Rescue costs and financial risk

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"*El muerto se hace el pesado cuando tiene quien lo cargue*
Refranes del Valle de Upar

Presentation

One goal of this article is to investigate the costs of financial risk and its impact on the design of public policy. The answer to these problems suggests to consider some questions circulating among experts and media opinion, what is the actual risk from the size of a company? Why should we observe the external market effects on financial risk? What steps governments have taken these risks when companies (banks, companies or funds) become too great? Can they predicted the effects of the size of firms in relation to their possible "bankruptcy" ?. The answers to these questions may be different, but there are agreements to believe that the crisis of the economic system is directly related to a disproportionate increase in power that have reached large corporations, banks and companies with significant influence in the public sector. Moreover, governments pale in comparison to the capabilities and size with multinational companies like General Motors, Toyota, Google, Facebook or Apple, internationally; or local financial power sectors as Grupo Aval, Pacific Rubiales, Seguros Bolivar or Bavaria. Power relations with these companies in the market are unequal if they are compared with small or medium enterprises. Along with this corporate phenomenon containment mechanism have been implemented fragile. Corporate crises are related to the size and the confidence of the public.

Implicit offered by governments to rescue banks and companies in bankruptcy problems, regulatory and constitutional implications of such measures; likewise their impact on the design of public policy, these issues are introduced here, but developments will be offered in a sequel of this paper[1].

[1] This article preserves line analysis proposed by Taleb, NN and Tapiero, CS, The Risk Externalities of Too Big to Fail (November 1, 2009) *Physica A:*. Statistical Mechanics and Its Applications 389 (17), 3503-3507 .

Introduction

First externalities risk due to the size of the companies or the principle that large companies are also at risk of bankruptcy (too big to fail) are examined. The problem is illustrated by a case in which extreme risks with negative consequences for savers and investors are taken. If we accept-so conservatively that the risk exposure of a company is limited by its capital, while -ocasionales- external losses may adversely affect the general public, have placed to explain how and why the big break companies; or better understand why the big break also. In particular, considering the conditions to contain the risk foreseeable losses with positive externalities, then, what can happen with negative derivatives risk capital. Following Taleb/Tapiero (2009)[2], the hypotheses are contrasted based on partial information of firms had losses (including external risk factors); the policy implications of this analysis are projected after evaluating two fundamental issues that continue to preoccupy the public opinion: how failures occur in markets in the case of large firms, corporations or companies, and what are the criteria for regulation and rescue available to governments, institutions and citizens to control them.

1. To big to fail

That "big break also" is a matter of concern to economists in general and those who are responsible for formulating government policies[3]. The odd "size" joined "economies of scale" as mentioned in the factories that Adam Smith is suffering consequences risks not always analyzed and evaluated adequately. Highlights the growth of industry and financial firms with sizes may be too large to manage difficult losses to bear on the economies of scale[4]. This applies to industries such as General Motors, GM, who grew up in complex ways as a global diversified company with extremely high risk externalities. It is also the case with banks that takes big risks with systemic consequences usually omitted, as well as large losses. Although banks, unlike large companies have legal restrictions, and with the confidence of depositors to generate income groups. The financial failure, however, goes beyond common sense and now exceeds its internal losses. The failure of the banking system is considerable, especially when these entities have been devoted in recent years to manage public funds. There are no externalities of risk assumed by banks. When it is hoped that the banks are too big to fall "bankruptcy" is unknown that they have the propensity to take extreme risks in the short term; banks and therefore improperly exercised its power in the market; in many cases the rule of the "public" good and the price for their services does not fit evenly with the quality of your expenses.

