), *Journal of Political Economy* 100 (June 1992): 506-534.
- "Long-Term Contracting and Multiple-Price Systems" (with R. Weiner), *Journal of Business* 65 (April 1992): 177-198.
- "Efficient Contracting and Market Power: Evidence from the U.S. Natural Gas Industry" (with R. Weiner), *Journal of Law and Economics* 34 (April 1991): 25-67.

"Interest Rate Differentials, Credit Constraints, and Investment Fluctuations" (with M. Gertler and A. Kashyap), in R.G. Hubbard, ed., *Financial Markets and Financial Crises*, Chicago: University of Chicago Press, 1991.

"Taxation, Corporate Capital Structure, and Financial Distress" (with M. Gertler), in L.H. Summers, ed., *Tax Policy and the Economy*, volume 4, Cambridge: MIT Press, 1990.

"Firm Heterogeneity, Internal Finance, and Credit Rationing" (with C. Calomiris), *Economic Journal* 100 (March 1990): 90-104.

"Coming Home to America: Dividend Repatriations in U.S. Multinationals" (with J. Hines), in A. Razin and J.B. Slemrod, eds., *Taxation in the Global Economy*, Chicago: University of Chicago Press, 1990.

"Price Flexibility, Credit Availability, and Economic Fluctuations: Evidence from the U.S., 1894-1909" (with C. Calomiris), *Quarterly Journal of Economics* 104 (August 1989): 429-452.

"Financial Factors in Business Fluctuations" (with M. Gertler), in Federal Reserve Bank of Kansas City, *Financial Market Volatility—Causes, Consequences, and Policy Responses*, 1989.

"Contracting and Price Adjustment in Commodity Markets: Evidence from Copper and Oil" (with R. Weiner), *Review of Economics and Statistics* 71 (February 1989): 80-89.

"Financing Constraints and Corporate Investment" (with S. Fazzari and B.C. Petersen), *Brookings Papers on Economic Activity*, 1988:1: 141-195; Reprinted in Z.J. Acs, ed., *Small Firms and Economic Growth*, Cheltenham, U.K.: Edward Elgar Publishing Ltd., 1995.

"Investment, Financing Decisions, and Tax Policy" (with S. Fazzari and B.C. Petersen), *American Economic Review* 78 (May 1988): 200-205.

"Market Structure and Cyclical Fluctuations in U.S. Manufacturing" (with I. Domowitz and B.C. Petersen), *Review of Economics and Statistics* 70 (February 1988): 55-66.

"Capital Market Imperfections and Tax Policy Analysis in the Life-Cycle Model" (with K. Judd), *Annales d' Economie et de Statistique* 9 (January-March 1988): 111-139.

"Social Security and Individual Welfare: Precautionary Saving, Borrowing Constraints, and the Payroll Tax" (with K. Judd), *American Economic Review* 77 (September 1987): 630-646.

"Oligopoly Supergames: Some Empirical Evidence on Prices and Margins" (with I. Domowitz and B.C. Petersen), *Journal of Industrial Economics* 36 (June 1987): 379-398.

"Uncertain Lifetimes, Pensions, and Individual Saving," in Zvi Bodie, John B. Shoven, and David A. Wise (eds.), *Issues in Pension Economics*, Chicago: University of Chicago Press, 1987, pp. 175-205.

"The Farm Debt Crisis and Public Policy" (with C. Calomiris and J. Stock), *Brookings Papers on Economic Activity*, 1986:2: 441-479.

"Liquidity Constraints, Fiscal Policy, and Consumption" (with K. Judd), *Brookings Papers on Economic Activity*, 1986:1: 1-50.

"The Intertemporal Stability of the Concentration-Margins Relationship" (with I. Domowitz and B.C. Petersen), *Journal of Industrial Economics* 35 (September 1986): 13-34.

"Pension Wealth and Individual Saving: Some New Evidence," *Journal of Money, Credit, and Banking* 18 (May 1986): 167-178.

"Supply Shocks and Price Adjustment in the World Oil Market," *Quarterly Journal of Economics* 101 (February 1986): 85-102.

"Regulation and Long-Term Contracts in U.S. Natural Gas Markets" (with R. Weiner), *Journal of Industrial Economics* 35 (September 1986): 51-71.

"Business Cycles and the Relationship Between Concentration and Price-Cost Margins" (with I. Domowitz and B.C. Petersen), *RAND Journal of Economics* 17 (Spring 1986): 1-17.

"Inventory Optimization in the U.S. Petroleum Industry: Empirical Analysis and Implications for Energy Emergency Policy" (with R. Weiner), *Management Science* 32 (July 1986): 773-790.

