Application of micro-data for systemic risk assessment and policy formulation

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1. Introduction

In general, macro trends are useful as it indicates collective behaviours and can be used to develop macroprudential policies on a broad-based level. However, macro data, while helpful, may mask or differ from certain micro trends. This could be due to the cross-subsidisation effect when aggregating micro data. For example, potential financial stress within certain income groups in the household sector may be artificially suppressed by other income groups that have larger financial buffers, creating the inaccurate conclusion that the entire household sector is sound. On the contrary, granular information could reflect more specific individual behaviours. This allows for a more detailed and in-depth assessment on systemic risks, which facilitate the development of more targeted macroprudential policies.

Acknowledging the importance of granular data for systemic risk assessments, the Central Bank of Malaysia has, in recent years, intensified efforts to enhance data capture and incorporate micro data in its macro level assessments of the household sector.

2. Types and sources of micro data for household sector assessment

Micro data for systemic risk assessments on the household sector can be categorised into three broad categories:

i.   Credit-related data;

ii.   Financial assets / Income data; and

iii. Behavioural data.

I. Credit-related Data

Credit information is vital for the assessment of both institutional and systemic risks. Credit information could be sourced from both regulated and non-regulated entities, and can either be centralised or segregated.

In Malaysia, the bulk of financing (excluding financing from the financial market) extended to the economy is captured in the public credit registry, or more commonly known as CCRIS (Central Credit Reference Information System). CCRIS is

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a major source of credit data for the Central Bank's financial stability monitoring and risk assessment activities. This centralised database, administered by the Central Bank, collates transactional credit information of all borrowers (individuals, businesses and other borrowers) of financial institutions regulated by the Central Bank and major non-bank financial institutions, and disseminates such information back to the participating financial institutions in the form of a credit report. Each financing application, regardless of amount, received by the participating financial institutions is captured in CCRIS and updated at least on a monthly basis. CCRIS contains both positive and negative credit information of any borrowings. It also captures approved and rejected financing applications, repayment behaviour, and borrower demographics.

Within the Central Bank, data in CCRIS is analysed extensively for systemic risk assessments and micro supervision using a range of tools, from simple standard reports to more complex query tools with data mining capability.

II. Financial Assets / Income Data (of households)

Financial assets include liquid financial assets (deposits with financial institutions, holdings of unit trusts and equity shares), and illiquid financial assets (endowment policies and savings in pension funds). Income refers to recurring monthly remuneration received by an individual. Financial assets provide an indication of an individual's wealth capacity to match his/her financial liabilities, while income data assists in the assessment of the ability of an individual to meet monthly debt obligations.

III. Behavioural Data

Behavioural information gives insight into the motivation and psychological drive behind borrowers' attitude towards credit. While credit and financial / income data quantifies the capacity and ability of a borrower to attain and repay financing, behavioural data captures the willingness of a borrower to do the same. Such qualitative characteristics are difficult to capture purely from quantitative data alone.

3. Methodology

The Central Bank utilises a combination of all three data categories above to ensure timely identification of risks to financial stability arising from the household sector, and subsequently to formulate targeted policy measures. There is no one fixed method to arrive at such assessments, but the continuous process below depicts the general method that the Central Bank uses in its assessment of the household sector:

i.   Identify data needs and potential sources of data

ii.   Source / collect data – preferably at the granular level

iii. Match data from various databases

iv.   Aggregate data

v.   Assessment and monitoring of data needs

I. Identify Data Needs

Identifying data that is needed for an assessment is an important part of systemic risk assessments. The lack of data could impede the quality of an assessment. This would primarily involve reviewing existing data to assess whether it is sufficient to facilitate meaningful assessment. If necessary, new data will need to be sourced or proxied.

In Malaysia's case, there is minimal gap in credit-related data, as a huge part of micro credit data is already captured in CCRIS. Efforts are underway to improve collection of income data, at the granular level. Income data is needed to, among others, compute debt-to-income ratios. This is important as overly leveraged individuals in the household sector with significant exposures to the financial system could pose a risk to social stability, if not financial stability.

II. Source Data

As mentioned above, credit-related data is primarily sourced from CCRIS. Unlike credit information, financial information in Malaysia is not centralised. Financial assets and income data are sourced from both public and private sources, including from financial institutions, the government / national tax authority, the capital market, and private pension funds.

The government conducts a periodic survey on households' income and expenditure to get a sense of households' spending patterns, consumption behaviour and attitude towards credit. To ensure that the result from the survey is representative of the entire population, the survey is done on households from different geographical locations, educational backgrounds, work experiences, and income levels. The Central Bank also conducts an annual survey to financial institutions and major non-bank financial institutions to get the credit exposure of these institutions by income groups. Additionally, work is also underway to develop a consumer sentiment survey to gauge an individual's current and future outlook on the economy that may affect consumption.

