

Interest Rate Risk and Renewable Energy Investment in Australia: Evidence from OLS Regression

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Abstract:

This paper studies the relationship between interest rate risk and renewable energy investment in Australia. Renewable energy projects usually need high upfront capital and long payback periods, so they can be sensitive to financing costs and changes in investor confidence. Using Clean Energy Council investment data and Reserve Bank of Australia cash rate data, the paper compares quarterly trends and runs exploratory OLS models in R. The study focuses on correlation rather than strict causal inference, because the available sample is short and renewable energy commitments may also be affected by project approval, PPA coverage, grid connection, and year-end project clustering. The results show that the RBA cash-rate level itself has weak explanatory power in this sample, while cash-rate changes and a simple rate-volatility proxy are more closely associated with investment commitments. This finding shifts the discussion from a single interest-rate-level story to a channel view of adjustment speed, financing uncertainty, project timing, and revenue stability. It also suggests that sustainable finance risk management should pay attention to both funding costs and the uncertainty around rate movements.

Keywords: Renewable energy investment; interest rate risk; sustainable finance; project finance; OLS regression.

1. Introduction

1.1 Research Background

In recent years, Australia's clean energy transition has required continuous investment in renewable energy and energy storage projects. However, such projects are typically characterised by high upfront

capital requirements, so their financial viability is highly sensitive to financing conditions [1]. In Australia's electricity market, Power Purchase Agreement (PPA) coverage, off-taker credit quality, and revenue stability also influence the financing terms of renewable energy projects [1, 2]. Rising interest rates increase financing costs, which can reduce the competitiveness of renewable energy projects and

raise the likelihood of investment delays [3]. Therefore, studying the relationship between interest rate risk and renewable energy investment in Australia can help identify the financing risks of green projects from a sustainable finance perspective [1, 3].

1.2 Research Purpose and Research Questions

This paper examines whether interest rate risk is associated with changes in renewable energy investment in Australia. This study focuses on correlation rather than strict causal inference. It adopts trend analysis and Ordinary Least Squares (OLS) regression as exploratory empirical tools to examine whether higher interest rates are associated with lower renewable energy investment and explores green project financing risk in Australia under a high-interest-rate environment. This paper adopts financially committed renewable generation capacity data from the Clean Energy Council (CEC) and cash rate data from the Reserve Bank of Australia (RBA) for analysis. The study does not seek to establish complex causality. Instead, it employs trend analysis and OLS regression to test whether higher interest rates are associated with lower renewable energy investment. The paper uses investment data from the CEC and cash rate data from the Reserve Bank of Australia. It first illustrates temporal trends and then conducts OLS regression analysis in R. This paper mainly answers three questions:

- (1) Has renewable energy investment in Australia exhibited substantial fluctuations in recent years?
- (2) Is the RBA cash rate associated with changes in renewable energy investment?
- (3) What implications do the findings hold for sustainable finance and green investment risk management?

This paper uses the Reserve Bank of Australia cash rate as a benchmark indicator of interest rate risk and treats renewable energy investment commitments as the investment outcome. The cash rate is selected because it reflects changes in Australia's broader financing environment and may affect bank lending, bond financing, and project capital costs. Investment commitments are used because they are more directly related to investment decisions than installed capacity, as they indicate whether projects have entered the financing and development stage. Therefore, this study uses cash rate data from the RBA and financially committed renewable generation capacity data published by the Clean Energy Council. The analysis first presents trend charts to examine whether the two variables have changed in opposite directions in recent years. It then applies an OLS model to test whether changes in the cash rate are statistically associated with changes in investment commitments.

2. Theoretical Basis and Influence Mechanism

This chapter uses quarterly data to examine the financing progress of renewable energy projects in Australia. Rather than discussing sustainable development in broad terms, this chapter focuses on how interest rate risk may affect renewable energy investment commitments in Australia. CEC quarterly reports regularly disclose the capacity of large-scale renewable energy generation projects that reached the financial commitment stage. Therefore, this study uses this indicator to measure quarterly investment activity and compares it with the RBA cash rate. The later empirical analysis separates interest rate risk into level risk, adjustment-speed risk, and volatility or uncertainty risk, so the mechanisms below are used to interpret more than one cash-rate channel. If rising interest rates push up capital costs, project investment commitments may be suppressed; however, this impact may also be moderated by PPAs, revenue stability, policy support, and investor risk preferences. This approach keeps the variable definition, trend figures, and subsequent OLS analysis at the same quarterly frequency.

