STATE OF ALASKA

THE REGULATORY COMMISSION OF ALASKA

Before Commissioners:

Robert M. Pickett, Chair
Stephen McAlpine
T.W. Patch
Norman Rokeberg
Janis W. Wilson

In the Matter of the Tariff Revision Designated as TA 148-122, filed by MUNICIPALITY OF ANCHORAGE d/b/a ANCHORAGE WATER AND WASTEWATER UTILITY, for its Water Utility, for Interim and Permanent Rate Relief	U-13-201
In the Matter of the Tariff Revision Designated as TA 147-126, filed by MUNICIPALITY OF ANCHORAGE d/b/a ANCHORAGE WATER AND WASTEWATER UTILITY, for its Wastewater Utility, for Interim and Permanent Rate Relief	U-13-202

PREFILED REPLY TESTIMONY OF BENTE VILLADSEN

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I. INTRODUCTION AND SUMMARY

Q1. Please state your name, occupation and business address.

A. My name is Bente Villadsen and I am a principal at The Brattle Group (Brattle). My business address is The Brattle Group, 44 Brattle Street, Cambridge, MA 02138, USA.

Q2. Did you submit Pre-filed Supplemental Testimony in this proceeding?

A. Yes. I filed pre-filed supplemental testimony in this proceeding on September 19, 2014. I reviewed the pre-filed direct testimony of Dr. Thomas M. Zepp (Zepp Testimony) submitted on behalf of Anchorage Water and Wastewater Utility (AWWU) as well other materials filed in this docket to (i) provide a recommendation regarding the reasonableness of the recommendations of the Zepp Testimony regarding the return on equity (ROE) and capital structure and (ii) comment on any issues in the Zepp Testimony, where I might have performed a different or supplemental analysis. I also adopted the pre-filed testimony of Dr. Zepp except where I specifically called out differences.

Q3. What is the purpose of your rebuttal testimony?

A. I have been asked by Anchorage Water and Wastewater Utility (AWWU) to respond to the pre-filed direct testimony of Mr. David C. Parcell (Parcell Testimony) on behalf of the Office of the Attorney General Regulatory Affairs and Public Advocacy Section (RAPA). I have also been asked to review and, if applicable, comment on responses from RAPA to information requests as they pertain to Mr. Parcell's ROE and cost of capital recommendations or procedures for Anchorage Water Utility (AWU) and Anchorage Wastewater Utility (ASU) (sometimes collectively referred to as the "Companies").

Q4. What do you discuss below?

A. In Section II, I discuss the development in interest rates since the original filings in these proceedings and since Mr. Parcells' testimony was filed. Section III discusses the specific risk of AWU and ASU. Specifically, I address the merit of the hypothetical capital structure proposed by AWWU and opposed by Mr. Parcell given (i) the low equity percentage in AWU's and ASU's actual capital structure, (ii) the much higher equity percentage in the comparable companies' capital structure, and (iii) AWU and ASU's need to finance capital projects and maintain solid financials. I also discuss the impact of financial leverage or risk on the cost of equity for AWU and ASU. Further, this section discusses why Mr. Parcell's heavy reliance on bond ratings is inappropriate since they measure default risk rather than shareholders' equity risk. I also discuss how such ratings have been used in the past by the Federal Energy Regulatory Commission and this Commission. Finally, this section discusses why the Plant Replacement and Improvement Surcharge Mechanism (PRISM) that has recently been allowed in Alaska and relied upon by Mr. Parcell are unlikely to impact AWU's and ASU's risk profile. Section IV first discusses the "roadmap" in Order 10 and Mr. Parcell's implementation thereof. It also discusses how economic and financial factors that impact cost of equity estimation have changed since the "roadmap" was issued. The second part of Section IV discusses my disagreement with Mr. Parcell's implementation of the cost of equity estimation methods and focuses on why the implementation downward biases the estimated ROE. Finally, Section V is the conclusion.

I continue to recommend that AWU and ASU for ratemaking purposes use a hypothetical capital structure including 52% equity (and 48% debt) and be allowed to earn an ROE in the high end of that estimated for the comparable companies on 52% equity.

II. CHANGES IN INTEREST RATES

Q5. How have interest rates changed during the course of this proceeding?

A. Interest rates declined from the time Dr. Zepp originally filed his testimony, on November 14, 2013, to the date of Mr. Parcell's testimony, filed January 29, 2015, and have recently increased slightly. Table 1 below shows the development in interest rates from August 2013, the timeframe for Dr. Zepp's pre-filed Direct Testimony, to today, March 2015. Realized yields on 10-year treasury bonds as well as A-rated utility bonds have declined, but are higher than at the time of Mr. Parcell's testimony. At the same time, forecast yields are expected to increase.

Table 1: Actual and Forecast Bond Yields at Selected Dates

Date		*30 Year Treasury*	*10 Year Treasury*	*A-Rated Utility Bonds*
Zepp Testimony Filing	8/23/2013	3.79	2.75	4.76
Villadsen Testimony Filing	9/19/2014	3.29	2.55	4.27
Parcell Testimony Filing	1/29/2015	2.40	1.81	3.52
Current	3/10/2015	2.70	2.10	3.78
Forecast	2016-2020	N/A	4.26	N/A

Sources and notes:
Historical numbers from Bloomberg as of 3/10/2015
Forecasts from October 2014 Blue Chip Economic Indicators
Fifteen day average interest rate leading to each date

Q6. Does the change in interest rates justify a modification in your recommended ROE?

A. The response to that question has two elements. First, the cost of capital is *the expected rate of return* in capital markets on alternative investments of equivalent risk. Thus, the cost of capital is forward looking and determined *ex ante*, so that at any given point in time the cost of equity is best estimated by the rate of return that investors would *expect* to earn elsewhere without bearing more risk. Therefore, the estimates provided at the time of filing provide the cost of capital as of that date for a period to come. Changing the cost of equity estimate because interest rates have changed during the course of these rate cases is the same as determining the cost of capital *ex post* and thereby violating the forward looking principle of

setting the cost of capital. Yet, Mr. Parcell ignored the interest rate at the time of filing and the expected interest rate.

Second, rates for AWU and ASU are expected to be in place for the present onward, so a part of the period for which the cost of equity is being estimated is still to come. Therefore, the cost of equity for that period may merit reconsideration. Looking to the development in the yield on 10-year treasury bonds, it has declined by about 65 basis points and the yield on A-rated utility bonds has declined by a little less than 100 basis points. At the time of Dr. Zepp's testimony, Blue Chip forecasted the government bond yield for 2015-16 at 4.2-4.8% and the Aaa-rated corporate bonds at 4.9-5.5%.[1] Today, Blue Chip forecasts the 2015-16 10-year yields at 2.4 – 3.2% and the Aaa corporate bond for 2015 at 5.2%.[2] Thus, the 1-2 year ahead 10-year government bond yield forecast has been reduced while the Aaa corporate bond yield has remained flat and is forecasted to increase substantially to about 5.2%.[3] As a result and based on the development in government bond yields, the recommendation today would plausibly be slightly reduced from what it was when pre-filed direct testimony was filed by AWWU in this proceeding. Because the cost of equity does not change one-for-one with interest rates, the reduction in ROE would not be as large as the reduction in interest rates.[4] A conservative estimate of the impact on the cost of equity is that it may have declined by 25 to 40 basis points using the actual decline in government bond yields for a plausible range estimate of 10.5 to 10.65% and a midpoint of about 10.6% going forward. As this estimate gives no weight to the fact that

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1 Zepp Pre-filed Direct Testimony, Exhibit TMZ-02, Page 11, Table 10. Moody's Aaa rating is roughly equivalent to S&P's AAA rating.

2 Blue Chip Economic Indicators, February 2015 and Blue Chip Economic Indicators, December 2014.

3 *Ibid*.

4 Roger A. Morin, "*New Regulatory Finance*," 2006, Chapter 4 provides evidence that the cost of equity drop by .4 to 0.5% when government bond yields drop by 1.0%.

corporate bond yields have not declined, the estimate is more likely to over-estimate rather than under-estimate the decline in ROE.

III. THE COMPANY IS NOT LESS RISKY THAN THE SAMPLE

A. CREDIT RATING IMPACT

Q7. Does having an AA-rated credit rating imply that AWU and ASU are materially less risky than the sample companies which are mostly A-rated?

A. Not necessarily. Mr. Parcell concludes that AWU and ASU must be less risky primarily because their credit ratings are AA compared to an average for the sample of about A.[5] Thus, AWU, ASU and the comparable companies have high credit ratings that are well above non-investment grade. Further, as RAPA acknowledges, bond ratings are measures of default risk.[6] Thus, the credit rating is the risk of default to the bonded debt only, not all debt. For example, it does not apply to the State loan debt or any general debt of the utilities to their vendors. The bonded debt is akin to secured versus unsecured debt and gets paid before the non-bonded debt, having a claim to the revenue ahead of any subordinated or other unsecured debt. Neither does it apply to equity holders, who are last in line. The risk profile as an equity holder looks much different than it does to a bonded debt holder and the bond rating says little about how the risks look from the bottom of the payment waterfall. A better measure of the risk of a company's equity is its beta measure, not its credit rating.

Q8. How about the claim that the FERC uses credit ratings as a primary measure of relative risk?

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[5] Parcell Pre-filed Testimony Q26-Q27, page 26; Exhibit BV-07: Response to AG-1-42.

[6] Exhibit BV-07: Response to AG-1-42 (a).

A. Mr. Parcell states that the FERC "routinely employs credit ratings as a primary measure of relative risk among electric and pipeline utilities."[7] While it is correct that the FERC has used bond ratings as one of its screening criteria when selecting samples for the estimation of electric cost of equity and in the past has linked bond ratings and the risk that shareholders receive their return, it does not use bond ratings to screen pipeline proxy groups.[8] Despite Mr. Parcell's statement that FERC "routinely" uses credit ratings as a primary measure of risk for pipeline utilities, he did not identify a single pipeline decision supporting his statement.[9] Also, it is a stretch to say that FERC *routinely* uses credit ratings as a *primary measure of relative risk* even for electric utilities. First, the FERC has in the past clearly stated that credit ratings are *one of several measures of relative risk*[10] and that it uses "as much information as possible regarding the business activities of each firm they [parties to the filing] propose to include in the proxy group."[11] Thus, the FERC does not specify credit ratings as the sole or primary measure of relative risk, but only as *one measure*.[12] Second, FERC Opinion 524-A is instructive. In that case, the FERC found that Portland Natural Gas Transmission System's *non-investment grade credit rating* (and regulatory risk) merited an increased ROE relative to the median of the sample.[13] Thus, the emphasis was on the effect of a non-investment grade credit rating rather than a comparison of

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7 Parcell Pre-filed Testimony Q28, page 27.

8 FERC Opinions 524, 524-A, 486-B and the Initial Decision in Docket RP10-729-000. The initial decision makes clear that proxy companies without ratings (TP Pipelines, whose parent was A- rated), through BBB+, BBB, BBB-, and non-investment grade were included. (See paragraphs 36-44, 826, and 1209).

9 Parcell Pre-filed Testimony Q28, page 27 and Exhibit BV-18: Response to AWWU-3-1.

10 FERC Opinion 486-B, ¶137.

11 FERC Opinion 486-B, ¶19.

12 See, for example, FERC Opinion 486-B, ¶149-153 for a discussion of factors considered by the FERC when comparing the risks of a target pipeline with those of the proxy companies.

13 FERC Opinion 524, ¶187 and 209-230.

entities with high and very high credit ratings as is the case, when comparing the proxy group and AWU and ASU.

Q9. Does it make sense to distinguish between investment grade and non-investment grade companies but not between AA and A rated companies?

A. Yes. A company's default risk increases substantially if it becomes a non-investment grade company (and to a degree even if it nears non-investment grade).[14] For example, a company with a non-investment grade credit rating faces non-trivial default risk and therefore the shareholders' risk of losing their investment increases substantially. This risk increases exponentially as the company's credit rating drops lower into the non-investment grade territory. However, for companies that have an AA or A credit rating, the default risk is minimal and comparable,[15] so investors face minimal risk of losing their assets regardless of whether the rating is AA or A. As RAPA admits,[16] the difference between having, for example a BBB rating and a BB rating is much larger than between having an AA and an A rating. This is especially true for equity investors for reasons stated above.

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[14] Standard & Poor's, "2013 Annual Global Corporate Default Study and Rating Transition," March 19, 2014 shows that the recent default rate for AA and A rated companies has been very low and zero since 2009. In comparison, the default rate for BBB rated entities has been 0 – 0.07% since 2009, while non-investment grade entities have much higher default rates.

[15] *Ibid*.

[16] Exhibit BV-18: Response to AWWU-3-1.

Q10. Has this Commission in the past considered credit rating when deciding on ROEs for AWWU?

A. As pointed out by Mr. Parcell, the Commission in U-08-157(10)/U-08-158(10) (Order 10) did consider bond ratings. However, it is important to point out that at the time of the decision limited information was presented regarding the sample's bond ratings. For example, only three of the eight companies were listed as having a bond rating.[17] Thus, limited information regarding the relative ratings was presented and American Water was at the time BBB rated.[18] Today all companies included in the comparable sample are in the A range. I also note that Fitch Ratings, Moody's and S&P all have revised their water and sewer ratings criteria since the filings in U-08-157/U-08-158 and have upgraded several water utilities[19] since then, but not AWWU's rating.

Further, Mr. Parcell states that "the Commission also relied on rating agency evaluations of AWWU's risk in rejecting a 140 basis point adjustment Dr. Zepp proposed in his cost of capital analysis."[20] A review of U-06-045(7) shows that while the Commission did look at the arguments regarding credit rating agencies, the Commission simply concluded that "on this record we do not find justification for a risk premium [for AWWU]" without explicitly specifying any reliance on credit ratings one way or the other.[21]

Q11. Do you have any other comments on the credit rating of AWU and ASU?

A. Yes. While Mr. Parcell emphasizes that AWWU has an AA rating, and while the comparable companies are in the A range, he does not address AWU's and ASU's

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[17] Pre-filed Direct Testimony of Dr. Woolridge in U-08-157 / U-08-158, Exhibit JRW-4.

[18] Capital IQ.

[19] American Water was upgraded from BBB+ to A+, Aqua America and California America were upgraded from A+ to AA-, Middlesex was upgraded from A- to A, while Connecticut Water was downgraded from A+ to A. See Exhibit BV-10.

[20] Pre-filed Testimony of Mr. Parcell Q29, pages 27-28.

[21] U-06-045, Order No. 7, p. 27.

historical inability to earn their allowed ROE, which was shown in Gibson Pre-filed Direct Testimony Exhibits GJG-01 at page 50, GJG-02 at page 50, and Gibson Pre-filed Reply Testimony Exhibits GJG-10 at page 52 and GJG-11 at page 51. The combination of a very low equity percentage, an ROE that is too low relative to the equity percentage and the inability to earn the allowed ROE would not enable AWU and ASU to maintain their high credit rating on a stand-alone basis. Moody's debt to capitalization benchmark for an A-rated utility is 40-55% equity and Fitch considers entities with more than 50% equity to be in their stronger category.[22] These credit rating agencies' benchmarks include substantially higher equity percentages than what AWU or ASU are predicting. Ms. Gibson discusses Fitch's most recent reviews of AWU and ASU bonds in her pre-filed reply testimony.[23] The reviews of both AWU and ASU reference the utilities' high level of debt and the possibility of downward pressure on ratings based on an increase in debt burden and deterioration of financial metrics.

B. FINANCIAL RISK AND HYPOTHETICAL CAPITAL STRUCTURE

Q12. How do AWU's and ASU's financial risk compare to that of the sample companies?

A. The actual capital structures of AWU and ASU have much less equity than the average for the sample companies based upon either a book value or a market value comparison. The actual capital structures as of year-end 2012 included 32.53% equity for AWU and 34.43% equity for ASU.[24] Even using the hypothetical capital structure for rate making purposes and a return of 10.9%, the actual equity percentage of AWU was expected to increase to only 36% by 2018,

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[22] Moody's, "Global Regulated Water Utilities," Dec. 2009, p. 22. FitchRatings, "U.S. Water and Sewer Revenue Bond Rating Criteria," Aug. 3, 2012 p. 8.

[23] See Gibson Pre-filed Reply Testimony at Q/A 17, 18, and 21.

[24] Bell Pre-filed Direct Testimony, Exhibit KMB-02, Schedule 23 and Exhibit KMB-03, Schedule 23.

while the actual equity percentage of ASU was expected to decline to 25%.[25] As shown in Exhibit GJG-13: ASU LRFP Reflecting RAPA Recommendations, page 3, if the recommendations of RAPA were adopted, the actual equity percentage of ASU is expected to decline to 22% by 2018. As for AWU the total debt service coverage ratio was expected to be 1.43 in 2018 using the hypothetical capital structure and an ROE of 10.9%, so reasonably close to Fitch Ratings' benchmark of 1.5 for a midrange rating.[26] However, using RAPA's recommendation, AWU's total debt service coverage ratio is expected to drop to 1.20,[27] which is below Fitch Ratings' benchmark for a weaker financial. ASU's total debt service coverage is expected to drop below 1.0 as early as 2017. .[28] As Fitch Ratings are concerned about the debt burden of the sewer revenue bonds,[29] a further decline in the equity ratio and total debt service coverage of ASU should be a concern to all stakeholders. Similarly, a decline in AWU's total debt coverage to "weaker" in Fitch Ratings' terminology is concerning. This is why the hypothetical capital structures have merit and are recommended.

In comparison, the comparable companies have 60-66% equity if measured on a market value basis and 51-52% if measured on a book value basis.[30] Mr. Parcell does not attribute any extra risk for AWU and ASU compared to the sample due to

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[25] Gibson, Pre-filed Direct Testimony Exhibit GJG-03, p. 2 and Exhibit GJG-04, p. 2.

[26] Gibson, Pre-filed Direct Testimony Exhibit GJG-03, p. 2 and FitchRatings, "US Water and Sewer Revenue Bond Criteria," August 3, 2012, p. 6.

[27] Exhibit GJG-12: AWU LRFP at 3 and Fitch Ratings, "US Water and Sewer Revenue Bond Criteria," August 3, 2012, p. 6.

[28] Exhibit GJG-13: ASU LRFP.

[29] Exhibit GJG-14: Fitch Ratings, "Fitch Affirms Anchorage, AK's Sewer Revs at 'AA'; Outlook Stable," 11 July, 2014.

[30] Villadsen Pre-filed Supplemental Testimony, Exhibit BV-3 using the range 5-year average and the 2012-2013 average. Zepp Pre-filed Direct Testimony, Exhibit TMZ-02, Table 1 and Parcell Pre-filed Testimony, Exhibit DCP-2, Schedule 6.

the difference between his recommended 32.53% equity for AWU, 34.43% equity for ASU and the equity component of the comparable sample(s).[31]

Q13. Why is a capital structure with a higher percentage of debt more risky for equity investors than a capital structure with less debt?

A. Equity investors receive their return only after all other costs, including the cost of debt, have been paid. As the percentage of debt in the capital structure increases, financial risk increases, and it increases at an increasing rate as the percentage of equity in the capital structure shrinks. As RAPA admits in its discovery responses on this subject,

> Borrowing creates financial leverage and risk.
>
> Increasing [the] financial leverage of a utility increases the risk of the common stock of that utility, other factors equal.
>
> If financial leverage of a utility increases the risk of the common stock of that utility, common shareholders of that utility will demand a correspondingly higher return because of this increased financial risk.[32]

I concur. The financial risk for an entity with 32-34 percent equity is much greater than the financial risk of an entity with 52 percent or more equity. It is simply wrong theoretically and practically for Mr. Parcell to ignore this fact.

Q14. What is Mr. Parcell's rationale for ignoring the effect of financial risk and recommending against the hypothetical capital structure?

A. Mr. Parcell points to AWWU's "Equity Management Plan" that targets 33% equity and notes that AWU's and ASU's credit ratings are AA even with a highly leveraged capital structure.[33] However, this is the same argument as to why Mr.

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[31] Parcell Pre-filed Testimony Q7, page 6-7.

[32] Exhibit BV-11: Response to AWWU-1-43. See also Brealey, Myers and Allen (2008) p. 483.

[33] Parcell Pre-filed Testimony, p. 38.

Parcell believes that AWU and ASU are less risky than the sample. As acknowledged by RAPA, a credit rating is an estimate of the default risk of a company's debt although RAPA also "believes there are other attributes and uses of bond ratings."[34] Further, AWWU's 2013 Equity Management Plan states that the "hypothetical capital structures are the key to AWWU maintaining financial health and setting the stage for possible future equity growth."[35,36] The hypothetical capital structure in AWWU's EMP is further discussed in Ms. Gibson's reply testimony in this proceeding.

Q15. What is the impact of Mr. Parcell ignoring the financial risk of AWU and ASU?

A. Not only is Mr. Parcell ignoring a fundamental financial tenet that "increasing [the] financial leverage of a utility increases the risk of the common stock of that utility, other factors equal," but he is recommending an equity return of 9.6% on a capital structure containing only 32 or 34% equity, when the sample has 51-52% equity as measured by Mr. Parcell. He underestimates the cost of equity by at least 200 basis points as a result.[37] Moreover, there is a mismatch between the capital structures of the sample companies used to estimate the cost of capital and the capital structures Mr. Parcell proposes to use for AWU and ASU.

Q16. Has Mr. Parcell in the past relied upon a hypothetical capital structure?

A. Yes, as acknowledged by RAPA in the response to AWWU-1-46[38], Mr. Parcell has in several past proceedings recommended a hypothetical capital structure. A review of Mr. Parcell's testimonies before the Commission reveals that he on

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[34] Exhibit BV-07: Response to AWWU 1-42.

[35] 2013 AWWU Equity Management Plan, Exhibit GJG-05, p. 7.

[36] Exhibit BV-12: Response to AWWU-2-7.

[37] Exhibit BV-08: ROE at AWU/ASU Equity Percentage for details.

[38] Exhibit BV-19: Response to AWWU-1-46.

several occasions has recommended a hypothetical capital structure as demonstrated in Table 2 below.

Table 2: Mr. Parcell's Past Views on a Hypothetical Capital Structure

Case		*Utility*	*Date*	*Actual Capital Structure (E/D)*	*Parcell's Recommended Capital Structure (E/D)*
U-13-206	[1]	Sand Point	08/22/14	47/53	49/51
U-13-207	[2]	TNSG	08/22/14	44/56	50/50
U-12-075	[3]	TNSG	12/07/12	24.5/75.5	50/50
U-10-029	[4]	AELP	01/18/11	54/46	54/46
U-09-090	[5]	Alaska Power Company	02/08/10	27/73	50/50
U-14-002	[6]	Alaska Power Company	08/01/14	38/62	54/46
U-14-004	[7]	Aurora Energy	10/07/14	-18/118	50/50

Note:
[5]: Actual capital structure in 2008 for Alaska Power & Telephone Company, which owns and provides all capital to Alaska Power Company. There is no distinct capital structure for APC.

