The use of micro-data in the financial system information model of *Banco de México*

Alejandro Gaytán González[1]

Introduction

The current financial system information model of *Banco de México* was a strategic response to the challenges the 1994–1995 "Tequila Crisis" brought about. Although there was evidence on the building up of some unbalances (*e.g.*, large public debt denominated in foreign currency, increasing current account deficits, private credit booms), it was different to the traditional balance of payment crisis. Nonetheless mismatches in bank balances and financial contagion mechanisms remained hidden.

In addition, in the mid-1990s the information model of the financial authorities was cumbersome and had several inefficiencies: i) disperse, non-structured and duplicated information requirements from financial authorities; ii) heavy information burden, *i.e.*, too many data requirements, some of them obsolete or inaccurate; and iii) inadequate frequency, granularity, and opportunity of the information.

Thus, information was insufficient to identify measure and monitor risks. Strengthening the supervision and compliance of new regulation as well as the measurement and monitoring of risks posed heavy information challenges. In this context, some important strategic decisions were undertaken: i) coordination and information sharing among financial authorities; ii) redesign of data requests to reduce duplicates and to generate economies of scale; and, iii) *Banco de México* develop a highly granular information model to ease future analysis and reduce information scarcity in turmoil times.

The Information Model at *Banco de México*

The information model in its collection of data integrates information collected by *Banco de México* and other authorities and sources. Currently, two types of data models converge into a single model: aggregated information and micro-data (transactional as well as other highly detailed information).

In general, the model has transactional information on all transactions of financial intermediaries in the different markets (see Figure 1):

- Daily: FX transactions, detailed transactions in Debt Securities (Spot sales/purchases, Repos, and lending) and Derivatives (OTC and exchange traded), Interbank Loans and Time Deposits, all transactions in Credit and Debit Card Switches.

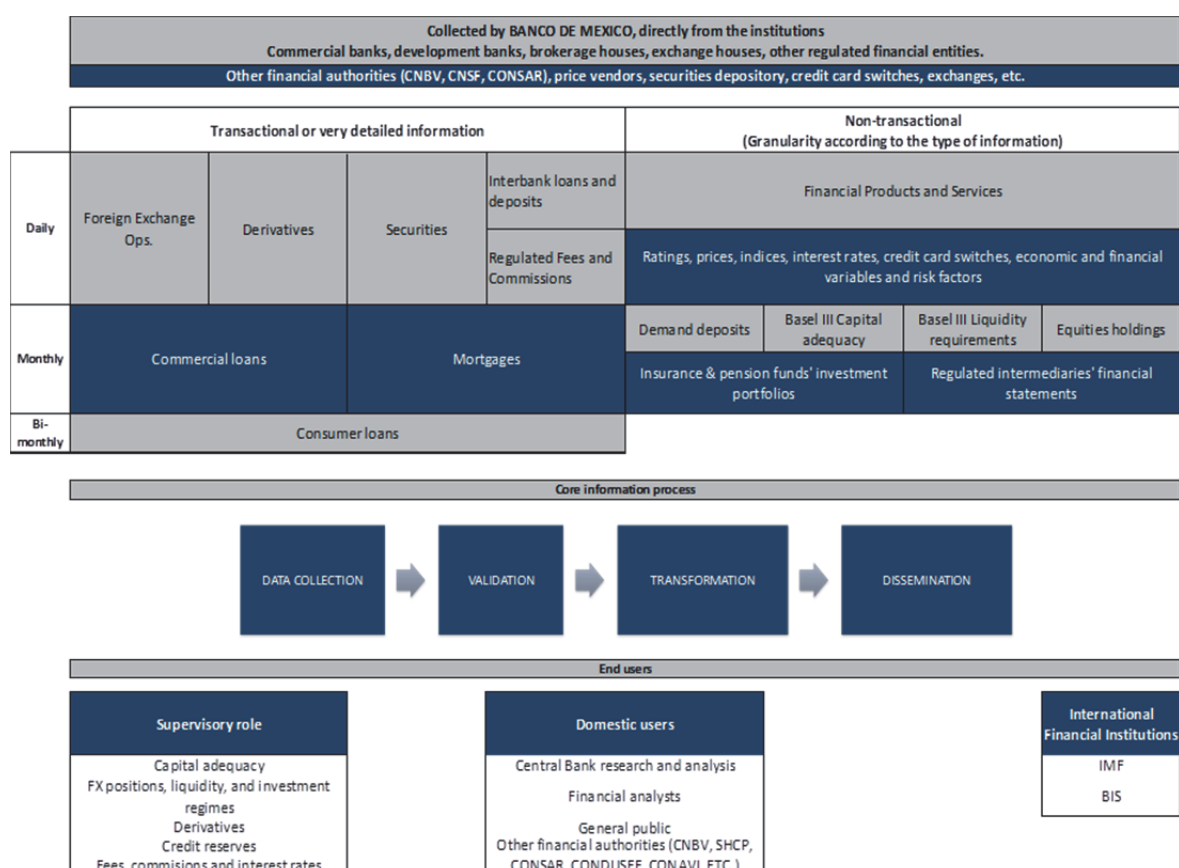- Monthly: Equity holdings and Commercial Loans and Mortgages.