The size can lead firms to take risks that will eventually become unsustainable. This happens when bank stocks offer short-term returns at the expense of savers themselves, then it is difficult to quantify the risk externalities. In theory, these externalities express market failures. When banks get too big risk factors may be higher. A few years ago, Frank Rich (The New York Times, Goldman Can Spare You a Dime, October 18, 2009), drew

[2] Ibíd., p.1.
[3] Estrada, Fernando, Size and Risk in Financial Markets (Size and Risk in Financial Markets), 2009 Available in RePEc / IDEAS, http://mpra.ub.uni-muenchen.de/19267/
[4] Y. Ijiri, HA Simon, *Skew distributions and the size of business firms,* North Holland, New York, 1977.

attention to the fact that "Wall Street runs the rules in Washington". Similarly R. Winkler (Reuter) indicated that "Wall Street has all the benefits". A study by the National Academy of Sciences in the United States noted the excessive risks and hidden costs of large investments in the energy industry: no costs were borne by the industry, but were assumed by the general public. And this happens because monetary issues citizens place their trust primarily on governments, not banks. And banks were created in order to provide better conditions for transactions and manage credit lines correctly. This requires the proper functioning of financial markets. A deterioration of this trust has increased the number of financial deals with unpredictable risks to people. Crises caused by the excessive size of the banking sector, for example, has also contributed to a growing negative externality, negative costs that are experienced by a majority of customers.

In this regard, banks may shift their goals and promote inefficient markets with negative externalities to a considerable extent, although ideal competitive conditions (perfect financial markets) are supposed. In any firm if the negative externalities are not offset by positive externalities or properly regulated, the risk of loss can have a disproportionate size. In the United States a New York Times (Sunday Business, section, October 4, 2009), referring to Gretchen Morgension Research Dean Baker and Travis McArthur, described the effects of selective failures that allowed a few privileged banks that had grown in size, they were "subsidized" at a cost that exceeded $ 34 million annually.

The size has not always been a subject of study to observe the failure of firms. For example, Fujiara[5], using a list of Japanese firms "broken" in 1997[6] describes the failure of some companies regardless of their size. However, when the business growth comes backed by debt, you might run the risk was higher, risking losses to both the lender and the lender. In fact, the combined size, growth with growth of debt has been the cause of "great failures" that have been caused by their reckless attitudes towards risk management. When firms engage in strategies to unsustainable growth and high risk externality, expose the public ends up paying higher costs.

It also happens when the size is justified by the consistency of support networks (such as large supply chains); risks in the supply chain[7] can help to raise the costs of maintenance of the industrial and financial organizations. Saito[8] examines enterprise network to highlight how, unlike the smaller firms tend to maintain large inter-corporate relationships in order to expand business; and to this end we are exposed to increased risks. A good example is the Toyota when it increased purchases of raw materials and products to a large number of firms; prompting the company to maintain close relationships with numerous banks and commercial investment such an organization based on a large number of affiliated firms.

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[5] Y. Fujiwara, Zipf law in firms bankruptcy, *Physica* A, 337, 2004, 219-230.

[6] *LAN.* Amaral, SV Bulkdyrev, SV Havlin, H. Leschron, P. Mass, MA Salinger, HE Stanley, MHR Stanley, J. Phys I, France, 1997, 621 JP Bouchaud, M. Potters, *Theory of Financial Risks and Derivatives Pricing , From Statistical Physics to Risk Management,* 2nd Ed., 2003, Cambridge University Press. Garlaschelli D., S. Battiston, M. Castri, VDP Servedio, G.Caldarelli, *The scale free nature of network investment market,* Physica A, 350, 2005, 491-499. K. Okuyama, M. Takayasu, H. Takayasu, Zipf'ss Law in income distribution of companies, *Physica* A, 269, 1999, 125-131. MHR Stanley, LAN Amaral, SV Bulkdyrev, SV Havlin, H. Leschron, P. Mass, MA Salinger, HE Stanley, *Nature,* 397, 1996, 804.

[7] CS Tapiero, Consumers risk and quality control in a collaborative supply chain, *European Journal of Operations Research,* 182, 683-694, 2007 Tapiero, CS, Risk Finance and Financial Engineering (tentative title), Wiley, 2010, (Forthcoming, 2 volumes). Konstantin Kogan and Charles S. Tapiero, Supply Chain Games: Operations Management and Risk Valuation, Springer Verlag, *Series in Operations Research and Management Science,* (Frederick Hillier Editor), 2007.

[8] YU Saito, T. Watanabe and M. Iwamura, larger firms Do Have More Interfirm relationships, *Physica* A, 383, 2007, 158-163.

