Content analysis of economic and financial resilience

Adrián García Buzón*, Marta de la Cuesta Gonzalez* y Juandiego Paredes-Gazquez*

*Departamento de Economía Aplicada. Universidad Nacional de Educación a Distancia. Paseo Senda del Rey, 11, 28040 Madrid.

E-mail: agarcia3916@alumno.uen.es

Abstract

The resilience term refers to capacity of a system to absorb and recover of the negative effects of an externals shocks, without it changing their functions or structure.

This concept in economics and finances is gaining importance in the recent years. In the first case through the more and more frequent natural hazards such as storms, hurricanes, floods and droughts; which have economic consequences and effects in human welfare. In the second case to measure and assess systemic risk for reduce the effects of future financial crisis related to contagions phenomenon into financial network, funding risk and financial stability. But it is not clear the principal trends and keywords for this issue.

This bibliometric communication focuses in does a content analysis of the abstracts of the last twenty years papers of “Business Economic” area research (according to the Web of Science categorization), in which economic resilience and financial resilience is a topic.

In this analysis, we used a clustering method to know the keywords of this articles. Furthermore, we realized a calculation of the co-occurrence relation among keywords to know the relation between topics.

As a conclusion, exits some similar keywords between economic and financial resilience keywords, although those a priori close related concepts they seem to be difference trend and they seem which issues do not have in relation. Also, the frequency and relation among the keywords seem have difference patterns between these two concepts.

This investigation is a good start point to develop an economic and financial resilience framework for we know the implication of those concepts in economic sciences.

JEL Classification: C42, F30, G15, Q 54

Keywords: economic resilience, financial resilience, content analysis, complex systems.

Resumen

El concepto de resiliencia se refiere a la capacidad de un sistema de absorber y recuperarse de los efectos negativos causados por shocks externos, sin que cambie su estructura ni sus funciones.

Este concepto en economía y finanzas esta ganando importancia en los últimos años. En el primer caso, a través de los cada vez más frecuentes desastres naturales como
tormentas, huracanes, inundaciones y sequías; los cuales tienen consecuencias económicas y afectan al bienestar humano. En el segundo caso, se utiliza al momento de medir y evaluar el riesgo sistémico para reducir los efectos de una futura crisis financiera en relación con los fenómenos de contagio en las redes financieras, riesgos de financiación y estabilidad financiera. Pero no están claras las principales tendencias y palabras clave en este tema.

Esta comunicación bibliométrica se centra en realizar un análisis de contenido de los abstracts de los artículos científicos publicados en los últimos 20 años en el área de investigación “Business Economic” (según la categorización de Web of Science). En los cuales aparecían los conceptos resiliencia económica y resiliencia financiera. En este análisis, nosotros usamos un método de clúster para conocer las palabras clave de estos artículos. Además, nosotros realizamos el cálculo de la relación de co-ocurrencia entre las palabras clave y conocer la relación entre estos conceptos.

Como conclusión, existe algunas palabras clave similares entre las identificadas para resiliencia financiera y resiliencia económica, aunque estos conceptos están a priori relacionados parecen tener diferencias en sus tendencias y parece que existen diferencias entre los patrones de estos dos conceptos.

Esta investigación es un buen punto de partida para desarrollar un marco de referencia sobre resiliencia económica y financiera para conocer la implicación de estos conceptos en las ciencias económicas.

Introduction

The first solid definition of resilience was into a study of ecological systems in the decade of the 70s of the 20th century (Walker and Cooper, 2011).

The fundamental work on which based in article developed by Holling in 1973 on stability and resilience in ecological systems. In this research, these two concepts framed within the study of complex non-linear systems.

A complex system is a network with a large number of components that add specific behavior caused by multi-secular dynamic and structural patterns, but also such behavior produces multi-sectoral models which did not deduce from the description of a system that encompasses only one narrow set of resolution options (Parrot and Kok, 2000).

Therefore, being non-linear systems, we cannot think regarding aggregation since the "the whole is more than the sum of the parts"(Matteucci and Buzai, 1998).

The structure of a complex system is heterogeneous, but there is an excellent interdependence among its components; any alteration of a part of the system propagated to the rest through relationships and influences that define the structure of the system. The complexity of a system characterized by the non-linearity of the processes and the evolutionary character that must guarantee its persistence (Holling, 2001).
The evolutionary character allows to see recurrent states in the state of the system (Beisner et al., 2003), these frequency systems have been modeling in the so-called adaptive cycles, were defined from the works of Simon (1974) on the adaptive significances studied in hierarchical ecological systems.

