



What do we really know about corporate hedging? A multimethod meta-analytical study (Geyer-Klingeberg et al., 2015)

2015 MAER-Net Colloquium in Prague, Czech Republic

- Research question
- Theoretical background
- Related literature and research gap
- Research design
- Empirical analysis
- Main results
- Limitations and discussion
- Conclusion and outlook



Research question

What factors affect corporate financial hedging decisions?

„*What risks should a firm take?*“

One of the ten most important questions in finance that have not been answered yet (Brealey et al., 2013)

Further intention

Introduction of the statistical (multivariate) meta-analysis methodology to corporate finance

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Overview of factors that affect hedging decisions

H1: Corporate tax	By evening out the tax base hedging reduces the average tax payments (Smith and Stulz, 1985)
H2: Bankruptcy and financial distress costs	Hedging reduces the volatility of future cash flows and therefore, the direct and indirect bankruptcy costs (Smith and Stulz, 1985)
H3: Asymmetric information and agency conflicts of equity	Hedging reduces the compensation demanded by managers (and other stakeholders) by lowering the company's risks (Smith and Stulz, 1985) Due to the management's information advantage shareholders are not able to fully understand corporate hedging decisions (DeMarzo and Duffie, 1991)
H4: Coordination of financing and investment policy and agency conflicts of debt	Hedging helps to coordinate investment and funding policies and lowers dependency on costly debt (Froot et al., 1993) Hedging lowers the project's risk and therefore, the agency conflicts due to opportunistic management behavior (Jensen and Meckling, 1976)



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Related papers

1) Aretz, K. & Bartram, S. M. (2010). Corporate Hedging and Shareholder Value. The Journal of Financial Research, 33, 317-371.

- Vote-counting (“direction of the effect”)
- 31 primary studies

No integration of heterogeneity: „As a whole, the findings of empirical studies remain controversial because the conclusions are largely sample specific.“ (Bartram et al., 2009)

2) Arnold, M. M., Rathgeber, A. W. & Stöckl, S. (2014). Determinants of Corporate Hedging: A (Statistical) Meta-Analysis. The Quarterly Review of Economics and Finance, 54, 443-458.

- Univariate meta-analysis (“direction and intensity of the effect”)
- 37 primary studies

No consideration of dependencies: Riley (2009) shows that ignoring dependencies can lead to a heavily biased estimation of the aggregated results.



Add-ons to previous research

- **Comprehensive literature search:** Covering most of the population
- **Random-effects** model: Allowing for a study-specific population effect
- Explicit integration of **gray literature:** Reduction of publication bias
- Consideration of dependencies among proxy variables by applying a **multivariate meta-analytic approach** for the first time in corporate finance: Allowing for the multi-dimensional value-adding property of corporate hedging yielding meaningful results

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Synthesizing previous literature

- Unique sample of **132 empirical studies** including more than **100,000 firm observations**
- Vote-counting (Aretz and Bartram, 2010) and univariate meta-analysis (Arnold et al., 2014) as **robustness checks**
- Explicitly dealing with publication bias in the univariate meta-analysis (Duval and Tweedie, 2000) and implicitly in the multivariate case (Kirkham et al., 2012) as well as detecting data-mining bias (Harvey et al., 2014)
- Univariate testing of 30 proxy variables and 12 proxy variables in the multivariate analysis (in the multivariate case there are more requirements regarding the necessary data)

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Overview of our sample covering 132 primary studies

Publishing type

Published studies	68.18%
Unpublished studies	31.82%

Sample size

Minimum	17
Maximum	7319
Mean	555.96
Standard deviation	1155.29

Observation period

Before 1995	22.66%
Between 1996 and 2000	33.99%
Between 2001 and 2005	25.62%
After 2005	17.73%

Examined countries

North America	45.45%
Europe	25.76%
Asia and Pacific	9.85%
Australia	9.09%
South America	4.55%
Other countries	5.30%

Vote counting

- Simplest quantitative method for aggregating primary study effects
- Reaching a conclusion for the overall direction of the effect by counting negative, neutral and positive findings for each proxy variable

Univariate meta-analysis

- Computing mean effects while incorporating study weights for each proxy variable based on Pearson`s correlation coefficients as effect sizes
- Considering heterogeneity among studies by a random-effects model including within-study and between-study variance

$$\hat{z}_j = \frac{\sum_{i=1}^k w_{ij} z_{ij}}{\sum_{i=1}^k w_{ij}}$$

Multivariate meta-analysis

- First step: Computing mean effects while additionally considering dependencies among all proxy variables using the well-known GLS-framework

$$\hat{z} = (\mathbf{X}'\mathbf{S}^{-1}\mathbf{X})^{-1}\mathbf{X}'\mathbf{S}^{-1}\mathbf{z}$$

- Second step: Modeling all interrelationships applying a linear model

$$b = \mathbf{R}_{XX}^{-1}\mathbf{R}_{XY}$$



Overview of proxy variables (I/II)

