Thematic Network for a Fair Radiography of the Global Financial Crisis: An ANP Model

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Abstract: Although thematic networks served as an instrument for analytical understanding and classification of scientific expositions, this instrument was never used in the context of the literature review. This paper show how an Analytic Network Model can be built on the structure of a thematic network for a meaningful representation of the results published on a certain topic- in this case the unconventional monetary measures ascribed during the last global financial crisis. While the first section offers a description of the history, structure and organization of the main monetary authority, the second section reviews the main steps in the creation of the thematic network and the structure and builds an ANP model to quantify the contingency values expressed as priority vectors for the intensity of the connections involved. The assessment of the intensity is completed in the last section by the sensitivity analysis regarding of the type" What if?", like what would be the embraced unconventional monetary policy measure if Europe, for instance, would have more influence in the financial decisions.
Keywords: Literature Review, Global Financial Crisis, Thematic Networks, Basic theme, Analytic Network Hierarchy, Sensitivity Analysis

Introduction
The Global Financial Crisis that emerged in 2007 has shown that people tend to view the notions that affect their life through a narrowed pathway without acknowledging the risks involved. The unquestioned belief in the financial system and a pattern which maps a constant increase in the home prices all over the United States of America has created a bubble in the housing market which acted as a foundation for the increase in people's confidence that prices would continue to increase guiding the prices of the houses in the same direction. All the actions that lead to the creation and the burst of the bubble from the housing market were possible due to a monetary policy of the Federal Reserves with undetected flaws, a lack of security and well defined

regulatory background checking and the existence of asymmetric information meaning there is no equilibrium between the information that two parties assemble. The Global financial crisis from 2008 represents a massive systemic failure.

Given the rapidly development of the crisis through the financial and the banking system across the world and its influence, the conventional measures taken in order to protect the banking system and therefore the economy of a country came a little too late to counter the effects of the crisis leading to the implementation of a number of unconventional monetary policies that acted as substitute from the monetary policy mandate of the United States of America and as a complement to the monetary policy of Europe in order to maintain price stability.

The paper focus of the study about how the unconventional monetary measures to overcome the crisis were reflected in the existent literature, a thematic network is derived and after that transformed into an Analytic Network Process (ANP) model. Subsequent to the presented introduction, the first chapter creates an image of how the main monetary authorities of two of the leading economies, SUA and Europe were established, the structure and the organizational framework. Following this, in the second chapter, the theoretical background of the methods used in the applicable part of the paper is presented as a step-by-step guideline in a journey through the theoretical framework. The third chapter presents the derived thematic network constructed based on the literature review as an integrated application and the evaluation of the intensity of the connections in the thematic network by ascribing an ANP model. Furthermore, a sensitivity analysis completes the assessment of the intensity by creating scenarios around the question 'What if".

This paper contributes to literature by introducing an original approach of doing a literature review, by using the thematic networks methodology. The latter represents a particular format of multi-actor projects. Thus, thematic networks collect and develop the existing scientific knowledge, but however, insufficient used in practice. The specific themes of the projects can be chosen using the bottom-up approach, prioritizing the most important themes, thus facilitating the transfer of knowledge. By selecting relevant articles in the chosen field by the authors (global financial crisis), by structuring them as it will be described further and by introducing them into an ANP model, one could evaluate the importance of the "themes" as core concepts, in the context of the specific literature, hence making it more relevant for researchers.

Banking Systems under Crisis, Unconventional Monetary Measures and Thematic Networks
Any system can present a weakness or a blind spot which left unprotected or undiscovered could lead to a disruption in the workflow, negative consequences or it could influence the relation with other systems. The financial crisis from 2008 not only uncovered such a weakness in the banking system but it also triggered a response from the main monetary authorities of two leading economic areas of the world: US Federal Reserve and the European Central Bank. Together, the euro area and the United States represent 37% of the world output.[1]

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[1] Pollard, P.S. (2003). A Look Inside Two Central Banks: The European Central Bank and the Federal Reserve. Federal Reserve Bank of St. Louis, January/February 2003.

The evolution, organizational framework and primary objective of the two institutions representing the main monetary authorities have been influenced by the national characteristics of the country they are representing but also from the different historical patterns and conditions. However, both the European Central Bank (ECB) and the US Federal Reserve are based on a decentralized system.

What is more, the differences in the actions of the institutions is defined by their outlook on the measures taken during the crisis, in other words, the measures taken by the European Central Bank are brought up as a complement to back up the main objective of the central bank, maintaining price stability, while in contrast, in the United States, the Federal Reserve actions of acquisitioning outright assets as an extra incentive to the economy is seen as a substitute.