[6]: Actual capital structure in 2013 for Alaska Power & Telephone Company, which owns and provides all capital to Alaska Power Company. There is no distinct capital structure for APC.

From Table 2 above, it is clear that Mr. Parcell has in past testimony before the Commission viewed hypothetical capital structures favorably. Notably, Mr. Parcell recommended an equity percentage of 54% for Alaska Power in 2014 although the actual equity percentage was only 38%; close to that of the Companies.[39] Further, Mr. Parcell in August 2014 reasoned:

> I note that the average and median equity ratios for his group [of comparable companies] in 2012 were about 54.5 percent, while the average 2009-2013 common equity ratio (using a broader perspective than limited to a single year) was 53.5 percent … As I indicate below, these are all consistent with the 54 percent common equity ratio I am proposing in this proceeding. Furthermore, the 2017-19 projected common equity for this group is 53.8 percent, which is also consistent with my recommended capital structure."[40]

[39] See Pre-filed Direct Testimony of Mr. Parcell in U-14-002 and U-09-090. Table 2 includes the actual and Parcell recommended equity percentage in the five dockets mentioned in the response to AWWU as well as in two other RCA proceedings, where Mr. Parcell filed testimony.

[40] Pre-filed Direct Testimony of Mr. Parcell in U-14-002, p. 30.

The justification for recommending a 50/50 capital structure for Aurora Energy was similar – the "50 percent equity ratio is also consistent with the capital structure ratios of other investor-owned electric utilities."[41] In this proceeding, we also have a group of comparable companies with book value capital structures including 51-52% equity, yet Mr. Parcell recommends using AWU's and ASU's 2012 actual capital structures with no consideration of the additional risk. Not only does this recommendation vary from his past recommendations presented in Table 2, but it impacts AWU's and ASU's ability to move towards more reasonable capital structures that are more in line with industry standards.

Q17. Please explain Mr. Parcell's arguments against a hypothetical capital structure.

A. Mr. Parcell calculates the effective ROE for AWU and ASU that would result if a hypothetical capital structure were to be used to be 14-15% using the requested ROE of 10.9%.[42] He notes that a 15% ROE is well above the sample's average estimated ROE.

However, rather than demonstrating that a hypothetical capital structure should not be used, this comparison really shows how critically important it is to consider capital structure when evaluating the results of the models. The average book value capital structure of Mr. Parcell's sample includes 51-52% equity in 2013,[43] so even using Mr. Parcell's recommended ROE of 9.6% at AWU's equity of 32.53% results in an ROE of 13.05% and at ASU's equity of 34.43% results in an ROE of 12.72%.[44] The difference in financial risk must be considered. This can be done using a hypothetical capital structure as AWWU proposed, making an

[41] Pre-filed Direct Testimony of Mr. Parcell in U-14-004, p. 27.

[42] Pre-filed Testimony of Mr. Parcell, Q39, pages 36-37.

[43] Pre-filed Testimony of Mr. Parcell, Q36 page 35, which reports the average book value capital structures for the group of water utilities covered by AUS Utility Reports for the period 2009 to 2013.

[44] Exhibit BV-08.

explicit adjustment for financial risk, or by a combination of the approaches, but it cannot simply be ignored as Mr. Parcell has done.

Q18. Does the use of a hypothetical capital structure deny customers the benefits of AWU and ASU's ability to access low cost debt?

A. No, of course not. About 2/3 of the assets of AWU and ASU are financed with debt. The cost of that debt is not changed by the use of a hypothetical capital structure. Use of a hypothetical capital structure is simply one way to achieve an apples-to-apples comparison between the ROEs estimated from the sample and setting the ROE for AWU and ASU. The relatively low cost of debt benefits customers regardless of the capital structure used for ratemaking purposes.

Q19. But if Mr. Parcell is wrong, who benefits from AWU's and ASU's return on equity?

A. The ratepayers benefit. In effect, rates paid by customers will be used by AWU and ASU to provide funds for capital investment necessary to provide service for customers. Unlike a privately owned utility, none of the earned return on equity is expected to be paid out in the form of dividends to shareholders.[45] The funds received through the ROE will primarily be reinvested in improvement to and replacement of assets which provide service to existing customers or funding assets previously funded by CIAC or debt.[46] The only access AWWU has to equity funding is through recovering a reasonable return through rates. Without the ability to earn a reasonable return, AWWU would be forced to fund all capital projects with debt.

Q20. Does a return of 10.9 percent on a hypothetical capital structure with 52 percent equity send the wrong price signal?

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[45] See, for example, Pre-filed Direct Testimony of Ms. Bell Q59 and Q60.

[46] Exhibit BV-13: Response to AG-11-7 (d).

A. No. If AWWU's requested ROE and hypothetical capital structure are approved, the weighted-average cost of capital (WACC) for the Companies would be lower than for the average regulated utility in the country. This can be seen by a comparison to the allowed WACC's as reported by Regulatory Research Associates (RRA).

Table 3: AWU / ASU WACC and Average Utility WACC

ASU WACC at 10.9% ROE and 52% Equity	7.2%
AWU WACC at 10.9% ROE and 52% Equity	7.4%
Average WACC for gas utilities	7.7%
Average WACC for electric utilities	7.7%

Sources:
Exhibit BV-09 and Regulatory Research Associates; Average WACC for 2014

As can be seen from Table 3 above, the cost of capital is lower at the requested ROE and capital structure than what has been allowed in the last year for other U.S. utilities.[47]

Q21. Why is AWU's and ASU's WACC lower than for the average company in the RRA report?

A. AWWU has several cost advantages. First, as a municipal utility, it pays no Federal or state income tax so the allowed ROE does not have to be "grossed up" to provide an allowance for income tax. Second, interest rates on its debt are lower than what is common among U.S. utilities. These benefits flow through directly to ratepayers.

[47] I do not have access to comparable information for water and wastewater utilities but note that Dr. Zepp reported an average allowed ROE of 9.97% for 2013 (Zepp Pre-filed Direct Testimony, Exhibit TMZ-02. Table 15 on page 16) and Mr. Parcell reports an expected ROE of 10.8% for 2014 (Exhibit DCP-2, Schedule 13). The average bond rating in the A range (Exhibit DCP-2, Schedule 7) and the average capital structure includes 51% equity. Using a bond yield of 4.7%, the WACC ranges from 7.4% - 7.8%. As the current yield on A-rated bonds likely underestimates the embedded cost of debt, which is historical, the cost of debt in the calculation is likely understated.

Q22. Are there any other impacts of the Companies tax-exempt status?

A. Yes. While the tax exempt status benefits customers who do not have to pay an additional return of 30-40% on the equity portion of AWU and ASU's assets, it makes the Companies' return more risky. To illustrate this, I have created a simple example below:

Example:

Assume two utilities have the same business risk and each has assets of $1,000, which are financed 50/50 with equity and debt. The ROE is 10% and the cost of debt is 5% for Private Utility and 3% = (1-40%) × 5% for Municipal Utility. Everything else equal, the finances for the two utilities work as follows:

	Municipal Utility	Private Utility
Costs	500.0	500.0
Interest	15.0	25.0
After tax required return on equity	50.0	50.0
Tax gross-up	-	33.3
Revenue Requirement	565.0	608.3
Net Income	50.0	50.0
Return to Shareholders	*10.0%*	*10.0%*
Costs increase by 5%		
Revenue	565.0	608.3
Costs	525.0	525.0
Interest	15.0	25.0
Income before Taxes	25.0	58.3
Taxes	-	23.3
Net Income	25.0	35.0
Return to Shareholders	*5.0%*	*7.0%*
Costs decline by 5%		
Revenue	565.0	608.3
Cost	475.0	475.0
Interest	15.0	25.0
Income before Taxes	75.0	108.3
Taxes	-	43.3
Net Income	75.0	65.0
Return to Shareholders	*15.0%*	*13.0%*

As is evident from the example, the tax exemption benefits customers, who (as a result of the lower revenue requirement) pay lower rates, but at the cost of increased volatility in the utility's return because there is no tax allowance to dampen the effect of cost variations. In other words, some of the variation in revenues or costs is absorbed by the change in income taxes. This is not available to municipal utilities which pay no income taxes.

C. PRISM AND THE COST OF EQUITY

Q23. What about Mr. Parcell's claim that the PRISM reduces risk?

A. Mr. Parcell states that the Plant Replacement and Improvement Surcharge Mechanism (PRISM)[48] reduces AWWU's risk and cites credit rating agencies' reports as support.[49] Further, he maintains that "ratepayers, who must accept this risk transfer involuntarily, should be compensated in the form of lower or reduced rates."[50]

Two issues are important to consider in this regard:

1. The PRISM only reduces the cost of equity if it reduces systematic risk;
   and
2. To the extent that the sample companies also have a PRISM-like mechanism, any impact on the ROE is already captured in the ROE estimate.

Q24. Please explain your first point.

A. It is well-known in finance that investors only expect to receive compensation for bearing systematic (market or non-diversifiable) risk,[51] so the PRISM would only reduce AWU's and ASU's cost of equity to the extent it reduces their systematic risk. As Mr. Parcell states, the PRISM "reduces regulatory lag related to cost recovery of qualifying infrastructure investments."[52] However, at no point does Mr. Parcell demonstrate that AWU's or ASU's systematic risk has been reduced.

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[48] The Commission's 2014 Order R-11-006(7) approved use of a PRISM, but I understand that it has not been implemented by AWU or ASU nor has the regulation had any adjudicatory rulings by the Commission.

[49] Pre-filed Testimony Mr. Parcell Q101-Q105, pages 84-88.

[50] Pre-filed Testimony Mr. Parcell Q105, page 88.

[51] See, for example, R.A. Brealey, S.C. Myers, and F. Allen, "*Principles of Corporate Finance*," 9th edition, 2008 (Brealey, Myers and Allen (2008)), Chapters 8-9.

[52] Pre-filed Testimony Mr. Parcell Q105, page 88.

Instead, he argues that credit rating agencies have favored PRISM-like mechanisms, once again mixing risks for equity and debt. While credit rating agencies have favored PRISM and other mechanisms, this is because earlier collection of cash flow reduces default risk, which is a crucial issue for bond holders – not equity holders. No evidence has been presented that the PRISM reduces the cost of equity. I note that other surcharge-like mechanisms such as decoupling have been studied empirically with the authors finding no statistically significant impact of the mechanism on the systematic risk of the utilities being studied.[53]

Q25. How about the sample companies? Do they have the same type of surcharge available?

A. In many cases, yes. While RAPA admits that Mr. Parcell has not studied whether his comparable companies have access to PRISM-like mechanism,[54] I was the co-author of a survey of alternative rate approaches for water companies, which found that a number of states have mechanisms similar to the PRISM (commonly referred to as DISC).[55]

Figure 1 (a and b) below summarizes the states that, to the best of my knowledge, currently allow PRISM-like surcharges. The figure also indicates states that have either no investor-owned regulated water utilities or where the state regulatory commission does not regulate water utilities. The latter is important because no information is readily available about the regulatory environment.

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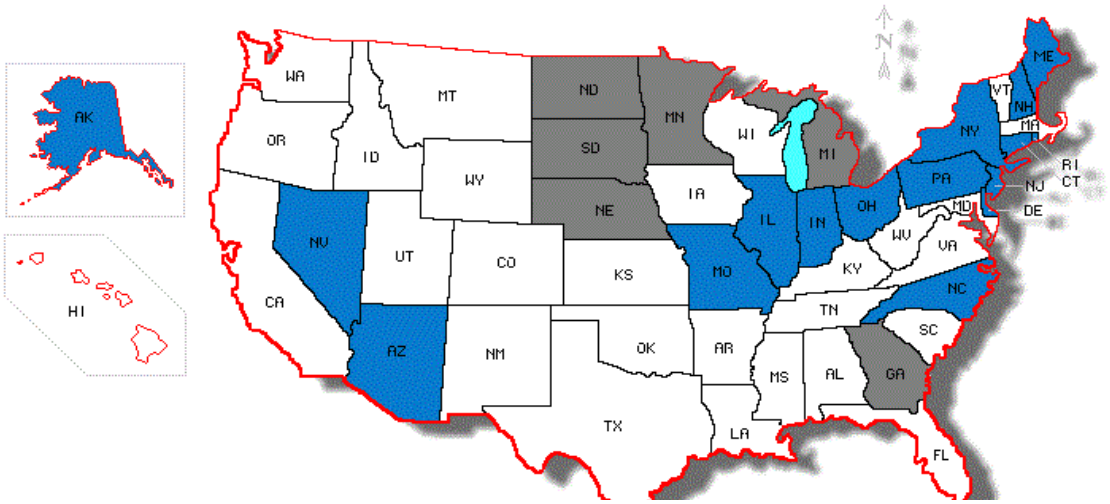
[53] Michael J. Vilbert et al., "The Impact of Revenue Decoupling on the Cost of Capital for Electric Utilities: An Empirical Investigation," prepared *for The Energy Foundation*, March 2014. Richard A. Michelfelder, "Decoupling: Impact on the Risk of Public Utility Stocks*," Rutgers Presentation*, April 2011.

[54] Exhibit BV-14: Response to AWWU-1-52.

[55] Joe Wharton, Bente Villadsen and Heidi Bishop, "*Alternative Regulation and Ratemaking Approaches for Water Companies: Supporting the Capital Investment Needs of the 21st Century*," prepared for the National Association of Water Companies, September 2013 (Wharton, Villadsen & Bishop 2013).

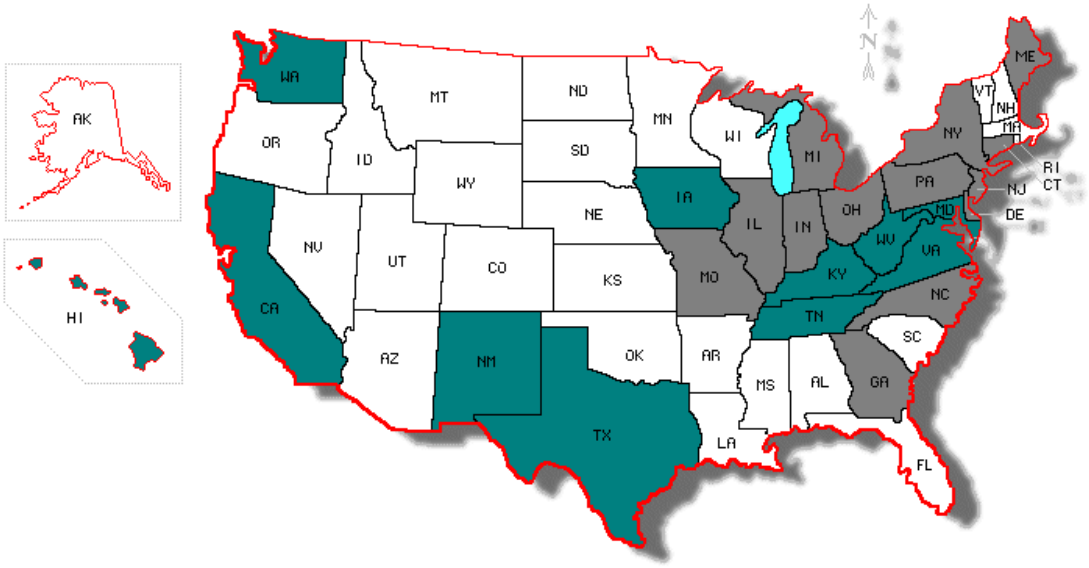
Figure 1a: States allowing distribution system improvement charges for water companies, and states with no state-commission regulated investor-owned water companies



– States allowing distribution system improvement charges (DSIC) for water companies: AK, AZ, CT, DE, IL, IN, ME, MO, NC, NV, NH, NJ, NY, OH, PA, RI

– States with no state-commission regulated, investor-owned water utilities: MI, GA, MN, NE, ND, SD, DC

Figure 1b: Coverage area of water utilities in sample



– States in coverage area that either allow DSIC for water companies or do not have state-commission, investor-owned water utilities: CT, DE, GA, IL, IN, ME, MI, MO, NC, NJ, NY, OH, PA

– Other states in coverage area: CA, HI, IA, KY, MD, NM, TN, TX, VA, WA, WV

As indicated in the figures, a large number of states have PRISM-like mechanisms. More important, however, is the fact that the sample companies have substantial regulated operations in the blue states that allow PRISM-like surcharges. For example, American Water and Aqua America both have operations in IL, IN, NJ, OH, and PA while Aqua America (American Water also have operations in MO). Connecticut Water operates in CT, Middlesex Water has operations in DE and NJ, while York Water has operations in PA. Artesian Resources, which was added to the sample by Mr. Parcell, operates in DE and PA. Thus, many of the sample companies have substantial operations in states with PRISM-like mechanisms.[56] In addition, American States Water, California Water and SJW Corp. operate primarily in California, which has many types of surcharges[57] albeit not a PRISM (DISC).

Because many of the comparable companies operate in regulatory jurisdictions that allow a mechanism similar to the PRISM and because there has been no evidence that the PRISM reduces systematic risk, I have no evidence and Mr. Parcell has presented no evidence that the PRISM makes AWU or ASU any more or less risky than the comparable companies.

D. SUMMARY

Q26. What do you conclude regarding AWU and ASU's risk relative to that of the comparable companies?

A. As I noted in my pre-filed supplemental testimony, AWU and ASU are smaller, have historically been unable to earn their allowed ROE and as noted above have a very low equity percentage in their actual capital structure. Further, there is no evidence that the availability of the PRISM lowers the cost of equity; no evidence

[56] Both American Water and Aqua America also have operations in states that do not have a DISC.

[57] See, for example, Wharton, Villadsen & Bishop 2013, Appendices A through C.

has been presented that the PRISM impacts the systematic risk. The majority of the comparable companies also have PRISM-like mechanisms and those that do not, have other mechanisms in place. Thus, the impact on the ROE, if any, is plausibly already captured in the estimated ROEs.

Mr. Parcell has overly focused on the credit rating of AWWU being AA, while the average of the sample companies is A (range of A- to AA).[58] However, the distinction between an AA and an A rating is very limited from equity investors' perspective as neither entity is likely to default. Further, while the FERC in the past has looked to credit ratings as one measure of business risk, it is not the only measure used by FERC and a recent order illustrates that a significant focus was directed at the non-investment grade aspect of an entity rather than on the difference between an AA and an A rating.

As a result, I continue to view AWU and ASU as being of higher risk than the sample companies (regardless of whether I consider Dr. Zepp's or Mr. Parcell's sample).

IV. TECHNICAL DETAILS AND INPUTS TO PARCELL'S ANALYSIS

Q27. What do you address in this section?

A. First, I address the "roadmap" from Order 10 in Dockets U-08-157/U-08-158 and how Mr. Parcell implements the order. Second, I address other technical aspects of Mr. Parcell's implementation of the DCF model and the CAPM and the impact on the estimated cost of equity.

A. THE ROADMAP FROM U-08-157/U-08-158

Q28. Can you put the "roadmap" in perspective?

[58] See Exhibit BV-12: Response to AWWU-2-8.

A. Yes. The Commission's recommendation on how to estimate the cost of equity in U-08-157(10)/U-08-158(10)[59] has been referenced as the roadmap. In Order 10 the Commission made a number of choices regarding the sample selection, methods to rely upon for cost of equity estimation, and the implementation of the DCF model and CAPM. Before I discuss the details of the Commission's choices in Order 10, it is worth noting that the Commission's order is based on the information presented in Dockets No. U-08-157/U-08-158. The cost of capital witnesses' testimony in those dockets was filed in July and August 2009.[60]

The date of the information available to the Commission is important because, as Mr. Parcell points out, "in 2008 and 2009, the economy declined significantly"[61] and "the impacts of the recession have been and will be felt for an extended period of time."[62] Put differently, the recession has had significant impact on financial markets and government policy, which (i) may have impacted the ability of the models to measure the cost of equity accurately, (ii) have led to interest rates that are unusually low and partly driven by government policy rather than market fundamentals, and (iii) may have impacted investors risk perception. These factors may necessitate revisiting the roadmap provided in Order 10. I provide my perspective on certain aspects below as I discuss the roadmap.

Q29. Please summarize the points you discuss regarding the roadmap.

A. I believe there are four areas that merit discussion: (1) the implementation of the DCF model, (2) the implementation of the CAPM, (3) the relative weight assigned to the two models, and (4) the placement of AWU and ASU within the range of

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[59] The Regulatory Commission of Alaska, U-08-157 / U-08-158(10), "Order Resolving Revenue Requirement Issues," dated February 11, 2010 (Order 10).

[60] Pre-filed Direct Testimony of Dr. Woolridge on behalf of the Attorney General's Office is dated July 7, 2009 and Pre-filed Reply Testimony Dr. Zepp on behalf of AWWU is dated August 17, 2009.

[61] Pre-filed Testimony of Mr. Parcell at 18, line 1.

[62] Pre-filed Testimony of Mr. Parcell at 19, lines 1-2.

plausible ROEs. Regarding the implementation of the DCF model, my discussion focuses upon which growth rates to use. For the CAPM implementation, I discuss Order 10's reliance on Morningstar/Ibbotson's historical Market Risk Premium (MRP) versus Mr. Parcell's reliance on a shorter time period and a geometric average to estimate the MRP. I also address the risk-free rate, which has been impacted substantially by monetary policy in recent years. Order 10 assigned 60% weight to the DCF estimates and 40% to the CAPM estimates; neither Mr. Parcell, Dr. Zepp nor I use the 60/40 weighting. Below I explain why the relied upon models and the weight assigned to them may merit reconsideration. Lastly, Order 10 did not adjust AWU or ASU's cost of equity for size or firm-specific factors although it found that "there may be more risk in AWWU's wastewater operation."[63] The primary reason given by the Commission was that no convincing evidence had been presented.

Mr. Parcell states that:

> In none of these orders did the RCA agree a risk adjustment was appropriate for either municipal utility based on claims of financial flexibility risks.[64]

However, the Commission has in the past allowed a premium for company-specific risk. In U-10-031(15), the Commission granted an 80 basis point company risk premium proposed by Dr. Zepp to ML&P. The order states:

> ML&P's [Capital Improvement Plan] CIP will ultimately nearly triple ML&P's net plant, without any expansion of its service area or customer base. We believe that this fact alone provides sufficient justification for a premium.[65] [footnote omitted]

This illustrates that company-specific risk premium in the past have been evaluated based on the evidence.

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[63] Order 10 at 43, lines 5-6.

[64] Pre-filed Testimony Mr. Parcell, Q99 at 83, lines 14-16.

[65] U-10-031(15) at 18, lines 15-17.

Q30. How did Order 10 implement the DCF model?