[1] Directorate of Financial System Information, *Banco de México*, agaytan@banxico.org.mx.

- Bimonthly: Consumer Credit (information card by card of Credit Cards and loan by loan in other consumer loans).

- Continuous: Registry of Regulated Fees and Commissions.

Non transactional information on the other hand includes daily information in Foreign Claims and Liabilities, information provided by data vendors and other sources, Demand Deposits, Basel III Capital Requirements and Liquidity Coverage, Equity Holdings and other intermediaries' financial information.

The Information Model at *Banco de México* – The current Banco de Mexico's information model, core information process and main end users

Figure 1

Some of the main advantages of this information model are:

- Since exhaustive attributes of all transactions are warehoused, it is possible to replicate a large set of aggregates.

- It helps to ensure the quality and consistency of information through comprehensive cross validation of information within the institution and between institutions.

- It allows fulfilling different information requests by users without additional requirements, reducing the reporting burden to financial intermediaries, *e.g.*, sectorial decomposition of banks' assets and liabilities, and statistics on markets activity.

- Entities' aggregated information may mask the build-up of risk; however, a comprehensive model could be reached through the high granularity information collected that allows for a deeper analysis of the entities.

- Financial supervisors can identify relevant operations and measure their marginal contribution.

- Counterparty identification of all transactions allows building very detailed models of risk and network analysis.

The "core information process" is divided in four different processes:

1) Data collection

2) Validation

3) Transformation

4) Dissemination.

As mentioned before, the process of validation is exhaustive. The "transformation" process provides the value added and it is here where the data are contextualized, aggregated, consolidated or utilized as input in both regulatory and risk models. The "dissemination" activity is centralized using a Data Hub and there are different means of dissemination, including access to data bases, reports, cubes, etc.

The model has several uses and users, including inside users in *Banco de México*, users in other financial authorities and the general public. Figure 2 presents some of the main uses of the information model.

Main Uses of the Financial System Information Model – Frequency, domain, processes and uses of the Financial System Information Model

Figure 2

Primary Information Processes			Description	Risks	Analysis	Costs	Regulation
Markets: Microdata, Transactional or huighly detailed Information	Daily	Derivatives	Operation by operation OTC and Exchange Traded: Life Cycle and Snapshot Approches (= Derivatives Repository)	✓	✓		✓
	Daily	Debt Securities	Operation by operation, securities lending, repos and spot sales/purcha ses	✓	✓		✓
	Daily	Interbank Funding and Time Deposits	Detail of interbank funding, funding concentration and time deposits	✓	✓		✓
	Monthly	Commercial Credit	Commercial Credit Registry Loan by loan	✓	✓	✓	✓
	Bimonthly	Credit Cards	Card by card balance, interest and payments & Transaction by transaction from switches (include debit cards)	✓	✓	✓	✓
	Bimonthly	Other Consumer Credits	Loan by loan : 1) payroll, 2) personal, 3) automovile, 4) urable goods, 5) gruop and 6) otros	✓	✓	✓	✓
Financial S	Monthly	Bank Balances	Financial balances with sectorial breakdown	✓	✓		✓
	Monthly	Other Regulatory Reports (other authorities)	ortgages, operative reports, securities portfolio of investmet funds, pension funds and other institutions	✓	✓		✓
	Monthly	FX Cash operations	FX cash operations	✓	✓		✓
	Qrt	Payment Systems	Checks, transfers, cards, ATMs, costs of payment systems		✓	✓	
Regulatory Compliance	Daily	FX regulatory Regimes	Liquidity and Exchange Risk	✓	✓		✓
	Daily	Fees and Commissions Registry	Costs of Deposits and Credit Financial Products (SMEs and Households)		✓	✓	✓
	Monthly	Capital Requirements (Basel III)	Templates with high level of detail	✓	✓		✓
	Monthly	Liquidity (Basilea III)	High level of detail	✓	✓		✓