III. Match Data

More often than not, data that is captured in separate databases are analysed in isolation. This may mask system level risks, which could have been detected from a consolidated assessment on a combination of data from different databases. The Central Bank is in the process of embarking on an exercise to match credit data with income data of each individual borrower. Using the national identification number as a unique identifier, credit data in CCRIS is to be matched with income data from various sources in a black box. To preserve the privacy and identity of the individual, only depersonalised information (sans identity) will be retrieved from the black box into a consolidated server for assessment. Given the size and magnitude of the information, analyses are to be done using a query tool that is sophisticated enough to allow data mining and assessments in the system itself.

In the interim, the Central Bank matches the different data types, for example credit and deposit or income information from various databases at the macro level to gauge, at the aggregate, the available financial buffers of different income groups.

IV. Aggregate Data

The micro credit data in CCRIS can be aggregated by various permutations, e.g. by financial stability indicators, by demographic or by sector (Table 1). It is important to ensure that data obtained is comparable, if data from different sources are to be aggregated.

Aggregation of CCRIS data	Table 1
Aggregation by	Examples
Financial stability indicators	Delinquency ratio, leverage level, repayment ratio
Demography	Geographical location, age groups
Sector	Financial institutions, non-bank financial institutions

V. Assessment and Monitoring

Another element in the process is continuous assessment and monitoring of existing data. This is important to ensure that data applied in assessment of risks remains relevant. If there is a need for new data, then the whole process repeats itself.

4. The Malaysian Experience

There are various types of systemic risk assessments that can be conducted with micro data. Among others, the information can be used to profile risk areas, identify concentration of risks, conduct trend analyses and develop econometric models. Based on the results of the assessments, targeted macroprudential policies may be formulated to address specific risk areas. Subsequently, the information would also help measure whether the policies that have been implemented meet intended objectives.

In the case of Malaysia, credit data that has been matched with income data, even at the aggregate, gives an indication of the leverage level of the different income groups. Although the entire household sector's balance sheet appears healthy when assessed in isolation, the consolidated assessment on data from different databases affirmed that lower income individuals had higher leverage levels when compared to those in the higher income category. Individuals in the lower income category were also found to have larger personal financing exposures with non-bank financial institutions, some of which are not regulated by the Central Bank. Based on these assessments, the authorities were able to develop targeted policy measures to help individuals in the lower income category cope with the higher cost of living. This included expanding the country's debt management and counseling services, which currently covers only regulated financial institutions, to include borrowers from non-bank financial institutions. Additionally, the government also provided financial assistance to targeted household sub-segments to ease financial burden.

Micro data can also be used to monitor the effectiveness of policy measures that have been implemented. For example, transactional data from CCRIS was used to implement the loan-to-value (LTV) limit to curb speculative activity and ensure a

sustainable property market in Malaysia. Subsequently, the data in CCRIS was used to measure the effectiveness of the same macroprudential measure. Following the introduction of a 70% LTV limit on the third housing loan onwards in 2010, the number of individuals with such loans grew at a much slower pace of 2.9% compared to 14.9% prior to implementation.

5. Conclusion

This recent crisis has reinforced the importance of data, especially granular level data, to assess systemic risks. A lack of granularity in data may impede in-depth assessments on macro-level risks to the financial sector. Based on Malaysia's experience, the availability of granular information has enabled the Central Bank to:

i. Conduct more in-depth risks assessments;

ii. Timely identification of risks to financial stability;

iii. Formulate targeted policy measures; and

iv. Measure effectiveness of macroprudential policies.

The process of capturing granular information and enhancing existing information databases is not without challenges. The relevant authorities would have to consider the available infrastructure and readiness of institutions to meet reporting requirements. Legal frameworks may also need to be established to ensure more efficient and effective sharing of information. There is also the need to obtain buy-in from all relevant stakeholders. Investment in infrastructure, may be costly and time consuming, but could avail authorities to consolidated data on a regular basis after the initial outlay. Alternatively, manual surveys could be cheaper and produce quicker results, but data will be less frequent, with potential break in the series. The other key challenge is capacity development. This includes having resources with the knowledge and skills to maintain quality of data, and to conduct data mining, interpretation and analytics.

Admittedly, having granular data alone may not help stop another crisis from occurring. Understanding the data, continuous surveillance and conducting consolidated assessments from various databases are also important. Collectively, this will, hopefully, help authorities in systemic risks assessments and formulation of macroprudential policies to help evade or minimise the impact of future crises.

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