2.1 Conceptual Background

2.1.1 Sustainable Finance

Sustainable finance in this study mainly refers to how the financial system allocates capital for green projects, identifies risks, and supports long-term investment. Although renewable energy projects have environmental value, whether they can proceed still depends on financing costs, revenue stability, and risk-sharing arrangements. Green finance research shows that the allocation of financial resources can promote innovation and investment in renewable energy, but credit risks and financing conditions will also affect the effectiveness of policies [4-8].

2.1.2 Renewable Energy Investment

Renewable energy investment in this study mainly refers to project progress after the financial commitment stage has been reached. This stage usually means that a project has completed key financing or investment commitments and is ready to move into further development. Since publicly available CEC pages do not report AUD investment values for every quarter, this study uses the capacity of large-scale renewable energy generation projects reaching financial commitment as a verifiable quarterly proxy measure.

2.1.3 Interest Rate Risk and Financing Cost

The RBA cash rate is not the actual loan interest rate for a single project, but it can reflect changes in Australia's overall financing environment. When the cash rate rises,

bank loans, bond financing, and project capital costs may increase accordingly. With long payback periods, higher financing costs will lower project net present value and make financial close more difficult [3, 4, 9]. In Chapter 3, this direct channel is mainly tested through the cash-rate level and the lag-one cash-rate model.

2.2 Trend Analysis of Core Variables in Australia

This section uses quarterly data from 2024Q1 to 2025Q4 to present trend figures. Renewable energy investment activities are measured by the capacity of large renewable energy power generation projects that have reached the financial commitment stage, in Megawatt (unit abbreviation: MW); interest rate risk is expressed as the quarterly average of RBA cash rate. Considering that there may be a lag in investment decision-making, the subsequent OLS analysis will give priority to the cash rate of the previous quarter. The basic model can be expressed as:

$$\text{Investment}_t = \beta_0 + \beta_1 \text{CashRate}_{t-1} + \varepsilon_t \quad (1)$$

Where Investment_t represents the large-scale renewable energy power generation capacity that reaches the financial commitment stage in the t quarter;

CashRate_{t-1} represents the quarterly average of the RBA cash rate in the previous quarter;

β_0 is the intercept term, representing the investment com-

mitment capacity predicted by the model when the cash interest rate in the previous quarter was zero. This value is mainly used as a regression benchmark and does not require a substantive economic interpretation;

β_1 is the interest rate coefficient, indicating the expected change in financially committed generation capacity (MW) for a one-percentage-point increase in the previous quarter's RBA cash rate. If β_1 is negative, it indicates that higher previous-quarter cash interest rates are related to lower investment commitment capacity;

t represents the current quarter, and $t-1$ represents the previous quarter of the current quarter;

ε_t is a random error term. This model is used to check whether there is a statistical correlation between interest rate risk and quarterly investment activities.

2.2.1 Trend of Renewable Energy Investment

Fig. 1 shows noticeable fluctuations in quarterly investment activity. 2024Q3 and 2024Q4 reached a high level, 2025Q1 to 2025Q3 weakened significantly, and 2025Q4 rebounded again. This suggests that renewable energy investment commitments do not follow a steady growth pattern but will be jointly affected by the concentrated implementation of projects, policy expectations, market conditions and the financing environment.

