

The Dimensions of Too Big to Fail

Introduction

TBTF means too big to fail. This implies that in case of liquidity or solvency problems of a large institution, the government intervenes in order to avoid the catastrophic global consequences of its bankruptcy. In recent years, there has been a great controversy about the TBTF theory, especially in the United States. The main reason for the existence of the TBTF lies in the fact that under the conditions of the current economic and financial system, the fall of large companies generates unwanted and highly complex external effects. These effects can include the disruption of a stable financial system and the inability to provide financial services to economic agents. This not only affects the financial sector, but the problems evolve in a cascade, affecting the entire real economy.

Basel Regulation

Regulation of banking activity is a controversial issue in academic and professional fields. According to Anginer and Demirgüç-Kunt (2019), among the policies adopted to promote financial stability, mainly in the banking sector, Deposit Insurance stands out. This type of insurance promotes depositors' confidence in the financial system and avoids contagion in bank runs, however, it has an unintended consequence of incentivizing financial institutions to take high risks. The Basel Regulation is the product of the agreement of a large number of countries, which at the time of applying them in their territories can make the adaptations they deem necessary and appropriate. Like most rules and regulations, Basel is the subject of controversy. The arguments that defend the need to regulate banking activity are diverse, depending on the elements taken as a reference, all of them are related to the specificity that is recognized for the institutions involved. From the monetary point of view, the regulation of banks derives, among other elements, from the need to limit the

consequences they have on price stability and guarantee the faithful functioning of the means and payment systems.

Regarding financial intermediation and the risks inherent to it, the objective of the regulation is to reduce the probabilities of a bank collapse due to the impact it would have on the economic system, starting with the losses that depositors would register and the paralysis of credit to the productive sector. According to De Lisa (2016), the 2008 financial crisis sparked a broad global debate about the need to adapt the financial safety nets that had existed until then. The key points of the discussion revolved around the design and modernization of the regulation of financial systems to have a guarantee of financial stability. As a result of this debate, the European Commission decided to expedite the establishment of the European Banking Union using various initiatives. Public intervention in the banking sector is very old: it covers issues such as the rules for issuing banknotes and the channeling of credit; the obligation to maintain certain liquidity coefficients and not to exceed certain interest rate limits; and the function of transforming short-term liabilities into medium and long-term assets.

Banking activity can generate collateral effects that banks themselves cannot fully prevent or easily resolve in the event of a crisis. To prevent them, institutions such as the lender of last resort and deposit insurance were created. Due to the role, they play in the system, have been responsible for assuming the part of the supervision and monitoring function of the banks' activity. A bank run, for example, can bankrupt a bank, regardless of the quality of its assets and the strength of its capital. Depending on how important that bank is within the system, there is a risk that its bankruptcy will have a domino effect, leading to a bank collapse or a financial crisis, with enormous consequences for the economy. First, savers would not recover all their deposits. Next, liquidity and available credit will drop, causing significant reductions in investment and product levels, as well as an increase in the

number of company bankruptcies. For this reason, it is considered essential to anticipate this type of problem.

To this end, and, where appropriate, to limit its impact, financial safety nets have been created. These include regulatory and supervisory systems and specialized institutions, such as last resort financial aid and deposit insurance. The first is to support a bank or a group of banks with liquidity problems; and the latter ensures that in any scenario, depositors will recover at least a part of their savings. The regulation of banking activity, in which these institutions collaborate in different ways, almost always in coordination with the tax authorities, becomes a crucial instrument to prevent and resolve banking crises. In this sense, the regulation of banking activity is essential for the long-term stability of the financial and monetary system, which is a necessary but not sufficient condition for sustained economic growth. However, there is no consensus on the nature and scope of regulation.

After the financial crisis experienced in 2008-2009, many economic agents demand more regulation mainly because some believe that financial institutions were responsible for what happened, partly as a result of lax regulation. The expense incurred by the treasury to save the banks and prevent the collapse of many of them is cited as an argument to impose more rigid regulation. For their part, financial institutions fear being over-controlled and try to form pressure groups to prevent their room for maneuver from being reduced. Their main argument is that excessive regulation can harm the freedom of financial markets and reduce their economic benefits.

