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Dynamic target capital structure and speed of adjustment: Evidence from Australian farm businesses

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Dynamic target capital structure and speed of adjustment

Introduction

Capital structure: The combination of debt, equity, and hybrid securities a firm uses to finance its operations and investments.

Speed of adjustment: How quickly a firm's capital structure is adjusted towards a firm-specific target combination of debt and equity.

Why do these matter for farm businesses?

Capital structure

- A key determinant of its overall financial risk, cost of capital, and consequently its value
- Influences its ability to access credit for capital investment necessary to adjust to changes in the production environment and adopt new technologies through capital investment

Speed of adjustment

- The speed with which it can adjust to changes in its production environment and technology

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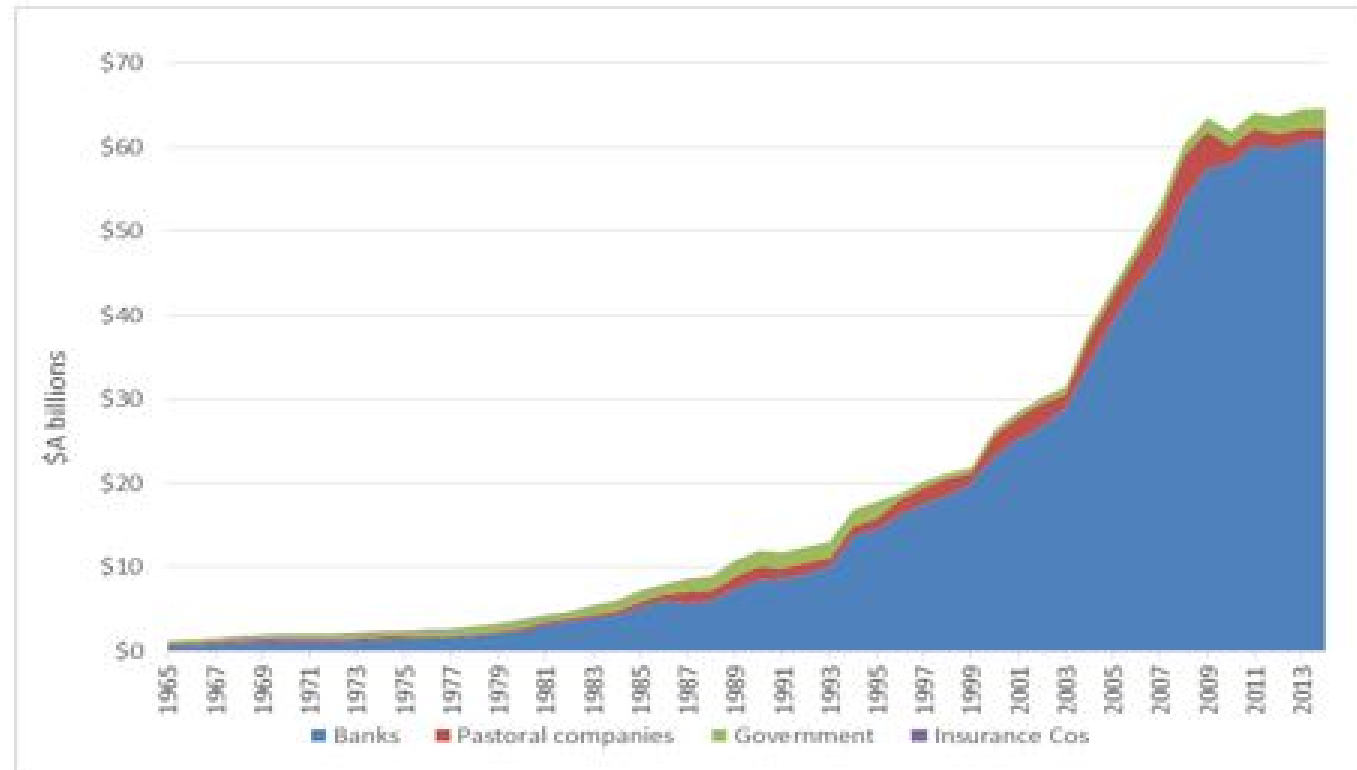
Context & Research Question

Context

- Rising indebtedness,
- Increased climatic risk,
- Trade and regulatory uncertainty,
- Consolidation of farm business ownership,
- And declining productivity growth in the survey region and developed world more broadly

Research Question

What has driven the capital structure of farm businesses and how rapidly was capital structure adjusted?