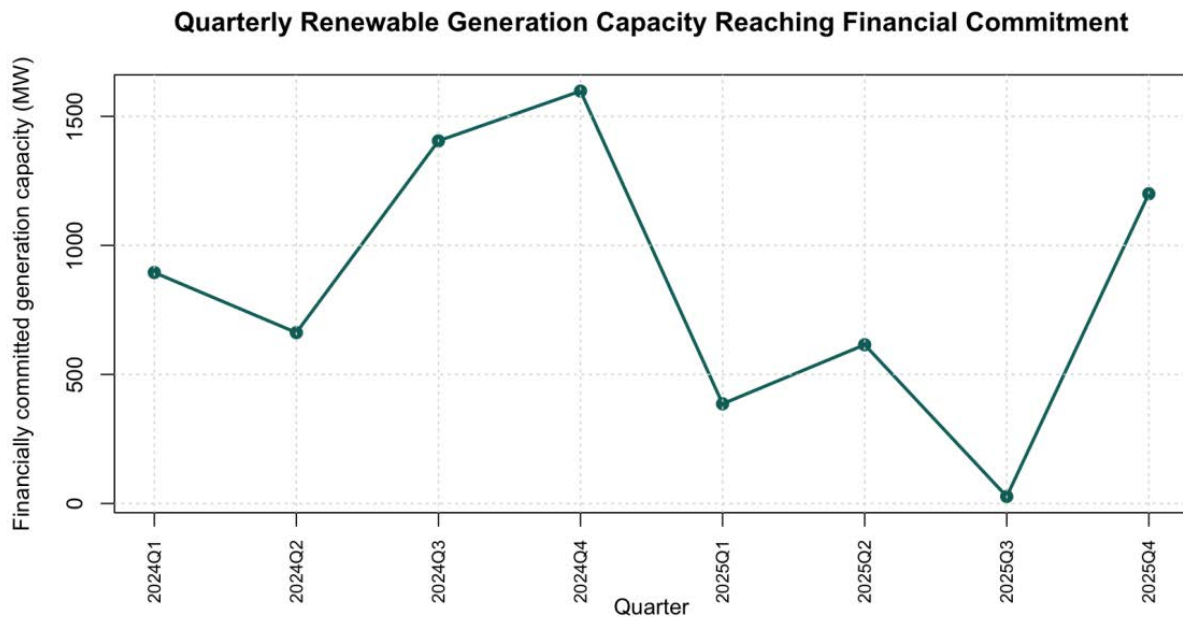


Fig. 1 Quarterly renewable generation capacity reaching financial commitment

2.2.2 Trend of RBA Cash Rate

Fig. 2 shows that the RBA cash rate remained high in 2024 and gradually declined in 2025. This trend indicates

that Australia's financing environment shifted from a high-interest-rate period towards a relatively more moderate condition. Since renewable energy projects rely on

long-term financing, changes in cash rate may affect investment commitments through capital costs.

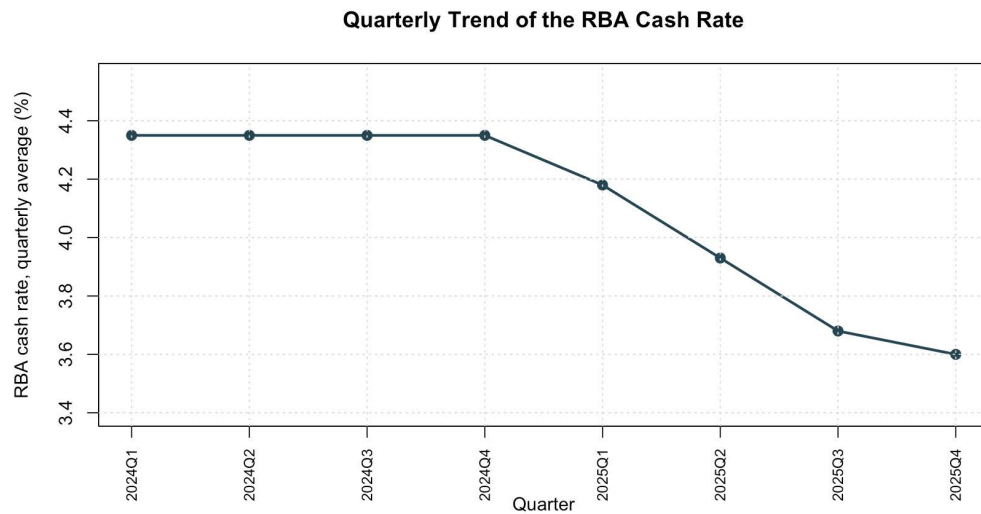


Fig. 2 Quarterly trend of the RBA cash rate

2.2.3 Preliminary Relationship between Investment and Interest Rate

Fig. 3 shows the preliminary relationship between cash rate and quarterly investment activities. The scatter plot does not show a simple linear relationship. Relatively strong investment commitments were still observed

during the high-interest-rate environment in 2024, and investment activities have not continued to rise after the interest rate fell in 2025. This shows that interest rate risk may be important, but it is not the only explanatory factor. PPA, policy support, grid access, and project approval cycle may all affect the quarterly investment commitment.