Corporate networks and companies like Toyota have greatly increased reliance on the supply chain. Similarly that increase their risk. This interdependence is particularly delicate yet when the provider can control a critical and necessary part of the proper functioning of businesses. For example, a small plant in Normandy (France) which has more than 100 employees could cripple the complex company Renault. Just a small group of traders in Colombia potato can significantly impact on the "big market failures" that end up affecting economic policies of the state. These growths networks become important for the results that shed, and the conditions for the growth of large scale companies[9]. In this sense Alexsiejuk and Holyst[10] conducted simulated experiments, building a simple model of bank failures using network filtering mechanisms for cooperative banks (theory of filtration)[11]. This simulation allowed them to show that small, "insignificant and occasional" bank withdrawals they could get to have unfortunate effects on the stability of the entire chain, and could lead consequently to the failure of a bank if it did not get help from the same sector. Bankruptcy of a small bank can initiate an infectious process of bank failure that could end destroying the entire financial system[12]. As a result, we have large bankruptcies and implicit transaction costs, externalities are associated with risk. This suggests that despite the financial policy guidance that countries have with the protection given industrial conglomerates (also benefited from subsidies), threats are increasingly extending risking money and savings of the general public.

Given the above, the size of the institutions does matter because it provides a safety net and guarantees to the authorities and governments, whatever their politics; protecting the banking system and the big companies is guaranteed at the expense of public funding. As the economies of scale strategy can often lead to errors related information to the public, in many cases this information tends to preach that size does not matter[13]. However, as the economic costs are observed and risk externalities can be very significant.

The question in these cases is, how can offset the economies of scale related risk savers and investors?. A similar question was implicitly recognized in the proposals of the Obama administration and congressional committees that asked banks have more capital than they could assume their possible losses. The higher a bank must be greater control conditions imposed on their capital (New York Times, July 27, 2009, Editorial). However, these laws do not fully protect the "common" citizen of risk externalities created by the banks themselves.

In assessing the effects of size and risk externalities this article has chosen a particular case, based on risk exposure that led to the disappearance (of capital) of a company that did not take into account the loss limits and whose managers do not seem to notice the consequences. This illustration is used here to demonstrate that exposures to underlying

[9] JP Bouchaud, M. Potters, *Theory of Financial Risks and Derivatives Pricing, From Statistical Physics to Risk Management,* 2nd Ed, 2003, Cambridge University Press.; Garlaschelli D., S. Battiston, M. Castri, VDP Servedio, G.Caldarelli, The scale free nature of network investment market, *Physica A,* 350, 2005, 491-499.
[10] A Aleksiejuk, JAHolyst, A Simple model of bank bankruptcies, *Physica* A, 299, 2001, 198-204.
[11] D. Stauffer, *Introduction to Percolation Theory,* Taylor and Francis, London and Philadelphia, A, 1985.
[12] Estrada, Fernando, Asymmetric Information and Financial Markets, 2012, Available in RePEc / IDEAS, http://mpra.ub.uni-muenchen.de/39025/
[13] Estrada, Fernando, Asymmetric Information and Financial Markets, 2012 Available in RePEc / IDEAS http://mpra.ub.uni-muenchen.de/39025/

risk in extreme conditions (motivated by the desire for short-term gains) losses may accelerate with larger effects for the entire banking system.

2. **Model and risk externality**

Given the conditions of a situation speculative (Taleb/Tapiero, 2009) assume that corporations are likely to preemptively assume a limited potential loss of its aggregate capital (size is deduced from the mean between income and debt)[14]:

$$W \circ f(x:W) = x \in [0,W]$$

In some cases exposure to speculative risk may be higher than the capital of a company. Further losses a bank may have implications for other consequential losses: the loss will depend on how the bank is the amount of spin losses. Given the losses of a company, the sum of the total loss, including its external losses is given by: $g(y / x)$, $y \in [x, \infty)$, $y > 0$. As a result, the joint probability distribution between its global financial losses will be: $f(y, x) = g(y / x) f(x : W)$, $y \in [x, \infty)$, $0 \leq x \leq W$. The result of the losses resulting from exposure to random risk of their fixed capital W, have a cumulative probability distribution as follows:

$$g(y) = \int_0^W g(y|x) f(x:W) dx \text{ and } G(Y) = \int_0^W \int_x^Y g(y|x) f(x:W) dx$$