Farm debt in Western Australia: 1985 – 2013

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Objective, Purpose, and Contribution

Purpose

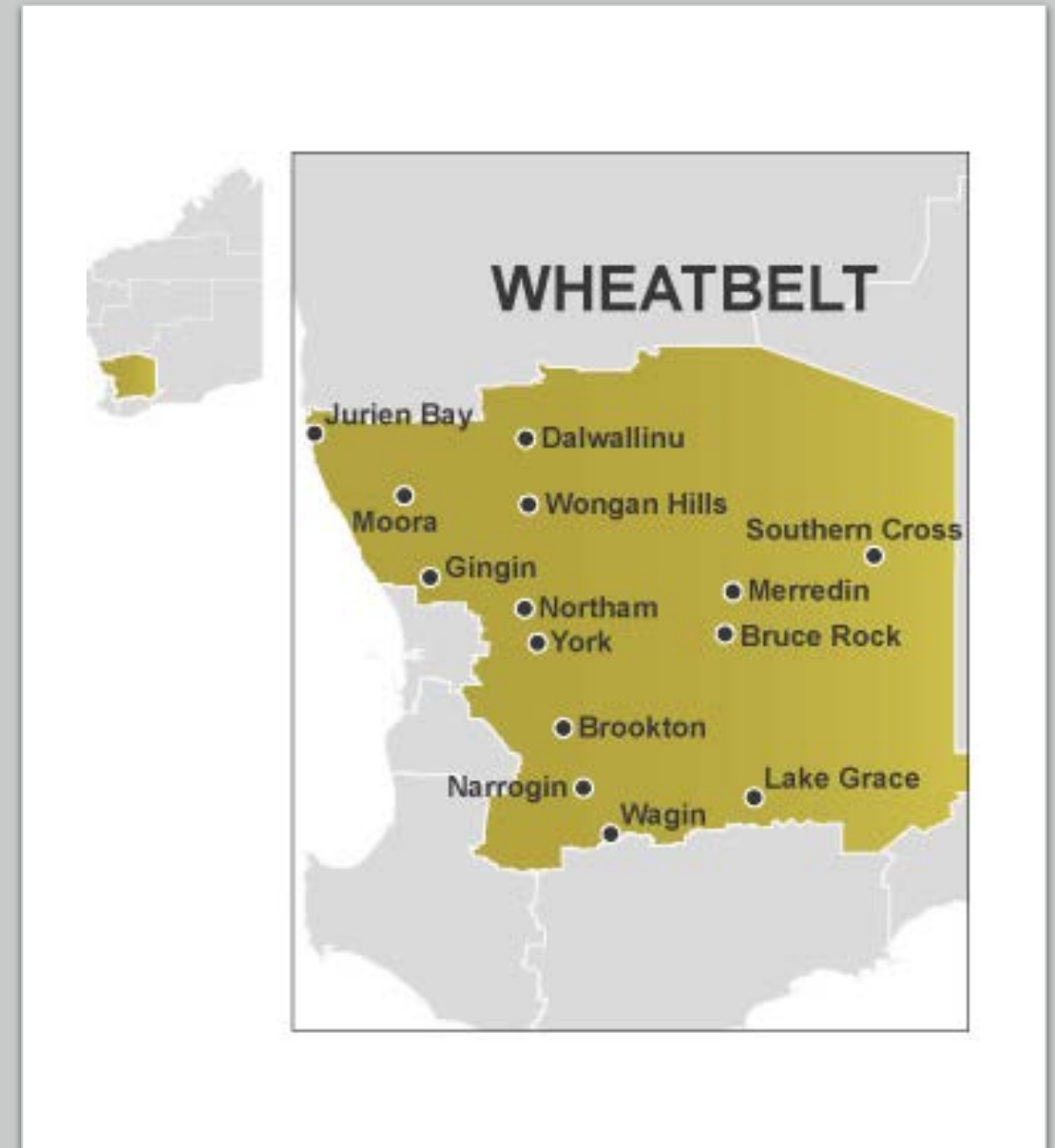
To understand what factors drive capital structure and the speed of capital structure adjustment in an Australian context.

Objective

Investigate the determinants of farm capital structure and its speed of adjustment towards individual target levels for a sample of sixty-one commercial farms in Western Australia's Wheatbelt over the period 2002 and 2011.

Contribution

1. Provides unique insight into capital structure and its speed of adjustment amongst Australian farm businesses.
2. Provides evidence of differences in capital structure and adjustment speed when controlling for farm location by rainfall zone.