Davies and Green (2011) consider that regulation must find a balance between robustness and security, on the one hand, and the level of risk assumed, on the other. According to them, minimum capital requirements can significantly reduce the incidence of bank or insurance bankruptcies, but the benefits available to savers and insurance holders are also reduced to the same extent. The terms on which investments can be offered to the public

may be restricted, but opportunities to diversify into more profitable assets are also more limited.

Basel Committee Methodology

The Basel Committee developed a set of methods to determine the importance of the system of G-SIBs. According to Moenninghoff et al. (2015), in April 2009, the Group of the 20 most important economies on the planet founded a Financial Stability Board intending to promote the development of guidelines for the regulation and more careful supervision of the G-SIBs. The FSB council would be charged with developing concrete measures to reduce the risk posed by these large financial institutions. The FSB council would act in cooperation with the Basel Committee on Banking Supervision. This methodology is based on a measurement of indicators. The chosen indicators summarize the different aspects of the factors that generate adverse effects and make a financial institution important for the desired stability of the economic and financial system. The main advantage of the measurement method based on multiple indicators is that it captures multiple dimensions that are important to the system, it is a simple method, and it is more robust than previous methodologies that were based on market variables.

There is no perfect method to measure the systemic importance for all G-SIBs, as there is high variability in the structures and activities, as well as in the nature and level of risk they pose to the global financial system. Therefore, the methodology based on quantitative indicators must be complemented with qualitative information obtained through a framework that integrates the discretionary judgment of the supervisory authorities. However, only in exceptional and notorious cases should supervisory discretion overlap or prevail over the results of the indicator-based methodology, also subject to an international peer-review process in order to ensure consistency in its application.

Indicator-based measurement method. The Basel Committee (2021) considers that the importance of the world financial system should be measured taking into account the impact that the bankruptcy of a bank may have on the system and the economy as a whole, and not as the risk of failure. It would, therefore, not be the probability of default (PD), but rather the overall loss for the system in the event of default (LGD). The indicators chosen are a reflection of the size of the institution, its interconnection, the absence of substitutes or easily available financial infrastructure for the services they provide, the international scope of its activity (inter-jurisdictional), and the complexity.

The categories of substitutability, interconnection, and size for the financial infrastructure are correlated in the IMF / BIS / FSB report submitted to the Central Bank Governors and Finance Ministers of the G-20 in October 2009. Given that the objective of this methodology is to identify banks of global systemic importance subject to requirements for the absorption of additional losses, the Basel Committee (2021) also considers it appropriate to include a category that measures their degree of globalization. In addition, a measure of complexity is added, since the resolution of the G-SIBs is likely to be more complex and, therefore, to alter the financial system as a whole and economic activity in general in a much more significant way. The methodology equates to 20% of each of the five indicated categories of systemic importance, namely, size, cross-jurisdictional activity, interconnectedness, financial infrastructure/substitutability, and complexity. In addition to size, the Committee has identified multiple indicators for each of the categories, with each indicator receiving equal weight within its category. That is, when there are two indicators in a category, each indicator is given a total weight of 10%; when there are three, each equal 6.67%, and so on.

For each evaluated entity, the points in the calculation of an indicator are obtained in a weighted manner, dividing the figure that corresponds to that bank by the aggregate figure

that corresponds to all the banks in the sample chosen for the calculation of that indicator. The score relates to the weight of the indicator within each category, then all the weighted scores are added. For example, a bank's size indicator representing 20% of the aggregate sample size variable will contribute 0.20 to the bank's total score (when each of the five categories is normalized to a score of one). Similarly, a bank representing 20% of aggregate cross-jurisdictional assets will receive a score of 0.10. The sum of the scores of the 12 indicators would constitute the total score of the bank. The maximum possible total score (that is if there was only one bank in the world) is 5 points.

Interjurisdictional activity. By focusing on G-SIBs, the objective of this measure is to identify the potential global impact of banks. The indicators in this category measure the weight represented by the bank's activities outside its country of origin. The idea is that the international impact of a troubled bank will depend on its share of assets and liabilities outside its registered office. The greater the global reach of a bank, the more difficult it will be to coordinate its resolution and the greater the contagion effect of its bankruptcy.

Size. A bank in crisis or failure is likely to do more harm to the world economy or financial markets when its activities represent a significant part of world activity. The larger your size, the more difficult it will be for other banks to replace you. Therefore, the greater the probability that their difficulties or bankruptcy will alter the normal functioning of the financial markets in which they operate. When such a circumstance occurs, confidence in the financial system as a whole is also likely to suffer further. Therefore, size is a key measure of importance in systemic evaluation. Size is measured using the same definition of total exposure as specified in paragraphs 157 to 164 of the Basel III text. Each bank's score is calculated by dividing its total exposure by the sum of the exposures of all banks in the sample (BIS, 2021).