Figure 1 presents a summary of the main elements of the banking systems discussed above as a parallel to illustrate a clearer image of the systems.

	Eurosystem	Federal Reserve System
Monetary policy decision-making body	Governing Council, comprising 18 members: the ECB Executive Board (6 members) and the governors of the 12 NCBs of the Eurosystem.	Federal Open Market Committee, comprising 12 members: the Board of Governors (7 members), the President of the New York Federal Reserve Bank and 4 other reserve banks presidents (on a rotating basis)
Monetary policy objective(s)	Price stability is the primary objective. This is defined in precise quantitative terms.	Multiple objectives: to promote maximimum employment, stable prices and moderate long-term interest rates.
Independence from political influence	Yes	Yes
Accountability and transparancy	• Immediate press conference with introductory statements following Governing Council meetings (scheduled at 2.30 pm); • Annual Report to EU institutions and presentations to the European Parliament; • Monthly Bulletin published.	• Immediate announcement and minutes following the FOMC; • Hearings before the Congress; • Monthly Bulletin/Report by the regional federal reserve banks.
Monetary policy strategy	Preannounced strategy.	Risk management approach.
Monetary policy implementation	Decentralised (operations conducted by the Eurosystem).	Centralised (operations conducted by the New York Federal Reserve Bank).

Figure 1. Summary of the banking systems of two leading economies of the world
Source: Gerdesmeier, D., Mongelli, F.P. & Roffia, B. (2007). The Eurosystem, the US Federal Reserve and the Bank of Japan – Similarities and Differences. European Central Bank working paper series no.742. p.14

Thematic Networks as a Qualitative Research Methodology
As an analytical tool, a thematic network aims to not only identify but also to organize and to make connections between the common themes encountered in a qualitative analysis. The recent global financial crisis is an undetermined mixture between quantitative data and its qualitative interpretation and risk perception. By applying a thematic network, the qualitative data is classified on different levels resulted through the thematic analysis based on their prominence offering a more clear visualization and understanding of the relationships between the non-numerical information used .The purpose of this paper is to conduct a qualitative analysis using as an analytical tool a thematic network with the main focus of study being the Global Financial Crisis and to evaluate the intensity of the connections in the thematic network. The research conducted in this study is a step-by-step guide through the beginning, the effects and the measures taken against the consequences of the crisis that has shaken the world in 2008.

The data collected to bring forth as evidence was further integrated and presented as a functional thematic network. However, while the focus of the study is conducted based on a conflicting issue thoroughly debated, the main objective of a thematic network is not to restore harmony through the conflicting views and interpretations of the problem but to rather examine the understanding of the problem or the meaning of the idea in discussion.

The thematic analysis searches to discover at different levels in an issue prominent themes. However, despite using the thematic networks as a web-like network to eliminate hierarchy and make clear the interconnectivity and fluidity throughout the themes at different levels, the networks are only tools used in the analysis and not the actual analysis itself.

A thematic network contains three types of themes: Basic Themes, Organizing Theme and the Global Theme. The direction of the process starts from the outside layer and it goes inwards. Attride-Stirling (2001) broadly classified the steps that comprise the process in: the reduction of the text, the exploration stage of the text and the integration of the previous stage in order to be able to obtain a conclusion to the researched topic. Another similar approach while analyzing the text organization is realized by Carter–Thomas in 1999.While using the two inter-related concepts *themes* and *rhemes*, in his article, the author represents the progressive variation of the themes identified in the text. Used in this context, the *rhemes* is represented by additional information which could be unpredictable that is not essentially mentioned in the text that is analyzed for the research. The addition brought to Carter-Thomas that is presented in the article is based on the synthesis of interpretations from Daneš (1974). The thematic progression is defined by Daneš (1974) as being divided in three relevant categories known as: "*Constant theme progression, Linear progression and Derived theme progression*".

In the construction of a thematic network in order to construct a fair radiography of the Global Financial Crisis it can be identified the derived theme progression which is based on the presence of a hyper-theme (or hyper-rheme) from which other themes can be derived.

Analytic Network Process (ANP) for Thematic Networks at Work
The foundation of an Analytic Network Process (ANP) is given by the Analytical Hierarchy Process (AHP) and both are implemented through the Super Decisions software which determines the decision-making based on both dependence expressed by nodes connected within the same cluster to each other and feedback represented by a both way relationship between the clusters.