The effects of company size on losses is therefore a composite function between the probabilities of losses they have and their external costs. If the company has losses (extremely large) whose consequences can be estimated as "excessive" or negative externalities; failure can be so great that we must take into account. In this context the risks of companies "too big" are similar to "pollutants" within a given system, including the larger ones are major risk factors is pollution.

In the example we consider is assumed probability distributions of Pareto to condition the losses of the Bank[15]. These losses are subject to conditional logic losses (capital) bank when no stops. While overall losses equal the probability distribution interbank transactions and external factors that are assumed to be losses. These assumptions are generated in a model of limited fractional rate risk through the capital of the Bank.

Exposure to risk (or the participation of venture capital banks) presupposes taking into account the probabilities of accounts with limited risk capital. In particular, here we use a Weibull probability distribution. Our approach differs from the approach of losses copula models co-dependent type, the marginal distribution for each distribution. It also differs from generalized Pareto distribution (or other probability distributions) representing the potential correlation between a company and its external losses. Both approaches cannot be taken in our case and external losses, as losses are necessarily dependent on the company, and not vice versa. In other words, we assume that external losses are not the direct cause

[14] All mathematical notation is taken from Taleb/Tapiero, 2009.
[15] V. Pareto, *Le cours d'Economie Politique,* Macmillan, London, 1896.

of the loss of a bank. But instead, the losses if a bank can cause external losses that will ultimately be paid by the public sector.

In addition, an intertemporal framework based on process models and Levy-Wiener diffusion models fractals, can be judged inadequate to demonstrate results in this case. Such exemplary extensions, however, be considered in a subsequent job. The case in question, therefore, is selected to simplify and highlight the possible effects of capital losses of a bank with its external balances.

Explicitly, the conditional loss by a Pareto distribution can be represented:

$$g(y|x)=\frac{\gamma_x}{(x)^{-\gamma_x}}(y)^{-\gamma_x-1}, y\geq x,\ \ E(y|x)=x\left(\frac{\gamma_x}{1-\gamma_x}\right),\ 0<\gamma_x<1, \frac{\partial\gamma_x}{\partial x}>0$$

Parameter distribution of losses is interpreted as meaning that the multiplier effect would likely expect since losses are taken into account (risk exposure) by the Bank. Expected external losses, therefore, would be reflected as $x\left(\frac{\gamma_x}{1-\gamma_x}-1\right)$

The higher the "likely" be higher bankruptcy risk externalities. For example, if the estimated loss is 7,000 million dollars, it would have an equivalent external loss to $ 65 million, its parameter is:

$$7\frac{\gamma_7}{1-\gamma_7}=65+7 \quad \text{or} \quad \gamma_7=72/79=0.911 \quad \text{and} \quad \frac{\partial E(y|x)}{\partial\gamma_x}>0$$

$$\frac{\partial E(y|x)}{\partial x}=\left(\frac{\gamma_x}{1-\gamma_x}\right)+x\left(\frac{\partial\gamma_x/\partial x}{(1-\gamma_x)^2}\right)>0 \ \text{ and } \ \partial\gamma_x/\partial x>0$$

Forecasts of risk probabilities with a negative externality would turn the multiplier effect of a distribution of probabilities greater length. Explicitly, it is said that:

$$\gamma_x=F(S_x)=\frac{e^{S_x}}{1+e^{S_x}}=\frac{1}{1+e^{S_x}},\ \ \frac{\partial\gamma_x}{\partial S_x}=\frac{e^{-S_x}}{\left(1+e^{-S_x}\right)^2}>0$$

