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Decoupling Mechanisms: Is there an Impact on Cost of Equity and Debt?*

(*Presentation based on the paper: "Revenue-Sales Decoupling Impact on Public Utility Conservation Investment," co-authored with P. Ahern and D. D'Ascendis currently under review at the *Energy Policy* journal.)

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Webinar

Introduction

- Ratemaking mechanisms that decouple revenues from commodity sales volume stabilize base revenues are sweeping the US.

- Started in CA in early 80's to take away utilities' disincentive to promoting energy end-use efficiency.

- Reduces business risk – is it enough to affect the cost of capital?

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Introduction

- The few studies that address this topic directly are Wharton and Vilbert (2014, EJ), Vilbert, Wharton, Zhang and Hall (2016, report from Brattle Group).

- Brennan (2010, Energy Policy) and Chu and Sappington (2013, J. Regulatory Economics) find that decoupling alone will not lead to an optimal use of energy efficiency resources.

- Moody's (2011, report to investors) looked at the impact on business risk.

- We attempt to estimate the impact of decoupling on the cost of common equity and risk for electric, electric and gas combination, and water utilities.

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Introduction

- We perform the analysis using two asset pricing models:
  - Standard CAPM
  - Generalized consumption asset pricing model, or commonly known as the predictive risk premium model
    - Superior to CAPM. GCAPM addresses many of the problems of the CAPM
    - Developed theoretically by Michelfelder and Pilotte (2011, J. Econ. & Bus)
    - Tested for public utilities cost of capital in three other peer-reviewed articles

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Decoupling Lowers Systematic Risk – Just A Quick Mention

Systematic risk is defined as:

$$\beta_i = \rho_{i,m} \frac{\sigma_i}{\sigma_m}$$

Where: $\rho_{i,m}$ = The correlation coefficient of the individual stock (i) and the market (m) return; and,

σ_i and σ_m = Standard deviation of the individual stock and market returns, respectively

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Decoupling Lowers Systematic Risk – Just A Quick Mention

Defining variables with superscript "*D*" to denote decoupling, σ^D_i and $\rho^D_{i,m}$ are lower as the volatility of the utility's returns are lower with decoupling and the utility's return has a lower correlation with the market return as the utility's revenues and profits are decoupled from the business cycle.

Therefore systematic risk is lower with decoupling as

$$\beta^D_i = \rho^D_{i,m}\ \sigma^D_i / \sigma_m < \beta_i = \rho_{i,m}\ \sigma_i / \sigma_m.$$

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Generalized Consumption Asset Pricing Model (GCAPM)

- Based on the vast intertemporal asset pricing model literature starting with Merton (1973, Econometrica) and summarized in Michelfelder and Pilotte (2011, JEB).

- Mich. and Pilotte (2011) derived a generalized model by releasing many of the assumptions/restrictions of previous models.

- Began to be implemented to estimate the cost of common equity about 6 years ago in rate proceedings and has shown up in a few textbooks.

- Other literature on its use for cost of capital: Ahern, Hanley, and Mich. (2011, JRE), Mich. (2015, JEB), Mich., Ahern, D'Ascendis (2013, EJ).

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GCAPM Specification: Theory – Just A Quick Mention

$$E_t[R_{i,t+1}] - R_{f,t} = -\frac{vol_t[M_{t+1}]}{E_t[M_{t+1}]} vol_t[R_{i,t+1}] corr_t[M_{t+1}, R_{i,t+1}]$$

$$M_{t+1} = \left(\frac{1}{1+k}\right)\frac{U_{c,t+1}}{U_{c,t}}$$

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GCAPM Specification for Estimation – Just A Quick Mention

$$R_{i,t+1} - R_{f,t} = \alpha_{i,t}\sigma^2_{i,t+1} + \varepsilon_{i,t+1}$$

$$\sigma^2_{i,t+1} = \beta_0 + \beta_1\sigma^2_{i,t} + \beta_2\varepsilon^2_{i,t} + \eta_{i,t+1}$$

$$\alpha_{i,t} = -\frac{vol_t[M_{t+1}]}{E_t[M_{t+1}]}corr_t[M_{t+1}, R_{i,t+1}]$$