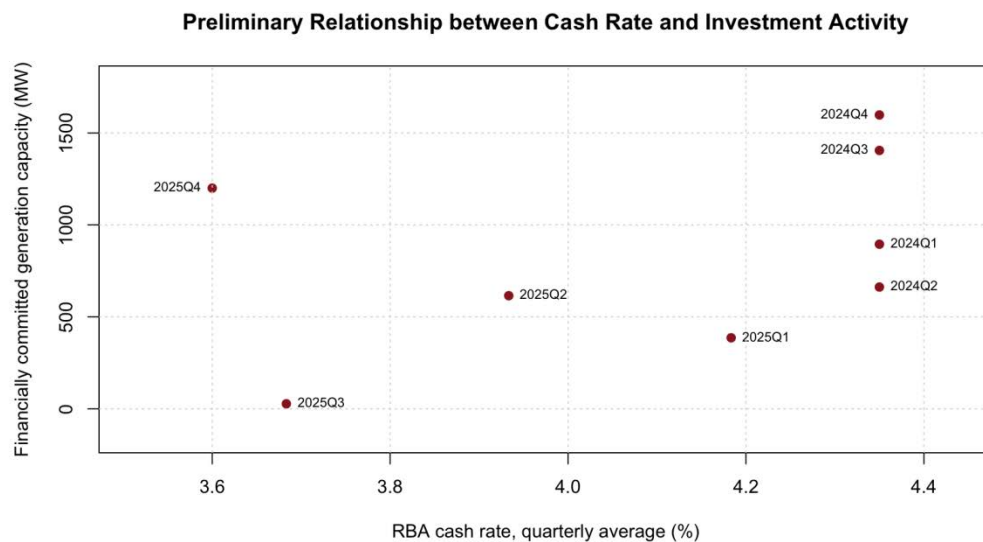


Fig. 3 Preliminary relationship between the RBA cash rate and quarterly investment activity

2.3 Influence Mechanisms of Interest Rate Risk

2.3.1 Impact on Project Financing Cost

The first mechanism concerns project financing costs. As discussed above, these projects depend heavily on long-

term debt financing. Rising interest rates directly push up debt and overall capital costs. If future revenue does not increase accordingly, it may be more difficult for the project to achieve the expected return, thus delaying investment commitments [3, 6]. This mechanism corresponds

most directly to level risk.

2.3.2 Impact on Investor Risk Preference

The second mechanism is the risk appetite of investors. High interest rates will increase the return of low-risk assets and the opportunity cost of long-term green projects. Investors may require a higher risk premium or give priority to assets with more stable cash flow. Credit risk research also shows that financial risk conditions will affect the effect of green financial policies and renewable energy development [8-10]. This mechanism is closer to adjustment-speed risk, because sudden rate changes can alter investors' waiting value and timing decisions.

2.3.3 Impact on PPA and Revenue Stability

The third mechanism concerns PPA and revenue stability. Long-term power purchase agreements can help projects secure part of their revenue and reduce the risk of fluctuations in spot electricity prices. Relevant Australian studies show that PPA coverage, credit quality, and income quality of the purchasing party will affect the financing conditions of the project [1, 2]. Therefore, in a high-interest rate environment, projects with more stable income may be more likely to obtain financing. This mechanism helps explain why the cash-rate level alone may not show a simple negative relationship with investment commitments.

2.3.4 Impact on Sustainable Finance Development

The fourth mechanism concerns risk mitigation arrangements within sustainable finance. If the market financing cost is high, relying on the project's own income alone may not be enough to support some green investment. Therefore, green loans, government guarantees, long-term power purchase agreements, and other policy support tools may play a role in sharing financing risks and stabilizing project cash flow. This mechanism is linked to volatility or uncertainty risk, because these tools mainly improve a project's ability to absorb financing shocks rather than simply lower the benchmark interest rate.

3. Empirical Analysis and Risk Governance Suggestions

To facilitate the research, the research questions can be collected into three testable questions: whether the absolute level of RBA cash rate explains quarterly investment commitments, whether cash-rate changes and rate-volatility proxies are more explanatory, and how these results are transformed into risk governance suggestions. Among them, interest rate risk needs to be split into level risk, adjustment-speed risk, and volatility or uncertainty risk to avoid the emergence of a single interest rate variable. In this way, the four mechanisms can better match the empirical variables: financing cost corresponds to level risk,

investor preference corresponds to adjustment-speed risk, and PPA and sustainable finance tools explain the ability to stabilise income and resist uncertainty.

3.1 Data and Methodology

3.1.1 Data Sources

The data calibre first determines what risks can be seen. CEC quarterly financial commitment capacity should not be treated as final commissioning, actual generation, or accounting capital expenditure, but indicates that a project has entered the financing and construction-preparation stage. The CEC directly reported 662 MW of generation projects reaching financial commitment in 2024Q2. After such data source processing, it is more suitable for observing whether the project has crossed the financing threshold. Australian electricity market research also shows that this threshold is directly related to revenue quality, PPA coverage, and off-taker credit quality [1].

There is another practical problem with this indicator: large-scale projects may focus on completing financial commitment in the same quarter, so the sequence will jump and will not move like a smooth investment curve. The study of Australian solar also reminds that revenue mix and unhedged risk will affect revenue stability [2]. Therefore, if only cash-rate level is used to explain all fluctuations, it is easy to misunderstand project clustering, hedging, and financing negotiation timing as interest rate effects.