The process enables the usage of both tangible and intangible principles and circumstances that have an influence in obtaining the best decision possible in each context. To assess the impact of the unconventional monetary policy, also known as quantitative easing (QE) policies, we construct a thematic network based on the triggered response of the main monetary authorities creating a fair radiography of the Global Financial Crisis from the point of emergence, America, to its effects on Europe, the two leading economies of the world. Due to the focus of the study in the research paper it is hard to claim any factual estimation because there is no publicly accepted theoretical framework. The thematic network synthetized is presented in the figure below.
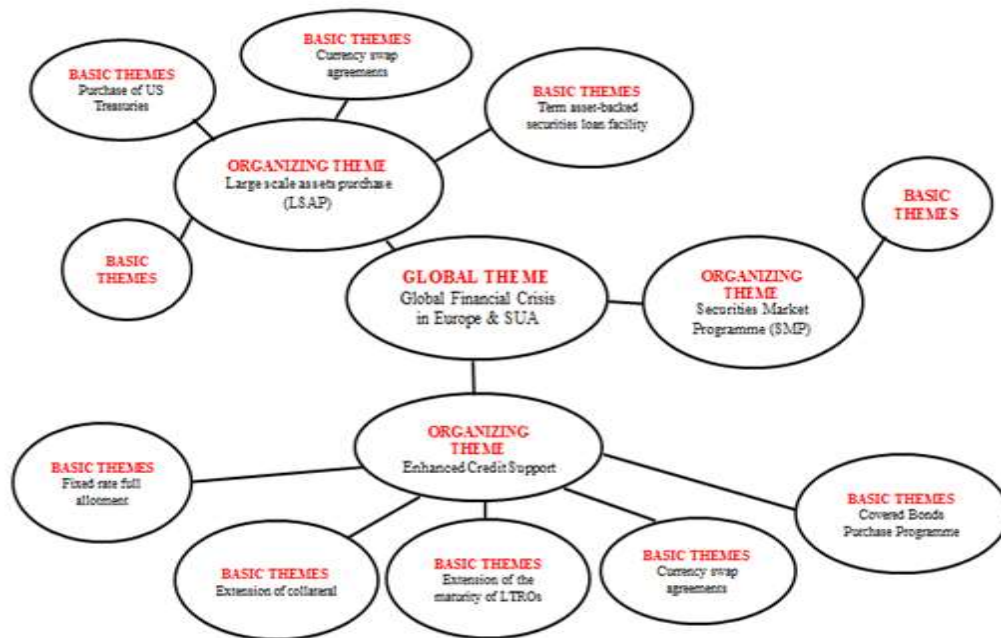
Figure 2. Thematic network
Source: Authors

Evaluation of the Intensity of the Connections in the Thematic Network

Due to the fact that the analytic Network Process (ANP) is the ultimate far-reaching structure accessible no days to the individuals that have to take a decision, upon constructing a thematic network in order to create a fair radiography of the Global Financial Crisis we obtain horizontal network, a web-like network that does not give a glimpse of the degree of implication for the elements that is comprised of, there is no hierarchy so we cannot denote which element brings forth a higher influence over the others. Taking this into consideration, by expressing the thematic network constructed above into an Analytic Network Process (ANP) model it can be evaluated the intensity of the connections in the thematic network.

Figure 3. below shows the transformation from the thematic network constructed, illustrating the triggered response of the main monetary authorities regarding to the Global Financial Crisis to the Analytic Network Process (ANP) in the Super Decisions software by bringing together the data into clusters and nodes.