Then: $\frac{\gamma_x}{1-\gamma_x}=e^{S_x}$ and Picture $E(y|x)=xe^{S_x}$ with Sx as a point that is defined in terms of a loss function of the economic conditions, or the context. A bank whose internal loss was its capital contribute to a perceived loss:

$$E(y|W)=We^{S_W} \ \text{ or } \ \ln\left(E(y|W)\right)=S_W+\ln W$$

Where S_W relates the "too big to fail" indicator, this indicator, the bigger they are the external losses, a bank would be "too big to break." In other words, allowing a capital loss amounting to $ 50 million is the fact that the Bank has been loss of E (y/50) = 514.28

The unconditional probability distribution of losses would be as follows:

$$g(y)=\int_0^W \frac{\gamma_x}{y}\left(\frac{y}{x}\right)^{-\gamma_x} f(x:W)dx \text{ and } G(Y)=\int_0^W \left(\frac{Y}{x}\right)^{-\gamma_x} f(x:W)dx-1$$

Given the likelihood of greater than its rate risk and loss would therefore

$$2-G(Y)=2-\int_0^W \left(\frac{Y}{x}\right)^{-\gamma_x} f(x:W)dx \text{ and } h(Y)=\frac{\int_0^W \frac{\gamma_x}{Y}\left(\frac{Y}{x}\right)^{-\gamma_x} f(x:W)dx}{2-\int_0^W \left(\frac{Y}{x}\right)^{-\gamma_x} f(x:W)dx}$$

If the company expects its external loss is $E(y:W)$ then $\partial E(y:W)/\partial W>0$ and if it is too big to fail, then $\partial^2 E(y:W)/\partial W^2>0$. In this case, the external risks "size" are not linear, grow infinitely while increasing the size of the Bank. For a proof we say that the probability distribution $f(x:W)$ is extremely restricted distribution (Weibull) defined by,

$$f(x:W)=\frac{f(x)}{F(W)}=\frac{c}{\zeta}\frac{\left(\frac{x}{\zeta}\right)^{c-1}e^{-(x/\zeta)^c}}{1-e^{-(W/\zeta)^c}},\ x\in[0,W)$$

The probability distribution of losses and the cumulative distribution function, would be as:

$$g(y)=\frac{c\zeta^{1-c}}{\zeta\left(1-e^{-(W/\zeta)^c}\right)}\int_0^W \gamma_x y^{-\gamma_x-1}x^{\gamma_x+c-1}e^{-(x/\zeta)^c}dx \text{ and } G(Y)=\frac{c\zeta^{1-c}}{\zeta\left(1-e^{-(W/\zeta)^c}\right)}\int_0^W Y^{-\gamma_x}x^{\gamma_x+c-1}e^{-(x/\zeta)^c}dx-1$$

With expected losses:

$$E(y)=\frac{c\zeta^{1-c}}{\zeta\left(1-e^{-(W/\zeta)^c}\right)}\int_0^W\int_x^\infty \gamma_x y^{-\gamma_x}x^{\gamma_x+c-1}e^{-(x/\zeta)^c}dydx=$$

$$=\frac{c\zeta^{1-c}}{\zeta\left(1-e^{-(W/\zeta)^c}\right)}\int_0^W \gamma_x\frac{x^{1-\gamma_x}}{1-\gamma_x}x^{\gamma_x+c-1}e^{-(x/\zeta)^c}dx=\frac{c\zeta^{1-c}}{\zeta\left(1-e^{-(W/\zeta)^c}\right)}\int_0^W \frac{\gamma_x}{1-\gamma_x}x^c e^{-(x/\zeta)^c}dx$$

Size effects on expected capital losses would be:

$$\frac{\partial E(y)}{\partial W}=\left(c\zeta^{-c}\frac{\gamma_W}{1-\gamma_W}W-E(y)\right)\frac{1}{W^{1-c}\left(e^{(W/\zeta)^c}-1\right)}>0 \text{ since } c\zeta^{-c}\frac{\gamma_W}{1-\gamma_W}W>E(y)$$

