

An Indian-Australian research partnership

Project Title: Demand for Cash: An Econometric Model for India

Project Number IMURA0731

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Research Clusters:
Research Themes:

Highlight which of the Academy's CLUSTERS this project will address? (Please nominate JUST <u>one</u> . For more information, see www.iitbmonash.org)		Highlight which of the Academy's Theme(s) this project will address? (Feel free to nominate more than one. For more information, see www.iitbmonash.org)	
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5	Earth Sciences and Civil Engineering (Geo, Water, Climate)	5	Nanotechnology
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7	Semi-Conductors, Optics, Photonics, Networks, Telecomm, Power Eng	7	Humanities and social sciences
8	HSS, Design, Management		

The research problem

The production, distribution, and maintenance of banknotes is an important issue facing nations in the modern economy. Such issues as cost, security, size, and durability of notes must be carefully considered by governments in order to ensure the smooth operation of the financial system. The recent trend towards digital currency is further complicating the issue, leading to a number of new factors which are difficult to quantify. The magnitude of the issue is difficult to overstate, as a functioning economy depends on its currency.

Nowhere is this more evident than India, as the world witnessed in the significant consequences of the 2016 banknote demonetisation. In the past, several detailed studies of banknote circulation have been conducted in other countries. In the Indian context, the only study that deals with modeling currency demand, both as an aggregate and for various denominations, has been undertaken by Nachane et al (2013). However, that study does not deal with certain aspects of the problem, such as how and when the notes are refurbished and replaced, the costs and type of materials used, security aspects of various payment systems, etc., and naturally does not address the events of the past few years. The aim of this project is to provide a mathematical model of banknote circulation given the sweeping changes that have occurred in India recently, both in terms of payment instruments and payments systems.

Project aims

The goal of this project is to develop an economic model for banknote circulation in India. Among other topics, the project must address the different denominations of notes, the amounts in circulation, how and when the notes are refurbished and replaced, materials used, security aspects, and an end-to-end understanding of the note lifecycle. The unique cultural and societal features of India must also be respected by the model. It is anticipated that the project will make heavy use of survival analysis and other sophisticated statistical methods.

To be more precise, the following will be the key aspects of the project.

- a) Identify the key aspects of cash circulation in India for the range of denominations and volumes in circulation. These include the circulation volumes, the velocity of cash in circulation, the cost of cash in circulation (both direct and indirect cost), the cost of issuance, and quality control.
- b) Understand the status of the Indian population with regard to financial literacy and the likely project of cash usage going forward as both a result of this and population growth, GDP, economic development etc. Ideally these results will be broken down by denomination.
- c) Assess the infrastructure requirements to meet future cash growth, including the production of cash, transportation, distribution, and destruction.
- d) Assess the environmental cost of cash in circulation both currently and in the future

The industry partner for this project, viz., Innovia Security Pty Ltd, has ambitions to be a supplier of polymer note technology to the Reserve Bank of India. This project will help them to assess their strategy, as well as providing a valuable resource for Indian government agencies. Ideally, this model will provide the foundations for a model which can be deployed in other environments globally.

Expected outcomes

We anticipate the following outcomes.

- a) A software-based economic model will be produced which would have a series of critical elements identified that form the basis of an economic model which can be deployed globally. The software package will be intuitive, concise, and clear.
- b) A process by which key elements are identified and quantified, including but not limited to projected infrastructure requirements and the change to payment systems and their likelihood. This must take into account the impact of such factors as online and mobile payments, etc.
- c) A process where simple economic reports can be given which highlight key economic considerations for both the current circulating environment and a future environment in which one or more denominations have been replaced with a polymer note of equivalent value.

It is expected that a robust model as described above will be produced. In addition to the general

expansion of knowledge, this model will serve to inform government policy and industrial decision-making in any areas of banknote adoption and production.

How will the project address the Goals of the above Themes?

Infrastructure Engineering
Humanities and social sciences

Capabilities and Degrees Required

The student must possess a Bachelor's Degree in statistics, economics (with econometrics as one of the subjects opted at the bachelors/Masters level), or a related technical field, and be looking to enter a Ph.D. program.

The student must be strong mathematically, ideally with a background in statistics, modelling, and/or econometrics. The student must be motivated and independent, able to conduct research under their own initiative.

The student must also possess strong coding skills.

Potential Collaborators

Select up to **(4)** keywords from the Academy's approved keyword list (**available at www.iitbmonash.org**) relating to this project to make it easier for the students to apply.