In several articles of the bibliography consulted there are references to complex socio-economic systems and concepts and variables used in economic theories. Besides, some authors are already investigating ways to unify the relationships of complex ecological systems to the banking system or the financial system (May et al., 2008). They are relating specific characteristics of these systems to systemic risks (Haldne and May, 2011) or creating Resilience indexes by country (NEF, 2013). These models also used in the investigation of the effects of contagion of disturbances by the global banking and financial network. Financial systems are complex and opaque poses a considerable challenge for the analysis of systemic risk by network effects, firesale externalities, and funding liquidity risk in financial stability (Anand et al. 2011).

Resilience within the science of complex systems can use as an operational strategy for risk management (Millennium Ecosystem Assessment, 2006). This concept can define as the ability of systems to absorb changes in the state of their variables. (Holling, 1973).

Resilience emphasizes those conditions that go beyond any equilibrium or stable state of the system, where instabilities can suddenly lead the system to a different regime of behavior and another "stability" domain. In this case, resilience refers to the magnitude of disturbance that can be absorbed by a system before it changes its structure, also improving the variables and processes that control its behavior (Holling and Gundesrson, 2002).

There are currently global financial institutions that they incorporate strategies related to resilience in their crisis management activities and developments in financial and economic regulation. For example, the International Monetary Fund (1995, 2005) or the World Bank (2006).

**Methodology**

1. Sample and collection

The reviews are essential due to help to identify the conceptual content of the field (Meredith, 1993). We used in this research a content analysis, this kind of analysis use from large bodies of data to reveal trends and patterns which are not visible (Krippendorf, 1989).

For the sample, we use the Web of Science database (WOS), because of its contain information of multidisciplinary scientific investigations of the most important reviews.
WOS is a multidisciplinary database made up of three citation indexes: Science Citation Index Expanded, Social Sciences Citation Index and Arts & Humanities Citation Index (Norris and Oppenheim, 2007).

In particular, Social Sciences Citation Index contents over 3,200 journals across 55 social science disciplines, as well as selected items from 3,500 of the world’s leading scientific and technical journals (Clarivate Analytics, 2017).

We developed a review of all of the articles and reviews in WOS whom title, abstract or keyword included one of the following terms "economic resilience" and "financial resilience". We use only the articles and reviews written in English.

Also, we searched for articles and reviews included in the WOS research area "Business Economic".

We identified through the WOS database, in the case of economic resilience, 3,539 articles, and 480 used the prior filters. In the case of financial resilience, we identified 985 articles for financial resilience and 280 applied the filters.

2. Content analysis

Content analysis has been defining as a systematic and replicable technique for compressing many words of text into fewer content categories based on explicit rules of coding (Berelson, 1952). It can be a useful technique for allowing us to discover and describe the focus of individual, group, institutional, or social attention (Weber, 1990).

In own research used this methodology to find the keywords of the abstracts of the articles identified in WOS used the search topic words "economic resilience", and "financial resilience". After we apply the filters lead to an initial database of 480 articles for economic resilience and 280 for financial resilience.

With this base of articles, we studied the keywords of the abstracts of the articles using an algorism wrote in R software. This algorism besides identify the keywords also calculate the frequency of appearance excluded short words, connectors, and common English words.

Then we search plurals, abbreviations, and similar meanings words; they only have been counting in the most frequency keyword, after we discard all of the words which their frequency was one (3240 words to economic resilience and 2802 words to financial resilience). Finally, we calculated the mean of the frequency, and then we filtered the list which the words above average (792 words to economic resilience and 652 words to financial resilience).

We would like the most frequency keywords so we did a cluster analysis for find the most frequency keywords of these terms. For it we seek previously the most efficient number of clusters thought two ways.

The former was a hierarchical analysis used R software. In this first study, we used the Ward method for standard agglomerative hierarchical clustering because the
admissibility conditions for this method are the most suitable for our sample (Everitt et al., 2011). Then we created four dendrograms used differences method to calculated the distances between differences frequency terms for developing clusters (Manhattan distance, Maximum distance, Euclidian distance and Canberra distance) to find differences in the number of clusters calculated.