Interest rate data also has boundaries. RBA cash rate is the benchmark indicator of the financing environment, but it is not project loan rates, corporate bond yields, or project-level weighted average cost of capital. Financing costs are usually transmitted through debt costs, risk premiums, and capital structure [3]. Therefore, in addition to the baseline cash-rate level model, this chapter also adds cash-rate changes and rate-volatility proxy.

3.1.2 Variable Design

The variable design revolves around three interest rate risk channels. The first is level risk: if the RBA cash rate is higher, the financing cost should rise, and the investment commitments should decrease. The second is adjustment-speed risk: the project may not only look at the interest rate level, but also at the policy adjustment speed and refinancing expectations. The third is volatility or uncertainty risk: the greater the change in interest rates in the quarter, the more difficult the debt cost is to estimate, and the project is more likely to wait. Another Q4 dummy is set up to separate year-end project clustering from the interest rate channel.

Judging from the splitting experience in past literature, green finance can promote renewable energy innovation, but the effect depends on financial conditions [7]. Credit

risk research points out that green financial policies may have threshold effects [8]. The article on Stochastic interest rate shows that uncertain interest rates will change the investment waiting value and project entry timing [4]. Therefore, this chapter will shift more research centres from "whether high interest rates reduce investment" to check which channel interest rate risk enters project financing.

3.1.3 OLS Model

The supplementary model adds time trend, cash-rate change, absolute cash-rate change, rate-volatility proxy, and Q4 dummy in order. Rate-volatility proxy is constructed with the standard deviation of monthly cash-rate values within each quarter. For visual comparison in Fig. 4, investment commitments and the cash rate are indexed to their sample means, while the volatility proxy is rescaled so that the mean of its positive observations equals 100; quarters without an intra-quarter rate change remain zero.

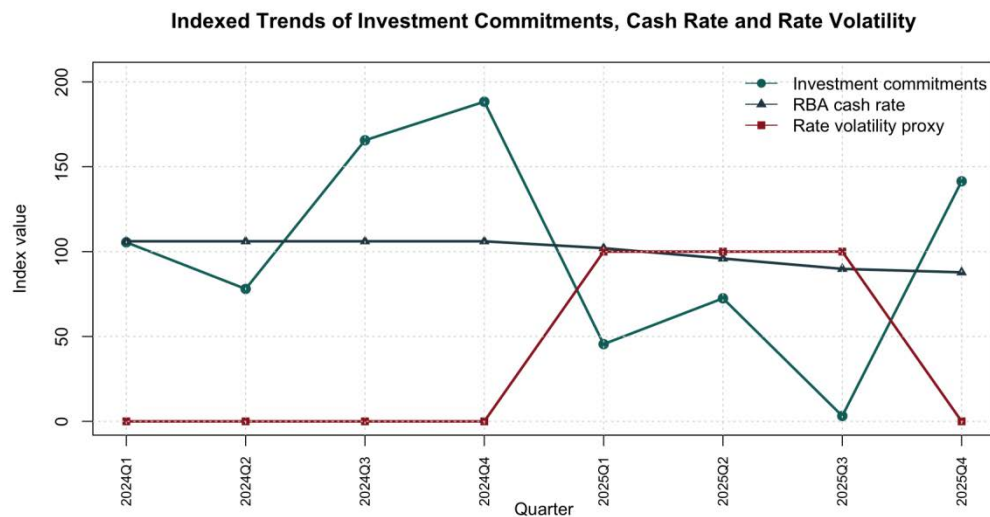


Fig. 4 Indexed trends of investment commitments, RBA cash rate, and rate-volatility proxy

The main specifications focus on contemporaneous model and lag-one model. Permutation tests and bootstrap tests are used to assess the robustness of the baseline coefficient against disturbances. Because the effective observations

of Lag-two and lag-three are only 6 and 5, they are only placed in Fig. 5 for sensitivity illustration, not as formal regression evidence.