A. Order 10 relied on the constant growth DCF model and implemented the model using the formula: $K = D_1/P_0 + g$, where K is the cost of equity, $D_1 = D_0 \times (1+.5g)$ is the current dividend grossed up for ½ of the growth rate, g. Order 10 determines the dividend yield (D_1/P_0) using a recent six month average.[66] Further, Order 10 used analysts' forecasted Earnings Per Share (EPS) growth rates from four available sources and made adjustments for unusual observations.[67]

Q31. Please discuss Mr. Parcell's DCF as it relates to Order 10.

A. Three issues merit comments. First, Mr. Parcell's implementation of the DCF model in Exhibit DCP-2, Schedule 8 deviates from Order 10 in at least three ways: (i) it relies upon historical growth rates, (ii) it relies on growth rates for dividends and book value per share, and (iii) it uses the average dividend yield over three months rather than six months. However, Mr. Parcell's implementation of the roadmap does look to forecasted EPS only and uses six months of dividend yields. Second, Order 10 eliminates a company and certain growth rates because they are somehow unusual. It is not obvious to me which companies or observations the roadmap would eliminate in this case, but Artesian has a zero percent growth rate from Value Line, which is based on one forecast. SJW Corporation has a 14% growth rate from First Call, but that observation is based on 2 analysts.[68] Thus, the 0% for Artesian may be a candidate for elimination. Eliminating Artesian's zero growth rates from Value Line would increase Mr. Parcell's Roadmap cost of equity estimate from 8.7% to 8.9% in Exhibit DCP-2, Schedule 9 (see Table 4). Both Dr. Zepp and I excluded Artesian from the proxy group in pre-filed testimony because it does not have a bond rating and it experiences limited trading

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[66] Order 10, p. 35.

[67] Order 10, pp. 37-38.

[68] Exhibit BV-15: Response to AWWU-1-36; AG00038.

of its stock.[69] Third, Order 10 looks to the growth estimates from four sources as did Dr. Woolridge in U-08-157/U-08-158.[70] Thus, there were data from four sources available in that docket for the Commission to consider. I note that these four data sources have some overlap in that Reuters commonly obtains its growth forecasts from First Call, and Zacks uses many of the same investment firms as First Call to generate its forecasts. Therefore, the four data sources are not independent as would be ideal.

Table 4: Revised DCF Estimates Following Order 10

Parcell's sample group

	Dividend Yield	Adjusted Dividend Yield	Value Line	First Call	Zacks	Reuters	Average	DCF Cost
American States Water Co.	2.6%	2.6%	6.5%	2.0%	2.0%	2.0%	3.1%	5.7%
American Water Works	2.5%	2.6%	7.5%	8.2%	7.9%	8.2%	8.0%	10.5%
Aqua America Inc.	2.7%	2.7%	8.5%	4.0%	5.0%	4.0%	5.4%	8.1%
Artesian Resources	4.1%	4.1%	Outlier removed	4.0%	na	na	4.0%	8.1%
California Water Service, Inc.	2.7%	2.8%	7.5%	6.0%	6.0%	6.0%	6.4%	9.2%
Connecticut Water Service, Inc.	3.1%	3.2%	7.0%	5.0%	5.0%	5.0%	5.5%	8.7%
Middlesex Water	3.7%	3.7%	5.0%	2.7%	na	na	3.9%	7.6%
SJW Corporation	2.7%	2.8%	7.0%	14.0%	na	na	10.5%	13.3%
York Water Company	2.9%	2.9%	7.0%	4.9%	na	na	6.0%	8.9%
Mean	3.0%	3.1%	7.0%	5.6%	5.2%	5.0%	5.8%	8.9%

Zepp's sample group

	Dividend Yield	Adjusted Dividend Yield	Value Line	First Call	Zacks	Reuters	Average	DCF Cost
American States Water Co.	2.6%	2.6%	6.5%	2.0%	2.0%	2.0%	3.1%	5.7%
American Water Works	2.5%	2.6%	7.5%	8.2%	7.9%	8.2%	8.0%	10.5%
Aqua America Inc.	2.7%	2.7%	8.5%	4.0%	5.0%	4.0%	5.4%	8.1%
California Water Service, Inc.	2.7%	2.8%	7.5%	6.0%	6.0%	6.0%	6.4%	9.2%
Connecticut Water Service, Inc.	3.1%	3.2%	7.0%	5.0%	5.0%	5.0%	5.5%	8.7%
Middlesex Water	3.7%	3.7%	5.0%	2.7%	na	na	3.9%	7.6%
SJW Corporation	2.7%	2.8%	7.0%	14.0%	na	na	10.5%	13.3%
York Water Company	2.9%	2.9%	7.0%	4.9%	na	na	6.0%	8.9%
Mean	2.8%	2.9%	7.0%	5.9%	5.2%	5.0%	6.1%	9.0%
Average DCF COE								**8.95%**

[69] See Pre-filed Supplemental Testimony of Dr. Villadsen, p. 10.

[70] While four data sources for growth rates were presented in Order 10, p. 37-38, I found no statement that these four sources were the "best" estimates of water or wastewater utilities growth rates.

Q32. How did Order 10 implement the CAPM?

A. As I understand it, Order 10 calculated the CAPM cost of equity as the risk-free rate plus beta times the MRP. Order 10 used Dr. Woolridge's recommended risk-free rate of 4.75%, which was then based on current observation of the yield and the "recent trend of increasing 30-year Treasury yields."[71] The selected risk-free rate was higher than the then current 30-year government bond yield by about 14 basis points. While neither Order 10 nor the cited testimony explains how the ultimate risk-free rate was calculated, the figure was higher than the then current 30-year government bond yield.[72] Looking to current trends and the forecasted yield on 30-year treasury bonds, a risk-free rate somewhat above the current yield of 2.80%,[73] but below the forecasted rate of a bit over 5% would be comparable.[74] The order relied on Value Line betas as do all three cost of capital experts, who have filed reports in these dockets. Finally, the order used an MRP of 6.5% referencing Ibbotson SBBI text.[75] The cited MRP is Ibbotson's 2008 reported arithmetic MRP over as long a period as possible.[76] The comparable figure is currently 6.96%.[77]

Q33. Did Mr. Parcell implement the CAPM following Order 10?

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[71] See Order 10 p. 39 and the Pre-filed Direct Testimony of Dr. Woolridge, p. 47.

[72] Dr. Woolridge's Exhibit JRW-3 provides historical and forecasted interest rates, but no calculation of 4.75%.

[73] Federal Reserve Bank of St. Louis, March 9, 2015 (http://research.stlouisfed.org/fred2/series/DGS30).

[74] The 10-year government bond yield is forecasted to double to about 4.26% and the spread between the 30-year and the 10-year government bond yield has averaged 77 basis points since the 30-year bond started trading again in February 2006, so if the spread remains constant, the 30-year yield would be above 5% going forward. Sources: Federal Reserve St. Louis and Table 1.

[75] Order 10, p. 41.

[76] See Morningstar, "Ibbotson SBBI 2009 Valuation Yearbook," Table A-1, p. 208.

[77] As Duff & Phelps have acquired Ibbotson SBBI series, the relevant reference is Duff & Phelps, "2014 Valuation Handbook," Exhibit 3-6.

A. No. The implementation of the roadmap in Order 10 would require the use of a 30-year risk-free rate that takes the "trend of increasing 30-year Treasury yields" into account and an MRP of 6.96% using the equivalent of Ibbotson SBBI figure. While it is not completely clear what it means to take the current trends of the risk-free yield into account, it is clear that recent trends have been upwards and analysts expect risk-free rates to increase. Therefore, the risk-free rate in the CAPM should be higher than the current 30-year yield used by Mr. Parcell.

For illustrative purposes, I use a risk-free rate of 3.50%. This risk-free rate takes into account Order 10's use of a 30-year government bond yield that reflects the trends,[78] yet acknowledges Order 10's concern over the "disparity between the current yield on 30-year U.S. Treasury bonds" and the "Blue Chip Consensus Forecast."[79] The 3.50% corresponds to the yield on 30-year government bonds during the spring of 2014 or viewed alternatively an inclusion of about ¼ of the expected increase in the 30-year government bond yield.[80] Using the parameters discussed above, I implement the roadmap from Order 10 to the best of my ability in Table 5.

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[78] Order 10 relied upon Dr. Woolridge's estimated risk-free rate, which was higher than the actual risk-free rate at the time by about 14 basis points. Dr. Woolridge's testimony does not provide an explanation for the 14 basis points but at the time, 10-year government bond yields were expected to increase. Currently, the 30-year yield is about 2.8%, has been increasing and the 10-year government bond yield is expected to double.

[79] Order 10, p. 39.

[80] See Exhibit BV-16 for a history of the 10-year and 30-year government bond yields.

Table 5: Revised CAPM Estimates Following Order 10[81]

	Risk free rate [1]	Beta [2]	Market risk premium [3]	CAPM ROE [4]
Parcell's group	3.50%	0.69	6.96%	8.30%
Zepp's group	3.50%	0.71	6.96%	8.44%
Average				8.37%

The resulting ROE estimates are higher than Mr. Parcell's roadmap estimates by about 70 basis points.

Q34. Please summarize weighting of the cost of equity estimation models.

A. All three cost of capital experts, who filed testimony in this proceeding estimated the cost of equity using several methods, looked to the range of estimation, and then placed AWU and ASU in the range.[82] Unlike Order 10, no specific weighting was assigned to individual estimation methods.

Q35. What has changed since Order 10 was issued and how might that have impacted cost of capital estimations?

A. As discussed by all three cost of capital witnesses, the financial crisis of 2008-09 had a major impact on financial markets and the

[81] Beta from Pre-filed Testimony of Mr. Parcell, Exhibit DCP-2. Market risk premium from Duff & Phelps 2014 Valuation Yearbook.

[82] Pre-filed Direct Testimony of Dr. Zepp Exhibit TMZ-02, Pre-filed Testimony of Mr. Parcell Q8, and Pre-filed Supplemental Testimony of Dr. Villadsen, Exhibit BV-2.

> U.S. and other governments have implemented and continue to implement unprecedented actions to attempt to correct or minimize the scope and effects of this recession.[83]

The effect has been unprecedented low risk-free rates and consequently very low CAPM cost of equity estimates. At the same time many investors are holding cash rather than investing,[84] which indicates that the returns are not sufficient to compensate them for the risk inherent in investments; i.e., the market risk premium is higher than measured by historical data. If the risk-free rate is artificially low or the MRP is higher than measured, then the CAPM does not accurately reflect investors expected equity return and the CAPM estimates are subject to measurement error.

At the same time, the DCF model results in lower than usual estimates because utility stock prices have been driven up - plausibly as a result of a flight to quality to obtain a higher dividend yield. This lowers the dividend yield and thereby the estimated cost of equity.[85] Further, at least one water utility has been buying back shares, which distribute cash to shareholders in the same manner as dividends, but are not recognized in the DCF model.[86] To the extent that share buybacks are material, the DCF model as implemented underestimates the cost of equity.

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[83] Pre-filed Testimony Mr. Parcell Q15at 18, lines 17-20.

[84] Blackrock, "Why Holding Cash May Mean Losing Money," NASDAQ, March 9, 2015.

[85] Relative to the dividend yield presented in U-08-157/U-08-158, the current dividend yield is down by approximately 0.75%. See Pre-filed Testimony of Mr. Parcell Exhibit DCP-02, Schedule 9 and Order 10, p. 38.

[86] York Water. See January 2015 Value Line Tear sheet.

Other models (or modifications to existing models) are less vulnerable to monetary policy or short-term volatility in financial markets and may therefore provide a more stable cost of equity estimate.

As a result, all three cost of equity experts have made recommendations based on the range of estimates rather than a specific weighting and have recommended an estimate in (or slightly above) the upper end of the estimated cost of equity.[87] In my view, the financial crisis has substantially impacted the ability to measure the cost of equity and therefore, it is necessary to rely on more than one estimation method and to avoid a fixed weighting of the estimation methods that may place too much weight on the CAPM, which currently provides very low estimates. I note that Mr. Parcell's recommended range does not include his CAPM estimates.[88]

Q36. What is your view on AWU and ASU specific risks and Order 10?

A. Several analyses have been presented in this proceeding that were not presented in the U-08-157/U-08-158 proceeding. First, information about AWWU's credit metric and inability to earn the allowed ROE has been presented in the current dockets.[89] Second, information about the need to replace the CIAC-funded plant

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[87] Pre-filed Direct Testimony of Dr. Zepp Exhibit TMZ-02, Pre-filed Testimony of Mr. Parcell Q8, and Pre-filed Supplemental Testimony of Dr. Villadsen, Exhibit BV-2.

[88] Pre-filed Testimony of Mr. Parcell Q8.

[89] Ms. Gibson Pre-filed Direct Testimony Exhibit GJG-01 at page 50 and Exhibit GJG-02 at page 50. Also see Ms. Gibson Reply Testimony, Exhibit GJG-10 at page 52 and Exhibit GJG-11 at page 51.

and maintain or improve the capital structure of AWU and ASU has been included.[90] Third, I have demonstrated the need to consider AWU's and ASU's financial risk and that regardless of whether the regulatory capital structure is compared to the book value or market value capital structure of the comparable companies, AWU and ASU have a very high financial risk. Fourth, while few comparable companies were reported as having a credit rating in U-08-157/U-08-158, Mr. Parcell and I agree that most of the comparable companies now have ratings in the A- to AA range. As discussed in my testimony above, these are high ratings and do not merit distinction from a cost of equity perspective.

For these reasons, I find that the amount of evidence regarding the company-specific risks have been enhanced to demonstrate the unique risks AWU and ASU face.

B. OTHER IMPLEMENTATION ISSUES

Q37. What aspects of Mr. Parcell's cost of equity estimation methods do you disagree with?

A. First, I discuss the DCF method, where I commonly estimate both a single-stage (Gordon growth model) and a multi-stage DCF model. Further, I rely exclusively on analysts' forecasts and usually do not adjust the dividend yield by ½ as Order 10 recommended. Finally, I consider whether there are share buybacks that merit consideration. Second, I disagree with several aspects of Mr. Parcell's CAPM

[90] Exhibit BV-13: Response to AG-11-7 (d).

implementation. My primary concern pertains to the determination of the MRP. There are several reasons for this: (i) for the purpose of determining the prospective MRP, the geometric average MRP is inappropriate, (ii) when using the historical average MRP, the best measure uses as long a period as possible and relies on the total return of the stock market and the income returns for the risk-free rate, and (iii) given the changes in financial markets, a forward-looking MRP merits consideration. Further, I find that the forward-looking risk-free rate merits consideration particularly in an environment where government bond rates are artificially depressed. In addition, I usually report results from the CAPM. Third, in some instances I present information on the risk premium methods similar to those of Dr. Zepp although I usually do not rely on the DCF-based method,[91] but instead calculate both the risk premium that result from the allowed ROE and from earned ROEs. Fourth, as discussed at length above, I explicitly consider the financial risk of the target utilities versus that of the sample companies. I discuss the first three issues in turn below, but have already addressed the fourth issue in Section III above.

1. DCF

Q38. What other aspects of Mr. Parcell's DCF implementation do you disagree with?

A. First, I agree with Order 10 that only forecasted growth rates are relevant as analysts have access to historical information and therefore would take that

[91] Pre-filed Testimony of Dr. Zepp, TMZ-02, Table 17.

information into account when forming their forecasts. Second, as discussed in my pre-filed supplemental testimony, I commonly implement a three-stage version of the DCF model, where the growth rate converges toward the overall growth in the economy over time. Dividends are actually paid quarterly and I use a quarterly model that takes any forecasted dividend into account, so I do not recommend making a ½ adjustment to the growth of the dividend yield. Third, companies distribute cash to shareholders through dividends, but may also distribute cash through share buybacks. Therefore, if the sample companies have share buybacks, the cash that is being distributed through such buybacks needs to be added to the dividends and thereby increases the dividend yield. It is important to note that the dividend for a company engaged in share buybacks may not be as large as that of a company that has no share buybacks, so in total the cash distribution may not be all that different.

Q39. Would there be a major impact of modifying the analysis?

A. The impact of using analysts' forecasts only and eliminating outliers was presented above and results in a DCF estimate of approximately 8.9% using Mr. Parcell's data. The results from the multi-stage DCF was presented in my Pre-filed Supplemental Testimony, Exhibit BV-2. Finally, as only York Water appears to have a share buyback program,[92] I do not believe the impact on the sample's cost of capital estimate would be material in this case.

[92] York Water, 2013 Annual Report p. 43.

2. CAPM

Q40. Please elaborate on your disagreements regarding the MRP.

A. I disagree with Mr. Parcell's reliance on the geometric market risk premium (MRP) and on a period that goes back to only 1997. As noted above, Order 10 accepted the historical arithmetic average MRP for the period 1926-today, which I agree is a reasonable measure of the MRP although there may be others. The geometric average looks at the compounded growth that has been achieved over a specific time period and is appropriate when reporting the historical performance of, for example, an investor's 401(k) stocks over the last year. However, for the purpose of determining the cost of equity for AWU and ASU, a forward-looking measure is required. We are interested in the expected growth over the next many years, not the performance over the last year or last decade.

To elaborate on the time period, Morningstar / Ibbotson advocates using a period going as far back as 1926 stating that:

> some analysts estimate the expected equity risk premium using a shorter, more recent time period on the basis that recent events are more likely to be repeated in the near future; furthermore, they believe that the 1920s, 1930s, and 1940s contain too many unusual events. This view is suspect because all periods contain "unusual" events. Some of the most unusual events of the last hundred years took place quite recently, including the inflation of the late 1970s and early 1980s, the October 1987 stock market crash, the collapse of the high-yield bond market, the major contraction and consolidation of the thrift industry, the collapse of the Soviet Union, the development of the European Economic Community, the attacks of September 11, 2001 and the more recent liquidity crisis of 2008 and 2009.[93]

[93] Morningstar, "*Ibbotson SBBI 2013 Valuation Yearbook*," p. 59.

Professors Ross, Westerfield and Jaffe agree and find that an estimate based on the historical U.S. MRP over as long a period as possible to be reasonable.[94] The 2014 Valuation Handbook put forth by Duff & Phelps estimates a risk premium of 6.96% for the period 1926-2013, which is the most recent period for which data are available.

The arithmetic mean is the appropriate parameter because it is a better measure of *expectations* about the future in the statistical sense of a probability-weighted average over possible future returns. As noted by Drs. Brealey, Myers and Allen,

> If the cost of capital is estimated from historical return or risk premiums, use arithmetic averages, not the compound [geometric] annual rates of return.[95]

Other academic texts agree that the geometric average MRP is inappropriate for the purpose of estimating the cost of capital, which is inherently a forward looking measure.[96] Giacchino and Lesser show that the reliance on a geometric average MRP downward biases the expected MRP.[97]

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[94] Stephen A. Ross, Randolph W. Westerfield, and Jeffrey Jaffe, "*Corporate Finance*," 10th Edition, 2013, p. 326.

[95] Richard A. Brealey, Stewart C. Myers, and Franklin Allen, "*Principles of Corporate Finance*," 9th edition, 2008, p. 176.

[96] See, for example, Morningstar, *Ibbotson SBBI Valuation Yearbook*, 2014, pp. 56-58, Roger A. Morin (2006), *New Regulatory Finance*, Public Utilities Reports, Inc., pp. 116-117; Alex Kane, and Alan J. Marcus (2005), *Investments*, 6th Edition, McGraw-Hill, p. 865, and Stephen A. Ross, Randolp W. Westerfield and Franklin Allen, "*Corporate Finance,"* 2013, pp. 158-159.

[97] Leonardo R. Giacchino and Jonathan A. Lesser, "Principles of Utility Corporate Finance," 2011, pp. 133-134.

While there is an ongoing debate in the academic literature about the exact value and determinants of the MRP, my Pre-filed Supplemental Testimony at Q22 discusses reasons why the current MRP may be above the historical MRP. I shall therefore not elaborate on those reasons here.

Q41. What about the risk-free rate?

A. As discussed above and in my Pre-filed Supplemental Testimony at Q22, the risk-free rate is currently downward biased as a result of monetary policy. Therefore, I find the reliance on a forward-looking risk-free rate appropriate (and Order 10 looked to the trend in risk-free rates). As noted above in Table 1, the currently forecasted risk-free rate is approximately twice that of the current rate; using the 10-year government bond as a benchmark. Therefore, a reasonable estimate of the 30-year government bond yield, relied upon by Mr. Parcell, would be somewhere between the current rate of 2.7% and the forecast of above 5% (see footnote 74).

Q42. What would be the impact of implementing the modifications listed above?

A. Using a risk-free rate of 3.50%, Value Line betas (which all experts rely on), and a market risk premium of 6.96% to be consistent with Order 10, I obtain the results in Table 6 below.

Table 6: Modifying Parcell's CAPM Results

	Risk free rate [1]	Beta [2]	Market risk premium [3]	CAPM ROE [4]
Parcell's group	3.50%	0.69	6.96%	8.30%
Zepp's group	3.50%	0.71	6.96%	8.44%
Average				8.37%

Sources and notes:

[1]: Combination of current and forecasted 30-year treasuries yield; See testimony for details

[2]: U-13-201/202 Exhibit DCP-2, Schedule 11

[3]: 1926-2013 S&P market risk premium; 2014 Valuation Yearbook (Duff & Phelps)

[4]: [1] + [2] x [3]

A comparison of Mr. Parcell's Exhibit DCP-2, Schedule 11 reveals that these modifications increase the estimated cost of equity for the sample by about 200 basis points and if the financial leverage is taken into account, the estimated ROE is comparable to the recommendation of Dr. Zepp and myself at 10.8 to 11% using the CAPM.[98]

V. CONCLUSIONS

Q43. Please summarize your findings regarding AWU and ASU's risk.

A. As acknowledged by RAPA,

> Increasing [the] financial leverage of a utility increases the risk of the common stock of that utility, other factors equal.
>
> If financial leverage of a utility increases the risk of the common stock of that utility, common shareholders of that utility will demand

[98] See Exhibit BV-17 for details.

> a correspondingly higher return because of this increased financial risk.[99]

Therefore, it is imperative that the high leverage of AWU and ASU is taken into account using (i) a hypothetical capital structure, (ii) an increase in the ROE relative to the sample companies, or (iii) through a combination of (i) and (ii). I therefore continue to recommend that the hypothetical capital structure be used. The hypothetical equity percentage that AWWU proposes is also consistent with the capital structure ratios of the sample companies used.[100] I note that Mr. Parcell has recommended the use of a hypothetical capital structure for other utilities in Alaska, which have had similar low equity ratios.

The credit ratings of AWU and ASU and the comparable companies are not all that different and measure default risk[101] rather than shareholder equity risk. Therefore, Mr. Parcell's over-emphasis on credit ratings as the sole indication of risk is not appropriate. Further, AWU's and ASU's smaller size, geographic location, past inability to earn the allowed ROE, intense capital improvement program with $30 million and $46 million in annual capital projects forecasted for AWU and ASU, respectively, to 2028,[102] and the need to fund not only infrastructure needs but also replace assets previously funded by CIAC makes

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[99] Exhibit BV-11: Response to AWWU-1-43. See also Brealey, Myers and Allen (2008) p. 483.

