Uses and classification of financial information: A map for new requirements

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Abstract

The current information model of Banco de Mexico is rich in micro-data on financial transactions. This model has allowed a wide range of potential uses at lower cost for financial institutions than a model with ad-hoc requirements. In this paper we describe some of the current uses of the data, including financial stability analysis, macroeconomic analysis, supervision and regulatory issues. In addition, considering different dimensions of financial information and its uses we propose a map to classify information resources, with the purpose of improving the architecture of information model by identifying missing pieces of information and supporting the design of new data requirements.

Keywords: micro-data; data classifications; architecture of information; financial stability.

1. Introduction

Over the last two decades there has been an important change in the financial system and, consequently, in the information needs of Central Banks. In particular, the increase in the number and complexity of financial interconnections, the transfers of risk and the roles played by different agents in the financial intermediation function, have implied a new sources of systemic risk and required a more detailed surveillance of the financial transactions by these authorities (FSB & FMI (2009)). Central banking has evolved from a traditional almost exclusive emphasis in monetary and price stability, which required a large but limited set of aggregated statistics and indicators to a broader view of an evolving framework of macroprudential, considerations along with price stability. These new policy challenges have greatly increase the set of information about financial instruments, institutions, sectors and cross border transactions needed. The recent global financial crisis has shown the importance of flexible information frameworks with detailed information about liquidity, exposures and risk transfers, among other, to improve the identification of risks. Several international initiatives, both at the regional [ECB] and global level have addressed the acquisition of transaction-by-transaction or instrument-by-instrument information (CPSS and TCIOSC (2012), work on money market information for repositories by the FSB). These changes in the type of data required have broaden the scope of financial information models of Central Banks, but also have increased the complexity of the structure of information and data management in these institutions.

In this paper we present the general idea and some advances of a methodological approach (a map) to classify the information of the Mexican financial system. We consider some recent work in progress on financial ontologies (FIBO, EDM (2014)), but taking an approach of the information relevant to central banks and financial authorities. This approach may be useful for the identification of data gaps, of opportunities of new statistics designed from existing information and for the data architecture design, among others.

In the following section we briefly describe the current financial information model in Banco de Mexico, how it was developed and some of its main uses. The third section describes some elements of the methodological approach and last section concludes.

2. Current information model and their uses

Although in the onset of the Mexican crisis of 1994-1995, there was some information about the accumulation of disequilibria: very high proportion of government securities issued in foreign currency, large current account deficits; there was not enough information to identify some of the transmission channels in the financial intermediaries, in particular, banks´ and firms leverage in foreign exchange and