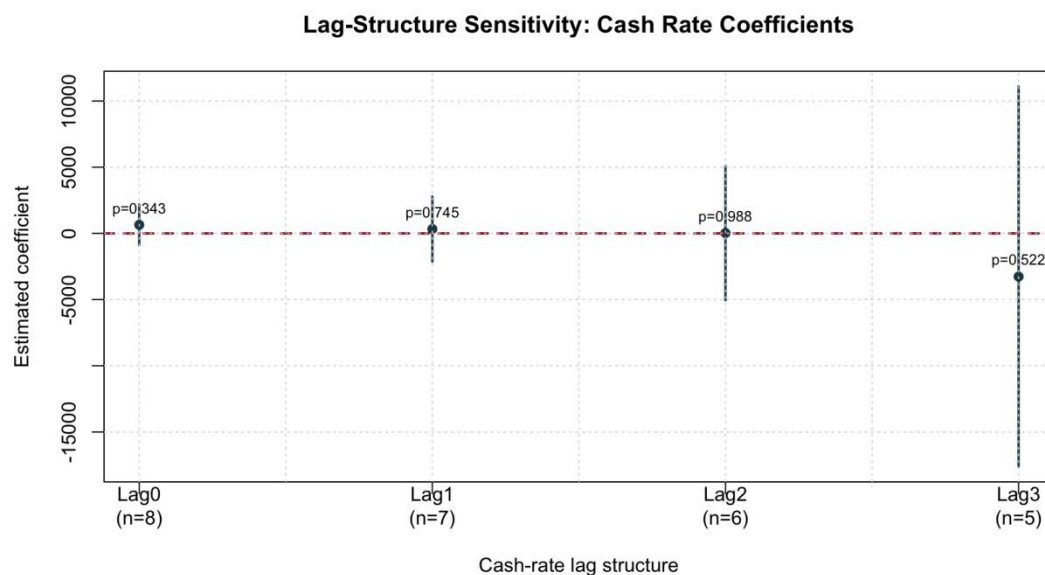


Fig. 5 Lag-structure sensitivity of cash-rate coefficients

3.2 Empirical Results and Financial Risk Interpretation

3.2.1 Trend Analysis

Fig. 4 compares the quarterly changes of the three indicators. Cash interest rates will remain high in 2024, but investment commitments in the third and fourth quarters are still strong. After entering 2025, the cash interest rate gradually declined, but the investment commitment from the first to the third quarter was generally weak, and the interest rate volatility agent value increased in the same period. In the fourth quarter, the volatility agent value fell to zero, and the investment commitment rebounded significantly. It can be seen that there is no stable inverse relationship between investment activities and cash interest rates, and its quarterly changes may also be affected by financing uncertainty and project landing time.

3.2.2 OLS Regression Results and Robustness Checks

The lag1 cash-rate coefficient of the Baseline lag-one

model is 327.9, the p-value is 0.745, and the R-squared is 0.023. In the current sample, the level of RBA cash rate in the previous quarter cannot explain the investment commitments in this quarter. The coefficient of the Contemporary model is 647.2, the p-value is 0.343, and the R-squared is 0.150, which is also not significant. After adding the time trend, the lag1 coefficient becomes -941.3, but the p-value is still 0.669.

The coefficient of the Cash-rate-change model in Fig. 6 is 3862.7, the p-value is 0.041, and the R-squared is 0.600. Since the rate changes in 2025 are mainly rate cuts, this positive coefficient suggests that larger policy adjustments themselves are accompanied by stronger uncertainty. The coefficient of Absolute-rate-change model is -3862.7, and the p-value is 0.041. The coefficient of the Rate-volatility proxy model is -5607.2, the p-value is 0.020, and the R-squared is 0.622, which is one of the strongest results in the single-variable model.