"Social Security, Liquidity Constraints, and Pre-Retirement Consumption," *Southern Economic Journal* 51 (October 1985): 471-484.

"Personal Taxation, Pension Wealth, and Portfolio Composition," *Review of Economics and Statistics* 67 (February 1985): 53-60.

"Industry Margins and the Business Cycle: Some New Microeconomic Evidence" (with I. Domowitz and B.C. Petersen), *Economics Letters* 19 (1985): 73-77.

"Oil Supply Shocks and International Policy Coordination" (with R. Weiner), *European Economic Review* 30 (February 1986): 91-106.

"Do IRAs and Keoghs Increase Saving?," *National Tax Journal* 37 (March 1984): 43-54.

The Financial Impacts of Social Security: A Study of Effects on Household Wealth Accumulation and Allocation, in *Monograph Series in Finance and Economics*, New York University, 1983.

Writings on Public Policy

"Overview of the Japanese Deficit Question," (with Takatoshi Ito), forthcoming.

"The U.S. Current Account Deficit and Public Policy," *Journal of Policy Modeling*, forthcoming.

"Making Markets Work," (with J.F. Cogan and D.P. Kessler), *Health Affairs* 24 (November/December 2005): 1447-1457.

How Capital Markets Enhance Economic Performance and Facilitate Job Creation (with W.C. Dudley), New York: Goldman Sachs Markets Institute, 2004.

"Would a Consumption Tax Favor the Rich?" In A.J. Auerbach and K.A. Hassett, eds., *Toward Fundamental Tax Reform*. Washington, DC: AEI Press, 2005.

"The Economist as Public Intellectual," *Journal of Economic Education* 35 (Fall 2004): 391-394.

"Success Taxes, Entrepreneurship, and Innovation," (with W.M. Gentry), in *Innovation and the Economy*, volume 5, forthcoming.

"Tax Policy and International Competitiveness," *Taxes-The Tax Magazine* (March 2004):233-241.

"Capital-Market Imperfections, Investment, and the Monetary Transmission Mechanism," in Heinz Hermann, ed., *Investing for the Future*. Frankfurt: Deutsche Bundesbank, 2001.

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"Tax Policy and Entry into Entrepreneurship" (with W.M. Gentry), Mimeograph, Columbia University, 2001.

"Tax Policy and Wage Growth" (with W. M. Gentry), Mimeograph, Columbia University, 2001.

"Investor Protection, Ownership, and Investment" (with C.P. Himmelberg and I. Love), Mimeograph, Columbia University, 2000.

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"Noncontractible Quality and Organizational Form in the U.S. Hospital Industry," (with K.A. Hassett), Mimeograph, Columbia University, 1999.

"Corporate Payouts and the Tax Price of Corporate Retentions: Evidence from the Undistributed Profits Tax of 1936-37" (with P. Reiss), Working Paper No. 3111, National Bureau of Economic Research, September 1989.

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"Finite Lifetimes, Borrowing Constraints, and Short-Run Fiscal Policy" (with K. Judd), Working Paper No. 2158, National Bureau of Economic Research, 1987.

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"Institutional Investors, Boards of Directors, and Corporate Governance," Korn/Ferry, 1997.

"An Economic Analysis of Saving Incentives," Securities Industry Association, 1994, with Jonathan Skinner.

"Securities Transactions Taxes: Tax Design, Revenue, and Policy Considerations," Catalyst Institute, 1993.

"Precautionary Saving in the U.S. Economy," Bradley Foundation, 1989-1990, with Jonathan Skinner and Stephen Zeldes.

"Taxation, Corporate Leverage, and Financial Distress," Garn Institute for Finance, 1989-1990.

"Precautionary Saving in a Dynamic Model of Consumption and Labor Supply," National Science Foundation (Economics Group SES-8707997), 1987-1989, with Jonathan Skinner and Stephen Zeldes.

"Industrial Behavior and the Business Cycle: A Panel Data Study of U.S. Manufacturing," National Science Foundation (Economics Group SES-8420152), 1985-1987, with Ian Domowitz and Bruce Petersen.

"Efficient Contracting and Market Power: Evidence from the U.S. Natural Gas Market," Transportation Center, Northwestern University, Summer 1985.

"Constructing a Panel Data Base for Studies of U.S. Manufacturing," University Research Grants Committee, Northwestern University, 1985-1986.

"Economic Analysis of Multiple-Price Systems: Theory and Application," National Science Foundation (Regulatory Analysis and Policy Group, SES-8408805), 1984-1985.

"Contracting and Price Adjustment in Product Markets," University Research Grants Committee, Northwestern University, 1983-1984.