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Theory & Applications in Agriculture

Prominent Capital Structure Theories

Pecking order theory (*Myers 1984; Myers and Majluf 1984*)

Signalling theory (*Spence 1961; Ross 1977*)

Trade-off or partial adjustment theory (*Miller 1977*)

Market timing theory (*Baker and Wrugler 2002*)

Managerial inertia theory (*Welch 2004*)



Example Applications to Agriculture

Barry et al. (2000)

Zhao et al. (2008a, b)

Mugera and Nyambane (2014)

Aderajew et al. (2018)

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Empirical Model

Target debt-to-asset ratio, DA_{it}^* (X : farm characteristics, N : Time dummies)

$$DA_{it}^* = f(X_{it}, N_t)$$

Partial adjustment model (θ : Speed of adjustment)

$$DA_{it} - DA_{it-1} = \theta(DA_{it}^* - DA_{it-1})$$

Integrated dynamic partial-adjustment model (Linear combination of farm characteristics time dummies)

$$DA_{it} = (1 - \theta)DA_{it-1} + \theta \left(\sum_{nm} \beta_n X_{it} + \gamma_m N_t \right) + \varepsilon_{it}$$

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Model Estimates

| | Debt-to-asset ratio | | | | | |
|---|---------------------|------------|-------------|------------|---------------|------------|
| | System-GMM | | OLS | | Fixed-Effects | |
| | Coefficient | Std. Error | Coefficient | Std. Error | Coefficient | Std. Error |
| <i>Debt-to-asset</i> _{<i>t-1</i>} | .4015*** | .1216 | .7098*** | .0435 | .3617*** | .0592 |
| <i>Net cash flow</i> _{<i>t-1</i>} | -1.1330*** | .0231 | -.7371*** | .0066 | -.6689*** | .0065 |
| <i>Equity</i> _{<i>t-1</i>} | -.8807*** | .2515 | -.1734** | .0735 | -.3342*** | .1112 |
| <i>Size</i> _{<i>t-1</i>} | .7763*** | .2278 | .1373** | .0656 | .2252** | .0875 |
| <i>Primary operator age</i> _{<i>t</i>} | -.0008 | .0005 | -.0035 | .0003 | .0678*** | .0013 |
| <i>University education</i> | -.0169 | .0128 | -.0131*** | .0073 | - | - |
| <i>Medium rainfall zone</i> | -.0271*** | .0088 | -.0143* | .0052 | - | - |
| Constant | .0983*** | .0330 | .0638*** | .0163 | -.1557 | .0567 |

*** Significant at a 1% level, ** Significant at a 5% level, * Significant at a 10% level

Systems GMM: Arellano & Bond (Autocorrelation), Sargan (Overidentification) tests satisfied

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Results

Factors of significance

Negative Impact on Debt-to-asset ratio: **Net cash flow_{t-1}, Equity_{t-1}, Medium rainfall zone**

Positive Impact on Debt-to-asset ratio: **Debt-to-asset ratio_{t-1}, Size_{t-1}**

Capital structure theory applicability in explaining practices

Adherence to **pecking order theory**: Net cash flow_{t-1}, Equity_{t-1}, Medium rainfall zone

Suggestive of **signalling**: Size_{t-1}

Capital structure speed of adjustment

Surveyed farms adjust capital structure far more rapidly towards their target level than the dairy, field crop and livestock farms in the Netherlands (*Aderajew et al. 2018*):

Surveyed farms half life: **~9 months**

Dutch field crop, dairy, and livestock farms: **3+ years**

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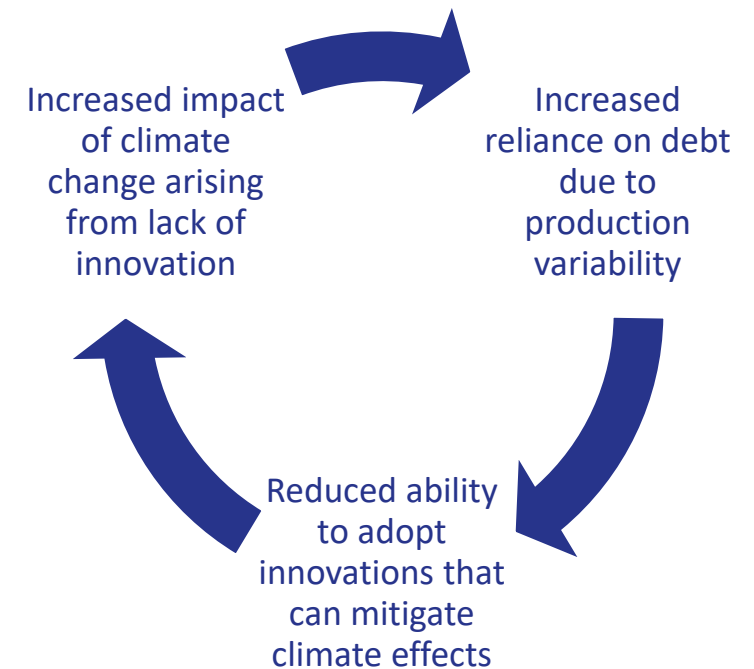
Implications and Possible Future Research Questions

Implications

1. Farm businesses with low debt-to-asset ratios adjust more rapidly toward their targets.
2. Farm business prefer low cost internal capital to external debt when available.