Interconnection. The financial difficulties of one institution can substantially increase the probability that other institutions will experience them as well, given the network of contractual obligations that these banks have. The systemic impact of a bank is likely to be positively related to the degree of interconnection with other financial institutions.

Substitutability/financial infrastructure. The systemic impact of a bank in trouble or bankruptcy is expected to be inversely related to its substitutability as a market participant and as a customer service provider. Therefore, the greater its importance in a certain line of business or as a provider of market infrastructure services, the greater the disturbance that its bankruptcy will cause, both in terms of service deficiencies and decreased market liquidity flow and infrastructure.

Complexity. The systemic impact of a bank experiencing difficulties or failure will be predictably directly related to its overall complexity; that is, with the complexity of your business, structural and operational. The cost and time required to resolve a bank increase with its complexity.

The BNP Paribas bank with assets of EUR 2,408 mm and Credit Agricole with assets of EUR 1,152 mm are both headquartered in France. The following table shows the different behavior of both banks, concerning the G-SIB:

Bank	Pre- Designation. No list, Before Nov 30, 2009	Post Designation leaked list Nov 30, 2009	Post Designation leaked list Nov 10, 2010	Post Designation official list Nov 4, 2011
BNP Paribas	*	*	*	*
Credit Agricole	*			*

Source: Moeninghoff et al. (2015, p. 226)

The French bank BNP Paribas remained as G-SIB on all lists until the official designation of 2001 because it has always met the criteria to be designated as such. For its part, the Credit Agricole bank, also French, was initially shortlisted, then was rejected twice but was included in the final list.

The Costs of Too-Big-To-Fail Banks

When facing the rescue of an institution through the TBTF policy, the preservation of the rescued is done at the cost of the party granting the rescue having losses. Among the parties granting protection are other financial institutions, interested parties, or taxpayers. Due to taxpayer intervention, bailouts have become a political topic of public debate. According to Barth and Wihlborg (2015), TBTF refers to a bank that is considered a generator of a very important risk for the financial system and the economy as a whole, if the Bank fails and cannot meet its obligations. Different from traditional companies, banks are generally interconnected and have liabilities with other banks through the payment system that can infect others and produce a fall with a domino effect. Questions are then posed such as: Why do taxpayers have to bear the losses of risky operations assumed by financial institutions? Or doesn't the deposit guarantee system create a system that encourages unsustainable risk assumptions?

The creation of deposit guarantee funds as insurance for citizens in most modern states has generated an intense debate on the role that institutions have had in aligning the incentives to take high risks on the part of banks and, consequently, the need for the guarantee fund manager to execute TBTF-based bailout policies. As the deposit guarantee fund exists, the induced risk has two manifestations. First, it encourages insured institutions to take greater risks, as they can risk making possible profits while potential losses are transferred to the Protector. Second, the incentives for both stakeholders to monitor the smooth running of the bank or its investments are reduced.

In other words, if there is no deposit guarantee, banks would be more prudent when granting a high-risk loan and will be aware that they will have to pay depositors for the additional risk through a risk premium or simply decide not to grant the loan. But when there is a deposit guarantee, they will not ask for the risk premium since they know that the Fund will guarantee their deposit up to the legally established limit, regardless of whether the financial institution meets its obligations or not. The existence of the deposit guarantee fund aligns the incentives for financial institutions to take greater risks, either by increasing their level of indebtedness or by investing in assets with high risk and thus also increases the exposure of the government and taxpayers to possible losses. Induced risk will be present as long as the expected benefits in the asset portfolio exceed the cost of the premiums involved in integrating it into the deposit guarantee fund, in addition to the indirect costs that have to do with regulatory elements. The Deposit Guarantee Funds, although they are treated as insurance, represent a guarantee against any event that prevents the guaranteed bank from fulfilling its obligations, regardless of the reason.