[100] See Direct Testimony of Mr. Parcell in U-14-004, p. 27 for a similar argument.

[101] Exhibit BV-07: Response to AG-1-42.

[102] Capital Program Values submitted in Pre-filed Direct Testimony of Ms. Gibson, Exhibit GJG-03 and Exhibit GJG-04.

AWU and ASU vulnerable to lower returns and more volatile returns. Therefore, I continue to believe that AWU and ASU are more risky than the average of the sample companies.

Q44. What do you conclude regarding the cost of equity?

A. Based on my review of Mr. Parcell's testimony, I conclude that if I modify his DCF and CAPM implementation, as discussed previously in my reply testimony, the results are consistent with an allowed ROE of 11% to 12% for AWU and 10.8% to 11.7% for ASU if their actual capital structures are used.[103] Using Mr. Parcell's recommended cost of equity, the appropriate ROE at AWU's and ASU's actual book value capital structure is above 12%. However, I continue to believe that a hypothetical capital structure of 52% equity / 48% debt as requested by AWWU combined with an ROE of 10.9% as estimated at the time of the application is appropriate. Should the Commission seek to give weight to current data, the ROE estimate drops to approximately 10.6% if a hypothetical capital structure of 52% equity is used.

Q45. Does the fact that you have not addressed every issue in Mr. Parcell's testimony imply that you agree with those not addressed?

A. No, not necessarily. I have only addressed those issues, which I consider most erroneous or had the most significant impact to the outcome for AWU and ASU.

[103] Exhibit BV-17: ROE Implied from Modified Parcell CAPM and DCF.

Q46. Does this conclude your reply testimony?

A. Yes.

EXHIBIT

BV-07

privately-owned utility in his analyses and produce all documents relied upon by Mr. Parcell in addressing such risk differences.

Response:

(a) Admit.

(b) Admit. Apparently AWWU witnesses Dr. Zepp and Dr. Villadsen also agree.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-42. Please refer to the Prefiled Testimony of David C. Parcell in these dockets at p. 24. Mr. Parcell notes that the current bond rating for AWWU is AA, which is higher than the credit rating of any company in his or Dr. Zepp's sample. From this and other information, Mr. Parcell concludes that AWWU is less risky than the sample.

(a) Does Mr. Parcell agree that a bond rating is an estimate of the default risk of a company's debt? If not, please explain.

(b) Does Mr. Parcell believe that a company's credit rating is also a measure of the risk of the company's equity? If yes, please explain the theoretical basis for that view and provide any publications Mr. Parcell relies upon for that view.

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(c) Would two companies with the same credit rating necessarily have the same cost of equity? Please explain why or why not.

Response:

(a) Mr. Parcell agrees with this, but also believes there are other attributes and uses of bond ratings.

(b) Yes, in a regulatory sense. For example, the Federal Energy Regulatory Commission has cited bond ratings as a relevant source of a utility's risk. See Mr. Parcell's testimony at page 27.

(c) Not necessarily, but they would be expected to have more similar risk and cost of equity than would two companies with different credit ratings.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-43. Please refer to the Prefiled Testimony of David C. Parcell in these dockets at p. 57. Mr. Parcell discusses the financial risk adjustment calculated by Dr. Villadsen.

(a) Does Mr. Parcell agree that financial leverage does not affect the risk or the expected return on the utility's assets? If not, please explain.

(b) Does Mr. Parcell agree that borrowing creates financial leverage and risk? If not, please explain.

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EXHIBIT

BV-08

Exhibit BV-08: ROE at AWU/ASU Equity Percentage

Implied ROE at Parcell's sample's equity percentage

Parcell's recommended ROE	[1]	9.60%
Parcell's sample's equity %	[2]	51.00%
AWU cost of debt	[3]	3.52%
ASU cost of debt	[4]	3.12%
AWU implied WACC	[5]	6.62%
ASU implied WACC	[6]	6.42%
AWU Actual % Equity	[7]	32.53%
ASU Actual % Equity	[8]	34.43%
Implied AWU ROE	[9]	13.05%
Implied ASU ROE	[10]	12.72%

Sources and notes:

[1][3][4][7][8]:	U-13-201/202, Exhibit DCP-2
[2]:	Exhibit DCP-2, Schedule 6
[5]:	[1] x [2] + [3] x (1 - [2])
[6]:	[1] x [2] + [4] x (1 - [2])
[9]:	[[5] - [3] x (1 -[7])]/[7]
[10]:	[[6] - [4] x (1 -[8])]/[8]

EXHIBIT

BV-09

Exhibit BV-09, Panel A: Utility Allowed WACC

		Cost of Equity [1]	% Equity [2]	Cost of Debt [3]	% Debt [4]	WACC [5]
ASU WACC at 10.9% ROE and 52% Equity	[a]	10.9%	52%	3.12%	48%	7.2%
AWU WACC at 10.9% ROE and 52% Equity	[b]	10.9%	52%	3.52%	48%	7.4%
Average WACC for gas utilities	[c]					7.7%
Average WACC for electric utilities	[d]					7.7%

Sources and notes:

[1]: ROE requested by AWWU

[2]: Capital structure requested by AWWU

[3]: Prefiled Testimony of David C. Parcell, U-13-201/2012 AWWU, p. 8

[4]: 1 - [2]

[5]: [1] * [2] + [3] * [4]

[c] - [d]: Villadsen Supplemental Testimony Exhibit BV-R2, Panel B and Regulatory Research Associates; Average WACC for 2014

Exhibit BV-09, Panel B: Summary Data from RRA

	Allowed ROE	Equity %
Distribution Only Electric Utilities		
2012-present average	9.5	49.3
2012	9.7	48.9
2013	9.4	49.4
2014	9.5	49.6
Integrated Electric Utilities		
2012-present average	10.2	50.8
2012	10.3	51.4
2013	10.2	49.8
2014	10.2	51.4
Gas Utilities		
2012-present average	9.8	51.0
2012	9.9	51.1
2013	9.7	50.6
2014	9.8	51.3

Sources and notes: Regulatory Research Associates, February 2015

EXHIBIT

BV-10

Exhibit BV-10: Credit Ratings

	Parcell's ratings [1]	2011 S&P ratings [2]
American States Water	A+	A+
American Water Works	A+	BBB+
Aqua America	AA-	A+
Artesian Resources Corp	NR	NR
California Water Service Group	AA-	A+
Connecticut Water Service, Inc	A	A+
Middlesex Water Company	A	A-
SJW Corporation	A	A
York Water Company	A-	A-

Sources and notes:

[1]: AUS Utility Report as used by Parcell, April 2013

[2]: 2011 S&P Industry Report Card for U.S. Regulated Gas and Water Utilities

EXHIBIT

BV-11

(c) Would two companies with the same credit rating necessarily have the same cost of equity? Please explain why or why not.

Response:

(a) Mr. Parcell agrees with this, but also believes there are other attributes and uses of bond ratings.

(b) Yes, in a regulatory sense. For example, the Federal Energy Regulatory Commission has cited bond ratings as a relevant source of a utility's risk. See Mr. Parcell's testimony at page 27.

(c) Not necessarily, but they would be expected to have more similar risk and cost of equity than would two companies with different credit ratings.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-43. Please refer to the Prefiled Testimony of David C. Parcell in these dockets at p. 57. Mr. Parcell discusses the financial risk adjustment calculated by Dr. Villadsen.

(a) Does Mr. Parcell agree that financial leverage does not affect the risk or the expected return on the utility's assets? If not, please explain.

(b) Does Mr. Parcell agree that borrowing creates financial leverage and risk? If not, please explain.

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(c) Does Mr. Parcell agree that increasing financial leverage of a utility increases the risk of the common stock of that utility? If not, please explain.

(d) Does Mr. Parcell agree that if financial leverage of a utility increases the risk of the common stock of that utility, common shareholders of that utility will demand a correspondingly higher return because of this increased financial risk? If not, please explain.

Response:

(a) No. Clearly financial leverage affects the risk and expected return for all entities, including utilities.

(b) Yes.

(c) Yes, other factors equal.

(d) Yes.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-44. Please refer to the Prefiled Testimony of David C. Parcell in these dockets. Mr. Parcell in Exhibit DCP-2, Schedule 8, relies upon the most recent three month average of the 20-year Treasury Bonds as his risk-free rate. Does Mr. Parcell believe that this three-month average is most indicative of investor's future, long-term expectations of the risk-free rate? If yes, please explain.

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EXHIBIT

BV-12

Response: OBJECTION, the discovery request requires RAPA to undertake investigation and perform or create a study to be able to make future capital spending projections. ASU is capable of undertaking such actions on its own. Subject to this and the general objections, RAPA responds as follows: Rapa has not undertaken the investigation to perform or create a study to be able to make the requested future capital spending projection.

Answering Witness: N/A.

Designated Hearing Witness: N/A.

AWWU-2-7. Please refer to the Prefiled Testimony of David C. Parcell filed in these dockets. Please admit that utilizing a hypothetical capital structure over a period of years in order to build equity to fund capital improvements can reduce rate shock to ratepayers that could occur if no equity was built before large capital improvements would have to be built. If your response is anything other than an unqualified admission, please state the complete basis for the response and produce all documents supporting your response.

Response: OBJECTION, the request presents a hypothetical fact pattern implying that the only method for a utility to build equity is the use of a hypothetical capital structure, and that failure to use a hypothetical capital structure results in a utility not building any equity. Subject to this and the general objections, RAPA responds as

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follows: Conditionally admit limited to the specific facts presented in the hypothetical fact pattern. Also, please see Mr. Parcell's Direct Testimony on pages 33-42.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-2-8. Please refer to the Prefiled Testimony of David C. Parcell in these dockets at page 45 and his response to Question 53. Please state each and every risk Mr. Parcell considered in making the statement that he "believe[s] that is generally true" that "AWWU has similar risk to that of the groups of proxy water utilities."

Response: Mr. Parcell's analyses of AWWU's risks do not address the individual risks of the utility (i.e., a "micro" approach). Rather his risk assessment uses a "macro" approach, which employs independent assessment of the utility's relative risks by the rating agencies. It is undeniable that AWWU has higher credit ratings than the water/wastewater industry, as demonstrated by Mr. Parcell on pages 24-28.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-2-9. Please refer to the Prefiled Testimony of Parker J. Nation, Jr. filed in these dockets. Please admit that both AWU pro forma adjustment 10 and ASU pro forma adjustment 10 are utilizing known and measurable data from within a year after the end of test year. If your response is anything other than an unqualified

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EXHIBIT

BV-13

Designated Hearing Witness:

Dr. Bente Villadsen, The Brattle Group

AG-11-7. Refer to AWWU's response to discovery request AG-10-22(a)-(b), which states in part: "Both AWU and ASU have very large CIAC, which exceed that of the standard utility."

(a) State the amount of CIAC for a standard utility.

(b) Identify and provide all documents supporting the response to subpart (a).

(c) Is the "standard utility" referred to in AWWU's discovery response a investor owned utility, a Co-op, or a municipal-owned utility?

(d) Provide copies of any empirical study or other authority relied on for the proposition that large CIAC result in higher financing risk for a utility.

Response:

(a) The standard amount of CIAC has to be viewed in relation to the CIAC the sample companies have, but is not necessarily a fixed number. Therefore, Dr. Villadsen reviewed the annual reports of the companies in the comparable sample to assess the magnitude of CIAC that was present. For clarification, Dr. Villadsen has summarized this information for 2013 in the worksheet labelled "Response to A" in the excel file "**AG-11-7-a&d.xlsx**," saved in the folder AG-11-7 contained on the CD-ROM "AWWU Responses

to AG-11 in U-13-201/202" which shows that the magnitude of CIAC for the comparable companies range from 8% to 17% of the companies' net property, plant and equipment. In contrast, AWU's net CIAC was approximately 45.9% of net plant in service in 2012 and ASU's net CIAC was approximately 48.3% of net plant in service in 2012. Thus, both AWU and ASU have substantially more CIAC than the comparable companies, which indicate a range of 8 – 17%.

(b) Please see the pdf files labelled; **AG-11-7-b American_AR 2013.pdf**, **AG-11-7-b Aqua_AR 2013.pdf**, **AG-11-7-b AWR_AR 2013.pdf**, **AG-11-7-b California_AR 2013.pdf**, **AG-11-7-b Connecticut_AR 2013.pdf**, **AG-11-7-b Middlesex_AR 2013.pdf**, **AG-11-7-b SJW_AR 2013.pdf**, **AG-11-7-b YORW_AR 2013.pdf** located in the folder labelled "AG-11-7" contained on the CD-ROM "AWWU Responses to AG-11 in U-13-201/202" which contains 2013 annual reports for the sample companies.

(c) The term "standard utility" as used in AWWU's discovery responses is an investor-owned utility for which public data is available to estimate the cost of capital.

(d) There is a typo in Dr. Villadsen's Supplemental Testimony, page 25, line 9, where the sentence "the utilities face financing risk" should read "the utilities face refinancing risk." Looking to AWU first, the CIAC is expected to decrease

by almost $40 million between 2014 and 2028 while long-term debt and net assets (equity-equivalent) are expected to increase by $147 million and $133 million, respectively (See the worksheet labelled "Response to D - AWU" in the excel file labelled "**AG-11-7-a&d.xlsx**," located in the folder labelled "AG-11-7" contained on the CD-ROM "AWWU Responses to AG-11 in U-13-201/202" which is based on Exhibit GJG-3 attached to the Prefiled Direct Testimony of Glenda Gibson). Similarly, for ASU the CIAC is expected to decrease by about $28 million between 2014 and 2028 while long-term debt and net assets (equity-equivalent) are expected to increase by $236 million and $170 million, respectively (See the worksheet labelled "Response to D - ASU" in the excel file labelled "**AG-11-7-a&d.xlsx**," located in the folder labelled "AG-11-7" contained on the CD-ROM "AWWU Responses to AG-11 in U-13-201/202" which is based on Exhibit GJG-4 attached to the Prefiled Direct Testimony of Glenda Gibson).

With about $68 million ($40 million for AWU plus $28 million for ASU) in CIAC disappearing, the amount will need to be replaced with other capital at a currently unknown cost of capital. For example, Professors Harford, Klasa and Maxwell summarized research on refinancing risk in a recent paper and wrote:

> When refinancing, firms face the risk that changes in market conditions or capital market imperfections could result in refinancing at a significantly higher interest rate…

> An additional cost arising from this refinancing risk is that it can increase the potential for underinvestment problems…[References not included]

The paper, "Refinancing Risk and Cash Holdings" by Jarrad Harford, Sandy Klasa, and William F. Maxwell, Journal of Finance, vol. 69, pp. 975-1012 is located in the folder "AG-11-7" labelled"**AG-11-7-d.pdf**" contained on the CD-ROM "AWWU Responses to AG-11 in U-13-201/202".

Answering Witness:

Dr. Bente Villadsen, The Brattle Group

Designated Hearing Witness:

Dr. Bente Villadsen, The Brattle Group

AG-11-8. Refer to AWWU's response to discovery request AG-10-23(a), stating that Dr. Villadsen has never placed the target utility below the range of potential costs of equity estimates.

(a) Please explain why Dr. Villadsen has never placed the target utility below the range of potential costs of equity estimates.

(b) Has Dr. Villadsen ever place the target utility above the range of potential costs of equity estimates?

(c) If the response to subpart (b) is affirmative explain why.

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Refinancing Risk and Cash Holdings

JARRAD HARFORD, SANDY KLASA, and WILLIAM F. MAXWELL*

ABSTRACT

We find that firms mitigate refinancing risk by increasing their cash holdings and saving cash from cash flows. The maturity of firms' long-term debt has shortened markedly, and this shortening explains a large fraction of the increase in cash holdings over time. Consistent with the inference that cash reserves are particularly valuable for firms with refinancing risk, we document that the value of these reserves is higher for such firms and that they mitigate underinvestment problems. Our findings imply that refinancing risk is a key determinant of cash holdings and highlight the interdependence of a firm's financial policy decisions.

BOTH CASH HOLDINGS AND THE maturity structure of long-term debt are major considerations for firms, and there are trade-offs in determining each. An important aspect for debt maturity is that shortening maturity increases potential costs stemming from refinancing risk. When refinancing, firms face the risk that changes in market conditions or capital market imperfections could result in refinancing at a significantly higher interest rate (Froot, Scharfstein, and Stein (1993)). Firms also face the risk that lenders could underestimate the continuation value of the firm and not allow refinancing to take place, leading to an inefficient liquidation of the firm (e.g., Diamond (1991, 1993) and Sharpe (1991)) or the sale of important firm assets at fire-sale prices (Brunnermeier and Yogo (2009) and Choi, Hackbarth, and Zechner (2013)). An additional cost arising from this refinancing risk is that it can increase the potential for underinvestment problems (Almeida et al. (2012)). Firms with long-term debt that has a shorter maturity (hereafter referred to as shorter maturity debt) face refinancing risk more frequently.

*Harford is with the Foster School of Business, University of Washington, Klasa is with the Eller College of Management, University of Arizona, and Maxwell is with the Cox School of Business, Southern Methodist University. We thank an anonymous referee; an Associate Editor; Malcolm Baker; Travis Box; Murillo Campello; Lin Chen; Amar Gande; Cam Harvey (the Editor); Chris James; Kathy Kahle; Swaminathan Kalpathy; Hayong Yun; and seminar participants at Brigham Young University, McGill University, Texas Tech University, Virginia Tech University, the University of Arizona, a University of Oregon conference, a City University of Hong Kong symposium, and the University of Innsbruck Financial Markets and Risk conference for helpful comments. We also thank Douglas Fairhurst and Matthew Serfling for excellent research assistance. Klasa thanks the University of Arizona Eller College of Management for the financial support provided by the Anheuser-Busch Endowed Chair in Entrepreneurship Studies.

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circumstances. This finding is further evidence that the association is driven by firms mitigating refinancing risk.

We next investigate whether the presence of credit lines affects our findings. Specifically, we test whether bank lines of credit substitute for cash in mitigating refinancing risk. To do so, we collect data from firms' annual reports on whether they have a credit line and have drawn on it. Firms that do not have a bond rating are potentially rationed by investors with respect to how much outside capital they can obtain (e.g., Faulkender and Petersen (2006)). For these firms, we do not find that having an untapped line of credit from a bank results in a weaker association between shorter maturity debt and cash holdings. This result is consistent with recent work suggesting that financially constrained firms are less likely to view credit lines and cash holdings as substitutes (e.g., Sufi (2009), Campello, Graham, and Harvey (2010), Lins, Servaes, and Tufano (2010)). Our findings are different for firms with a bond rating (less constrained); we document that shorter maturity debt continues to be positively associated with cash holdings when a firm has at least partially drawn its credit line. However, this association becomes insignificant for rated firms with an untapped line of credit. One interpretation of this result is that firms that normally enjoy easier access to capital view an untapped credit line as a viable substitute for cash holdings to mitigate unexpectedly unfavorable refinancing conditions. For these firms, refinancing difficulties would likely be caused by debt market conditions rather than firm-specific distress (which would affect their access to a line as well).

One way that large cash reserves can provide value for firms with shorter maturity debt is by reducing underinvestment when firms can only partially roll over their debt or they refinance it at a higher rate. Consistent with this proposition, we document that the positive effect of cash holdings on investment is more pronounced for firms with shorter maturity debt and that this result becomes even stronger when credit market conditions are tight and refinancing risk is therefore higher.

Finally, if larger cash reserves mitigate refinancing risk and the costs associated with this risk, such as underinvestment, the market's valuation of an incremental dollar of cash holdings should be higher for firms with shorter maturity debt. Employing the Faulkender and Wang (2006) methodology, we find that the value of an incremental dollar of corporate cash reserves is indeed higher for firms with shorter maturity debt. Furthermore, we document that this effect is substantially more pronounced during years when credit market conditions are tight. These two findings are additional support for the hypothesis that large cash holdings are especially valuable for firms that face greater refinancing risk.

Overall, our study contributes to the literature in several ways. First, we provide insights on how the maturity of a firm's long-term debt impacts its other financial policy decisions, as well as the intertwined nature of these decisions. By documenting that refinancing risk associated with shorter maturity debt induces firms to hold more cash and save more cash from their cash flows, we show that debt maturity is an important determinant of a firm's corporate

liquidity policies, helping to explain the general upward trend in corporate cash holdings. Furthermore, we report that (1) the positive associations between shorter maturity debt and the level and market value of corporate cash holdings are more pronounced during years when credit market conditions are not as strong and (2) the more positive effect of cash holdings on investment for firms with greater refinancing risk is stronger during such years. These findings highlight the usefulness of considering time-variation in the supply of credit when conducting research about what drives corporate financial policy choices. Recent work that examines how credit supply affects firm behavior focuses on the 2007 to 2008 credit crisis (e.g., Campello, Graham, and Harvey (2010), Duchin, Ozbas, and Sensoy (2010), and Campello et al. (2011)). Our findings suggest that there is also considerable variation in credit supply and refinancing risk during noncrisis periods that can be exploited by researchers who study corporate financial policy decisions.

The remainder of the paper is organized as follows. Section I discusses our sample and provides evidence on how the structure and maturity of the debt of U.S. corporations has changed since 1980. Section II provides our empirical results. Finally, Section III concludes.

I. Sample Description and the Changing Nature of Debt in the United States

Our initial sample of 124,372 firm-years consists of U.S. incorporated industrial firms (utilities and financial firms are excluded) from 1980 to 2008 with nonzero sales and total assets. Our final sample of 103,806 observations excludes firms that do not have long-term debt, where long-term debt is defined as debt maturing in more than one year plus the current portion of this debt.

To proxy for debt maturity, prior work focuses on the fraction of a firm's total debt that is due in the next three years, which includes debt that has a maturity of less than one year at issuance (e.g., Barclay and Smith (1995), Johnson (2003), Billett, King, and Mauer (2007)). However, we exclude debt with less than a year to maturity when issued from our debt maturity/refinancing risk measure. We do so because nonfinancial firms typically pay this debt when it is due rather than refinance it, as it is used to finance a firm's short-term assets and other short-term liquidity needs that are often seasonal in nature.[7] This follows from the matching principle that short-term assets are financed with short-term debt, and that long-term assets are financed with long-term debt, preferred stock, or common equity. Stohs and Mauer (1996), Guedes and Opler (1996), and Graham and Harvey (2001) provide evidence consistent with

[7] In contrast, refinancing risk related to debt with a maturity of less than one year at issuance can be an important source of risk for financial firms. For instance, see Acharya, Gale, and Yorulmazer (2011) for evidence on how financial firms' refinancing risk resulting from their reliance on short-term debt that needed to be rolled over was an important factor that led to the recent financial crisis.

nonfinancial firms following the matching principle.[8] As such, we use the fraction of a firm's *long-term debt* due in the next three years (including the current portion of this debt) as our main proxy for the maturity of a firm's debt and its refinancing risk. We note that the study's results are not dependent on the choice of the time period used in the numerator or on excluding short-term debt from our measure for refinancing risk (we do not ignore short-term debt, but rather include it when calculating net working capital, which is a control variable in our cash models).