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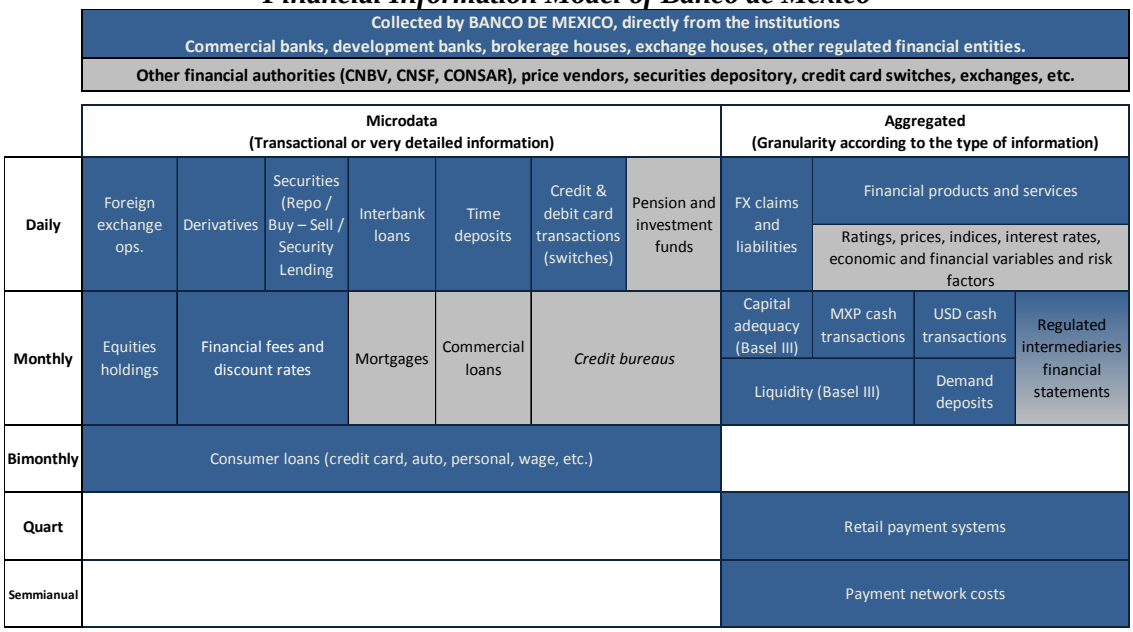
counterparty risk. The need to improve the information model with respect to financial stability was evident and Banco de Mexico started building a model rich in granular data and moved gradually from an aggregated and top-down approach to a micro-data and bottom-up approach. The main advantage of the bottom-up approach is its flexibility to respond to a wide range of information requirements for risk analysis and policy decision using existing information or with low cost for financial intermediaries. The disadvantage is the high cost of maintenance. Nonetheless, in periods of financial turmoil, the benefits of having the information greatly surpasses any maintenance costs Gaytan (2014). As a result of interagency cooperation, the current information model of Banco de Mexico includes information collected by Banco de Mexico, and the other financial authorities. Figure 1 shows a diagram of current information model of Banco de Mexico.

Figure 1

Financial Information Model of Banco de Mexico



Collected by Banco de Mexico, directly from the institutions (commercial banks, development banks, brokerage houses, exchange houses, other regulated financial entities).

Other financial authorities (CNBV, CNSF, CONSAR), price vendors, securities depository, credit card switches, exchanges, etc.

Market daily micro-data on derivatives, money market (repos and reverse repos, securities buy and sell and securities lending), FX transactions, and unsecured interbank lending has been collected for between ten and fifteen years. In addition, there are other monthly and bimonthly micro-data databases and several other aggregated information, in particular, different regulatory regimes on FX (FX position and liquidity), Capital Requirements, and Basel III Liquidity Coverage Ratio. This model is used to generate aggregates by sectors, to supervise markets and perform offsite supervision of institutions, among several other uses. In addition, the information has been used to develop credit and contagion network risks models. Availability of data has made possible to build a data model as a tool for a broad research agenda on systemic risk exploiting the complete network of exposures of financial intermediaries in all markets. Marquez & Martinez (2009) develop a model of network contagion of banks to study the probability distribution of losses when a shock is transmitted along the complete network of exposures. Further work extend the application of these models: identifying systemic and contagion elements of those losses (Martínez et al 2010); including other financial intermediaries and foreign banks, in addition to domestic banks, finding that incomplete information of exposures may underestimate contagion risk (Solórzano et al 2013); it has been also used to analyze the consequences of regulation on limiting large interbank exposures on contagion

and aggregate losses to large capital shocks. Currently the model has been used to analyze contagion of liquidity shocks in the secured and unsecured interbank market.

The design of the information requests to financial intermediaries should be guided by the information needs of its users. For some regulatory and surveillance purposes there are complete methodologies developed by international agencies working with the countries (Capital Requirements and Liquidity regimes defined by the Basel Committee of Bank Supervision, Monetary and Financial Statistics Manual of the IMF, etc.) Nonetheless, for micro-data, the design of the information requests has fewer guidelines and cannot rely heavily on the immediate needs of the users as its nature is to have a broad use and definition and not to respond to ad-hoc requirements. For the design of these requirements it is, in general, necessary to review market practices, contracts and other experiences.[1] An excellent guide for these requirements would be a structured inventory (a taxonomy) of the financial system, , this information organized by classes that define the entities, their relationships, the instruments for the transfer of value across time and space, potential uses, etc. Nonetheless, it is the cross of the different classes that characterize a piece of information what defines its "location" in a "space" of classification. Originally, the idea of this space came as a map to help the design of information requests to financial intermediaries by Banco de Mexico and to help the generation of new statistics from the item by item transactional databases. This methodological approach could help to: i) develop a broad and efficient classification scheme, functional in all its potential uses; ii) avoid duplicities both in collected information and in transformations; iii) guide in the aggregate in the bottom-up approach; iv) identify data gaps and potential relevant new information that can be built from available data; v) map new requirements by users to existing information in an efficient way; and vi) integrate micro databases into a fully structured and efficient central bank information model.