In figure 4. is presented the finalized Analytic Network Process (ANP) model which is constructed containing three clusters entitled with the name of the three themes that create the thematic network. Furthermore, each cluster brings together the data identified for the themes and shows the relationship not only between the elements of a cluster but also between the clusters themselves.
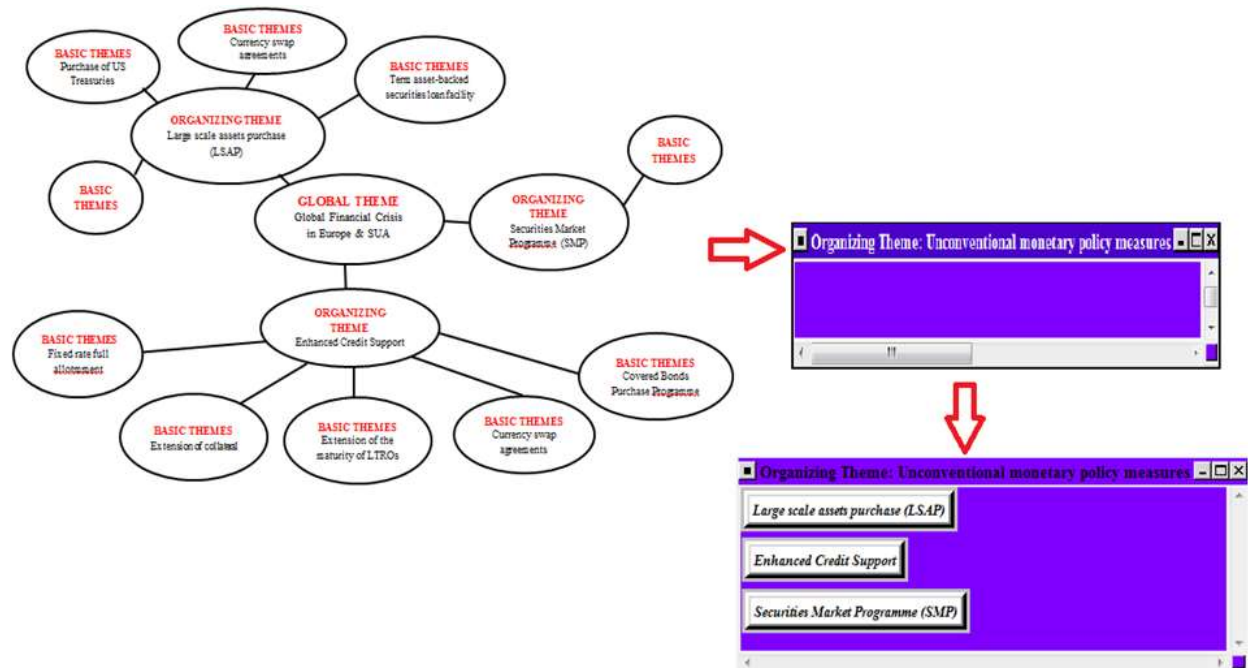
Figure 3. Transformation process from thematic network to ANP model
Source: Authors

The final version of the ANP model obtained from the transformation of the thematic network has in its structure three clusters and a varied number of nodes from one cluster to another. Figure 4 gives a glimpse in an illustrated way how one of the clusters from the Analytic Network Process (ANP) model was expressed from within the thematic network by a reinterpretation of the information given through the network. The three organizing themes from within the thematic network were grouped and expressed through a cluster introduced as" Organizing theme: Unconventional monetary policy measures". The global theme, which is the core of the thematic network, constitutes a standing along cluster entitled "Global theme: Crisis" and it has two nodes represented by the two leading economies of the world, SUA and Europe, based on which the focus of the study for this research paper was implemented. The nodes in the "Basic themes" cluster are the identified unconventional measures taken during the Global Financial Crisis based on their specific applications, such as: "Currency swap agreements", "Fixed rate full allotment" and so on. This cluster presents the highest number of nodes in the ANP model constructed. On the other hand, the nodes from the "Organizing theme: Unconventional Monetary Policy Measures" are the generalized measures expressed by finding the common connection between the basic themes.
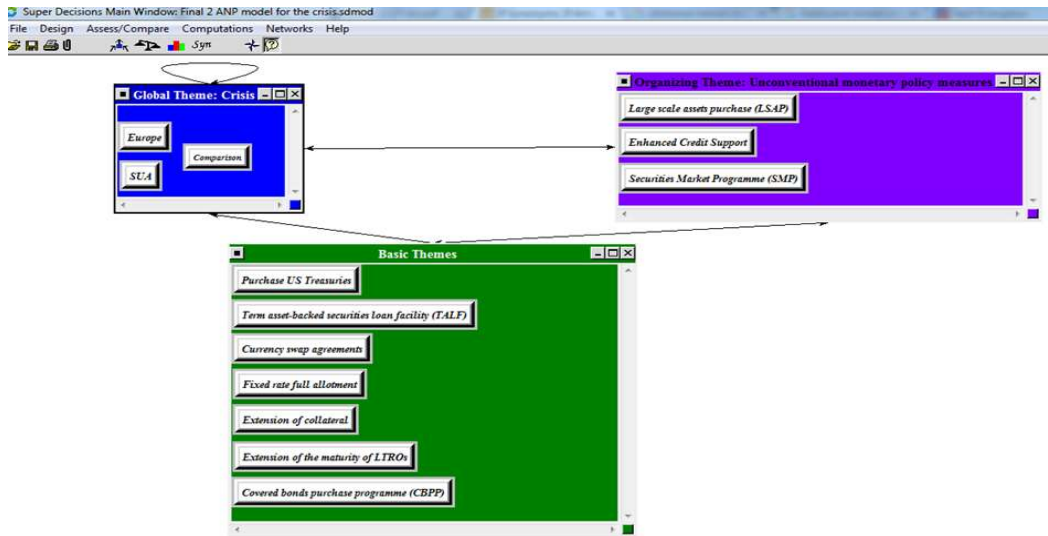
Figure 4. ANP model based on the thematic network
Source: Authors

The next step in the transformation of the thematic network to ANP model was to create connections between the nodes. The connections between the nodes are established according to their theoretical connection dependencies. For instance, the "Large scale assets purchase (LSAP)", since it contributes to the global theme it is connected to both SUA and Europe while on the other hand, the node Europe is connected only to the "Enhanced Credit Support" and "Securities Market Programme (SMP)" since these measures were only applied in Europe.