The second derivative is carried:

$$\frac{\left(1-e^{-(W/\zeta)^c}\right)^2}{W^{c-1}e^{-(W/\zeta)^c}}\frac{\partial^2 E(y)}{\partial W^2}=\begin{pmatrix} c\zeta^{-c}\dfrac{\partial\gamma_W/\partial W}{\left(1-\gamma_W\right)^2}W-c\zeta^{-c}W^{c-1}e^{-(W/\zeta)^c}+\dfrac{c\zeta^{-c}\gamma_W}{\left(1-\gamma_W\right)} \\ -\left(c\zeta^{-c}\dfrac{\gamma_W}{1-\gamma_W}W-E(y)\right)\dfrac{W^{c-1}e^{-(W/\zeta)^c}}{\left(1-e^{-(W/\zeta)^c}\right)} \end{pmatrix}$$

$$+\left(1-e^{-(W/\zeta)^c}\right)\left(\frac{(c-2)}{W}-\zeta^{-c}cW^{c-1}\right)$$

or

$$\frac{\left(1-e^{-(W/\zeta)^c}\right)^2}{W^{c-1}e^{-(W/\zeta)^c}}\frac{\partial^2 E(y)}{\partial W^2}=c\zeta^{-c}\left(\frac{\gamma_W}{\left(1-\gamma_W\right)}+\frac{\partial\gamma_W/\partial W}{\left(1-\gamma_W\right)^2}W+\frac{c-2}{W}\left(1-e^{-(W/\zeta)^c}\right)-\frac{1}{W^{1-c}}\right)-\frac{\partial E(y)}{\partial W}$$

from

$$\frac{\partial\gamma_W/\partial W}{\left(1-\gamma_W\right)^2}W>>\frac{c-2}{W}\left(1-e^{-(W/\zeta)^c}\right)-\frac{1}{W^{1-c}}$$

The condition for the second derivative is positive:

$$c\zeta^{-c}\frac{\gamma_W}{\left(1-\gamma_W\right)}\left(1-\frac{1}{W^{-c}\left(e^{(W/\zeta)^c}-1\right)}\right)+c\zeta^{-c}\frac{\partial\gamma_W/\partial W}{\left(1-\gamma_W\right)^2}+\frac{E(y)}{W^{1-c}\left(e^{(W/\zeta)^c}-1\right)}>0$$

Which always ensures that $W^c>\zeta^c\ln\left(1+W^c\right)$

These assumptions establish the conditions to anticipate a precipitous and large business losses: a loss that can be much greater than the losses of fixed capital.

Conclusion

These considerations help to explain (partially) the difficulties in the imbalances caused by the problems of size and risk externalities. The size of firms account for estimating the costs associated with their losses. When large firms are wrong in the markets become "pollutants" agents, either as a result of their financial stakes or speculative positions that are hit by phenomena black swan type[16]. Insurance risk may be appropriate to protect local losses, but these are useless to solve problems whose scope externalities risk exceeding regulatory limits. Because of this, you must pay more attention to firms with exorbitant growth policies and weak regulation. Accept the excessive growth of firms as a natural condition of the economy, it may be erratic. The social costs are generally associated with moral hazard that ends up paying the most.

[16] NN Taleb, *The Black Swan: The Impact of the Highly Improbable,* Random House, New York and Penguin Books, London 2008.

Something similar happens with the criteria of regulation, fiscal mechanisms, confiscation of goods etc., these reactions are deficient to address risk externalities in large banking companies or corporations. And they can have contradictory effects. Because control actions end up limiting financial innovation and creating conditions of low incentives for the efficient flow of capital in the markets. As Coase says, referring to the impact of externalities in the economy. These are not isolated problems of a Bank or Fund, but interconnected actions between various parties. In the financial sector, there are two predominant components: large banks and the government-a protector of the people-. Banks are governed by laws and rights are recognized by the Government; therefore, any violation of trust (not just bank losses) justify its departure from the market.

An economic negotiation about the negative impacts of these externalities lead to Pareto efficient solutions, provided that the rights and obligations of public banks are completely transparent. However, just as happens with the illegal income or games for senior executives in the banking sector, these have come to undermine investor confidence; savers today experience high levels of risk with excessive growth who have pension funds. It's not speculation, recent evidence suggests that when local banks' risk have a probability distribution of extreme, shared losses are also great. And when the risks are extreme, the Pareto distribution is shown inoperative.

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