2019 AFAANZ Research Grant Report

(1) Name, Position, Contact Details for each applicant

Dr Sagarika Mishra

Deakin Business School

Email: Sagarika.Mishra@deakin.edu.au

Phone: +61 3 92517150

Dr Aziz Hayat

Email: Aziz.Hayat@deakin.edu.au

Phone: +61 3 92446358

(2) Project Title: Effect of non-linear correlation on diversification benefits for banks and insurance companies in Australia

Due to limited funding, we restrict our sample to banks only. Moreover, we later find out that the non-linear correlation measured by the distance correlation (Szekely, G.J., Rizzo, M.L., and Bakirov, N.K., 2007) loses interpretation for diversified VaR because the non-linear correlation is non-negative. We, therefore, rely on linear specification for the correlation between the risk category indices. It is going to change the title of our paper.

(3) Updated Project Summary (500 words) including any variations between the project undertaken and the original application

A permeative and puzzling feature of banks' Value-at-Risk (VaR) is its high level, which leads to excessive regulatory capital. A possible explanation for the tendency of commercial banks to magnify their VaR is that they may incompletely account for the diversification effect among broad risk categories (e.g., equity, interest rate, commodity, credit spread, and foreign exchange).

The VaR measures the maximum trading loss that a bank can face over a given horizon (usually a day) and under a specified confidence level (usually 99%). The Australian banks report semi-annual or annual aggregate VaR at either 97.5% or 99% confidence level covering both physical and derivatives trading positions for the bank's principal trading centres for the four risk categories: foreign exchange, interest rate, credit, commodity and equity. The aggregate VaR can be a biased estimate.

The biasedness whether due to over-reporting of aggregate VaR or under-reporting of aggregate VaR by the banks has its consequences. The over-reporting of VaR means banks have to maintain an excessively higher capital since its level is given by a positive function of

the bank VaR. The under-reporting of VaR is riskier for the banks when losses incurs more than expected/planned.

Moreover, as acknowledged by the Basel Committee on Banking Supervision (1996) in the Amendment of the Based Accord, banks have discretion to consider empirical correlations within and across broad risk categories when computing their aggregate or diversified VaR. In practice, because the correlation across the risks is less than perfectly positive, the aggregate VaR will be less than the sum of the individual VaRs.

Australian banks performed extremely well during the GFC when major banks in most developed countries were on the run. In the case of diversification benefits being larger among the risk category indices than accounted by the banks, this can be show that banks aggregate VaR is over-reported. This can provide banks the basis to withdraw excessive capital that is uselessly there because of the use of bias correlation structure for the diversification benefits.

In this paper, we examine empirically the validity of this hypothesis using actual VaR data from major Australian commercial banks. In contrast to the VaR diversification hypothesis, our preliminary evidence show no sign of systematic underestimation of the diversification effect by Australian banks. In particular, diversification effects used by banks tend to be close to (and quite often larger than) our empirical diversification estimates. A direct implication of this finding is that individual VaRs for each broad risk category, just like aggregate VaRs, are biased risk assessments.

We implement the method for diversification benefit following Pérignon C and Simth D. R., 2010. We calculate the DVaR for the banks using equation (4). As can be seen that the implementation of equation (4) requires us to calculate the correlation structure among the risk category indices.

We briefly explain Pérignon C and Simth D. R., 2010 methodology below. The VaR of an asset i is given by eq (1), where κ is the scaling coefficient, σ_i is the standard deviation of asset i and x_i is the dollar position of asset i. The scaling coefficient will depend on the underlying distribution of the asset. For example, a 99% VaR under normal distribution will be 2.33. The diversified portfolio of the VaR is given by equation (2).

$$VaR_i = \kappa \sigma_i x_i \qquad (1)$$

$$DVaR = \kappa\sqrt{x'Hx} \quad (2)$$

where, $H = DRD$, where D is a diagonal matrix with the standard deviation of asset i as the element i on the principal diagonal, R is the correlation matrix of the assets' returns. Combining the bank's individual VaR and their diversified VaR, we have the bank's diversification coefficient as follows:

$$\delta = \frac{\sum_{i=1}^{N} VaR_i - DVaR}{\sum_{i=1}^{N} VaR_i} \qquad (3)$$

In eq. (3), $\sum_{i=1}^{N} VaR_i$ is the summation individual VaRs under each risk category. We have five risk categories. The $DVaR$ in eq. (2) can be written as

$$DVaR = \sqrt{V'RV} \qquad (4)$$

In eq. (4), V is a column vector containing individual VaRs.

(4) Funds Granted

AUD $4000

(5) Detailed Report on Expenditure of Funds against Budget Items, with variations explained

We used the AFAANZ budget for casual research assistant work. The expenditure distribution is as follows (refer to table). We have also got some limited support from our department to cover the cost above AUD $4,000.

Banks	ASX_ CODE	Time periods	No of annual reports	Per hour rate	No. hours	Total = No. of annual reports * No. hours per report*hourly rate
AUSTRALIA AND NEW ZEALAND BANKING GROUP LIMITED	ANZ	2000-2017	18	$44.35	1.5	$1,197.45
COMMONWEALTH BANK OF AUSTRALIA	CBA	2000-2017	18	$44.35	1.5	$1,197.45
NATIONAL AUSTRALIA BANK LIMITED	NAB	2000-2017	18	$44.35	1.5	$1,197.45
WESTPAC BANKING CORPORATION	WBC	2000-2017	18	$44.35	1.5	$1,197.45
						$4,789.80

(6) Outcomes, for example, working papers, presentations and publications (give full details, including abstracts)

We are trying to extend the time series data span to 2018. We are hoping to get the draft of the paper out by mid of 2020. Our preliminary abstract is:

In this paper, we examine empirically the validity of this hypothesis using actual VaR data from major Australian commercial banks. In contrast to the VaR diversification hypothesis, our preliminary evidence show no sign of systematic underestimation of the diversification effect by Australian banks. In particular, diversification effects used by banks tend to be close to (and quite often larger than) our empirical diversification estimates. A direct implication of this finding is that individual VaRs for each broad risk category, just like aggregate VaRs, are biased risk assessments.

(7) Future Intentions for this Project (give full details)

a. Conference submissions

We aim to submit the paper in December 2020

b. Journal submissions

We aim to submit the paper in the Journal of Banking and Finance or Journal of Financial Quantitative Analysis.

c. Grant applications

We will use this project to explore funding from the banking industry in Australia.

d. Projects

We would like to extend the project to insurance companies in Australia. Due to budgetary limitations, we could not carry this extension.

(8) Summary of Outcomes and Benefits

We are aiming the paper to go into A* journal publication. Once finalized, we would to share our findings with banking industry in Australia. We see that our findings have implications for APRA.