We report time trends in debt characteristics in Table I. To do so, we split the sample into six time periods and compute yearly means and then take the average of the years for each time period. Before discussing changes in debt maturity over time, we note that the percentage of firms with long-term debt in their capital structure decreases from 90.0% to 76.3% between the 1980 to 1984 and 2005 to 2008 periods. Comparing the same periods, there is a slight increase in the average ratio of long-term debt to total assets from 0.229 to 0.243 for firms with long-term debt.

Turning to debt maturity, Table I documents that the fraction of a firm's long-term debt due in the next three years increases from 0.383 to 0.482 from the 1980 to 1984 to the 2000 to 2004 periods. The 2005 to 2008 period began with a significant amount of refinancing, which tends to increase debt maturity. As a result, over this period the fraction of long-term debt due in the next three years decreases to 0.427. Overall, between the 1980 to 1984 and 2005 to 2008 periods, this fraction increases by 11.5%, implying a shortening of debt maturity and an increase in firms' refinancing risk (to be succinct whenever discussing a changing statistic over time, we are always comparing the beginning time period to the last time period unless otherwise noted). The statistics for the summary measures calculated using the fraction of long-term debt due in one or five years also suggest that debt maturity has decreased over our sample period. Specifically, these two fractions increase by 28.2% and 17.0% over time. Further consistent with a shortening of debt maturities, Table I reports that the

[8] To provide further insights on whether nonfinancial firms are likely to pay off short-term debt when it comes due rather than refinance it, we examine whether the amount of these firms' outstanding short-term debt varies considerably across the quarters of a firm's fiscal year. If so, this would be consistent with these firms typically paying off short-term debt when it is due. For this analysis, we use Compustat quarterly and annual data to back out the amount of a firm's outstanding debt that was short-term at issuance during every quarter of its fiscal year. Specifically, for firm-years in our sample in which there is outstanding short-term debt, each quarter we subtract from a firm's value for the Compustat quarterly variable DLCQ (which represents the sum of outstanding short-term debt and the current portion of long-term debt) the average value for the firm for the Compustat annual variable DD1 (which represents the current portion of long-term debt) at the end of its prior and current fiscal year. In doing so, we implicitly assume that the amount of the current portion of a firm's long-term debt typically remains roughly constant across the quarters of its fiscal year. For each of these firm-years, we then calculate the ratio of the estimate of outstanding short-term debt during the quarter when it is highest to that in the quarter when it is lowest. The median value of this ratio is 1.7, which suggests that, during the fiscal quarter when outstanding short-term debt is highest, it is approximately 70% higher than it is during the quarter when it is lowest. This finding is consistent with firms paying off short-term debt when it is due rather than refinancing it.

Table I

The Changing Nature of Debt and Cash Holdings in the United States

This table examines the changing nature of debt and cash holdings characteristics of U.S. incorporated firms with nonzero sales and total assets and with long-term debt >0 over the 1980 to 2008 period. Utilities and financials are excluded. Our final sample includes 103,806 firm-years. Long-term debt is defined as debt maturing in more than one year and the current portion of long-term debt (Compustat variables DLTT + DD1). To express the time trends in debt characteristics over time, we split the sample into six time periods and compute yearly means and then calculate the average over the years for each time period. The maturity structure of firms' public and private bonds is calculated with data from the FISD database. The maturity structure of firms' bank debt is calculated with data from the Dealscan database. We merge both databases with Compustat. To calculate the maturity of bonds and bank loans, we collect data at the issue level on the amount of bonds and loans issued each year and then create a value-weighted average maturity of debt for newly issued bonds and bank debt.

	1980 to 1984	1985 to 1989	1990 to 1994	1995 to 1999	2000 to 2004	2005 to 2008
Debt Characteristics						
Proportion of Compustat firms with long-term debt	0.900	0.876	0.844	0.822	0.788	0.763
Leverage ratio	0.229	0.245	0.235	0.243	0.241	0.243
Fraction of long-term debt due within one year	0.149	0.179	0.209	0.208	0.225	0.191
Fraction of long-term debt due within three years	0.383	0.425	0.488	0.470	0.482	0.427
Fraction of long-term debt due within five years	0.535	0.567	0.631	0.620	0.626	0.626
Debt tied to prime/long-term debt	0.168	0.204	0.208	0.232	0.226	0.258
Debentures/long-term debt	0.093	0.096	0.062	0.042	0.036	0.031
Average bond maturity		16.6	13.2	13.5	10.4	11.3
Average bank loan maturity		5.0	4.1	4.3	3.1	3.8
Average bond & loan weighted maturity		10.9	6.8	6.9	6.3	5.6
Cash						
Cash holdings and short-term investments/book assets	0.110	0.124	0.126	0.149	0.176	0.177

fraction of long-term debt consisting of debentures, which are debt contracts with a maturity of more than 10 years, decreases from 0.093 to 0.031. Also, the fraction of long-term debt consisting of debt with a variable interest rate (debt tied to prime in Compustat), which is usually bank debt with a shorter maturity, increases from 0.168 to 0.258.

To provide further evidence on whether debt maturity has changed over time, we use data from the Mergent Fixed Income Securities Database (FISD) and Dealscan databases on the maturity of public and private bond issues and the maturity of bank loans. The analysis is limited to those firms that have data on either or both of the Dealscan or FISD databases, which limits our sampling to 1986 onward. We approximate the maturity of newly issued bonds each year by using the FISD data on public and private bond issues. Table I

shows that original issue maturity decreases from 16.6 to 11.3 years. Similarly, we calculate an estimate of the maturity of newly issued bank loans each year using the Dealscan data. The average maturity of a firm's bank loans falls from 5.0 to 3.8 years. To reflect the increased utilization of bank debt, Table I also reports estimates for the value-weighted maturity of individual sample firms' outstanding bonds and bank debt, in which the weighting is a function of the value of the amount of newly issued bonds and bank debt. The results for this analysis show that the average maturity of bonds and bank debt decreases from 10.9 to 5.6 years. Finally, as it relates to our other variable of interest, we report that average cash holdings/book assets increases from 0.110 to 0.177, a 60.9% increase over our sample period.

Table I makes no adjustment for potential changes in Compustat firm characteristics over time. To address this issue, we estimate a panel regression in Table II in which the fraction of long-term debt due in the next three years is regressed on supply-side and demand-side determinants of debt maturity as well as a variable representing the fiscal year of the observation. We use the coefficient on the year variable to estimate the extent to which debt maturity has changed from 1980 to 2008 after controlling for the determinants of maturity.[9]

The control variables are drawn from prior literature. Diamond (1991) predicts that, because liquidity risk increases with leverage, it will be preferable for firms with more leverage to have debt with a longer maturity. In addition, in firms with larger cash flows, higher debt could reduce agency costs by forcing managers to pay out funds that might otherwise have been invested in negative net present value projects (e.g., Jensen (1986), McConnell and Servaes (1995)). Thus, firms with higher debt should have less of a need to shorten maturity to reduce agency costs. Both of these factors imply a positive association between leverage and debt maturity. Hence, to account for a firm's debt maturity being affected by the total amount of long-term debt, we control for total debt/book assets.

Following Barclay and Smith (1995), we also control for firm size, market-to-book assets, the difference between the yield on a government 10-year and six-month bond, and future abnormal earnings. Smaller firms suffer from greater information asymmetry problems with capital providers, such that these firms often only have access to bank debt, which tends to have a shorter maturity (James (1987), Lummer and McConnell (1989), and Faulkender and Petersen (2006)). Firms with higher market-to-book assets are expected to have larger growth opportunities, and as such they could face larger information asymmetry problems with capital providers and rely more on shorter maturity bank debt. Furthermore, Myers (1977) argues that underinvestment problems caused by debt overhang can be reduced if debt matures before the

[9] In the Table II regression models, we limit the sample to those firms appearing in the simultaneous equations models in Tables IV and VI. However, the results are very similar if we include the full sample of firms for which we have necessary data to run the regressions in Table II. The results of these robustness tests are reported in the Internet Appendix, which may be found in the online version of this article.

Table II

The Change in Debt Maturity after Controlling for Determinants of Maturity

Data are for Compustat industrial firms over the 1980 to 2008 period. The dependent variable is long-term debt due over the next three years/total long-term debt. Observation year is the fiscal year when an observation takes place. Term structure is the difference between the yield on a government 10-year and six-month bond. Future-year abnormal earnings is the difference between earnings per share in year $t + 1$ (excluding extraordinary items and discontinued operations and adjusted for any changes in shares outstanding) minus earnings per share in year t, divided by the year t share price. Weighted average asset maturity is defined as the book value–weighted maturity of long-term assets and current assets, where the maturity of long-term assets is computed as gross property, plant, and equipment divided by depreciation expense and the maturity of current assets is computed as current assets divided by the cost of goods sold. Industry cash flow risk is calculated as follows. For each firm-year, we compute the standard deviation of cash flow to assets for the previous 10 years, requiring at least three observations. We then average the firm cash flow standard deviations each year across each two-digit SIC industry. Net debt issuance is annual long-term debt issuance minus long-term debt reduction. Industry effects are controlled for by including dummies for Fama-French (1997) 48 industry groups. Significance levels for whether coefficient estimates are different from zero are in parentheses. The standard errors of the coefficients are adjusted for clustering of observations at the firm level.

Model	1	2
Intercept	−15.801	−15.900
	(<0.001)	(<0.001)
Observation year	0.008	0.008
	(<0.001)	(<0.001)
Total debt/book assets	−0.221	−0.240
	(<0.001)	(<0.001)
Natural logarithm of real book value of assets	−0.058	−0.059
	(<0.001)	(<0.001)
Market-to-book assets	0.000	0.002
	(0.748)	(0.074)
Term structure	0.004	0.004
	(<0.001)	(<0.001)
Future year abnormal earnings	0.030	0.031
	(<0.001)	(<0.001)
Weighted average asset maturity	−0.003	−0.003
	(<0.001)	(<0.001)
Industry cash flow risk	0.043	0.051
	(0.212)	(0.142)
Net debt issuance/book assets	−0.328	−0.322
	(<0.001)	(<0.001)
Firm had its IPO during the prior five years dummy	0.003	0.004
	(0.418)	(0.357)
Natural logarithm of cash and short-term investments/book assets		−0.011
		(0.000)
Industry fixed effects	Yes	Yes
R^2-adjusted	0.198	0.200
N	80,035	80,035

expiration of growth options. Thus, firms with higher market-to-book assets, which are expected to have larger growth options, should use shorter maturity debt. We include the slope of the yield curve, but there are differing predictions for how it should relate to debt maturity. Brick and Ravid (1985) argue that the tax shield value of long-term debt is higher when the yield curve is more upward sloping, which suggests debt maturity lengthens when the slope of the yield curve increases. However, Taggart (1977), Marsh (1982), Graham and Harvey (2001), and Faulkender (2005) argue that managers find shorter maturity loans relatively more attractive when short-term interest rates are particularly low compared to long-term rates, which suggests that firms' debt maturity should be negatively associated with the term structure premium. Finally, changes in firm value have a greater effect on the value of longer term debt as opposed to shorter term debt. Firms with private information about abnormal future earnings could reduce debt maturity, producing a positive relation between future abnormal earnings and the amount of a firm's shorter term debt.

Following Stohs and Mauer (1996), Johnson (2003), and Billett, King, and Mauer (2007), we include the average asset maturity of a firm in our debt maturity model. Myers (1977) argues that underinvestment problems can be reduced if the maturity of a firm's debt is matched with the maturity of its assets, which suggests a positive association between asset and debt maturity. We also include a variable measuring industry cash flow volatility to control for the effect of industry cash flow risk on the maturity of a firm's debt. In industries where cash flow volatility is higher, firms may face greater information asymmetry problems, which could result in financing with shorter maturity bank debt. Likewise, given that the value of shorter maturity debt is less sensitive to changes in firm risk, lenders may have a preference for shorter loan maturities when industry cash flow risk is higher.

To control for the fact that issuing (retiring) debt typically lengthens (shortens) the maturity of a firm's debt, we include net debt issuance scaled by book assets. We also include a dummy variable identifying whether a firm had an initial public offering (IPO) during the prior five years. This variable controls for changes in debt maturity that are the result of new firms entering our sample rather than existing firms altering the maturity of their debt. It also controls for the fact that, due to information asymmetry–related issues, most young firms do not have access to the public debt markets and consequently rely on banks for financing (Faulkender and Petersen (2006)). Finally, we also include industry fixed effects in our debt maturity models to control for other unmodeled industry effects.

The results for the first model in Table II show that the regression coefficients on most of the control variables are statistically different from zero and have the expected signs. Furthermore, the coefficient on the year variable is significantly different from zero and equals 0.008. This indicates that, after controlling for the determinants of debt maturity, the fraction of total long-term debt due in the next three years increases by 0.008 per year on average from 1980 to 2008,

for a total increase of 0.224 (=28 * 0.008). For the 80,035 firm-years used in the first two regression models in Table II, the mean value of the fraction of long-term debt that is due in the next three years increases from 0.338 to 0.394, a 16.6% increase from 1980 to 2008 (see Table III). Using the beginning period value for this fraction, we estimate that, after controlling for the determinants of debt maturity, the fraction of long-term debt due in the next three years increases by approximately 66.3% (=0.224/0.338) over our sample period. Thus, after accounting for changes in firm characteristics, the decrease in firms' debt maturity is even more apparent. The fact that Compustat firms have begun to hold abnormally high levels of shorter maturity debt is consistent with the conjecture that unmodeled changes in the supply of credit explain the shift. Also, this finding implies that the refinancing risk of U.S. industrial firms has increased markedly.

The second model in Table II reports the results when cash holdings are included as an independent variable. As discussed earlier, it is possible that higher current cash holdings could increase both the likelihood that lenders offer a firm a shorter term loan and the firm's propensity to accept such a loan offer. Following much of the work in the cash holdings literature, we measure the cash holdings/book assets ratio as the natural logarithm of this ratio.[10] We find that controlling for cash holdings in our debt maturity model has little effect on the results. Specifically, the coefficient on the year variable continues to be 0.008. The findings for this model also show that the coefficient on the cash holdings variable is negative, suggesting that larger cash holdings result in firms *increasing* the maturity of their debt. However, caution should be used in drawing inferences from this result given that the second model in Table II does not account for the joint determination of cash holdings and debt maturity. Indeed, later we report results showing that these two variables are endogenously determined, and subsequently estimate specifications that account for this endogeneity. The sign on cash holdings in the debt maturity regression then reverses, but its economic magnitude is quite small.

Finally, as robustness tests, we also reestimate the first model in Table II but change the dependent variable to be the fraction of a firm's long-term debt due in the next one or five years or the fraction of a firm's *total* debt due (which includes short-term debt) in the next three years. Here, we find results indicating that these three fractions increase by 113.8%, 51.1%, and 39.0% between 1980 and 2008 (see the Internet Appendix). Thus, the conclusion that there has been a significant decrease in firms' debt maturities is robust to the metric used to calculate debt maturity.

[10] A change in cash holdings can have markedly different consequences dependent on the firm's initial cash position, and there are significant outliers in the cash to assets ratio. By taking the natural logarithm of the ratio, we mitigate these issues.

Table III

Univariate Characteristics of Sample Used for Multivariate Tests

Panels A, B, and C report descriptive statistics using the sample of 80,035 firm-years for which it is possible to calculate the dependent and independent variables used in the regression models in Tables IV and VI. Panel D reports for each year from 1980 to 2008 the four-quarter moving average of the spread of the commercial and industrial loan rates over the federal funds rate.

Sample Period	Mean	25th Pct.	Median	75th Pct.	Fraction of Firms with All Long-Term Debt Due within Three Years
Panel A: 1980 to 2008					
Cash holdings and short-term investments/book assets	0.124	0.019	0.058	0.160	–
Fraction of long-term debt due within three years	0.400	0.110	0.314	0.653	0.089
Panel B: 1980					
Cash holdings and short-term investments/book assets	0.085	0.022	0.049	0.106	–
Fraction of long-term debt due within three years	0.338	0.155	0.274	0.456	0.028
Panel C: 2008					
Cash holdings and short-term investments/book assets	0.139	0.024	0.074	0.183	–
Fraction of long-term debt due within three years	0.394	0.040	0.293	0.678	0.124

Panel D: Four-Quarter Moving Average of the Spread of Commercial and Industrial Loan Rates over the Federal Funds Rate

Year	Spread	Year	Spread	Year	Spread
1980	2.01	1990	1.53	2000	1.80
1981	2.73	1991	1.75	2001	1.71
1982	1.87	1992	1.63	2002	1.79
1983	1.23	1993	1.57	2003	2.07
1984	1.24	1994	1.37	2004	1.95
1985	0.83	1995	1.37	2005	2.08
1986	0.97	1996	1.23	2006	1.73
1987	1.42	1997	1.31	2007	1.59
1988	1.54	1998	1.38	2008	2.12
1989	1.73	1999	1.64		

II. Empirical Results

A. Methodological Approach

Firms' cash holdings and the maturity of their debt are likely determined jointly. Consequently, to examine the effect of debt maturity on cash holdings, we use a simultaneous equations framework in which cash holdings and debt maturity are treated as endogenous. We estimate a two-stage least squares (2SLS) system of equations in which the standard errors of the coefficients are adjusted for the clustering of observations at the firm level. To do so, we first separately estimate two OLS regressions for cash holdings and debt maturity, and then simultaneously estimate the two structural equations by including the predicted values from the first-stage regressions as explanatory variables. The 2SLS methodology accounts for any correlation between the residuals of the debt maturity and cash holdings models that is caused by unobserved influences on cash holdings and debt maturity.

For the cash holdings model, we measure cash holdings as the natural logarithm of cash and short-term investments deflated by book assets. We follow Opler et al. (1999) and include the following variables in our model: net working capital net of cash scaled by book assets, the natural logarithm of real inflation-adjusted book assets, market-to-book assets, research and development expenses scaled by sales, capital expenditures scaled by book assets, and a dummy variable for whether a firm paid dividends in a given year.

Net working capital can substitute for cash. Thus, firms with a higher value for net working capital are expected to hold less cash. We note that we do not include the current portion of long-term debt in our calculation of the net working capital variable given that this portion of a firm's debt appears in our debt maturity variable. However, debt with a maturity of less than one year at issuance is included in our net working capital measure, which helps to control for the refinancing risk, if any, stemming from this type of debt. Book assets controls for the issue that smaller firms typically suffer from larger information asymmetry problems with external capital providers, and as a result are expected to hold larger cash balances. Market-to-book assets and research and development expenses proxy for growth opportunities and information asymmetry between a firm and market participants concerning the firm's prospects. Underinvestment is more costly for firms with larger growth opportunities, and consequently these firms are predicted to hold more cash. Likewise, because external financing costs are higher for firms with greater information asymmetry about their prospects, such firms are expected to have larger cash reserves. Capital expenditures proxy for a firm's level of investment. Firms that invest more are expected to accumulate less cash. Therefore, capital expenditures are predicted to be negatively associated with cash holdings. Firms that pay dividends are expected to have easier access to external capital and consequently a smaller cash balance.

We also include operating income/book assets, total debt/book assets, and industry cash flow volatility as independent variables in our cash holdings model. Controlling for operating income addresses the issue that more

profitable firms are less likely to be financially constrained and to need large cash balances for precautionary purposes. In addition, it controls for the possibility that more profitable firms suffer from greater agency costs related to managerial discretion. Including leverage in the cash model controls for the fact that interest payments reduce the ability of firms to accumulate excess cash balances (Jensen (1986)), which results in a negative impact of financial leverage on cash holdings. Furthermore, including leverage in the cash model addresses the fact that firms with greater leverage are subject to a higher level of refinancing risk than are firms with less leverage. Finally, industry cash flow volatility controls for cash flow uncertainty in an industry. When cash flow uncertainty in an industry is higher, firms in the industry should suffer from larger information asymmetry problems with capital market participants, and therefore industry cash flow volatility is predicted to be positively associated with cash holdings.

As in Bates, Kahle, and Stulz (2009), we also include acquisition expenses scaled by book assets in the cash model. Like capital expenditures, acquisition expenses proxy for a firm's level of investment, and are expected to be negatively associated with cash holdings. To the extent that managers of firms with large cash holdings could make acquisitions that benefit themselves personally but reduce firm value (e.g., Jensen (1986), Harford (1999)), controlling for acquisitions also helps to control for such agency costs. We also include a control for credit market conditions during a particular year. When the supply of available credit tightens and refinancing risk consequently increases, firms may increase their cash holdings to mitigate refinancing risk. To proxy for credit market conditions, we follow Harford (2005) and Officer (2007) and use the four-quarter moving average of the spread of commercial and industrial loan rates (on loans greater than $1 million) over the federal funds rate (hereafter referred to as the C&I rate spread) as a proxy for the supply of available credit.[11] We further control for net debt issuance/book assets because, if a firm issues more long-term debt than it retires in a given year, this could increase its cash reserves.[12] We also include a dummy variable identifying firms that had an IPO during the prior five years to control for changes in the

[11] As discussed in Harford (2005), through the Federal Reserve Senior Loan Officer (SLO) survey, the Federal Reserve surveys senior loan officers across the United States asking them whether over the previous quarter they tightened or eased credit standards for commercial loans. Unfortunately, from 1984 to 1990 the Federal Reserve did not collect this information. However, Lown, Morgan, and Rohatgi (2000) study the 1973 to 1983 and 1991 to 1998 periods and document that over the period for which data are collected for the SLO survey, the extent to which the SLO survey reports that credit conditions are tightening is highly correlated with the C&I rate spread. Thus, based on the results from Lown, Morgan, and Rohatgi (2000), the C&I rate spread may be used as a proxy for the extent to which credit market conditions are tightening.

[12] If we control for net debt issuance over the prior three years/book assets rather than net debt issuance during the current year/book assets, our results are very similar (see the Internet Appendix). This implies that the positive association we document between shorter maturity debt and cash holdings is not due to firms with shorter maturity debt having larger cash holdings because they received a loan in the prior one to three years and are still holding on to some of the proceeds from the loan.

population of Compustat firms over time and for the potential of larger information asymmetry problems for these firms (Bates, Kahle, and Stulz (2009)). Finally, industry and year fixed effects are included to capture unobserved industry and time factors correlated with corporate cash holdings.

The dependent variable in the debt maturity model is the fraction of a firm's long-term debt due in the next three years. The independent variables in the model include those appearing in the first model in Table II, except for the time trend variable. Also, we include the C&I rate spread because credit market conditions may jointly affect a firm's cash holdings and the maturity of its debt. This would occur if difficult refinancing conditions naturally lead to a shortening of debt maturities as fewer issues are refinanced. Finally, both industry and year fixed effects are included in the debt maturity model.