The complete picture of the outcome resulted after the transformation of the thematic network to ANP model containing the cluster and dependencies according to their theoretical background is shown in figure 5.
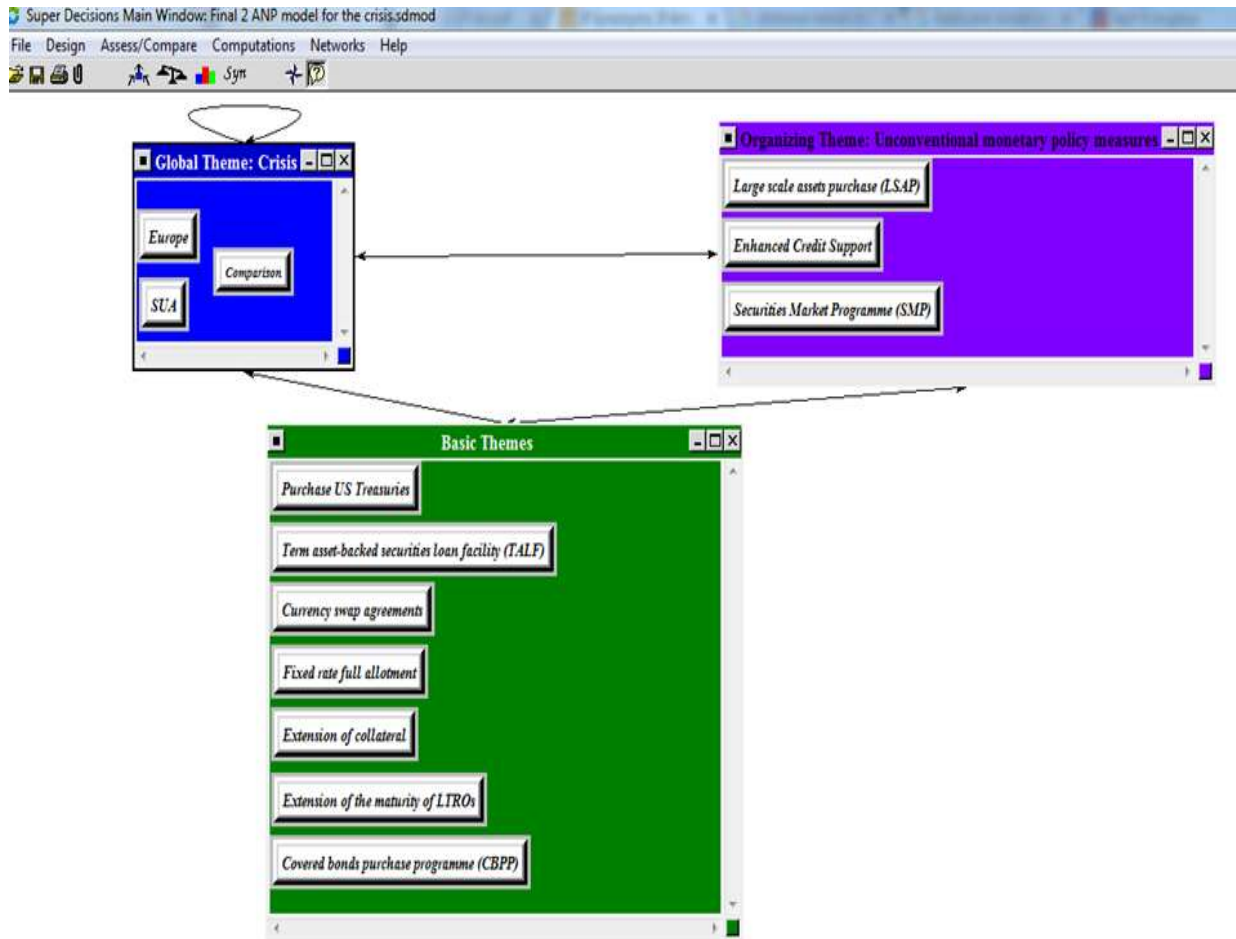
Figure 5. ANP Thematic Network for unconventional monetary measures
Source: Authors