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Test for Change in Risk Premium After Decoupling

$$Predicted\ RP = a\ (Predicted\ \sigma^2) + a_D D_{rp}\ (decoupling)$$

$$Predicted\ \sigma^2 = b_0 + b_1\ (Previous\ \sigma^2\ ) + b_2\ (Previous\ Prediction\ Error)^2$$

D_{rp} *is the change in the predicted RP after decoupling*

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Test for Change in Volatility of Risk Premium after Decoupling

$$Predicted\ RP = a\ (Predicted\ \sigma^2)$$

$$Predicted\ \sigma^2 = b_0 + b_1\ (Previous\ \sigma^2\ ) + b_2\ (Previous\ Prediction\ Error)^2 + b_D D_v\ (decoupling):$$

D_v *is the change in volatility in risk premium after decoupling*

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Data and Sample

GCAPM Data: Monthly holding period returns from U. Chicago CRSP minus Ibbotson yield on US Long Treasury Bonds

Beta Data: CRSP annual betas

Public utilities sample: all electric and combination electric and gas company stocks where 95%+ of revenues are decoupled; water companies with all decoupled revenues.

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Differences in Systematic Risk

Electric and Electric and Gas	Mean β_{PRE}	Mean β_{POST}	$\sigma(\beta_{PRE})$	$\sigma(\beta_{POST})$	t-Statistic
ED	0.608	0.427	0.172	0.064	-1.329
PCG	0.522	0.535	0.174	0.373	0.112
EIX	0.588	0.582	0.199	0.294	-0.051
CHG	0.680	0.401	0.279	0.326	-0.759
CMS	0.758	0.559	0.198	0.140	-0.815
HE	0.619	0.570	0.253	0.155	-0.171
POR	0.637	0.658	0.069	0.052	-0.151
IDA	0.905	0.728	0.251	0.125	-0.818
Mean	0.670	0.560			
Water	Mean β_{PRE}	Mean β_{POST}	$\sigma(\beta_{PRE})$	$\sigma(\beta_{POST})$	t-Statistic
AWR	0.975	0.623	0.535	0.279	-1.430
CWT	1.192	0.520	0.544	0.257	-2.735***
CTWS	0.664	0.502	0.235	0.176	-1.232
ARTNA	0.075	0.146	0.100	0.161	0.909
Mean	0.434	0.475			

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Estimation Results: GCAPM

Electric and Electric and Gas	α_i	$\alpha_{i,D}$	$b_{i,D}$
ED	1.460***	0.004	-0.000
PCG	1.781***	0.001	-0.001
EIX	1.379***	0.003	0.000
CHG	2.094***	0.004	-0.000
CMS	1.440***	0.011	-0.000
HE	1.607***	0.004	-0.000*
POR	0.461	0.010	-0.000
IDA	1.939***	0.003	-0.000
Water	a_i	$a_{i,D}$	$b_{i,D}$
AWR	0.596	0.011	0.000
CWT	0.525	0.004	-0.000
CTWS	-1.008	0.009	0.000
ARTNA	3.006	-0.004	-0.002*

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Observation from Moody's (2011) Business Risk Comparisons

See our model on cash flows changes in the paper – essentially one that Moody's applied.

Moody's (2011) compared the business risk for pre- and post-decoupling:

- change in std. dev. of gross profit growth rates.

They found that:

- business risk fell from decoupling, but,
- it did not reduce other financial ratio measures of risk / bond ratings.

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Conclusion

The impact of decoupling on stock returns, risk, and common equity cost of capital with current approaches so far cannot be isolated or measured due to the myriad of other risk drivers impacting the investment risk of public utility stocks.

Next step is to apply the GCAPM to bond yields for specific utilities rather than holding company stocks.

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