The validation of this theoretical exposition was manifested in the global financial system during the last crisis of 2007-2009, which demonstrated that the existence of guarantee funds increases the possibility of bank failure. By combining this factor with other macroeconomic factors, such as the free setting of interest rates that allow banks to acquire high-yield assets while assuming high risks, the situation is complicated until reaching the already known limits. Furthermore, once the deposit guarantee fund is part of a financial system, it is very difficult to suppress it due to the interest it arouses in economic agents. If this is added to technological advances in financial products and flexible regulations, the induced risk increases significantly. In the same way, banks are increasingly complex and participate in a large number of activities, creating highly interconnected financial companies. They are a network of factors that, combined with the political-economic context,

prompted the government to adopt the TBTF policy to large financial institutions during the last crisis of 2007-2009.

The Largest Banks in The World

The list of the largest banks is made taking into account the total assets of the banks. For several consecutive years, mainly Chinese banks have taken the top positions. The largest and richest bank in the world is the Industrial and Commercial Bank of China, even though it is a public bank and does not have much activity outside the Chinese territory. It is part of "The Big Four" of the financial system of the Asian country. It controls almost 20% of all banking in China. It has a total of 4,009 billion in assets according to the latest data (Carlson, 2021). It is followed by China Construction Bank Corporation whose assets amount to more than \$ 3.4 trillion and its market capitalization generates \$ 133 trillion. The third place belongs to the Agricultural Bank of China with assets reaching \$ 3,235.65 billion. In fourth place is the Bank of China with assets of \$ 2,991.9 billion (Carlson, 2021). The growth of Chinese Banks seems to correlate with the size of the Asian giant's economy.

The Largest Banks According to Their Assets

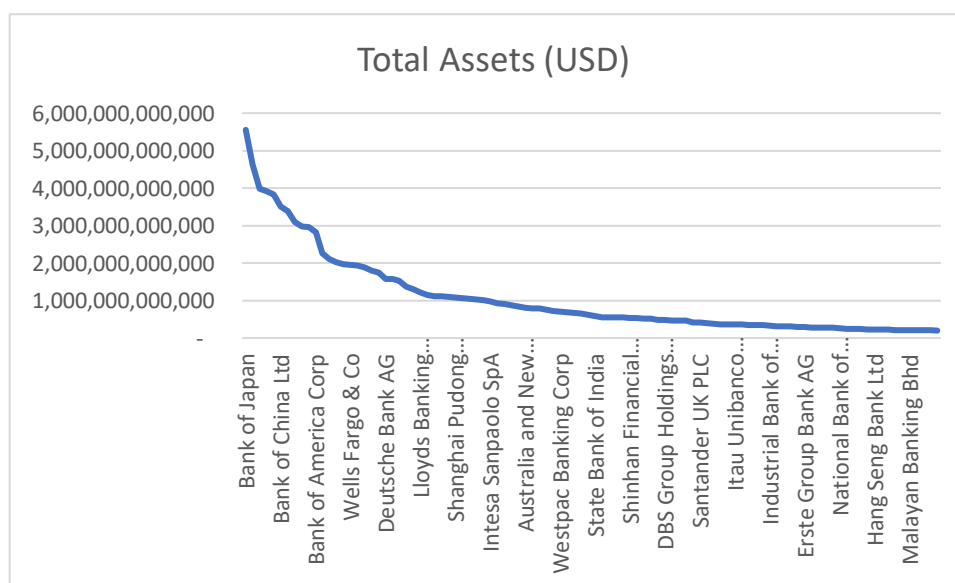
Rank	Bank	Assets	Country
1	Industrial And Commercial Bank of China	4,009.26	China
2	China Construction Bank Corporation	3,400.25	China
3	Agricultural Bank Of China	3,235.65	China
4	Bank Of China	2,991.9	China
5	Mitsubishi UFJ Financial Group	2,784.74	Japan
6	JPMorgan Chase & Co.	2,615	United States
7	HSBC Holdings PLC	2,521.77	United Kingdom
8	BNP Paribas	2,357.07	France
9	Bank Of America	2,338	United States
10	Crédit Agricole	2,117.16	France
11	Citigroup Inc.	1,925	United States
12	Japan Post Bank	1,874.02	Japan
13	Wells Fargo & Co.	1,872	United States
14	Sumitomo Mitsui Financial Group	1,775.14	Japan
15	Deutsche Bank	1,765.85	Germany
16	Banco Santander	1,736.23	Spain
17	Mizuho Financial Group	1,715.25	Japan