PAPERS PRESENTED

University Seminars

Bard College, University of Bergamo, University of California (Berkeley), University of California (Los Angeles), Carleton, University of Chicago, Columbia, University of Dubuque, Emory, University of Florida, University of Central Florida, Florida Atlantic University, George Washington, Georgetown, Harvard, Hendrix College, University of Illinois, Indiana University, Johns Hopkins, Laval, Lehigh, University College (London), University of Kentucky, London School of Economics, MIT, University of Maryland, Miami University, University of Michigan, University of Minnesota, New York University, Northwestern, Oxford, University of Pennsylvania, Princeton, Rice, University of Rochester, Stanford, Syracuse, University of Miami, University of Texas, Texas Tech University, Tufts, University of Virginia, University of Wisconsin (Madison), University of Wisconsin (Milwaukee), Virginia Tech, and Yale.

Conference Papers Presented

American Council for Capital Formation, Washington, DC, June 1994.

American Economic Association, Boston, 2006; Philadelphia, 2005; San Diego January 2004; Atlanta, January 2002; New Orleans, January 2001; Boston, January 2000; New York, January 1999; New Orleans, January 1997; San Francisco, January 1996; Washington, D.C., January 1995; Boston, January 1994; Anaheim, January 1993; Washington D.C., December 1990; Atlanta, December 1989; New York, December 1988; Chicago, December 1987; New Orleans, December 1985; Dallas, December 1984.

American Enterprise Institute, Conference on Corporate Taxation, 2006; Conference on Multinational Corporations, 2004, 2003; Conference on Multinational Corporations, February 1999; Conference on Income Inequality, January 1999; Conference on Transition Costs of Fundamental Tax Reform, November 1998; Conference Series on Social Insurance Reform, 1997-1998; Conference Series on Fundamental Tax Reform, 1995-1998; Conference on Distributional Analysis of Tax Policies, Washington, D.C., December 1993.

American Finance Association, San Diego, January 2004; Boston, January 2000; New York, January 1999; New Orleans, January 1997.

Association of Environmental and Resource Economists, Dallas, December 1984; San Francisco, December 1983.

Association of Public Policy Analysis and Management, New Orleans, October 1984; Philadelphia, October 1983.

Bipartisan Commission on Entitlement and Tax Reform, Washington, DC, June 1994.

Brookings Panel on Economic Activity, September 1994, April 1988, September 1987, September 1986, April 1986, September 1985.

Centre for Economic Policy Research Conference on Capital Taxation and European Integration, London, September 1989.

Conference on International Perspectives on the Macroeconomic and Microeconomic Implications of Financing Constraints, Centre for Economic Policy Research, Bergamo, Italy, October 1994.

Congressional Research Service Conference for New Members of Congress, Williamsburg, January 1999.

Congressional Research Service Conference for Members of the Ways and Means Committee, Baltimore, October 2001.

Deutsche Bundesbank Conference on Investing for the Future, Frankfurt, Germany, May 2000.

Eastern Economic Association, Boston, March 1988; Boston, February 1983.

Econometric Society, New Orleans, January 1997; San Francisco, January 1996; Washington, D.C., January 1995; New Orleans, January 1992; Washington, December 1990; Atlanta, December 1989; New York, December 1988; Chicago, December 1987; New Orleans, December 1986; New York, December 1985; Boston, August 1985; Madrid, September 1984; San Francisco, December 1983; Pisa, August 1983.

Energy Modeling Forum, Stanford University, August 1983; February 1983; August 1982.

European Commission, Conference on Taxation of Financial Instruments, Milan, June 1998.

European Institute for Japanese Studies, Tokyo, September 2002, March 2002.

Federal Reserve Bank of Boston, Annual Economic Conference, North Falmouth, Massachusetts, June 1995.

Federal Reserve Bank of Kansas City Symposium on "Financial Market Volatility – Causes, Consequences, and Policy Responses," Jackson Hole, Wyoming, August 1988; Comment of Rogoff, August 2004.

Federal Reserve Bank of New York, Conference on Consolidation of the Financial Services Industry, New York, March 1998.

Federal Reserve Bank of Philadelphia Conference on Economic Policy, Philadelphia, November 2001.

Federal Reserve Bank of St. Louis, Conference on Economic Policy, St. Louis, October 1994.

Harvard Law School U. S.-Japan Symposium, Tokyo, December 2003; Washington, D. C., September 2002; Tokyo, December 2001.

Hoover Institution, Conference on Fundamental Tax Reform, December 1995.

The Institute of Gas Technology, Washington, DC, May 1982.

The Institute of Management Science/Operations Research Society of America, Orlando, November 1983; Chicago, April 1983.

International Association of Energy Economists, Boston, November 1986; Philadelphia, December 1985; Bonn, June 1985; San Francisco, November 1984; Washington, DC, June 1983; Denver, November 1982; Cambridge (England), June 1982; Houston, November 1981.

