HOUSTONKEMP
Economists

Greg Houston Partner
Office +61 2 8880 4810
[redacted]
Address Level 40, 161 Castlereagh Street
Sydney NSW 2000

Dr Leon Berkelmans
Senior Manager, Securities Markets
Domestic Markets Department
Reserve Bank of Australia
Sydney NSW 2001

11 March 2022

Dear Dr Berkelmans

I am writing in relation to the Reserve Bank of Australia's (RBA) research discussion paper (RDP) 2019-04, *A history of Australian equities*, authored by Thomas Mathews. I understand that Mr Mathews was an employee of the Bank at the time RDP 2019-04 was published, but is no longer associated with the Bank.

I am sure you are aware that RDP 2019-04 has attracted the close interest of the Australian Energy Regulator (AER), in the context of its measurement of the long term equity market risk premium for application in determining the rate of return to be applied to energy network service providers.

I understand that the AER wrote to you last year in relation to a report prepared by my Special Adviser colleague, Dr Simon Wheatley, on behalf of Energy Networks Australia (ENA), the industry body that represents electricity and gas network infrastructure providers. Dr Wheatley's report, entitled *A new MRP estimate? A review of RBA discussion paper 2019-04*, was submitted by ENA to the AER in September 2021. I also appreciate that the preamble to RDP 2019-04 states that the views expressed in the paper are those of the author and not necessarily those of the Bank, and that you have previously encouraged the AER to address any questions about RDP 2019-04 directly to Mr Mathews.

Notwithstanding, as a matter of courtesy I am writing to draw your attention to an error in the analysis underpinning RDP 2019-04 that has subsequently been uncovered by my colleagues. The nature of the error is such that the empirical findings reported in RDP 2019-04 are invalid.

By way of summary, the error arises in the R programming code that underpins the calculation of the equity returns reported by Mr Mathews, which is reported in supplementary information made available by the RBA at: https://www.rba.gov.au/publications/rdp/2019/2019-04/supplementary-information.html

Mr Mathews uses the programming language R to write code that constructs the equity returns reported in RDP 2019-04. The error arises in an 'ifelse' statement that is an integral part of the function that Mr Mathews uses to construct the reported returns. In the R code that Mr Mathews employs, the ifelse statement operationalises a classification scheme that Mr Mathews intends to use to handle changes in the issued capital of the firms that are the subject of his research.

In R, the ifelse statement takes the form ‘ifelse(test, yes, no)’, where:

- ‘test’ represents a condition that may or may not be satisfied;
- ‘yes’ represents the value taken if the condition is satisfied; and
- ‘no’ represents the value taken if the condition is not satisfied.

However, the R code reported by Mr Mathews instead writes ‘ifelse(test, no, yes)’.

The impact of this coding error is that the scheme that Mr Mathews adopts to classify changes in issued capital is back to front. By way of example, the consequence is that Mr Mathews’ empirical estimates will have:

- classified most share issuances as stock splits; and
- classified almost all stock splits as share issuances, and buybacks as reverse splits.

The attached memo, prepared by Dr Wheatley, describes in detail the impact these misclassifications can be expected to have on the returns that Mr Mathews presents in RDP 2019-04. Although it is not possible to say whether this coding error will cause the returns reported by Mr Mathews to be higher or lower than would be the case without the error, the very existence of an error of this kind means that the results presented in RDP 2019-04 cannot be relied upon to support the claims made in the discussion paper.

In the ordinary course, the appropriate remedy would be for Mr Mathews to correct the code and prepare an *erratum* that could be placed on the Bank’s website, alongside the original RDP. I appreciate that Dr Wheatley’s 2021 review of RDP 2019-04 raises separate concerns as to the reliability of a series of returns generated purely from data in relation to dividends, prices and shares outstanding, and that a reliable estimate must properly adjust for the capital changes that firms regularly undertake. However, the significance of the coding error I describe above is more fundamental, in that the capital changes classification scheme that Mr Mathews states has been applied is not, in fact, what has been applied.

As a leader of a firm with two dozen staff who regularly both perform and review complex analysis of the kind undertaken by Mr Mathews, I well appreciate that from time to time errors do occur. In our own close assessment of the research reported in RDP 2019-04, we sought to check the reported returns by comparing them with existing, independently constructed series of returns. It was this process that led Dr Wheatley and other colleagues to take a closer look at the programming code that Mr Mathews used to construct returns and thereby uncover the coding error embedded in the ‘ifelse’ function.

The contextual difficulty that arises is the degree of external attention that RDP 2019-04 has received, and its potential to influence decisions being made in the real economy. I have already noted the interest of the AER in RDP 2019-04, and you may also be aware that in its 19 June 2019 article, *A 100-year history of the Aussie sharemarket*, the Australian Financial Review refers to the data that Mr Mathews assembles as the ‘RBA data’. In its 14 September 2021 letter to the Bank, the AER similarly refers to the data that Mr Mathews assembles as the ‘new RBA data series’.

Taking into account that it is likely to be impracticable for the research reported in RDP 2019-04 to be corrected, I invite you to consider an appropriate alternative course of action. For example, I believe it would be appropriate for the Bank to consider either:

- the addition to its online arrangements for RDP 2019-04 of a notice alerting users to the existence of errors in the manipulation of the underlying data; or
- the withdrawal of RDP 2019-04 altogether.

I appreciate that the details set out in this letter present an inconvenience and that the easiest course may be simply to overlook the matters being raised. However, in my opinion to set aside the matters I describe above would be to under-estimate the significance of the intellectual and public policy contribution that the Bank continues to make through its ongoing research program.

Please do not hesitate to get in touch should you have any questions or wish to discuss any aspect of this letter, which I am copying to Warwick Anderson at the AER, and Garth Crawford at ENA.

[redacted]

Greg Houston

CC Warwick Anderson
General Manager
Network Pricing
Australian Energy Regulator
23 Marcus Clarke Street
Canberra ACT 2601

Garth Crawford
General Manager
Economic Regulation
Energy Networks Australia
Unit 5, Level 12, 385 Bourke Street
Melbourne VIC 3000

Encs