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3. A financial information map

As Loehrlein et al. (2014) mention, the last financial crisis highlighted weakness in the availability, quality and management of information and that the existing classification of information was insufficient to provide the transparency and proper risk identification. Along these lines, we are proposing to develop a methodology for a map of financial information and its uses by financial authorities. The basic building block of the map is the dimension, its "axes", which would include the "relevant" characteristics of the financial system, the market, the instrument and the counterparties, among other classes, and where relevance would be given by the potential uses of the information. The financial dimensions would cross with dimensions related with classes of data characteristics, i.e., aggregation, frequency and opportunity. The map should allow representing as surfaces the data included in an information model, an information request, data gaps, and even the uses of information.

In the literature of data warehousing a dimension could be defined as "a collection of reference information about a measurable event", or using a definition from physics it is "each one of the magnitudes in a set that are useful to define a phenomena". In our case, working with discrete items of classification, a dimension of financial information could be defined as: "a collection of reference information that is useful to characterize financial phenomena" (relevant for analysis in central banks). Dimensions are composed by non-overlapping and exhausting individual elements of the same class, which have as primary functions filtering, grouping, and labelling financial information.

The scope and depth of the map are defined by its specific uses, for example it can provide a broad picture of the complete financial system or it can be specific to a given financial institution, financial instrument or market with the highest level of granularity of data. An object can be an instance of a class and at the same time a class with other objects as instances, defining a classification hierarchy (Pels 2006), The depth of the map is given by different layers of a classification hierarchy of a given dimension and its crosses with other

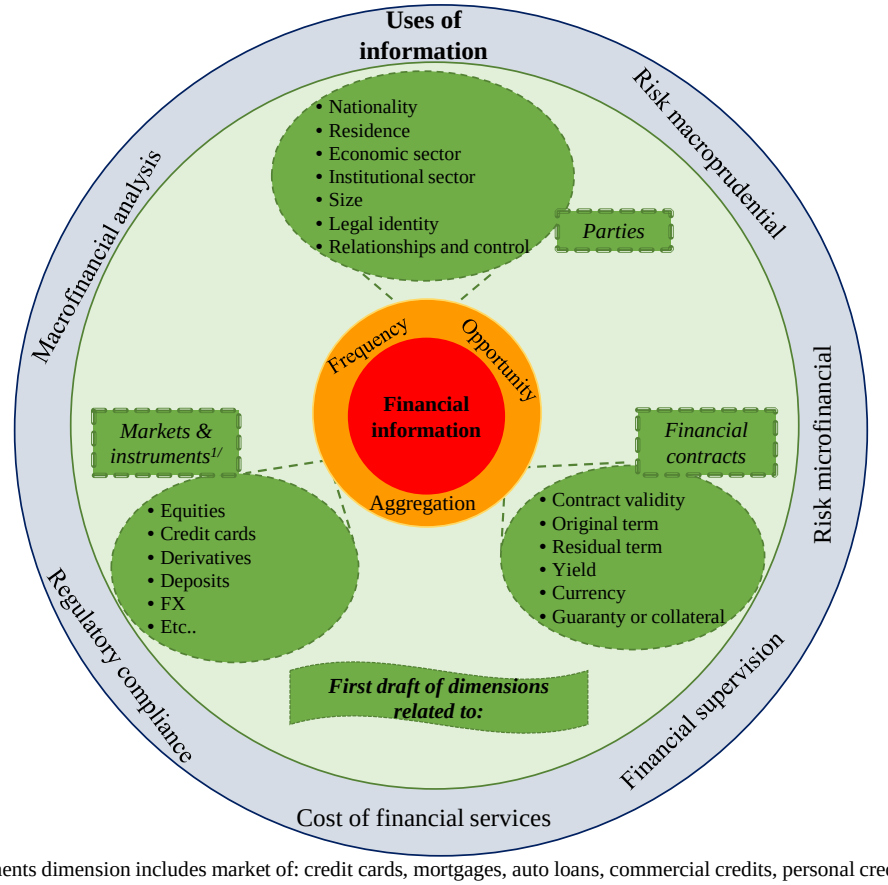
[1] Another complication is that the development of markets, institutions and regulation gives place to changes in the information needed to describe the functioning and operation of the corresponding subject of analysis.