18	Barclays PLC	1,531.73	United Kingdom
19	Société Générale	1,531.13	France
20	Groupe BPCE	1,512.27	France
21	Bank Of Communications	1,389.07	China
22	Postal Savings Bank of China	1,385.12	China
23	Lloyds Banking Group	1,097.67	United Kingdom
24	Royal Bank Of Canada	1,038.53	Canada
25	Toronto-Dominion Bank	1,026.36	Canada
26	ING Group	1,016.11	Netherlands
27	Norinchukin Bank	1,006.98	Japan
28	UniCredit	1,004.79	Italy
29	Royal Bank of Scotland Group	997.58	United Kingdom
30	Industrial Bank (China)	986.55	China

Source: Carlson (2021)

The 100 largest banks in the world are concentrated in a small number of countries and distributed as follows: The United States 17, China 15, Canada 6, Japan 5, United Kingdom 5, India 5, Arabia Saudi 4, Australia 4, Sweden 3, Spain 3, Singapore 3, France 3, Indonesia 3, Brazil 3, rest of countries 21 (Feliba & Ahmad, 2021). Even though China has high participation in the largest banks, many of these are public banks and they operate within Chinese territory without as much impact in the international financial sphere as the North American banks have.

Cumulative assets of the world's biggest banks



Source: Barth & Wihlborg (2015)

The graph shows the distribution of the largest banks according to accumulated assets. It can be seen that the banks that are the first banks to top the list also accumulate the highest percentage of assets concerning the total number of financial institutions.

Merton's Model

Credit risk is understood as the possible loss assumed by an economic agent as a result of the breach of contractual obligations incumbent on the counterparties with which it relates, generating losses and a decrease in the value of assets (Brock, 2021). In this way, credit risk is associated with the probability of non-return or partial return of resources generally incurred by financial institutions and banks. The Basel Accord on Financial Supervision states that credit risk can be calculated through three fundamental components: the probability of default, loss at default, and exposure at default (Basel Committee, 2005).

In this way, the credit risk results from the combination of the probability of default of the counterparty and the losses caused by it. The objective of credit risk measurement systems is to quantify the economic impact of events. But for this, it is necessary to measure the probability that the counterparty defaults. The Merton Model emerges as an alternative to measure the probability of default of companies. It assumes that companies have two forms of financing through stocks and debt. Under the assumptions of the model, it is established that the company will default when its liabilities exceed its assets (Kenton & Boyle, 2020). To do this, it uses a mathematical formulation based on the Black-Scholes formula that allows measuring the number of standard deviations between the expected value of the asset and the value of the debt (default point), which is known as the default distance (DD). In the structural models of default risk, conditions are identified under which agents are expected to default and then the probability of these conditions occurring is estimated. Merton proposes a model that links the risk of default with the capital structure of companies (Kenton & Boyle,

2020). The basic premise of the Merton model assumes that, for a limited liability company, default occurs if the value of the assets falls below the liabilities of the company.

From the accounting identity $\text{Assets} = \text{Liabilities} + \text{Equity}$, and the assumption according to which the shareholders receive the residual value of the company, if the liabilities exceed the value of the assets, the value of the net worth will be zero and the company will be expected to exercise the option to declare a default. This option of the company can be evaluated through the theory of financial options (Gray et al., 2007). The Merton model establishes that the company's liabilities are represented by a zero-coupon bond with nominal value L and expires on date T . No payments are made until T , and shareholders must wait until T before deciding whether or not to default. Consequently, the probability of default is the probability that at time T , the value of the liabilities exceeds the value of the assets. To determine this probability, information on the company's liabilities obtained from the balance sheet is required.

Conclusion

The existence of the TBTF policy is not a recent phenomenon but dates back to the birth of this type of institution, a result of the last financial crisis. Regulators have been challenged with how to create a regulatory regime to end this problem for more than half a century. The current financial model, in which there is a deposit guarantee fund, reduces the discipline of market agents while increasing their incentives to take excessive risk. In effect, this government guarantee system has resulted in the bailout of numerous financial institutions not only in the US but also in many other states.

The size, complexity, and interrelation in global terms of these institutions are the fundamental elements that motivate their rescue. The negative externalities of systemic risk generated by institutions with these characteristics have been the main reason why regulatory authorities prefer not to run the risk of letting them fail. However, the implications of applying the TBTF theory and the subsequent bailouts are numerous. Not only do they increase the cost of capital, the size, and the activity of banking entities, but they also harm the State's tax system.

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