Variable	Hyp. sign	Description
H1: CORPORATE TAXES		
Tax credits	+	Absolute value of available tax credits
Tax-loss carryforwards (binary)^a	+	Dummy variable that takes a value of “1” if the firm has tax-loss carryforwards available and “0” otherwise
Tax-loss carryforwards (continuous) ^a	+	Tax-loss carryforwards (scaled)
H2: BANKRUPTCY AND FINANCIAL DISTRESS COSTS		
Cash flow availability	-	Firm’s operating cash flow (scaled)
Convertible debt ^b	?	Book value of convertible debt (scaled)
Debt maturity	+	(Logarithm of) Debt that matures in more than 1 year
Dividend yield (binary)	?	Dummy variable that takes a value of “1” if the firm pays dividend to its shareholders and “0” otherwise
Dividend yield (continuous)	?	Dividend per share (scaled)
Interest coverage ratio	-	(Logarithm of) Earnings before interest and taxes ÷ interest expenses
Leverage ratio^c	+	Book value of long-term or total debt (scaled)
Liquidity^d	-	Current assets or cash and cash equivalents (scaled)
Preferred stock ^b	?	Book value of preferred stock
Profitability	-	(Logarithm of) Sales or return on assets or EBIT (scaled)
Size	-	(Logarithm of) Book value of total assets or market value of the firm
Tangible assets	-	Tangible assets (scaled)

The variables covered by the multivariate analysis are in bold.



Overview of proxy variables (II/II)

Variable	Hyp. sign	Description
H3: ASYMMETRIC INFORMATION AND AGENCY CONFLICTS OF EQUITY		
Blockholders ownership	?	Number of outside investors holding more than 5% of firm's shares
CEO cash	-	CEO salary + CEO bonus (scaled)
Institutional investors	-	Percentage, (Logarithm of) number or market value of shares held by institutional investors
Intangible assets	+	Intangible assets (scaled)
Number of analysts	-	Number of analysts following the firm
Option ownership (binary)	?	Dummy variable that takes a value of "1" if managers or directors own options of the firm and "0" otherwise
Option ownership (continuous)	?	Percentage, (Logarithm of) number or market value of options held by managers or directors
Share ownership	+	Percentage, (Logarithm of) number or market value of shares held by managers or directors
Tenure	?	Number of years that the officer(s) hold in their current job
H4: COORDINATION OF FINANCING AND INVESTMENT AND AGENCY CONFLICTS OF DEBT		
Asset growth rate	+	Current year change in net tangible assets + depreciation (scaled)
Capex	+	Capital expenditures (scaled)
Price-earnings ratio	+	Earnings per share ÷ share price
Research and development	+	Research and development expenses (scaled)
Sales growth rate	+	Current year change in firm's sales
Tobin's Q	+	Market value of firm ÷ book value of total assets

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Multivariate meta-analysis

- Our results indicate a **strong evidence** for the bankruptcy and financial distress hypothesis (H2).
- Regarding the corporate tax (H1) and the coordination of financing and investment policy and agency conflicts of debt hypotheses (H4) we find **weak support**.
- Regarding the asymmetric information and agency conflicts of equity hypothesis (H3) we find **no support**.

Robustness checks

In general, confirmation of the empirical results of the previous (quantitative) reviews by Aretz and Bartram (2010) and Arnold et al. (2014).

Overall, we can provide new insights into the corporate tax hypothesis as well as new findings on the proxy level.

Proxy variable	Hyp. sign	Multivariate results	
		Emp. sign	p-value
H1: CORPORATE TAXES			
Tax-loss carryforwards (binary)	+	+	0.0956*
H2: BANKRUPTCY AND FINANCIAL DISTRESS COSTS			
Dividend yield (continuous)	?	+	0.0202**
Interest coverage ratio	-	-	0.7530
Leverage ratio	+	+	0.2607
Liquidity	-	-	0.0108**
Profitability	-	+	0.2135
Size	-	+	0.0002***
Tangible assets	-	+	0.2425
H3: ASYMMETRIC INFORMATION AND AGENCY CONFLICTS OF EQUITY			
Institutional investors	-	+	0.1203
Option ownership (continuous)	?	-	0.5275
Share ownership	+	-	0.2091
H4: COORDINATION OF FINANCING AND INVESTMENT POLICY AND AGENCY CONFLITS OF DEBT			
Capex	+	-	0.3169
Research and development	+	+	0.0541*
Tobin's Q	+	+	0.1856

■ = sign. at 5% ■ = sign. at 10%



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There are **several issues to be critically considered** when conducting a meta-analysis and interpreting its results. These aspects concern the underlying literature, the analyzed input data, and the mathematical framework amongst others.

- Literature search procedure
- Endogeneity problem
- Missing data
- Biases

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- 1) The multivariate meta-analysis is the **most appropriate approach** for synthesizing the findings of primary studies (in our case on corporate hedging).
- 2) Meta-analyses can also **be applied to other research questions** in finance, e.g. corporate dividend payment behavior.
- 3) In other disciplines this research technique is a standard statistical tool (psychology, education, medicine, etc.).
- 4) It is important to consider the limitations when interpreting the results. These distortions, including potential biases, do not only appear in (multivariate) meta-analyses but they **restrict all literature overviews**.



Thank you very much for your attention!

Do you have any questions?

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