Formation of Tectonic Waves Networks: Dynamics of the Mexican Payment System Structure

Biliana Alexandrova-Kabadjova, Antoaneta Serguieva and Liliana Garcia Ochoa

December 2014
Background*

- Payment methods and systems have evolved over time

- Financial Market Infrastructures (FMI) are economic platforms that facilitate the clearing and settlement of electronic transactions

- FMI authorities face a complex landscape in order to establish the rules that allow interoperation among financial system participants

- The cooperative and competitive interactions among financial institutions, together with their business strategies, formed the compound structure

- Network models have become the natural tool to represent the operational relationship among FMI participants

*The views presented in this study are exclusively those of the authors and do not necessarily reflect those of Banco de México
Contents

1. Introduction

2. The liquidity provision in Mexico

3. The tectonic waves

4. Final remarks and future work
Introduction

- The purpose of the present study is to analyze the network structure of the Mexican large value payment system (LVPS), SPEI, by accounting for all direct participants.

- We build the bilateral relationships of the financial institutions based on the aggregated amount of transactions performed on a daily basis.

- We look through two different segments:
  - The first are the institutions that have direct access to the liquidity provided by the Mexican Central Bank through SIAC, and
  - The other formed by the institutions that do not have such access.

- In order to determine the overall structure of the network, we identify different components and measure their connectivity. We term this structure ‘tectonic waves’ by analogy with structural geology and we found that it exhibits dynamic properties.

- The present study is part of a project aimed at building a model that incorporates network structure and FMI participants’ behavior.

- The model will allow assessment of the impact of policy decisions on liquidity provision as well as the effectiveness of measures taken to strengthen the soundness of the FMIs.
The Mexican Large-Value Payment System (SPEI)

• In Mexico, the LVPS called SPEI® is equivalent to a real-time gross settlement (RTGS) system which enables low- and large-value payments between financial institutions and third parties (clients) to be processed simultaneously during opening hours.

• The system is operated by Banco de México (BdM) and settled 895,000 transactions daily on average in 2013.
  • More than 93% of the obligations are payments with a value lower than US$10,000.
  • Around 0.5% of the transactions surpass US$1 million.

• There are 98 direct participants in SPEI®, within four categories:
  • Private multiple-purpose banks (commercial banks)
  • Public development banks
  • Brokerage houses
  • Other nonbank financial institutions.
Intraday liquidity flows

BdM - Banco de Mexico
CB – Private multiple-purpose banks (commercial banks)
DB - Public development banks
B - Brokerages
NBFI – Non bank financial institutions
DALÍ - the Mexican Security Settlement System
CLS - originally Continuous Linked Settlement
SIAC – the system holding current accounts for the banks, allowing direct access to liquidity provided by BdM

*Aggregated data per sector and per FMI processed for 2013
The stages of development

- First stage - accounting only for multiple-purpose banks from the perspective of large- and low-value payments
  - Alexandrova-Kabadjova and Solís-Robleda, 2013 study commercial banks’ behavior by evaluating the need for external funds and the degree of recycled payments per participant
  - Martinez-Jaramillo et al., 2014 evaluate the network structure and identify the dominant players

- Second stage – considering all direct participants in SPEI
  - Alexandrova-Kabadjova et al., 2014a look at liquidity provision and provide a framework to evaluate its impact on participants’ behavior in managing funds
  - Alexandrova-Kabadjova et al., 2014b determine the overall structure of the network in order to identify components and measure the degree of connectivity
Contents

1. Introduction

2. The liquidity provision in Mexico

3. The tectonic waves

4. Final remarks and future work
Liquidity provision

BdM - Banco de Mexico
B - Brokerages
DB - Public development banks
CB – Private multiple-purpose banks (commercial banks)
DALÍ - the Mexican Security Settlement System
SIAC – the system holding current accounts for the banks, allowing direct access to liquidity provided by BdM
The overdrafts distribution: daily pattern

Transaction data as of 2013 in billions
Funding vs. recycling: daily pattern

- Only sixth of direct participants’ transactions processed in SPEI are covered with external funds, the remaining are recycled.

**General perspective**

**Per sector**

*Transaction data as of 2013 in billions*
The overdrafts distribution: hourly pattern

Transaction data as of 2013 in billions
Funding vs. recycling: hourly pattern

General perspective

Per sector

Transaction data as of 2013 in billions
Contents

1. Introduction

2. The liquidity provision in Mexico

3. The tectonic waves

4. Final remarks and future work
The formation of tectonic waves

2nd of January of 2013

Direct participants network
Credit institutions network

Non-bank financial institutions network
Inter-network: Credit institutions & NBFI
Wave representation
Average Degree*

Banco de México’s data from 2013.
Average shortest path

Banco de México’s data from 2013.
The size of core

Banco de México’s data from 2013.
Contents

1. Introduction

2. The liquidity provision in Mexico

3. The tectonic waves

4. Final remarks and future work
Final remarks and future work

• We have gained insight on the dynamics of the network structures from different perspectives

• We have studied the behavior of SPEI® participants by calculating the need for external funds and the degree of recycled payments

• We should evaluate to what extent a payment initiated by a third party increases the demand for liquidity or allows for lower pressure through recycling

• We need to gain more insight on the mechanism of redistribution of funds among participants through unsecured/secured lending

• We are working on building an agent-based model to test new rules on policy decisions on liquidity provision and measures taken to strengthen the soundness of the FMIs
Participants’ behavior

Existing rules

Measuring observed behavior

High Frequency Data (SPEI)

Overdraft (SIAC) – Repos (RSP)

Modelling behavior

Testing new rules

Measuring modelled behavior

Network description
Thank you
References

References related to the project