dimensions and it respective hierarchies, A given class depth could represent the level of aggregation of the information over that dimension. For example, a dimension can be the financial markets (derivatives, securities, etc.), or their instances of financial instruments, and this dimension can cross with the characteristic of entities at both sides of the financial transactions, for example classified as institutional sectors, then aggregating over the entities characteristic could provide sectorial flows or exposures with those instruments. Thus, to classify a financial information resource in the map also requires data characteristics of the data mainly frequency and level of aggregation.

Figure 2 shows a graphical representation of examples for some of the possible dimensions of a map. The concepts in green represent the classes on the financial transactions and the parties, while the orange circle includes characteristics of the data. Different pieces of information of the financial system would be located at different crosses of these dimensions. Moreover, a set of information, for example the information for macroprudential analysis could be represented as a surface over the map.

The map could improve the classification and structuring of information and connecting information with the basics of characteristics of financial transactions and entities.

Figure 2
A Simple Representation of a Map of Information of the Financial System: Conceptual Elements



1/ Market and instruments dimension includes market of: credit cards, mortgages, auto loans, commercial credits, personal credits, saving accounts, banking notes, certificates of deposits, payroll accounts, checking accounts, shares, bonds, convertible bonds, medium-term notes, money market instruments, options, futures, warrants, forwards, swaps, referential instruments and foreign exchanges.

Currently, the methodology of the map is under definition, in these process of definition we are using mainly three sources. The first source is the conceptual formulation, where we are currently defining the classification hierarchies, the dimensions, the relevant crosses and the relevant potential uses of information. In the second source we are using the "existing" experience, i.e., Banco de Mexico´s templates (both aggregated and micro-data), catalogs and metadata. The third source corresponds to the international experience and standards: the information for derivatives repositories of IOSCO/CPSS, CFTC, ESMA; templates on data repositories about money market operations; other international agencies templates and methodologies, and recently the Financial Industry Business Ontology (FIBO)™ by EDM (2014). These sources are being used to develop a methodology for the map. We present a gross illustration of the methodology in derivatives markets.

Banco de Mexico has been collecting daily information in all derivatives transactions, exchange based and OTC, by banks and brokerage houses in some instruments since 1999, including information of the counterparties, the detailed characteristics of the instrument in the contract, novations, valuation, etc. The experience acquired in managing this information has made that the central bank is now providing functions of Trade Repository of derivatives in Mexico. To fulfill this latter task, some new information was required to update of the information requirement. Using a "map", made it clear that there were still opportunities of improvement.[2]

A small application of crossing some classes (dimensions) of the map is shown in Figure 3. These crossing are used in the example to identify missing pieces of information and how it can serve for the design of new data requirements. The dimension derivatives market is crossing with examples of other dimensions. These crossings help to identify some missing information in the current requests. If we take data of swaps negotiated in the OTC market, we can identify that the current information model of Banco de Mexico includes micro-data with frequency and opportunity on daily base, also has information of counterparty about residence and institutional sector, but the information model does not includes data about nationality, economic sector, guaranty or collateral and size of counterparty. From the "empty crossing points", the first three are going to be fulfilled with a new data requirement in the near future; however, due to restrictions on the design of the template, the rest of the empty crossing points are not been considered to be fulfilled at this moment and could be taken as an future improvement.