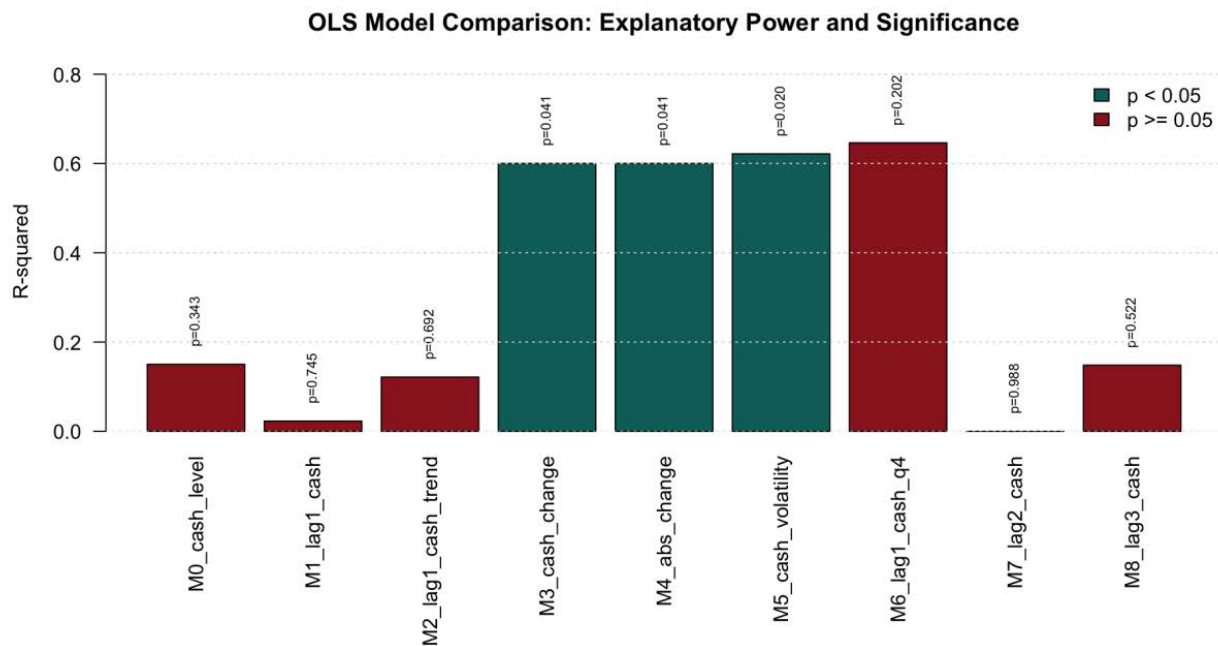


Fig. 6 OLS model comparison by R-squared and coefficient significance

Project clustering cannot be ignored. After adding the Q4 dummy, model R-squared rises to 0.647. Fig. 6 reports the p-value of the lag-one cash-rate coefficient, while the Q4 coefficient is 1006.0 with a p-value of 0.057. This shows that the high commitments of 2024Q4 and 2025Q4 may be related to the completion of the year-end project, the pace of approval, and the conclusion of financing negotiations.

In order not only to rely on conventional p-values, the

baseline lag-one model also does permutation tests and bootstrap checks. Permutation p-value is 0.733, which means that after randomly disrupting the interest-rate sequence, there is still a 73.3% probability of obtaining a result not less than the observed coefficient. Bootstrap 95% interval is about -945.0 to 3585.1, including 0. Fig. 7 also shows that the observed coefficient is not in the extreme position of permutation distribution.

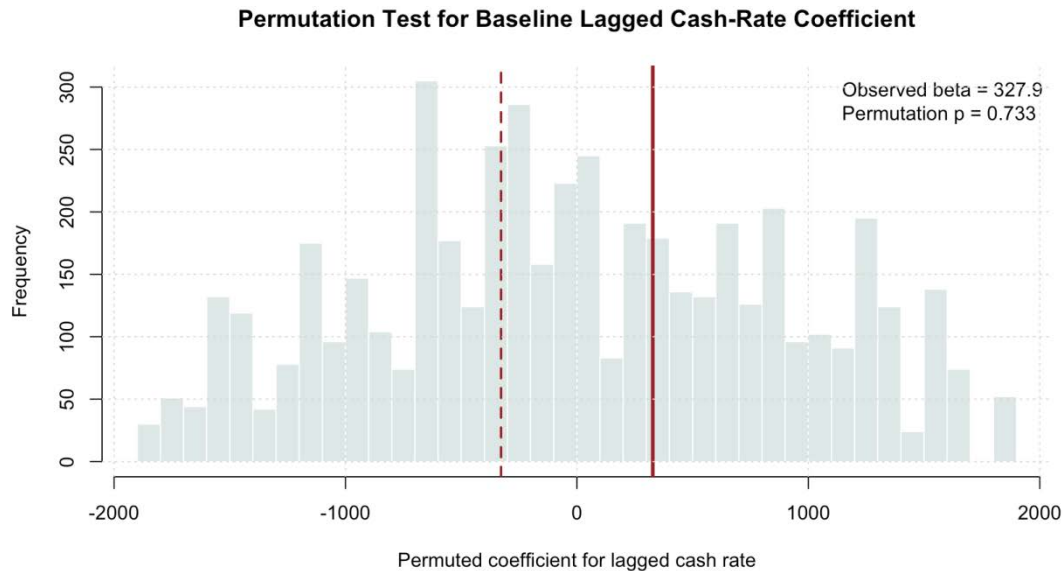


Fig. 7 Permutation test for the baseline lagged cash-rate coefficient

3.2.3 Financial Risk Interpretation

A core judgment is that the cash-rate level is not significant, but it does not mean that the interest rate risk is not important. It shows that risk transmission may have shifted from "absolute level" to "adjustment speed" and "uncertainty". Large-scale renewable energy projects often lock in some debt conditions in advance and use fixed-rate debt, hedging tools, or PPA to stabilise income, so the benchmark cash-rate level may not be immediately reflected in financial commitment timing.