The latter was a no hierarchical partitioning around medoids analysis (PAM) used R software. In R software we repeat the same analysis for two to five clusters. After then we chose the number of groups with the average silhouette is higher and there have similar size between clusters. In this case, also we used the four kinds of distances used in the hierarchical analysis.

After the cluster analysis, we took the most frequency cluster for released a co-occurrence analysis to measure the strength of the relationship between keywords to revealing trends (Cambrosio et al., 1993). We used the equation number one to calculate the co-occurrence factor for pairs of words to quantify the intensity of the relationship.

\[
c = \frac{n_{1-2}}{(n_1+n_2)-n_{1-2}} \text{ equation 1}
\]

Where c is the co-occurrence factor, n is the frequency of appearance and n_{1:2} is the frequency of concurrence of the two terms. This coefficient varies between zero (when it does not exist co-occurrence) and one (when two terms always co-occur).

Finally, we extract the most co-occurrence coefficients, and we made two co-occurrence and frequency network graph for creating a graphic visualization of the conceptual framework and the relationships among the concepts.

Results and Discussion

Identify the keywords of the abstracts we realized thought a cluster analysis. As a result of the hierarchical analysis for economic resilience, we found two levels of clustering, first in two groups and second in four groups. The situation for financial resilience is similar, first in two categories and second in four.

To search the consistency of the analysis, we did a no hierarchical analysis of the frequency clustering. In this case, we used a PAM analysis and a silhouette graph. As a result of this analysis, although, the diagram for two clusters has the best average. We selected the four clusters way because this has a good average, and the size of the groups are more similar than the two clusters way, these results are in line with the hierarchical cluster analysis.

We identified the keywords from the words into the first cluster; these are the most used words. After that, we used a co-occurrence analysis for finding the relations between the keywords inside the first group.
For the economic resilience concept, the words belong to the first cluster is fifteen, for the financial resilience the keywords are seventeen.

Figure 1: Co-occurrence of the most used keywords from economic resilience.

In figure 1 and 2 we draw a co-occurrence network. The size of the words means the frequency of appearance, the strength of the line and the position in the network put in relation the different co-occurrence index between keywords.

For economic resilience, the most frequency keyword is “Regional”, but their co-occurrence index is not better. "System" is the best keyword for frequency and co-occurrence. Other keywords with a high frequency and co-occurrence is "Change", “Analysis” and "Impact".

Regarding the financial resilience (network in figure 2), “Impact” is the best-related keyword, but it has a low frequency. "Crisis" is the keyword has the best equilibrium between frequency and co-occurrence.

About the two networks, we observed some differences and particularities. First, the co-occurrence values are higher in financial resilience network than economic resilience network, but the financial resilience keywords have less frequency than economic resilience network. Second, exists a better relation between frequency and co-occurrence at the financial resilience network.
Third, two networks have in common eight words. The most robust relation between keywords in the different networks is the word “Crisis”.

Finally, it exists a strong co-occurrence between seven pairs of keywords in economic resilience network. In the case of financial resilience, this strong co-occurrence grows to ten pairs. In the economic resilience network all but one of these relations included the principal word System, however, in the case of financial resilience, the strong relations involve differences or origins. The financial resilience network has more extended than the economic resilience.

Conclusions

The concept of resilience has been evolving from a term used in engineering and ecological sphere to a term used for the social sciences and economics. This evolution is a consequence of the similarities between the ecological and economic system.

The resilience term refers to capacity of a system to absorb and recover of the negative effects of an externals shocks, without it Changing their functions or structure.

The contest analysis disclosed the keywords for the abstract of the articles included in the last twenty years the economic and financial resilience as a topic into the business economic area of research. A result of this analysis we have the financial resilience network have more extended than the economic resilience. The co-occurrence values are higher in financial resilience network than economic resilience network. The financial resilience keywords have less frequency than economic resilience network. The co-occurrence values are higher in financial resilience network than economic resilience network, but it exists a better relation between frequency and co-occurrence at the financial resilience network. Two networks have in common eight words.

For future research we include others kind of analysis such as a context analysis of the quantity and quality the articles in relation with this concepts, it could be interesting repeat this analysis with the general term resilience, we could included some
bibliometric index of obsolescence and importance of the term in the scientific literature such as h-index, Price index or half-pass index or we could develop the most relevant articles filter for the importance of their keywords and the number of citations.

References


Berelson, B. (1952). Content analysis in communication research.


Clarivate Analytics. (2017). Source publication list for Web of Science. Social Science Citation Index.