Possible Future Research Questions

1. Are firms with lower leverage ratios more innovative?
2. What is the impact of reducing adjustment costs on innovation amongst farm businesses?
3. Is there any evidence of a 'vicious cycle' emerging in the relationship between indebtedness, innovation, and climate change at the farm level?



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APPENDIX SLIDES

1. Survey Population Summary
2. Debt-to-asset ratios: Survey Region
3. Expected relationship between debt-to-asset ratio and potential determinants
4. Policy Recommendations

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Survey Population Summary

Region

61 Mixed-Enterprise Broadacre Farms in Western Australia's Wheatbelt

Period

2002 – 2011

Average Revenue & Size

A\$1.30mn & 3,970 hectares



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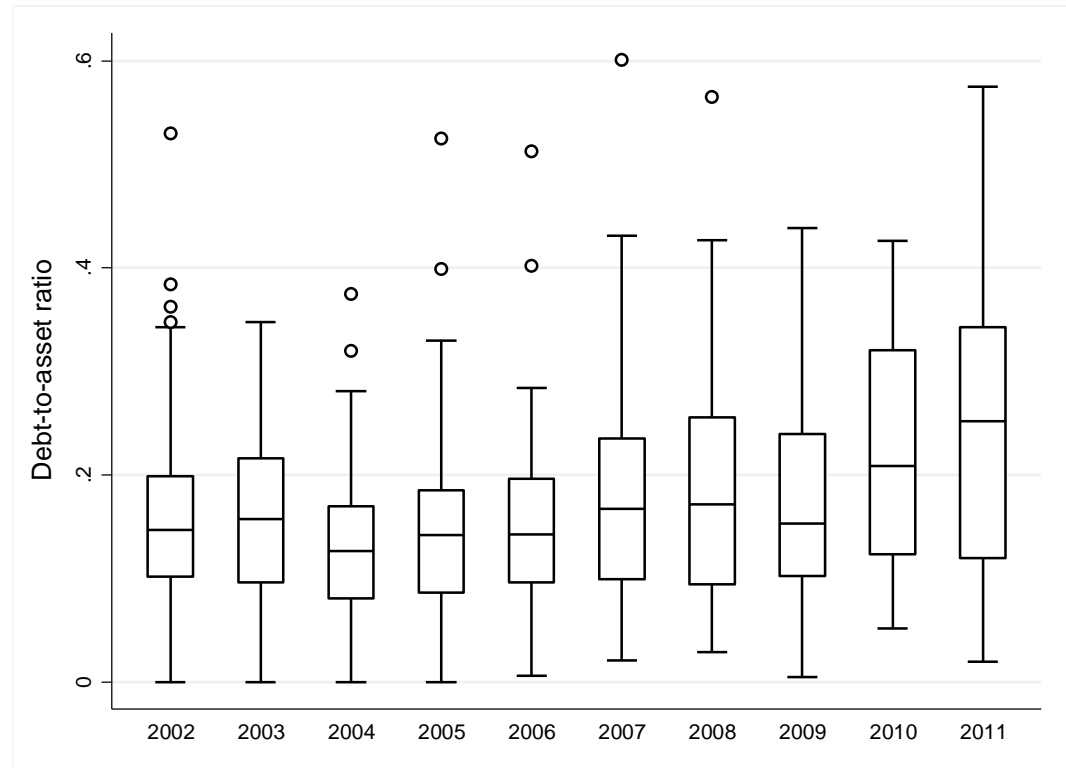
Debt-to-asset ratios: Survey Region

Comparison to other regions

Study mean: **0.1776**
(2002 - 2011)

Dutch farms (Aderajew et al. 2018): **0.363**
(2001 - 2015)

Kansas FAMA (Brewer et al. 2019): **0.32**
(2002 - 2012)



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Expected relationship between debt-to-asset ratio and potential determinants

| Determinant of debt-to-asset ratio | Pecking Order | Signalling |
|---|---------------|------------|
| Net cash flow $t-1$ | - | + |
| Equity $t-1$ | - | + |
| Size $t-1$ | N/A | + |
| Primary operator age t | N/A | + |
| University education (primary operator) | N/A | + |
| Medium rainfall zone | - | + |

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Policy Recommendations

1. Implementing policies such as the Australian Government's Farm Management Deposit Scheme or Revenue Contingent Loans will assist towards **keeping farm indebtedness low**.
2. Policymakers should focus on identifying and implementing **measures that further reduce adjustment costs** for farm businesses trying to reach their target capital structures.
3. In finding that farm businesses in low rainfall regions have higher debt-to-asset ratios, policymakers are encouraged to **pay close attention to the evolution of the capital structures in marginal areas**, as greater reliance on debt may limit the ability of these farm businesses to further adapt to climate change.