To evaluate the intensity of the connections in between the nodes considered above according to the literature review performed, the following steps were taken. The first step consisted in selecting the relevant research papers for the topic. In this case five working papers were chosen: "Unconventional Monetary Policy Measures: A comparison of the ECB, FED and BOE" by the Directorate General for Internal Policies, the Policy Department A: Economic and Scientific Policies; "Unconventional Monetary Policy of the ECB during the financial crisis: An assessment and new evidence" DNB Working paper by Christiaan Pattipeilohy, Jan Willem van den End, Mostafa Tabbae, Jon Frost and Jakob de Haan;" The Impact of Unconventional Monetary Policy Measures by the Systemic Four on Global Liquidity and Monetary Conditions", IMF Working paper by Yevgeniya Korniyenko and Elena Loukoianova;" The ECB's non-standard monetary policy measures - the role of institutional factors and financial structure", European Central Bank Working paper by Philippine Cour-Thimann and Bernhard Winkler;" ECB Policy Responses between 2007 and 2014: a chronological analysis and a money quantity assessment of their effects", FESSUD (Financialisation, Economy, Society and Sustainable Development) Working paper by Carlos Rodríguez and Carlos A. Carrasco.

The counting of the concept was done by calculating how many times the concept appeared even if it was not identically written within one working paper or from one working paper to another.

For example, the concept "Extension of the maturity of LTROs" appears in one working papers as "extraordinary longer maturity loans" (Rodriguez & Carrasco, 2014) and in a second working paper, the concept is expressed as "three-year long-term refinancing operations (LTRO)" (Korniyenko & Loukoianova, 2015). The mentions regarding to SUA and Europe were counted to the global theme. Synthesis is shown in Figures 6 and 7.

Figure 6. An illustration of the counting system in the working papers
Source: Authors

Figure 7. An illustration of synthetized information for all working papers
Source: Authors

To evaluate the intensity of the connections, the information from the final table with the synthetized counting of the concepts is reorganized in a hierarchy view as in table 8.

Table 8. The values of the concepts identified in the literature review

Global Theme: Crisis		Organizing Theme: Unconventional monetary policy measures		Basic Themes	
SUA	*55*	Large scale assets purchase (LSAP)	*9*	Purchase of US Treasuries	*5*
				Term asset-backed securities loan facility (TALF)	*3*
				Currency swap agreements	*2*
Europe	*148*	Enhanced Credit Support	*6*	Fixed rate full allotment	*12*
				Extension of the collateral	*29*
				Extension of the maturity of LTROs	*54*
				Currency swap agreements	*4*
				Covered Bonds Purchase Programme (CBPP)	*12*
		Securities Market Programme (SMP)	*63*		

Source: Authors

To evaluate the intensity of the connections in the thematic network expressed through the Analytic Network Process (ANP) the application is not based on a simple research of the concepts

researched in the literature review but by understanding, exploring and identifying the meaning of the researched concept even if the writing is not identical throughout the working papers selected as literature review. Following the identification of the concepts the values are registered and presented in the table from above and used to compute the pairwise comparison by introducing them in the window as shown in the figure 9.
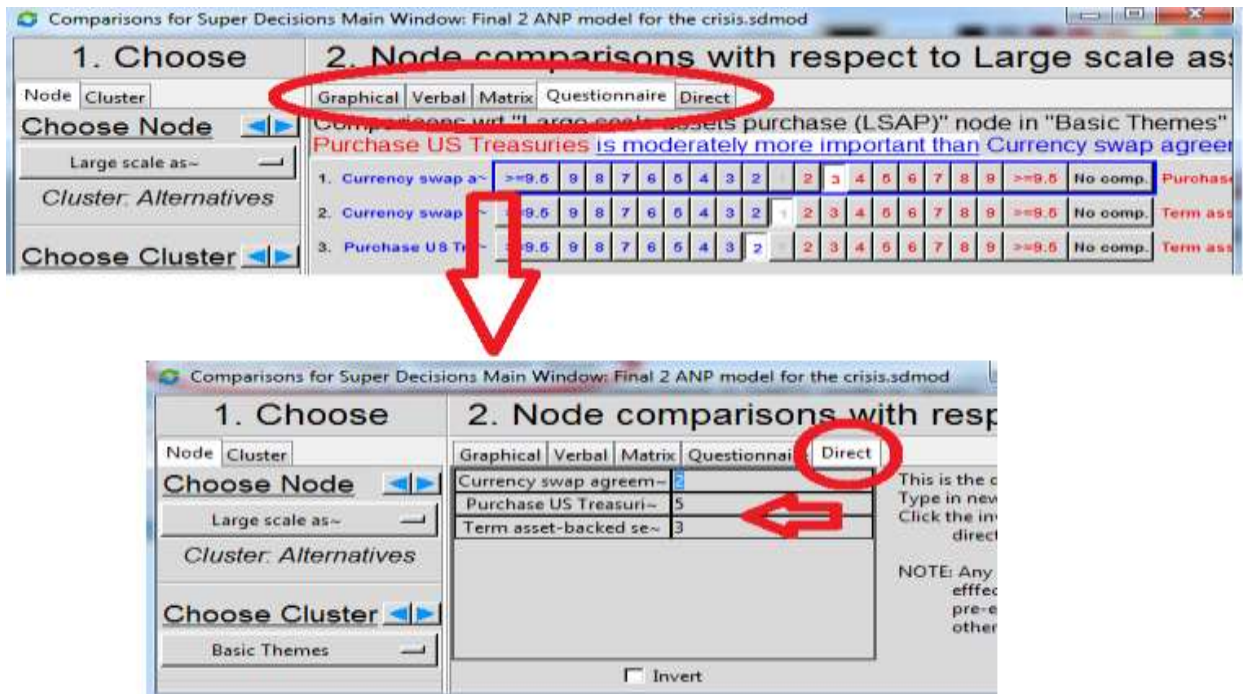