International Conference on the Life Cycle Model, Paris, June 1986.

International Institute of Public Finance, Innsbruck, August 1984.

International Seminar on Public Economics, Amsterdam, April 1997.

National Academy of Sciences, February 1997.

National Association of Business Economists, Orlando, September 2003; Washington, September 2002; New York, September 2001; Boston, September 1996; Dallas, September 1992; New Orleans, October 1987.

National Bureau of Economic Research - IMEMO Conference on the American Economy, Moscow, August 1989.

National Bureau of Economic Research Summer Institute, August 2005; July-August 2003; July-August 2000; July-August 1999; July-August 1998; August 1997; July 1995; July 1994; July 1993; August 1992; July-August 1991; July-August 1990; July-August 1989; July-August 1988; July-August 1987; July-August 1986; July 1985; July 1984; July 1983.

National Bureau of Economic Research Conference on Asymmetric Information, Corporate Finance, and Investment, Cambridge, May 1989.

National Bureau of Economic Research Conference on Chinese Economic Reform, Shanghai, China, July 2000.

National Bureau of Economic Research Conference on Financial Crises, Key Biscayne, March 1990.

National Bureau of Economic Research Conference on Government Expenditure Programs, Cambridge, November 1986.

National Bureau of Economic Research Conference on Indian Economic Reform, Rajasthan, India, December 1999.

National Bureau of Economic Research Conference on Innovation Policy, Washington, DC, April 2004, April 2003.

National Bureau of Economic Research Conference on International Taxation, Washington, DC, April 1994; Cambridge, January 1994; New York, September 1991; Nassau, Bahamas, February 1989.

National Bureau of Economic Research, Macroeconomic Annual Conference, Cambridge, MA, April 2004.

National Bureau of Economic Research Conference on Macroeconomics and Industrial Organization, Cambridge, July 1988; Cambridge, July 1987; Cambridge, July 1986; Chicago, November 1985.

National Bureau of Economic Research Conference on Nonprofit Organizations, Cheeca Lodge, January 2002; Cambridge, October 2001.

National Bureau of Economic Research Conference on Pensions, Baltimore, March 1985; San Diego, April 1984.

National Bureau of Economic Research Conference on Productivity, March 1988; March 1987.

National Bureau of Economic Research Conference on Public Economics, Cambridge, April 1999, April 1994, April 1993, November 1991, April 1991, March 1988, November 1987, March 1987.

National Bureau of Economic Research Conference on Tax Policy and the Economy, Washington, DC, October 2001, November 1998, November 1996, November 1994, November 1991, November 1989.

National Bureau of Economic Research Trans-Atlantic Public Economics Seminar, London, May 2002; Gerzensee, May 2000; Turin, May 1994.

Organization for Economic Cooperation and Development, Economic Policy Committee Meeting, Paris, November 2002, April 2002, November 2001, April 2001.

National Tax Association/Tax Institute of America, Washington, DC, June 2000; Atlanta, October 1999; Arlington, May 1992; Seattle, October 1983.

Organization for Economic Cooperation and Development, Ministerial Meeting, Paris, May 2002, May 2001.

Princeton Center for Economic Policy Conference, October 2000, October 1995.

Sveriges Riksbank/Stockholm School of Economics Conference on Asset Markets and Monetary Policy, Stockholm, Sweden, June 2000.

U.S. House of Representatives, Budget Committee, June 2001.

U.S. House of Representatives, Committee on Ways and Means, Washington, DC, June 2006; June 2005; June 1999; April 1997, June 1996, July 1992.

U.S. Joint Economic Committee, Washington, DC, February 2003, October 2002, October 2001, May 2001.

U. S. Senate Committee on Banking, Housing, and Urban Affairs, Washington, DC, October 2001, May 2001.

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U. S. Senate Committee on Commerce, Science, and Technology, July 2002.

U.S. Senate Committee on Finance, Washington, DC, February 2003, February 2002, February 1997, January 1995, January 1992, December 1981.

TESTIMONY AS AN EXPERT WITNESS 2002-2006

Joe Comes et al., v. Microsoft Corporation. Retained by counsel for Microsoft Corporation, and deposed on September 5, 2006

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Florida State Board of Administration v. Alliance Capital Management L.P. Retained by counsel for Alliance Capital Management, and provided deposition testimony in 2004 and trial testimony in 2005.

CERTIFICATE OF SERVICE

I hereby certify that on this 8th day of December, 2006, I caused a copy of the foregoing
Comments of the Association of American Railroads to be served by first class mail, postage
prepaid or more expeditious method of delivery, on the following:

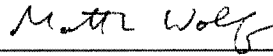
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