Level risk is mainly connected to financing costs, but the evidence in this sample is not strong. Adjustment-speed risk is closer to investor waiting and policy signal changes, and the significant results of cash-rate-change model also support this judgment. Volatility or uncertainty risk will increase the difficulty of financing negotiations and affect the buffering effect of PPA revenue quality and sustainable finance tools, so rate-volatility proxy shows stronger explanatory power in the model. Overall, the results suggest that the impact of interest rate risk has shifted from the simple high and low interest rate to the two more specific transmission links of adjustment speed and uncertainty.

3.3 Policy and Risk Mitigation Suggestions

3.3.1 Optimise Financing Mechanisms to Reduce Interest Rate Risk Exposure

Policy suggestions can focus on adjustment-speed risk first. The project can lock debt pricing in stages, split long-term debt into several financing windows, and reduce the pressure brought by the single interest rate assumption.

Rate-volatility trigger clause can also be added to the loan contract. When the interest rate fluctuates beyond the preset threshold in the quarter, the project party and the lender can recheck the debt service coverage ratio, PPA pricing assumption, and refinancing window.

3.3.2 Stabilise Project Revenue to Mitigate Investment Volatility Risk

The second type of recommendation is for volatility or uncertainty risk. Long-term PPAs, contracts for difference, creditworthy off-takers, and clear grid-connection timeline can improve the estimation of future cash flow. Regulatory and approval departments should also avoid many projects concentrating on approval or grid connection at the end of the year. Flattening the approval rhythm can reduce Q4 clustering and reduce the pressure of competing for financing, equipment, and construction resources for projects in the same quarter.

3.3.3 Improve Sustainable Finance Risk Governance Framework

Sustainable finance risk governance should also shift from "supporting green projects" to "identifying financial risks within green projects." The monitoring framework should at least track RBA cash rate, cash-rate changes, rate volatility, debt spreads, PPA coverage, approval progress, and grid-connection risk at the same time. For non-rate risks, the focus is on income stability, approval coordination, and grid transparency; for OLS, the interest rate transmission risks that have not been directly captured are the focus of financing-structure disclosure, interest-rate stress testing, and credit-spread monitoring.

4. Conclusion

This article examines whether interest rate risk affects the financing progress of renewable energy investment commitments in Australia. The result is very clear: the RBA cash-rate level has no stable explanatory power in the current short sample, and the contemporary model and the lag-one model are not significant.

The truly interpretable results mainly come from cash-rate changes, absolute rate changes, and rate-volatility proxy. Compared with the cash-rate-level model, these variables can better explain the changes of investment commitments, among which the performance of rate-volatility proxy is the most obvious, with R-squared about 0.622 and p-value about 0.020. Q4 dummy also shows that project clustering will affect investment fluctuations. Based on these results, the transmission focus of interest rate risk has shifted from absolute level to adjustment speed and uncertainty.

There is a certain limitation of the sample size. The current data is only 8 quarters, and the lag-one model only has 7 observations left. Lag-two and lag-three only have 6 and 5 observations left, so they cannot support the formal distributed lag inference. To reliably test the transmission delay of more than 3 to 4 quarters, at least 20 quarters of data are needed. Follow-up research can extend CEC financial commitment data to 2020-2023 and check whether the post-2022 high-interest-rate period constitutes a structural break.

The second restriction comes from the economic meaning of MW proxy. Financial commitment capacity is public and verifiable data, but MW cannot be directly equivalent to AUD investment value. The unit investment cost of different technology types, states and project scales varies greatly. For example, 1.2 gigawatt (GW) and AUD 3.5 billion in Q4 2025 can help judge the magnitude, but it cannot replace the complete investment value series.

The third disadvantage is that the interest rate indicator is still macro. RBA cash rate can represent the benchmark financing environment, but the actual financing cost of the project also includes bank spreads, bond yields, credit risk premiums, green loan terms, and Bank Bill Swap Rate (BBSW) which can be added for follow-up research, and the test results come from benchmark rate or broader credit conditions.

External auxiliary data is also worth joining. Australian Energy Market Operator (AEMO) electricity price volatility, Large-scale Generation Certificate (LGC) prices, grid-connection queue data, project announcements, and PPA or Contract for Difference (CfD) signing information may explain why investment commitments are concentrated in some quarters. Even if these variables do not enter the main regression for the time being, they can also be

used for event annotation, trend segmentation, and robustness figures.

Another thing worth improving is that it can provide some finer data to support event-study design. If RBA daily rate announcements, project financial commitment dates, and market yield changes can be matched, there is no need to compress all project information into quarterly observation values. In this way, it is easier to judge whether the interest rate changes have really changed the project financing timing.

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