Before turning to the results of the 2SLS analyses, we report univariate statistics for cash holdings and the fraction of a firm's long-term debt due in the next three years for the sample of 80,035 firm-year observations over the 1980 to 2008 period that meet the data requirements for the variables included in our system of equations. Panels A, B, and C of Table III provide additional evidence of a shortening of debt maturity and show that the average ratio of cash holdings to book assets for our sample firms rises from 0.085 to 0.139 from 1980 to 2008, a 63.5% increase. Panel D in Table III provides the values for the C&I rate spread over our sample period. As documented in this panel, there is considerable variation in the spread values over our sample years.

B. Multivariate Evidence on the Effect of Debt Maturity on Cash Holdings

After confirming that the instruments used in the cash and debt maturity models are valid and that debt maturity and cash holdings are indeed endogenously determined, we estimate our system of equations.[13] Table IV reports the second-stage results for the structural equation that explains cash holdings. The first model in this table shows that the coefficients on most of the control variables are significant and have the expected signs. The significantly positive coefficient on the long-term debt due in the next three years/total long-term debt variable implies that the maturity of a firm's debt has a causal effect on

[13] To determine the validity of using 2SLS, we examined the suitability of the instruments in the cash and debt maturity equations and the appropriateness of using an instrumental variables approach. The results of these analyses are as follows. First, the results of F-tests and partial R^2 tests of excluded instruments indicate that the instruments in the cash and debt maturity equations are jointly significant in explaining the endogenous variables and that the instruments are valid. Second, the results of tests for whether we have underidentification or weak instrument problems reject the hypothesis that the instruments in our equations suffer from such problems. Third, we ran a Sargan test and found that the cash and debt maturity equations do not suffer from overidentification problems. Finally, we ran a Hausman test to examine if debt maturity is exogenous to cash holdings. The results of this test confirm that debt maturity is indeed endogenous to cash holdings and that it is consequently appropriate to use an instrumental variables approach rather than ordinary least squares when examining the effect of debt maturity on cash holdings.

Table IV

The Effect of Debt Maturity on Cash Holdings

Data are for Compustat industrial firms over the 1980 to 2008 period. The table reports the second-stage results for the structural equation that explains cash holdings estimated using the 2SLS methodology. The second-stage results for the structural equation that explains debt maturity are reported in the Internet Appendix. The second-stage structural equation that explains debt maturity has long-term debt due over the next three years/total long-term debt as the dependent variable, and the independent variables for this model are the predicted value of the natural logarithm of the sum of cash and short-term investments/book assets, total debt/book assets, the natural logarithm of real book assets, market-to-book assets, the difference between the yield on a government 10-year and six-month bond, future-year abnormal earnings, weighted average maturity of a firm's assets, industry cash flow risk, net debt issuance/book assets, whether a firm had its IPO during the prior five years, the average commercial and industrial loan rate spread (spread above the federal funds rate) over a firm's fiscal year, Fama-French (1997) 48 industry dummy variables, and year dummy variables. Industry cash flow risk is calculated as follows. For each firm-year, we compute the standard deviation of cash flow to assets for the previous 10 years, requiring at least three observations. We then average the firm cash flow standard deviations each year across each two-digit SIC industry. Net debt issuance is annual long-term debt issuance minus long-term debt reduction. Industry fixed effects are dummies for Fama-French (1997) 48 industry groups. Significance levels for whether coefficient estimates are different from zero are in parentheses. The standard errors of the coefficients are adjusted for clustering of observations at the firm level.

	Sample Period 1980 to 2008				Sample Period 1980 to 2006
Model	1	2	3	4	5
Intercept	−6.789	−3.910	−8.492	−6.800	−6.589
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Long-term debt due in next three years/total long-term debt	5.954				5.887
	(<0.001)				(<0.001)
Long-term debt due in next year/total long-term debt		5.122			
		(<0.001)			
Long-term debt due in next five years/total long-term debt			6.811		
			(<0.001)		
Debt due in next three years/total debt				6.614	
				(<0.001)	
Net working capital/book assets	−1.867	−1.506	−2.190	−4.017	−1.844
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Natural logarithm of real book value of assets	0.285	0.112	0.291	0.252	0.278
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Market-to-book assets	0.122	0.092	0.155	0.085	0.121
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Research and development expenses/sales	0.593	0.579	0.588	0.659	0.589
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Capital expenditures/book assets	−1.750	−1.272	−2.331	−2.175	−1.756
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Dividend paying dummy	−0.099	−0.131	−0.142	−0.127	−0.081
	(0.018)	(<0.001)	(0.004)	(0.004)	(0.061)
Operating income/book assets	0.663	0.951	0.350	1.321	0.645
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Total debt/book assets	−0.701	−1.084	−1.000	−0.564	−0.785
	(<0.001)	(<0.001)	(<0.001)	(0.001)	(<0.001)

(*Continued*)

Table IV—*Continued*

Model	Sample Period 1980 to 2008				Sample Period 1980 to 2006
	1	2	3	4	5
Industry cash flow risk	0.267	0.112	0.705	−0.075	0.506
	(0.309)	(0.590)	(0.031)	(0.808)	(0.102)
Acquisition expense/book assets	−2.092	−1.838	−3.182	−2.215	−2.147
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Commercial and industrial loan rate spread	0.021	0.007	−0.022	0.014	0.019
	(0.636)	(0.820)	(0.673)	(0.775)	(0.663)
Net debt issuance/book assets	3.084	2.356	3.382	3.600	3.122
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Firm had its IPO during the prior five years dummy	0.034	−0.032	0.048	0.027	0.035
	(0.270)	(0.163)	(0.199)	(0.410)	(0.264)
Year fixed effects	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes
N	80,035	80,035	80,035	80,035	76,398

its cash holdings. A shorter (longer) maturity results in larger (smaller) cash holdings.[14]

The positive effect of shorter maturity debt on cash holdings is not only statistically significant, but also economically significant. Over our sample period, the mean value of the fraction of a firm's long-term debt due in the next three years is 0.400. We multiply a 1% increase (0.004) in this number by its coefficient from the first model in Table IV and take the antilog of the resulting value. Our resulting estimate indicates that a 1% increase in the fraction of total long-term debt due in the next three years leads to a 2.4% increase in cash holdings.

It is also important to consider whether cash holdings affect debt maturity. In the Internet Appendix, we report results for the second-stage structural equation that explains debt maturity. We find that cash holdings positively impact the fraction of a firm's long-term debt due in the next three years. However, the economic importance of this result is very small. Specifically, a 1% increase in cash holdings/book assets increases the fraction of a firm's long-term debt due in the next three years by only 0.04%. Thus, after controlling for

[14] Bond ratings can proxy for a firm's ability to access external capital and whether it has publicly traded debt. However, data on bond ratings are only reliably available from Compustat from 1985 onward. As a result, we do not include a dummy variable for whether a firm has a bond rating in the cash and debt maturity models. As a robustness test, we reestimate the first model in Table IV over the 1985 to 2008 period including this dummy variable and find that our results are unaffected (see the Internet Appendix). This is potentially not surprising as we include firm size in both equations, which is a widely used proxy for a firm's ability to access external capital and which Faulkender and Petersen (2006) show is a statistically and economically important determinant for whether a firm has a bond rating. Also, our remaining control variables capture firm characteristics related to access to capital.

the simultaneity of cash holdings and debt maturity, we conclude that changes in firms' cash holdings have only a minimal effect on the maturity of their debt.

In the fifth model of Table IV, we assess the sensitivity of our results to the financial crisis years by reporting the results when the sample period is 1980 to 2006 instead of 1980 to 2008. Also, excluding 2007 and 2008 from the analysis allows us to use the regression coefficients from the fifth model in this panel to estimate how much of the increase in corporate cash holdings over the 1980 to 2006 period studied in Bates, Kahle, and Stulz (2009) can be explained by the contemporaneous decrease in debt maturity.

The results for this model show that the coefficient on the fraction of long-term debt due in the next three years is very similar to that reported for the first model, which implies that including 2007 and 2008 in our analysis does not have an important effect on the positive association between shorter maturity debt and cash holdings. Using the coefficient on the debt due variable in this model and the change in the mean proportion of long-term debt due in three years from 1980 to 2006, we estimate that this change predicts a 28.8% increase in cash holdings over this period. For the 76,398 firm-year observations for which we have data for all variables used in the 2SLS system of equations over the 1980 to 2006 period, the mean value of cash holdings scaled by book assets rises from 0.085 to 0.162, a 90.6% increase.[15] Therefore, the results for the fifth model in Table IV suggest that the shortening of debt maturity explains roughly 31.8% (= 28.8/90.6) of the increase in cash holdings for our sample firms from 1980 to 2006.[16] We conclude that a large fraction of the increase in the cash holdings of publicly traded U.S. industrial firms over this period can be explained by the contemporaneous shortening of debt maturity.[17]

[15] As reported earlier, the mean value of cash holdings/book assets for the sample firms used in our 2SLS analyses increases by 63.5% from 1980 to 2008. Presumably, the decrease in corporate cash holdings from 2006 to 2008 partly reflects firms drawing on their cash reserves over the 2007 to 2008 credit crisis period. The 90.6% increase in cash holdings/book assets that we find over the 1980 to 2006 period compares to the 112% increase that Bates, Kahle, and Stulz (2009) report over the same period for the sample of firm-year observations that they are left with after data requirements for the variables included in their cash model. The difference in our findings for the change in the mean cash holdings/book assets ratio from 1980 to 2006 relative to those in Bates, Kahle, and Stulz (2009) occurs because we only study firms that have long-term debt as well as the additional data requirements for the debt maturity model.

[16] Bates, Kahle, and Stulz (2009) report that, over the 1980 to 2006 period, firm-level changes in research and development expenses, capital expenditures, cash flow risk, and net working capital explain about 40% of the increase in the cash holdings of U.S. firms. Given that these four firm characteristic variables are included as control variables in our models, our findings imply that the decrease in debt maturity over time is incrementally important in explaining the change in cash holdings over time.

[17] We examined whether shorter maturity debt's impact on cash holdings changes over our sample period. Specifically, we split our 29 sample years into three subperiods of approximately equal length or two subperiods of approximately equal length and then reran our analyses using only the years from each subperiod. We find that the coefficient on the debt due variable does not significantly differ across subperiods (see the Internet Appendix). This evidence indicates that refinancing risk has not become more severe over time (so that during recent periods the same amount of shorter maturity debt would cause firms to hold more cash to mitigate refinancing risk).

The second, third, and fourth models in Table IV report the results when the debt maturity variable is defined as the fraction of a firm's long-term debt due in the next year, or the next five years, or the fraction of a firm's *total* debt due in the next three years. The results for these models show that the finding of a positive effect of shorter maturity debt on cash holdings is robust to the use of these alternative debt maturity measures. Furthermore, we find that the results obtained with these three models are economically important. Specifically, 1% increases in the fraction of a firm's long-term debt due in the next year or five years or in the fraction of a firm's total debt due in the next three years result in, respectively, 0.86%, 3.87%, or 3.12% increases to a firm's cash holdings.

We also find that the positive effects of shorter maturity debt on cash holdings documented in the first five models of Table IV are robust to controlling for firm fixed effects (see the Internet Appendix). Furthermore, we estimate the economic importance of these results and find that they are economically important with magnitudes similar to those for the Table IV results.[18]

C. The Level of Debt and Refinancing Risk

Firms with both higher debt levels and shorter maturity debt should be subject to the greatest refinancing risk. Thus, if mitigation of refinancing risk drives the positive effect of shorter maturity debt on cash holdings, then this effect should be more pronounced for firms with higher debt. To test this prediction, we have to recognize that the level of a firm's debt is likely jointly determined with its cash holdings and the maturity of its debt. Accordingly, we first estimate a model that predicts firms' debt levels and then use the fitted values from this model to instrument for debt levels. Following Kayhan and Titman (2007), we predict book leverage with the following variables (all lagged): market-to-book assets; property, plant, and equipment/book assets; research and development expenses/sales; a dummy variable for whether a firm reports no research and development expenses; selling expenses/sales, the natural logarithm of sales; and Fama-French 48 industry and year dummy variables.

Instead, the reason U.S. firms are now holding more cash to mitigate refinancing risk is that the shortening of the maturity of long-term debt has led many firms to become subject to greater refinancing risk.

[18] As discussed earlier, debt that is short-term when issued is included in our measure for net working capital. To provide insights on how short-term debt is related to a firm's cash holdings, we ran a slightly different specification of the cash model. In this model, we removed short-term debt from the net working capital variable and included the amount of a firm's short-term debt scaled by its total debt as a separate control. We document a significant negative coefficient on this variable (see the Internet Appendix). This finding is consistent with predictions derived from the pecking order model that short-term debt can serve as a substitute for internal financial slack because it typically has low exposure to information asymmetries relative to other sources of capital. As well, this finding suggests that firms do not hold more cash in anticipation of difficulties issuing short-term debt.

Table V provides the results of our analysis of whether the positive association between shorter maturity debt and cash holdings is more pronounced for firms with higher debt levels. The first model in this table reports the results for firm-years in which predicted book leverage is higher than the median sample value during a particular year. The second model reports the findings for firm-years below the median sample value. The coefficient on the debt due variable in the first model is markedly more positive than it is in the second model (6.397 vs. 1.620), a difference that is significant at the 5% level based on a Chi-squared test. This evidence is consistent with our interpretation that refinancing risk mitigation leads to the positive association between shorter maturity debt and cash holdings.

D. The Effect of Credit Market Conditions

We next examine how the supply of credit affects the positive association between shorter maturity debt and cash holdings. This allows us to further test the study's hypothesis that firms with shorter maturity debt hold larger cash reserves to mitigate refinancing risk. Our hypothesis generates the following three predictions. First, when credit conditions are strong, firms are less worried about refinancing risk, and consequently shorter maturity debt has a smaller effect on cash holdings. Second, a natural implication of our hypothesis is that firms will occasionally draw on their cash reserves to mitigate the impact of refinancing difficulties. As a result, during years when credit conditions are tight, some firms with high refinancing risk may *reduce* the level of their cash holdings relative to firms with lower refinancing risk. This suggests that the positive association between shorter maturity debt and cash holdings would become less pronounced or even insignificant during years when credit conditions are tight. Third, our hypothesis predicts that the positive effect of shorter maturity debt on cash holdings is strongest during periods when credit conditions are weakening, so that firms become concerned with the possibility that they might face refinancing difficulties in the future, but credit market conditions and the economy are still strong enough so that firms are able to increase their cash holdings.

Table VI provides results consistent with each of the three predictions described above. The first model in Table VI reports results when the 2SLS system of equations is estimated over the years with strong credit market conditions (the years when the C&I rate spread is below the median value for the 29 years from 1980 to 2008), while the second model in this table reports results for the other years. Comparing the coefficient on long-term debt due for the first two models, we find that the coefficient on this variable is markedly lower for the first model compared to the second model (0.669 vs. 4.389), a difference that is significant at the 5% level. These results indicate that the positive effect of shorter maturity debt on cash holdings is much weaker when credit conditions are strong and firms should be less concerned with refinancing risk.

The fourth model in Table VI reports results for the years when credit market conditions are tight (the five years when the spread is highest), while the third

Table V

Predicted Debt and the Effect of Debt Maturity on Cash Holdings

Data are for Compustat industrial firms over the 1980 to 2008 period. The table reports the second-stage results for the structural equation that explains cash holdings estimated using the 2SLS methodology. The variables and the debt maturity model that has long-term debt due over the next three years/total long-term debt as the dependent variable are defined in Table IV. A firm's predicted book leverage is the fitted value from a regression of book leverage on lagged market-to-book assets; lagged property, plant, and equipment/book assets; lagged research and development expenses/sales; a dummy variable for whether a firm has no research and development expenses; lagged selling expenses/sales; the lagged value of the natural logarithm of sales; Fama-French (1997) 48 industry dummy variables, and year dummy variables. Significance levels for whether coefficient estimates are different from zero are in parentheses. The standard errors of the coefficients are adjusted for clustering of observations at the firm level.

Model	Predicted Debt Level > Annual Sample Median Value 1	Predicted Debt Level ≤ Annual Sample Median Value 2
Intercept	−7.718	−2.281
	(<0.001)	(<0.001)
Long-term debt due in next three years/total long-term debt	6.397	1.620
	(<0.001)	(0.019)
Net working capital/book assets	−1.216	−2.681
	(<0.001)	(<0.001)
Natural logarithm of real book value of assets	0.304	0.040
	(<0.001)	(0.030)
Market-to-book assets	0.103	0.116
	(<0.001)	(<0.001)
Research and development expenses/sales	0.572	0.577
	(<0.001)	(<0.001)
Capital expenditures/book assets	−1.326	−2.775
	(<0.001)	(<0.001)
Dividend paying dummy	−0.032	−0.223
	(0.596)	(<0.001)
Operating income/book assets	0.300	0.557
	(0.012)	(<0.001)
Total debt/book assets	−0.308	−2.099
	(0.139)	(<0.001)
Industry cash flow risk	1.131	−0.205
	(0.003)	(0.380)
Acquisition expense/book assets	−2.041	−2.569
	(<0.001)	(<0.001)
Commercial and industrial loan rate spread	0.005	−0.025
	(0.946)	(0.533)
Net debt issuance/book assets	2.898	2.093
	(<0.001)	(<0.001)
Firm had its IPO during the prior five years dummy	−0.032	−0.033
	(0.471)	(0.231)
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
N	37,155	37,168

Table VI

Credit Market Conditions and the Effect of Debt Maturity on Cash Holdings

Data are for Compustat industrial firms over the 1980 to 2008 period. The table reports the second-stage results for the structural equation that explains cash holdings estimated using the 2SLS methodology. The variables and the debt maturity model that has long-term debt due over the next three years/total long-term debt as the dependent variable are defined in Table IV. The first model reports the results for the years when the commercial and industrial loan rate spread was less than the median value of 1.63 for the 29 years from 1980 to 2008. The second model reports the results for the years when the commercial and industrial loan rate spread was greater than or equal to the median value of 1.63 for the 29 years from 1980 to 2008. The third model reports the results for the years from 1980 to 2008 when the commercial and industrial loan rate spread is greater than or equal to the median value of 1.63 for the 29 years from 1980 to 2008, but excluding the five years with the highest spread values. The fourth model reports the results for the five years from 1980 to 2008 with the highest commercial and industrial loan rate spread values. Significance levels for whether coefficient estimates are different from zero are in parentheses. The standard errors of the coefficients are adjusted for clustering of observations at the firm level.

	Credit Market Is		Less Strong Credit Market Is	
Model	Strong 1	Less Strong 2	Weakening 3	Tight 4
Intercept	−1.605	−6.032	−9.728	−2.246
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Long-term debt due in next three years/total long-term debt	0.669	4.389	6.236	0.515
	(0.041)	(<0.001)	(<0.001)	(0.132)
Net working capital/book assets	−2.010	−1.837	−1.720	−2.345
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Natural logarithm of real book value of assets	0.038	0.117	0.201	−0.036
	(0.032)	(<0.001)	(<0.001)	(0.007)
Market-to-book assets	0.106	0.118	0.119	0.129
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Research and development expenses/sales	0.514	0.559	0.606	0.422
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Capital expenditures/book assets	−1.891	−1.343	−0.898	−2.302
	(<0.001)	(<0.001)	(0.007)	(<0.001)
Dividend paying dummy	−0.165	0.106	0.194	−0.097
	(<0.001)	(0.036)	(0.008)	(0.016)
Operating income/book assets	0.507	0.819	0.893	0.618
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Total debt/book assets	−2.071	−0.771	−0.343	−1.622
	(<0.001)	(<0.001)	(0.216)	(<0.001)
Industry cash flow risk	−0.272	−1.041	−1.829	0.197
	(0.238)	(<0.001)	(<0.001)	(0.342)
Acquisition expense/book assets	−1.842	−2.333	−2.097	−2.541
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Commercial and industrial loan rate spread	−0.384	0.619	1.967	0.076
	(<0.001)	(<0.001)	(<0.001)	(0.016)
Net debt issuance/book assets	1.392	2.611	3.285	1.152
	(<0.001)	(<0.001)	(<0.001)	(<0.001)

(*Continued*)

Table VI—*Continued*

Model	Credit Market Is		Less Strong Credit Market Is	
	Strong 1	Less Strong 2	Weakening 3	Tight 4
Firm had its IPO during the prior five years dummy	0.007 (0.062)	0.010 (0.763)	−0.006 (0.898)	0.041 (0.252)
Year fixed effects	No	No	No	No
Industry fixed effects	Yes	Yes	Yes	Yes
N	41,586	38,449	27,229	11,220

model reports results for the years when credit conditions are weakening (the remaining 10 years when the spread is equal to or greater than the median value over our sample period). The results for the fourth model in Table VI show that, over the five years with the tightest credit market conditions, the coefficient on the debt due variable becomes insignificant. In contrast, the results for the third model document that the coefficient on this variable is 6.236 and that this is the highest coefficient value on this variable across the four models in Table VI. Furthermore, a Chi-squared test reveals that the coefficients on the debt due variable in the third and fourth models of this table differ at the 5% significance level. Taken together, the Table VI results provide strong support for the conclusion that refinancing risk mitigation drives the positive association between shorter maturity debt and cash holdings.

E. Do Bank Lines of Credit Reduce the Need to Mitigate Refinancing Risk with Large Cash Reserves?

Most publicly traded firms in the United States have a bank line of credit (Sufi (2009)), providing a potential alternative source to mitigate refinancing risk. However, how firms use credit lines as substitutes for cash is a function of firm and market characteristics. Sufi (2009) reports that a line of credit is a viable substitute for cash holdings, but only for financially unconstrained firms. Lins, Servaes, and Tufano (2010) examine whether cash holdings and lines of credit are used to hedge against different types of risk and show that credit lines allow firms to take advantage of profitable investment opportunities available in good times, while cash reserves are used to protect firms from negative cash flow shocks in bad times. Campello, Graham, and Harvey (2010) and Ivashina and Scharfstein (2010) provide evidence from the recent financial crisis on how an important tightening of the credit supply affects the substitutability between cash holdings and lines of credit. Collectively, the findings from these two papers indicate that, when credit supply tightens markedly, financially constrained firms face the risk that their lines of credit will get pulled. Finally, Campello et al. (2011) show that, during the crisis, the terms of financially

constrained firms' credit lines worsened. For instance, line maturity declined and the interest rate charged on funds drawn increased.