4. Conclusions

The recent changes in the policy approach to financial stability worldwide impose new challenges for the generation of financial information in central banks and other financial regulators. The response to these challenges will lie more on more on micro-data and will require an increasing complexity of the data architecture and data management. These challenges require different tools for achieving the required scope and depth of financial information. In this paper we presented the general idea of a methodological approach for the structuring and classification of information of the financial system. This tool could help the analysis of existing information, the design of the requirements for intermediaries, the identification of data gaps and duplicated information, and in general the standardization and improvement of the data processes (design, collection, validation, transformation and dissemination).

[2] Gaytan et al (2015) has a deeper description of data derivatives included in the information model of Banco de Mexico.

Figure 3
Example of Crossing Dimensions: Market of Derivatives vs. Rest of Dimensions

Crossing anchor dimension vs rest of dimensions			Anchor dimension: Derivatives market						
			Negotiated in:						
			Exchange markets		OTC				
			Futures	Swaps	Forwards	Options	Swaps	Structured Notes 1/	Credit Derivatives
Rest of dimensions	Data attributes	Micro data	✓	✓	✓	✓	✓	✓	
		Frecuency (D=Daily basis)	D	D	D	D	D	D	
		Opportunity (D=Daily)	D	D	D	D	D	D	
	Parties attributes	Entity identifier	✓	✓	✓	✓	✓	✓	
		Legal identity	✓	✓	✓	✓	✓	✓	
		Nationality	*Not applicable*		§	§	§	§	
		Residence			✓	✓	✓	✓	
		Economic sector (NAICS)			§	§	§	§	
		Institutional sector			✓	✓	✓	✓	
		Size							
	Financial characteristics	Contract validity	✓	✓	✓	✓	✓	✓	
		Original and maturity term	✓	✓	✓	✓	✓	✓	
		Guaranty or collateral	§	§	§	§	§	§	
		Plus/minus MtM (Yield)	✓	✓	✓	✓	✓	✓	
		Currency	✓	✓	✓	✓	✓	✓	

1/ Refers the embedded derivative in the structurated note.

✓ Complete information
✓ Individuals and individuals with business activities are not identified
§ New information requirement of Banco de Mexico's derivatives trade repository
§ Micro data under the trading scheme for Guarantees and Collateral in Derivatives market
Missing information

References

Committee on Payment and Settlement Systems and Technical Committee of the International Organization of Securities Commissions (2012) "Report on OTC derivatives data reporting and aggregation requirements", BIS and OICV-IOSCO.

Enterprise Data Management (2014) "Financial Industry Business Ontology Foundations", EDM.

Financial Stability Board and International Monetary Fund (2009) The Financial Crisis and Information Gaps. FSB and IMF.

Financial Stability Board (2014) Overview of Progress in the Implementation of the G20 Recommendations for Strengthening Financial Stability. FSB.

Gaytan, G. A. (2014) The use of micro-data in the financial system information model of Banco de México. In: Integrated management of micro-databases. BIS, IFC Bulletin No 37.

Gaytan, G. A., Toledo, C. R. and Mejía, V. A. (2015) Derivatives data at the Banco de Mexico: Its structure and uses. Document presented at 60th World Statistic Congress, ISI, Rio de Janeiro.

Loehrlein A., Lemieux V. and Bennett M. (2014) "The classification of financial products", Journal of the Association for Information Science and Technology, 65(2), p. 263-80.

Márquez D. J. and Martínez J. S. (2009) "A network model of systemic risk: Stress testing the banking system", Intelligent Systems in Accounting, Finance and Management, 16(1) p. 81-110.

Martínez S., Pérez O., Avila E. F. and López G. F. (2010) "Systemic risk, financial contagion and financial fragility", Journal of Economic Dynamics and Control, 34(11) p. 2358-74.

Pels, H.J. (2006) "Classification hierarchies for product data modelling", Production Planning & Control, 17(4), p. 367–77

Solórzano M. J., Martinez J. S. and López G. F. (2013) "Financial Contagion: Extending the Exposures Network of the Mexican Financial System", Computational Management Science, 10(2) p.125-55.