Figure 9. Pairwise comparison
Source: Authors

The selected method used for the Analytic Network Process (ANP) model based on the thematic network in the study is represented by the direct input of the values obtained after the counting of the concepts, following the in-depth literature review of the five working papers.
Results are illustrated in Figure 10.

Figure 10. The change from registered values to pairwise comparisons
Source: Authors

Synthesized Results
The cluster on which a Synthesis is applied is entitled as "Alternatives". An illustration is shown in Figure 11. Here are depicted the Super Decisions results obtained following the synthesis of the "Basic Themes" cluster. It can be noted that the unconventional monetary policy measure most used and recognized as such is the "Extension of the maturity of policy measure "Covered bonds purchase programme (CBPP)" and the "Fixed rate full allotment" on equal grounds.
The least important unconventional monetary policy measure recognized in the specialty literature is represented by the "Term asset-backed securities loan facility".
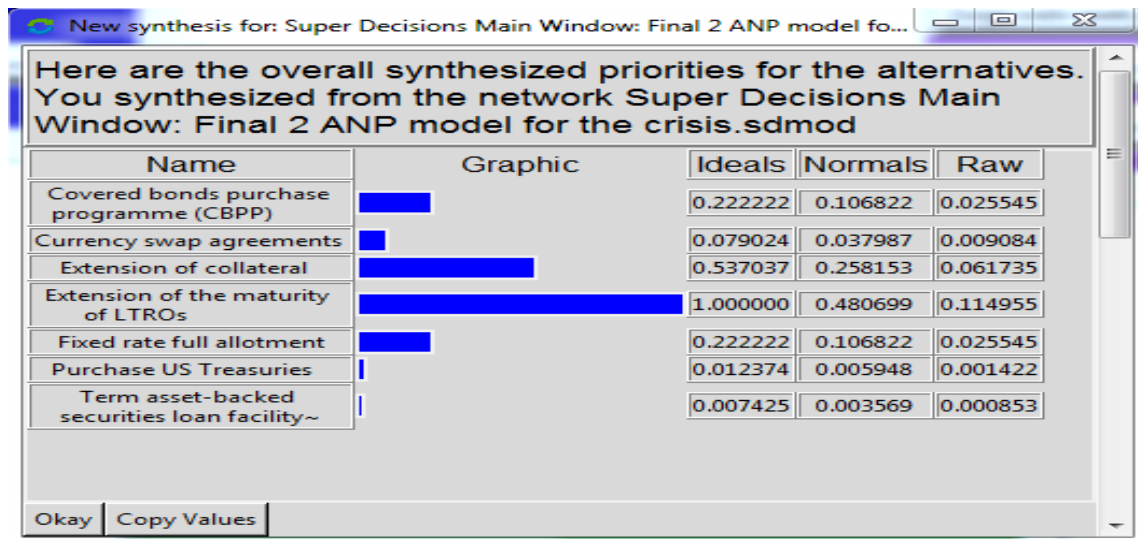

Figure 11. Synthesized Results for the "Basic Themes" cluster
Source: Authors

LTROs". Half from the importance of this measure is granted to the unconventional monetary policy measure "Extension of collateral".
In Figure 12 are revealed the results obtained after the synthesis of the "Global theme: Crisis" cluster. Between the two countries, Europe is denoted by far with the highest importance while in contrast, SUA registers a value almost insignificant.

Figure 12 Synthesized Results for the "Global theme: Crisis" cluster

Source: Authors

To implement the sensitivity analysis in a network is to modify the priority of the element wanted to be analyzed and, in the structure, followed by the observation of how the outcome has been changed.