The prior research discussed above suggests that, for financially unconstrained firms, a credit line can substitute for cash holdings. If so, then the larger is an unconstrained firm's unused credit line, the more easily the firm could mitigate refinancing risk with the funds available from its credit line. To provide some evidence on this issue, we collect firms' annual 10-K filings over the 1996 to 2008 period and follow the methodology outlined in Sufi (2009) to search for phrases in these filings that would indicate a firm has a line of credit. We find that a firm has a bank line of credit in approximately 88% of firm-years in our sample. Subsequently, we develop an algorithm that enables us to search for phrases in firms' 10-K filings that imply that all of the funds available from a firm's credit line(s) are unused at the end of the firm's fiscal year. We next create a dummy variable that takes a value of one if a firm has used some of its credit line funds at the end of its fiscal year (this variable equals one for 77% of the firm-years when a firm has a credit line). We use this variable to proxy for whether a firm potentially has limited credit line resources. In the Internet Appendix, we provide a detailed description of the algorithms used to create the credit line variables as well as the results of reliability tests, which suggest the variables are reliably coded. Our sample for the analyses using data on credit lines consists of 26,714 firm-year observations over the 1996 to 2008 period.

Tables VII and VIII provide the results of our 2SLS analyses using the credit line variables. The results for the first model in Table VII show that we continue to find that shorter maturity debt positively impacts firms' cash holdings. The second model provides results when the dummy variable for whether a firm has a credit line is included in both the debt maturity and cash models. As shown in this model, having a credit line negatively affects a firm's cash holdings, implying, on average, a substitute relationship between cash holdings and the presence of a credit line. The results also show that controlling for whether a firm has a line of credit has only a small effect on the association between debt maturity and cash holdings. The third model in Table VII reports similar findings for the 23,502 firm-years when a firm has a credit line. Finally, the fourth model in Table VII reports a negative coefficient on the dummy variable for whether a firm is using its credit line. This implies that firms that have a credit line and actually draw on it hold less cash, presumably because these firms substitute cash holdings usage with credit line use.

Table VIII provides evidence on whether firms with an unused credit line are likely to use the credit line rather than cash holdings to mitigate refinancing risk. In the first two models in Panel A of Table VIII, we compare firms that are using their credit line (Model 1) with firms that are not using their line (Model 2). The coefficients on the debt due variable in these two models are similar (3.835 vs. 4.726). The third model in Panel A includes the dummy variable for whether a firm is using at least some of its credit line and the interaction of this variable with the debt due variable. We find an insignificant coefficient on the interaction. This suggests that shorter maturity debt's positive impact

Table VII

Credit Lines and the Effect of Debt Maturity on Cash Holdings

Data are for Compustat industrial firms over the 1996 to 2008 period for which we collect data on credit lines. The table reports the second-stage results for the structural equation that explains cash holdings estimated using the 2SLS methodology. The variables and the debt maturity model that has long-term debt due over the next three years/total long-term debt as the dependent variable are defined in Table IV. In the Internet Appendix, we report how we create the credit line variables. The table reports regression results estimated using the 2SLS methodology. Significance levels for whether coefficient estimates are different from zero are in parentheses. The standard errors of the coefficients are adjusted for clustering of observations at the firm level.

	All Firms		Firms with a Credit Line	
Model	1	2	3	4
Intercept	−5.145	−5.001	−5.161	−4.622
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Long-term debt due in next three years/total long-term debt	3.824	4.099	4.000	3.900
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Net working capital/book assets	−2.351	−2.221	−2.324	−2.269
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Natural logarithm of real book value of assets	0.241	0.267	0.260	0.249
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Market-to-book assets	0.133	0.121	0.145	0.131
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Research and development expenses/sales	0.519	0.466	0.621	0.641
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Capital expenditures/book assets	−1.703	−1.556	−1.689	−1.549
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Dividend paying dummy	−0.239	−0.230	−0.223	−0.239
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Operating income/book assets	0.424	0.514	0.292	0.186
	(<0.001)	(<0.001)	(0.019)	(0.125)
Total debt/book assets	−0.667	−0.534	−0.710	−0.491
	(0.001)	(0.009)	(0.002)	(0.026)
Industry cash flow risk	0.178	0.147	0.062	0.104
	(0.478)	(0.568)	(0.808)	(0.670)
Acquisition expense/book assets	−2.400	−2.271	−2.333	−2.146
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Commercial and industrial loan rate spread	−0.117	−0.092	−0.197	−0.156
	(0.323)	(0.456)	(0.125)	(0.213)
Net debt issuance/book assets	2.253	2.299	2.333	2.214
	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Firm had its IPO during the prior five years dummy	−0.039	−0.040	−0.044	−0.032
	(0.290)	(0.299)	(0.273)	(0.410)
Firm has a credit line dummy		−0.596		
		(<0.001)		
Firm is using some of its credit line dummy				−0.712
				(<0.001)
Year fixed effects	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes
N	26,714	26,714	23,502	23,502

Table VIII

The Effect of Credit Line Usage on Firms' Propensities to Mitigate Refinancing Risk with Cash Holdings

Data are for Compustat industrial firms over the 1996 to 2008 period for which we collect data on credit lines. The table reports the second-stage results for the structural equation that explains cash holdings estimated using the 2SLS methodology. The variables and the debt maturity model that has long-term debt due over the next three years/total long-term debt as the dependent variable are defined in Table IV. In the Internet Appendix, we report how we create the credit line variables. Significance levels for whether coefficient estimates are different from zero are in parentheses. The standard errors of the coefficients are adjusted for clustering of observations at the firm level.

Panel A: Financially Constrained and Unconstrained Firms Analyzed Together

Model	1	2	3
Firm is using at least some of its credit line	Yes	No	–
Intercept	−5.171	−6.215	−4.698
	(<0.001)	(<0.001)	(<0.001)
Long-term debt due in next three years/total long-term debt	3.835	4.726	4.059
	(<0.001)	(0.002)	(<0.001)
Dummy for if a firm is using its credit line			−0.631
			(<0.001)
Long-term debt due in next three years/total long-term debt × Dummy for if a firm is using its credit line			−0.201
			(0.334)
Net working capital/book assets	−2.320	−1.921	−2.272
	(<0.001)	(<0.001)	(<0.001)
Natural logarithm of real book value of assets	0.269	0.223	0.249
	(<0.001)	(0.023)	(<0.001)
Market-to-book assets	0.166	0.051	0.130
	(<0.001)	(0.048)	(<0.001)
Research and development expenses/sales	0.606	0.697	0.641
	(<0.001)	(<0.001)	(<0.001)
Capital expenditures/book assets	−1.476	−1.685	−1.551
	(<0.001)	(0.025)	(<0.001)
Dividend paying dummy	−0.211	−0.421	−0.240
	(<0.001)	(<0.001)	(<0.001)
Operating income/book assets	0.118	0.566	0.181
	(0.364)	(0.047)	(0.135)
Total debt/book assets	−0.660	0.836	−0.484
	(0.002)	(0.324)	(0.027)
Industry cash flow risk	0.020	0.308	0.106
	(0.944)	(0.457)	(0.665)
Acquisition expense/book assets	−1.841	−3.573	−2.156
	(<0.001)	(<0.001)	(<0.001)
Commercial and industrial loan rate spread	−0.229	0.259	−0.152
	(0.124)	(0.353)	(0.224)
Net debt issuance/book assets	2.020	3.032	2.213
	(<0.001)	(<0.001)	(<0.001)
Firm had its IPO during the prior five years dummy	−0.032	−0.011	−0.034
	(0.469)	(0.887)	(0.392)
Year fixed effects	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes
N	18,186	5,316	23,502

(*Continued*)

Table VIII—*Continued*

Panel B: Financially Constrained and Unconstrained Firms Analyzed Separately

Model	1	2	3	4	5	6
Firm has a bond rating	No	No	No	Yes	Yes	Yes
Firm is using at least some of its credit line	Yes	No	–	Yes	No	–
Intercept	−4.963	−4.642	−4.251	−1.504	0.135	−0.999
	(<0.001)	(0.003)	(<0.001)	(0.032)	(0.890)	(0.117)
Long-term debt due in next three years/total long-term debt	3.370	3.138	3.228	3.484	−1.187	3.758
	(0.002)	(0.007)	(<0.001)	(<0.001)	(0.534)	(<0.001)
Dummy for if a firm is using its credit line			−0.831			−0.451
			(<0.001)			(0.004)
Long-term debt due in next three years/total long-term debt × Dummy for if a firm is using its credit line			0.216			−0.525
			(0.442)			(0.491)
Net working capital/book assets	−2.367	−2.154	−2.346	−2.040	−2.260	−1.930
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Natural logarithm of real book value of assets	0.300	0.142	0.216	−0.114	−0.180	−0.128
	(0.002)	(0.062)	(<0.001)	(0.002)	(<0.001)	(<0.001)
Market-to-book assets	0.153	0.055	0.121	0.303	0.164	0.272
	(<0.001)	(0.013)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Research and development expenses/sales	0.564	0.638	0.597	1.040	3.107	1.098
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Capital expenditures/book assets	−1.839	−2.523	−1.941	−1.280	−1.590	−1.286
	(<0.001)	(<0.001)	(<0.001)	(0.061)	(0.072)	(0.031)
Dividend paying dummy	−0.125	−0.372	−0.167	−0.319	−0.203	−0.319
	(0.091)	(<0.001)	(0.006)	(<0.001)	(0.049)	(<0.001)
Operating income/book assets	−0.061	0.579	0.026	−0.618	−1.182	−0.693
	(0.639)	(0.021)	(0.832)	(0.130)	(0.025)	(0.059)
Total debt/book assets	−1.253	−0.305	−1.107	−0.700	−1.810	−0.695
	(<0.001)	(0.654)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Industry cash flow risk	−0.158	0.517	−0.002	0.540	0.084	0.393
	(0.621)	(0.278)	(0.993)	(0.186)	(0.801)	(0.227)
Acquisition expense/book assets	−1.663	−3.349	−2.008	−2.586	−3.968	−2.684
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(<0.001)
Commercial and industrial loan rate spread	−0.044	0.152	−0.034	−0.519	0.074	−0.384
	(0.796)	(0.570)	(0.808)	(0.018)	(0.836)	(0.042)
Net debt issuance/book assets	2.271	3.217	2.523	1.584	0.802	1.589
	(<0.001)	(<0.001)	(<0.001)	(<0.001)	(0.089)	(<0.001)
Firm had its IPO during the prior five years dummy	−0.110	0.023	−0.092	0.129	−0.126	0.011
	(0.056)	(0.750)	(0.064)	(0.729)	(0.271)	(0.886)
Year fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
Industry fixed effects	Yes	Yes	Yes	Yes	Yes	Yes
N	13,207	3,895	17,102	4,979	1,421	6,400

on cash holdings does not differ significantly between firms with or without an unused credit line. This could reflect the possibility that, for many financially constrained firms, credit lines are not a viable substitute for cash holdings, particularly to mitigate refinancing risk. As reported earlier, during tight credit periods, when refinancing risk is highest, many financially constrained firms face the risk that access to their lines of credit may become restricted. Thus,

during periods when credit is not tight, financially constrained firms with a significant amount of shorter maturity debt choose to hold larger cash reserves, regardless of whether they have an unused credit line. This allows these firms to mitigate potential refinancing difficulties during tight credit periods when access to their lines of credit could become restricted.

In Panel B of Table VIII, we use the existence of a bond rating to examine the issue separately for financially constrained and not financially constrained firms. The first three models in this panel provide results for only firms without a bond rating. The insignificant coefficient on the interaction variable in the third model reveals that, as expected, for firms without a bond rating, the positive impact of short-maturity debt on cash holdings is not affected by whether all of the funds in a firm's credit line are unused. The fourth, fifth, and sixth models in Panel B of Table VIII consider only firms with bond ratings. The results for the fourth model show that the positive association between debt maturity and cash holdings remains for rated firms using their credit line. However, the results for the fifth model document that, for rated firms with untapped credit lines, there is an insignificant relation between debt maturity and cash holdings. The findings for the sixth model in this panel show that the coefficients on the debt due variable in the fourth and fifth models do not differ significantly. Nevertheless, the result of an insignificant coefficient on this variable in the fifth model supports the proposition that the availability of a large amount of untapped credit line funds could be a viable substitute for cash holdings to mitigate refinancing risk for financially unconstrained firms.[19] As such, our findings with respect to credit lines are consistent with recent work that suggests financially unconstrained firms are more likely than are constrained firms to view credit lines and cash holdings as substitutes (e.g., Sufi (2009), Campello, Graham, and Harvey (2010), Lins, Servaes, and Tufano (2010)).

F. Refinancing Risk and a Firm's Propensity to Save Cash Out of Its Cash Flows

Our hypothesis that firms with shorter maturity debt hold more cash to mitigate refinancing risk also leads to the prediction that these firms have a higher propensity to save cash from their cash flows. To test this prediction, we use the Almeida, Campello, and Weisbach (2004) model to calculate a firm's propensity to save cash out of current cash flows. In their model, the annual change in cash holdings scaled by book assets is regressed on annual cash flow scaled by book assets and control variables. The regression coefficient on the cash flow variable represents the extent to which a firm saves cash out of current cash flows. Debt maturity and the extent to which a firm saves

[19] The finding that the coefficients on the debt due variable in the fourth and fifth models of Panel B do not significantly differ is due in part to a very large standard error for the coefficient on this variable in the fifth model. Specifically, in the fourth and fifth models in this panel the standard errors relative to the regression coefficients on this variable are, respectively, 0.904 versus 3.484 and 1.906 versus −1.187.

cash from its cash flows are likely to be determined simultaneously. Thus, we calculate fitted values of debt maturity. We do so by using a slightly modified version of the first model in Table II (we use separate year dummies in place of the time trend variable representing the observation's year). To examine whether firms with greater refinancing risk save more cash out of their cash flows, we include a dummy variable for whether a firm's fitted value for the fraction of its long-term debt due in the next three years is in the top sample quintile over a particular year. We then interact this variable with the cash flow variable.

Following Almeida, Campello, and Weisbach (2004), we include the following control variables in our model: market-to-book assets, the natural logarithm of real book assets, capital expenditures/book assets, acquisition expense/book assets, and the current-year change in net working capital/book assets. Instead of controlling for the current-year change in short-term debt/book assets as they do, we control for net debt issuance/book assets, as in our prior regression models. Finally, because a firm's prior-year cash holdings should influence how much cash the firm saves from its current-year cash flows, we also control for lagged cash holdings.

The first model in Table IX documents that, on average, our sample firms save approximately 4 cents out of every dollar of cash flow. The findings for the second model show that firms in the bottom four quintiles for the predicted fraction of long-term debt due in the next three years save on average about 3.4 cents out of every dollar of cash flow. The significant coefficient on the interaction variable in this model indicates that firms that are in the top quintile for this predicted fraction save on average 5.1 cents (=3.4 + 1.7) per dollar of cash flow. The finding that firms with higher instrumented shorter maturity debt save more cash from their cash flows is additional evidence in support of the proposition that firms with greater refinancing risk try to mitigate this risk by holding more cash.

G. The Effect of Debt Maturity on the Importance of Cash Holdings for Investment

As discussed earlier, our hypothesis predicts that larger cash holdings should mitigate underinvestment problems more for firms with higher refinancing risk. Table X provides the results of empirical tests of this prediction using the basic investment model employed in Faulkender and Petersen (2012). In their model, investment is defined as the sum of capital expenditures and research and development and advertising expenses. As control variables, they include the natural logarithm of the market value of assets, market-to-book assets, and preinvestment earnings/book assets, where preinvestment earnings are defined as earnings before interest, taxes, and depreciation plus research and development and advertising expenses. In addition, we include a dummy variable for whether the fraction of a firm's long-term debt due in the next three years is in the highest sample quintile for that year. This variable is meant to identify firm-years with high refinancing risk. We also include lagged

Table IX

Debt Maturity and the Propensity to Save Cash Out of Current Cash Flows

Data are for Compustat industrial firms over the 1980 to 2008 period. The table reports OLS regressions of the change in cash holdings on current cash flow, a dummy variable for whether the fitted value for the fraction of long-term debt due in the next three years is in the top sample quintile over a particular year, an interaction term between this dummy variable and current cash flow, and control variables. The dependent variable is the change in cash and short-term investments scaled by book assets. Cash flow is earnings before extraordinary items and depreciation minus dividends scaled by book assets. The fitted value used in Model 2 is from a regression model explaining long-term debt due in the next three years/total long-term debt, where the independent variables are total debt/book assets, the natural logarithm of real book assets, market-to-book assets, the difference between the yield on a government 10-year and six-month bond, future year abnormal earnings, weighted average maturity of a firm's assets, industry cash flow risk, net debt issuance/book assets, whether a firm had its IPO during the prior five years, Fama-French (1997) 48 industry dummy variables, and year dummy variables. Cash holdings are not included in the change in net working capital variable. Significance levels for whether coefficient estimates are different from zero are in parentheses. The standard errors of the coefficients are adjusted for clustering of observations at the firm level.

Model	1	2
Intercept	0.043	0.020
	(<0.001)	(<0.001)
Cash flow	0.040	0.034
	(<0.001)	(<0.001)
Fitted value of long-term debt due fraction is in the top sample quintile		0.026
		(<0.001)
Cash flow × fitted value of long-term debt due fraction is in the top sample quintile		0.017
		(<0.001)
Market-to-book assets	0.010	0.009
	(<0.001)	(<0.001)
Natural logarithm of real book value of assets	−0.002	0.001
	(<0.001)	(<0.001)
Capital expenditures/book assets	−0.241	−0.236
	(<0.001)	(<0.001)
Acquisition expense/book assets	−0.332	−0.333
	(<0.001)	(<0.001)
Change in net working capital/book assets relative to prior year	−0.051	−0.055
	(<0.001)	(<0.001)
Net debt issuance/book assets	0.045	0.064
	(<0.001)	(<0.001)
Prior year cash holdings/book assets	−0.272	−0.276
	(<0.001)	(<0.001)
Year fixed effects	Yes	Yes
Industry fixed effects	Yes	Yes
R^2-adjusted	0.245	0.252
N	79,077	79,077

cash holdings/book assets and the interaction of this variable with the high refinancing risk variable. Because issuing debt can affect both investment and the maturity of a firm's debt, we also control for net debt issuance/book assets during the year. We attempt to deal with the potential endogeneity of cash

Table X

The Effect of Debt Maturity on the Importance of Cash Holdings for Investment

The table reports OLS regressions of investment on a dummy variable for whether the fraction of a firm's long-term debt due in the next three years is in the top sample quintile during a particular year, lagged cash holdings, the interaction of the two prior variables, net debt issuance/book assets, the natural logarithm of the real market value of assets, market-to-book assets, and preinvestment earnings/book assets. The sample is made up of firms included in our analysis of the market valuation of corporate cash holdings and consists of 56,252 firm-year observations over the 1980 to 2008 period with required data for the regressions. Investment is defined as the sum of capital expenditures, acquisition expenses, research and development expenses, and advertising expenses scaled by book assets. Preinvestment earnings/book assets is defined as earnings before interest, taxes, depreciation, and amortization plus research and development and advertising expenses scaled by book assets. The second model is the same as the first, except that it is run using data for only the five years during which the spread of commercial and industrial loan rates over the federal funds rate is in the highest quintile for the 29 years over the 1980 to 2008 sample period. Significance levels for whether coefficient estimates are different from zero are in parentheses. The standard errors of the coefficients are adjusted for clustering of observations at the firm level.

Model	Full Sample 1	Tight Credit Market Conditions 2
Constant	0.105	0.144
	(<0.001)	(<0.001)
Fifth quintile of long-term debt due in next three years	−0.005	−0.016
	(0.004)	(0.005)
Cash holdings$_{t-1}$	0.127	0.121
	(<0.001)	(<0.001)
Fifth quintile of long-term debt due in next three years × Cash holdings$_{t-1}$	0.020	0.074
	(0.005)	(<0.001)
Net debt issuance/book assets	0.214	0.159
	(<0.001)	(<0.001)
Natural logarithm of real market value of assets	−0.001	−0.003
	(0.210)	(0.162)
Market-to-book-assets	0.002	−0.048
	(<0.001)	(0.002)
Preinvestment earnings/book assets	0.063	0.144
	(<0.001)	(<0.001)
Year fixed effects	Yes	No
Firm fixed effects	Yes	Yes
R^2-adjusted	0.167	0.177
N	56,252	10,153

holdings and investment by including lagged rather than current-year cash holdings in the investment model and also including firm fixed effects.

The results from the first model in Table X show that the coefficients on the lagged cash holdings variable and its interaction with the high refinancing risk dummy variable are both positive and significant. The significant interaction term implies that, consistent with our prediction, cash holdings have a more pronounced positive effect on investment for firms with greater refinancing risk. Based on the first model in Table X, an incremental dollar of cash

reserves in the prior year leads to an extra 12.7 cents in investment in the current year for firms that do not face significant refinancing risk. However, for firms with significant refinancing risk, an incremental dollar of cash reserves in the prior year leads to 14.7 cents in investment in the current year, an economically significant increase.[20] These findings are consistent with the conclusion that sometimes firms with greater refinancing risk need to draw on their cash reserves to pay off debt coming due or to pay interest on debt that is refinanced at a higher interest rate. As a result, having a large cash balance can be particularly useful for avoiding underinvestment for these firms.

The second model in Table X reports the results when we estimate our regression using data for only the five years during which the C&I rate spread is in the highest quintile from 1980 to 2008. Consistent with our hypothesis, we find that, when credit market conditions tighten, the incremental effect of cash holdings on investment for firms with higher refinancing risk becomes even larger. Specifically, the coefficient estimates from this model suggest that, under tight credit market conditions, an incremental dollar of cash reserves in the prior year leads to an extra 12.1 cents in investment in the current year for firms that do not face significant refinancing risk. However, for firms with significant refinancing risk, an incremental dollar of cash reserves in the prior year leads to 19.5 cents in investment in the current year.

H. The Impact of Debt Maturity on the Contribution of Cash Holdings to Firm Value

The results from Tables IV to X support the hypothesis that firms with shorter maturity debt hold more cash to mitigate potential costs stemming from refinancing risk. As an additional test of this hypothesis, we examine whether the contribution of cash holdings to firm value is larger for these firms. We estimate how a change in cash holdings leads to a change in a firm's market value using the approach developed by Faulkender and Wang (2006). For this purpose, we use a sample of 58,433 firm-year observations from 1980 to 2008 for which we are able to construct the variables required for the analysis.

Table XI provides the results of our analysis. The first model in this table is a base-case model that is identical to the model used in Faulkender and Wang (2006). The results for this model show that the coefficient on the change in

[20] The findings for the first model in Table X also show that the coefficient on the dummy variable identifying firms with higher refinancing risk is significant and negative, which is consistent with the Almeida et al. (2012) finding that, during the 2007 financial crisis, firms that had more debt coming due soon decreased their investment levels the most. It is interesting to note that they find their result in the context of a credit crisis. However, our result implies that, overall, having debt with shorter maturity negatively impacts investment. This finding runs counter to the Myers (1977) prediction that shortening the maturity of a firm's debt reduces underinvestment problems because debt would then be more likely to mature before investment options expire, which would reduce debt overhang. A potential explanation for this finding is that the negative effect on corporate investment of refinancing risk resulting from having shorter maturity debt outweighs the benefits for corporate investment of shortening debt maturity in an attempt to reduce debt overhang.