Information collected by Banco de México
Información collected by other authority

Some Uses of Information

Risks Micro y Macroprudential
- Contagion Models
- Market Risk Models
- Capital Requirements Model
- Liquidity Risk
- Financial Institutions
- FX positions

Macrofinancial Analysis
- Indebtness by Sector
- International Banking Statistics (BIS)
- Monetary and Financial Aggregates
- Balance of Paymets
- Fincial Positions of Households and Firms
- Financial Programming

Costs of Fianancial Services
- Interest Rates and Total Anual Costs
- Reports on Comparative Costs
- Fees and Commissions Registry

Regulatory Compliaince
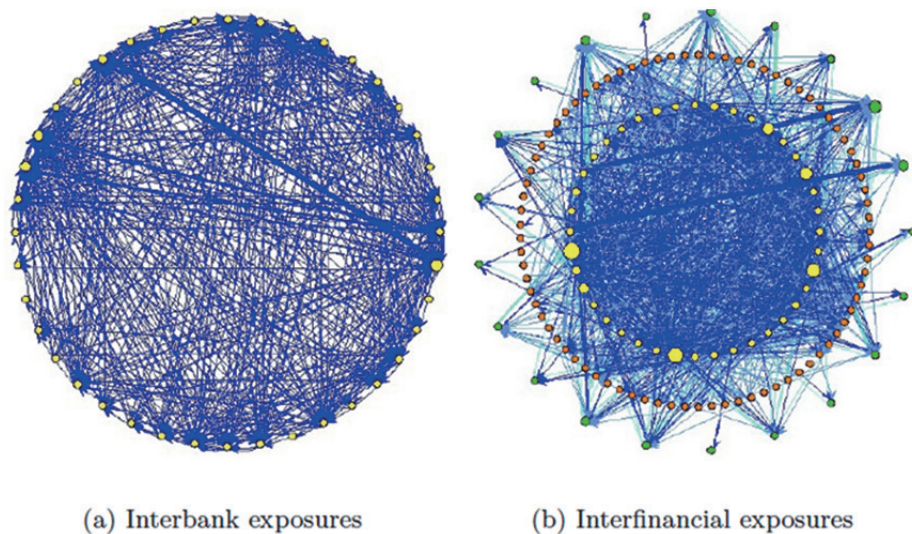- Derivados, Valores, Tasas, Capitalización, Moneda Extranjera

One of the uses of the information model, the analysis of systemic risk (contagion) based on detailed network models is a good example of intensive use of micro-data and the identification of counterparties available.

The data model for counterparty risk analysis is fed with daily information reported by Banks, Brokerage Houses, Investment Funds and Pension Funds. Martinez *et al.* (2012 and 2013), for example, build-up network models to analyze stress scenarios and the contagion channels through the financial system. They conclude that previous research results showing that contagion mechanisms may not be relevant are probably biased by the lack of a complete set of information and assumptions like maximum entropy.

Figure 3 shows the network of exposures in Martinez *et al.* (2013).

Exposures networks – Interbank and interfinancial exposures networks	Figure 3

(a) Interbank exposures (b) Interfinancial exposures

Conclusion

In our experience, the use of micro-data (transactional or highly granular data) has been of great help in attending different information requests from the users with existing information requirements. It has also improved data quality as it allows comprehensive cross checks between data sets. More importantly, however, are the benefits to data users due to the increased analytic value of expanding data to any level of disaggregation and the possibility for supervisors to follow the impact of a particular operation through all data sets.

In times of financial turmoil the advantages of having the precise information surpasses any maintenance costs associated with such a model, nonetheless, there are also great benefits in steady times.

References

Martínez Jaramillo, S., Kabadjova, B. A., Bravo Benítez, B. & Solórzano Margain, J. P. (2012). "Systemic Risk Analysis by means of Network Theory: An Empirical Study of the Mexican Banking System". *Banco de México Working Papers*, 2012–7.

Martínez Jaramillo, S., Solórzano Margain, J. P. & López Gallo, F. (2013). "Financial Contagion: Extending the Exposures Network of the Mexican Financial System". *Computational Management Science*.