Table XI

The Effect of Debt Maturity on the Market Valuation of Cash Holdings

The table reports OLS regressions of changes in firm value on changes in cash holdings, a dummy variable for whether a firm's long-term debt has a short maturity, the interaction of the prior two variables, and control variables. The sample consists of 58,433 firm-year observations over the 1980 to 2008 period with required data for the regressions. The dependent and independent variables are defined as in Faulkender and Wang (2006). A delta (Δ) indicates that the variable is calculated as the change from year $t-1$ to t. The first model is the basic model from Faulkender and Wang (2006). In the second model, we include a dummy variable for whether the fraction of a firm's long-term debt due in the next three years is in the top sample quintile for that year, and also include the interaction of this dummy variable with Δ Cash holdings. The third model is the same as the second model, except that it is run using data for only the five years during which the spread of commercial and industrial loan rates over the federal funds rate is in the highest quintile for the 29 years over the 1980 to 2008 sample period. Significance levels for whether coefficient estimates are different from zero are in parentheses. The standard errors of the coefficients are adjusted for clustering of observations at the firm level.

	Full Sample		Tight Credit Market Conditions
Model	1	2	3
Constant	0.040	0.058	0.044
	(<0.001)	(<0.001)	(<0.001)
Δ Cash holdings	1.201	1.128	1.264
	(<0.001)	(<0.001)	(<0.001)
Fifth quintile of long-term debt due in next three years		−0.061	−0.046
		(<0.001)	(<0.001)
Fifth quintile of long-term debt due in next three years × Δ Cash holdings		0.247	0.345
		(<0.001)	(<0.001)
Δ Earnings	0.664	0.659	0.672
	(<0.001)	(<0.001)	(<0.001)
Δ Net assets	0.036	0.036	0.026
	(<0.001)	(<0.001)	(<0.001)
Δ Research and development expenses	0.546	0.506	0.430
	(<0.001)	(<0.001)	(<0.001)
Δ Interest expense	−1.557	−1.511	−1.352
	(<0.001)	(<0.001)	(<0.001)
Δ Dividends	0.152	0.295	3.005
	(0.689)	(0.004)	(<0.001)
Cash holdings$_{t-1}$	0.444	0.444	0.385
	(<0.001)	(<0.001)	(<0.001)
Leverage	−0.430	−0.457	−0.324
	(<0.001)	(<0.001)	(<0.001)
Net financing	0.238	0.233	0.110
	(<0.001)	(<0.001)	(<0.001)
Cash holdings$_{t-1}$ × Δ Cash holdings	−0.902	−0.918	−1.211
	(<0.001)	(<0.001)	(<0.001)
Leverage × Δ Cash holdings	−0.730	−0.616	−0.526
	(<0.001)	(<0.001)	(<0.001)
R^2-adjusted	0.098	0.100	0.105
N	58,433	58,433	10,603

current-year cash holdings is significant and positive, which indicates that the marginal value of an extra dollar of cash is positive.

The second model investigates whether the contribution of cash holdings to firm value is larger for firms with greater refinancing risk. To examine this issue, we include the dummy variable used in Table X for firms with high refinancing risk and its interaction with the change in current-year cash holdings. We find that the coefficient on the interaction variable is significantly positive, implying that the marginal value of an extra dollar of cash is significantly higher for firms with greater refinancing risk. We evaluate the economic importance of this result. To do so, we use the regression coefficients on the change in current-year cash holdings and its interactions with other variables in the second model of Table XI and also use the mean values of market leverage and of lagged cash holdings as a percentage of market value of equity (0.223 and 0.107). For the group of firms with higher refinancing risk, the marginal value of an extra dollar of cash equals \$1.14 (=1.128 + (−0.918 ∗ 0.107) + (−0.616 ∗ 0.223) + 0.247), while for the other firms this marginal value equals \$0.89 (=1.128 + [−0.918 ∗ 0.107] + [−0.616 ∗ 0.223]), revealing an economically important difference.

The third model in Table XI provides evidence on whether this difference becomes more pronounced when credit market conditions tighten. This model is the same as the second model, except that it is estimated using data for only those years during which the C&I rate spread is in the highest quintile from 1980 to 2008. The results from this analysis show once again that the market's valuation of a dollar of cash holdings is significantly higher for firms with higher refinancing risk. During tight credit years, the marginal value of an extra dollar of cash equals \$1.37 (=1.264 + (−1.211 ∗ 0.105) + (−0.526 ∗ 0.209) + 0.345) for firms with high refinancing risk, while for other firms the marginal value of an extra dollar of cash is \$1.03 (=1.264 + [−1.211 ∗ 0.105] + [−0.526 ∗ 0.209]). Importantly, during tight credit years the difference between the market value of an extra dollar of cash holdings for firms with high refinancing risk and the value for other firms increases from 0.25 to 0.34. Overall, the Table XI findings are strong evidence that larger cash holdings are particularly valuable for firms with shorter maturity debt because they can help mitigate refinancing risk.

I. Robustness Tests

We conduct several robustness tests and tabulate the results of these tests in the Internet Appendix. First, we examine the sensitivity of our results to changing our measure of debt maturity. Specifically, we reestimate the main models in Tables IX, X, and XI defining debt maturity as the fraction of a firm's long-term debt due in the next one or five years or as the fraction of a firm's *total* debt due in the next three years. We find that the main results from these tables (that firms with shorter maturity debt save more cash from their cash flows, that the positive effect of cash holdings on investment is more pronounced for these firms, and that the value of cash is higher for these firms) are robust to the use of these alternative proxies for debt maturity.

Table II shows that firms shorten the maturity of their long-term debt over our sample period and Table IV establishes that shorter maturity debt positively affects cash holdings. To ensure that these results are not driven by changes in the population of Compustat firms over time, we reestimate the models from these two tables on only the 273 firms in our sample that survive our 1980 to 2008 sample period. We find that the results are robust to only considering this group of firms.

Although agency problems are potentially lower in firms with shorter maturity debt, it is still possible that they could explain some of our results. For instance, asymmetric information and agency problems (resulting from managerial discretion) could be greater in firms with large cash reserves, resulting in greater refinancing risk for these firms. Thus, we perform sensitivity tests to examine whether agency problems could be related to the positive association between shorter maturity debt and cash holdings. In the 2SLS cash and debt maturity equations, we include a firm's value for the G-index (e.g., Gompers, Ishii, and Metrick (2003)), the E-index (e.g., Bebchuk, Cohen, and Ferrell (2009)), the fraction of the board of directors made up of independent directors, or the percentage equity ownership of directors and officers. We find that including these measures in our models does not affect the positive association between shorter maturity debt and cash holdings. We also form subsamples using each of these measures based on whether a firm's value for a measure is above or below the median sample value for the measure over a particular year. We find that the coefficient on the variable representing the fraction of a firm's long-term debt due in the next three years does not significantly differ between the subsamples formed on the basis of the governance measures.

III. Conclusion

We hypothesize that firms mitigate the refinancing risk resulting from shorter maturity debt by holding larger cash reserves. Supporting this hypothesis, we find that shorter maturity debt positively impacts a firm's propensity to hold a large cash balance and to save more cash from its cash flows. In conjunction with these findings, we also document that, from 1980 to 2008, the maturity of the long-term debt of U.S. firms has significantly decreased and that this phenomenon can help to explain an important fraction of the contemporaneous large increase in the cash holdings of U.S. firms.

We perform a number of other tests to confirm the validity of our hypothesis. We find that the positive association between shorter maturity debt and cash holdings is more pronounced for firms with more debt, for which refinancing risk should be a greater concern. Consistent with cash holdings' role of mitigating costs resulting from refinancing risk, we document that the positive effect of cash holdings on investment is more pronounced for firms with shorter maturity debt. We further document that the marginal value of an incremental dollar of cash is greater for these firms. We also examine whether the additional liquidity provided by bank lines of credit reduces firms' need to mitigate

refinancing risk with large cash holdings and find only limited evidence supporting this proposition.

Credit market conditions are important. We show that the positive association between shorter maturity debt and cash holdings is more pronounced during years when credit market conditions are weakening and refinancing risk is consequently increasing. In the tightest credit years, firms with greater refinancing risk draw on their cash holdings, eliminating the positive association between shorter maturity debt and cash during those years. Likewise, we document that the more positive effect of cash holdings on investment for firms with greater refinancing risk is heightened when credit market conditions are tight. Finally, we show that the positive association between shorter maturity debt and the incremental value of a dollar of cash holdings is more pronounced during tight credit years. These findings are further evidence consistent with firms increasing their cash holdings to mitigate refinancing risk. Overall, our findings imply that larger cash holdings are valuable for firms with shorter maturity debt and that these firms trade off costs of holding a large cash balance with the benefits resulting from a decrease in refinancing risk.

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Supporting Information

Additional Supporting Information may be found in the online version of this article at the publisher's web site:

Appendix S1: Internet Appendix

EXHIBIT

BV-14

solely rely on rating agency evaluations in rejecting the 140 basis point adjustment of Dr. Zepp in U-06-045(7) at 26-27. If your response is anything other than an unqualified admission, please state the complete basis for the response and produce all documents supporting your response.

Response: Admit. However, the request for admission does not conflict with either Mr. Parcell's testimony on page 27 or the Commission's rejection of the requested 140 basis point risk adjustment in Order U-06-045(7).

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-52. Please refer to the Prefiled Testimony of David C. Parcell in these dockets. In his Answer to Question 30, Mr. Parcell states "It is apparent that AWWU has several positive characteristics and regulatory mechanisms that are, in some cases, not generally available to most public utilities".

(a) Please state how many utilities in Mr. Parcell's proxy group have access to infrastructure improvement surcharges similar to 3 AAC 52.800 - .890, and identify each such utility.

Response: OBJECTION. RAPA is not required to conduct legal or fact research for AWWU. Subject to these and the above-stated general objections, RAPA responds as follows: This information is not available to Mr. Parcell.

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Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-53. Please refer to the Prefiled Testimony of David C. Parcell in these dockets. In his Answer to Question 42, what "last two sets of filings" is Mr. Parcell referring to?

Response: Please see Q/A 41.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-54. Please refer to the Prefiled Testimony of David C. Parcell in these dockets. His Answer to Question 44 on p. 40 at lines 6-7 states that "AWWU's actual capital structures have now reached the Equity Management Plan's desired level of 33 percent."

(a) Please admit the Equity Management Plan ("EMP") states that the calculation of rates in the long range financial plan is based on a hypothetical capital structure of 48% debt and 52% equity. If your response is anything other than an unqualified admission, please state the complete basis for the response and produce all documents supporting your response.

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EXHIBIT

BV-15

AWWU-1-35. Please refer to the Prefiled Testimony of David C. Parcell in these dockets. Please provide Exhibit DCP-2 in excel format with all formula intact.

Response: Please see attached Excel spreadsheet.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-36. Please refer to the Prefiled Testimony of David C. Parcell in these dockets. Please provide the actual data and date of the information underlying DCP-2, Schedule 5.

Response: Please see attached data.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-37. Please refer to the Prefiled Testimony of David C. Parcell in these dockets. Please provide the actual data and date of the information in Exhibit DCP-2, Schedule 8.

Response Please see attached data.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

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ATTACHMENT FOR RESPONSE TO AWWU-1-36

Add to Portfolio Like 2

SJW Corp. (SJW) - NYSE

32.18 0.06(0.19%) 10:08AM EST - Nasdaq Real Time Price

Analyst Estimates

Get Analyst Estimates for: GO

Earnings Est	Current Qtr. Dec 14	Next Qtr. Mar 15	Current Year Dec 14	Next Year Dec 15
Avg. Estimate	0.26	0.02	2.52	1.94
No. of Analysts	2.00	1.00	2.00	2.00
Low Estimate	0.23	0.02	2.50	1.70
High Estimate	0.29	0.02	2.54	2.17
Year Ago EPS	0.23	0.04	1.12	2.52

Revenue Est	Current Qtr. Dec 14	Next Qtr. Mar 15	Current Year Dec 14	Next Year Dec 15
Avg. Estimate	64.80M	55.09M	315.19M	302.59M
No. of Analysts	2	1	2	2
Low Estimate	58.70M	55.09M	309.10M	296.07M
High Estimate	70.89M	55.09M	321.27M	309.10M
Year Ago Sales	67.26M	54.60M	276.87M	315.19M
Sales Growth (year/est)	-3.70%	0.90%	13.80%	-4.00%

Earnings History	Dec 13	Mar 14	Jun 14	Sep 14
EPS Est	0.27	0.18	0.38	0.52
EPS Actual	0.23	0.04	0.34	1.88
Difference	-0.04	-0.14	-0.04	1.36
Surprise %	-14.80%	-77.80%	-10.50%	261.50%

EPS Trends	Current Qtr. Dec 14	Next Qtr. Mar 15	Current Year Dec 14	Next Year Dec 15
Current Estimate	0.26	0.02	2.52	1.94
7 Days Ago	0.26	0.02	2.52	1.94
30 Days Ago	0.26	0.02	2.18	1.53
60 Days Ago	0.25	0.04	2.18	1.46
90 Days Ago	0.27	0.04	1.39	1.56

EPS Revisions	Current Qtr. Dec 14	Next Qtr. Mar 15	Current Year Dec 14	Next Year Dec 15
Up Last 7 Days	0	0	0	0
Up Last 30 Days	0	0	0	1
Down Last 30 Days	0	0	0	0
Down Last 90 Days	N/A	N/A	N/A	N/A

Growth Est	SJW	Industry	Sector	S&P 500
Current Qtr.	13.00%	-7.00%	192.20%	17.60%
Next Qtr.	-50.00%	3.90%	99.80%	17.10%
This Year	125.00%	5.20%	-2.20%	8.00%
Next Year	-23.00%	-6.40%	6.40%	8.80%
Past 5 Years (per annum)	8.99%	N/A	N/A	N/A
Next 5 Years (per annum)	14.00%	7.64%	6.58%	9.18%
Price/Earnings (avg. for comparison categories)	12.86	15.87	17.41	21.21

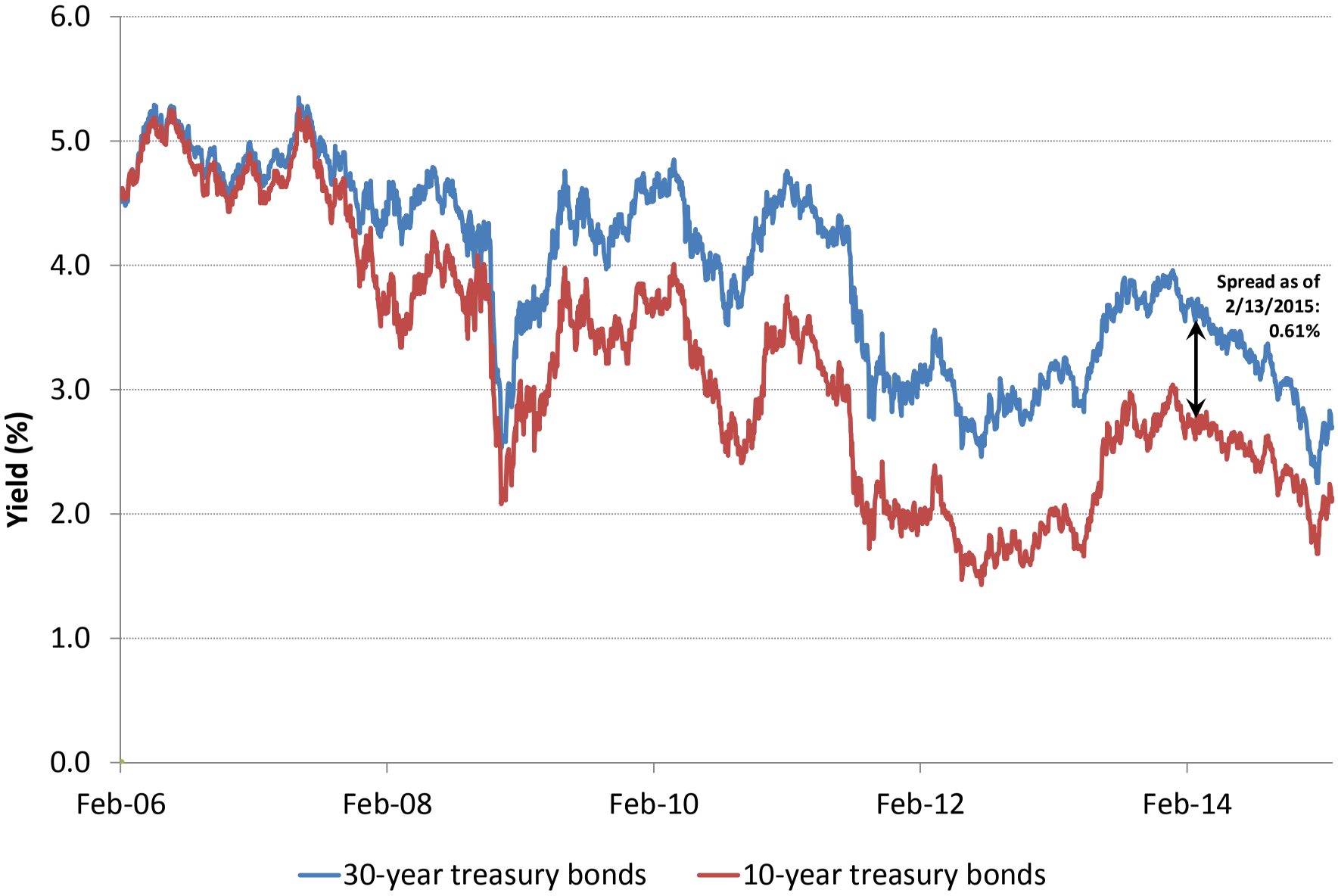
PEG Ratio (avg. for comparison categories)	0.92	5.22	8.14	2.17

Currency in USD.

EXHIBIT

BV-16

Exhibit BV-16: Treasury Bond Yields



Source: Federal Reserve of St. Louis.

EXHIBIT

BV-17

Exhibit BV-17
Implied ROE at Parcell's sample's equity percentage

		CAPM	DCF
Parcell's modified ROE	[1]	8.37%	8.95%
Parcell's sample's equity %	[2]	51.00%	51.00%
AWU cost of debt	[3]	3.52%	3.52%
ASU cost of debt	[4]	3.12%	3.12%
AWU implied WACC	[5]	5.99%	6.29%
ASU implied WACC	[6]	5.80%	6.09%
AWU Actual % Equity	[7]	32.53%	32.53%
ASU Actual % Equity	[8]	34.43%	34.43%
Implied AWU ROE	[9]	11.12%	12.03%
Implied ASU ROE	[10]	10.90%	11.76%

Sources and notes:

[1]	Table 5
[3], [4], [7], [8]:	U-13-201/202, Exhibit DCP-2
[2]:	Exhibit DCP-2, Schedule 6
[5]:	[1] x [2] + [3] x (1 - [2])
[6]:	[1] x [2] + [4] x (1 - [2])
[9]:	[[5] - [3] x (1 -[7])]/[7]
[10]:	[[6] - [4] x (1 -[8])]/[8]

EXHIBIT

BV-18

I. GENERAL OBJECTIONS

1. RAPA objects to any Discovery Requests submitted by AWWU that seeks information protected by the Attorney-Client, Attorney Work Product or any other applicable privilege.

2. RAPA objects to any and all instructions contained in AWWU's Discovery Requests to the extent the instructions exceed the discovery requirements and obligations governed by statute, regulation and Commission precedent.

By submitting responses and objections to these Discovery Requests, the AG does not waive any Attorney – Client or Attorney Work Product privilege that may also be applicable.

Each and every discovery response by RAPA is made subject to the above-stated general objections.

II. DISCOVERY REQUESTS

AWWU-3-1. Please refer to the Prefiled Testimony of David C. Parcell filed in these dockets, at his responses to Questions 27 and 28 at pp. 26-27 and the response to AWWU-1-42(a) which states his belief that "there are other attributes and uses of bond ratings," and the response to AWWU-1-42(b) regarding FERC precedent and especially Docket Nos. ER08-92-000 *et.al.* cited in his testimony.

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(a) Would Mr. Parcell agree that the impact on equity investors is larger if a company is downgraded from BBB to BB than if it is upgraded from BBB to A? Please explain why or why not.

(b) Please identify and provide citations to all pipeline proceedings Mr. Parcell is referring to in stating in his response to Q/A 28, at line 8 on page 27 that FERC "routinely employs credit ratings as a primary measure of relative risk among electric and pipeline utilities."

Response:

(a) Mr. Parcell agrees that the impact of a hypothetical downgrade of a hypothetical company from BBB to BB is greater than from an upgrade from BBB to A, since the former results in the hypothetical company being downgraded to non-investment grade status.

(b) OBJECTION. This request asks Mr. Parcell to perform studies of all FERC proceedings involving pipelines. Parties are not required to conduct or prepare studies to respond to discovery requests. Subject to this and the general objection, RAPA responds as follows: Please see Mr. Parcell's testimony on page 27 where he cites a specific FERC reference to bond ratings reflecting risk.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

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EXHIBIT

BV-19

Response: Mr. Parcell believes that, in efficient markets, the current interest rate is the most indicative indicator or future expectations.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-45. Please refer to the Prefiled Testimony of David C. Parcell in these dockets. Mr. Parcell in Exhibit DCP-2, Schedule 9, lists Reuters estimated growth rates for Parcell's and Zepp's sample groups. Please explain why the growth rates from the same source (Reuters) for the same companies are different in Parcell's sample group and Zepp's sample group.

Response: Exhibit DCP-2, Schedule 9, Page 2 appears to incorrectly depict the Reuters EPS growth rates for the Zepp Water Utilities Sample Group. Attached is a revised Exhibit DCP-2, Schedule 9, Page 2 of 2. Note that the revised schedule contains lower DCF results using the Order No. 10 "Roadmap" than did the original schedule.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

AWWU-1-46. Please refer to the Prefiled Testimony of David C. Parcell in these dockets. Please provide a list of all cases during the last five years in which Mr. Parcell supported the use of a hypothetical capital structure in the determination of

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ratemaking cost of capital of a utility. For each such case, please produce Mr. Parcell's testimony and any order from that case addressing the issue of hypothetical capital structure. Please also state for each such case why Mr. Parcell supported the use of a hypothetical capital structure.

Response: OBJECTION. This request requires Mr. Parcell to perform a study that is beyond the scope of his testimony. Mr. Parcell does not maintain a list of cases in which he has recommended a hypothetical capital structure. Subject to these and the above-stated general objections, RAPA responds as follows:

Mr. Parcell does recall, from memory, that he has proposed a hypothetical capital structure in the following cases in Alaska over the past five years:

Alaska Power	U-09-90
Alaska Power	U-14-002
TDX North Slope Generating	U-12-075
TDX North Slope Generating	U-13-207
Aurora Energy	U-14-004

Mr. Parcell's testimony is available on the RCA website for each above-identified docket.

Answering Witness: David C. Parcell.

Designated Hearing Witness: David C. Parcell.

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