To find which of the unconventional monetary policy measures would be more influenced by the 50% increase in the financial decision making of Europe, the rate of change in the priority vector must be calculated. The values are transcribed in the table from below and the rate of change is computed.

Table 13. Computation of the rate of change if the node is Europe
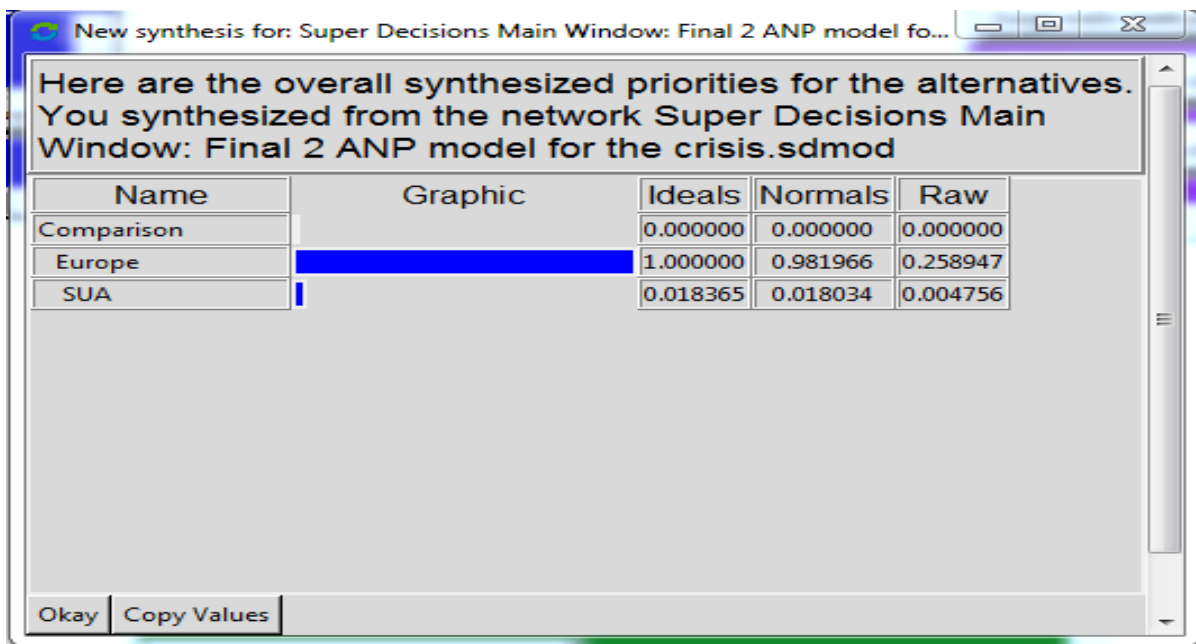
Securities Market Programme (SMP)	0.040	0.059	$\dfrac{0.059 - 0.040}{0.040}$	0.475
Large scale assets purchase (LSAP)	0.011	0.002	$\dfrac{0.002 - 0.011}{0.011}$	-0.818
Enhanced Credit Support	0.948	0.939	$\dfrac{0.939 - 0.948}{0.948}$	-0.009

Source: Authors

The rate of change of the unconventional monetary policy measure "Large scale assets purchase (LSAP)" is big and negative therefore, this measure largely applied in SUA would have been restrictive. This finding confirms the common sense feeling according to which measure taken by SUA will be more limited if Europe would have more influence in the financial decision.

The unconventional monetary policy measure "Securities Market Programme (SMP)" is the most sensible to the territorial importance of the financial decisions. On the assumption that Europe would have had a financial policy with 50% more influential than the existing one, then the unconventional monetary policy measure "Securities Market Programme (SMP)" would have been the most influenced by this fact.

Conclusions

The new approach consisted in the construction of a thematic network based on the triggered response from the main monetary authorities to the global financial crisis built on an in-depth literature review completed at different levels of the thematic network within a selected number of working papers where the concepts researched were identified even if it was not identically written. Moreover, from within the basic themes, the weights of importance resulted expose that the policy measure most used and recognized as such is the "Extension of the maturity of LTROs". Half from the importance of this measure is granted to the measure "Extension of collateral". A fifth from the importance assumed to the measure "Extension of the maturity of LTROs" corresponds to both the unconventional monetary policy measure "Covered bonds purchase programme (CBPP)" and the "Fixed rate full allotment" on equal grounds.

To conclude, this paper brings forth a new approach of interpreting and analyzing an innovator literature review by constructing a thematic network which create a bridge between what the researcher discovered, including expressing different perceptions of other authors and the readers, and further through the evaluation of the intensity of the connections in the thematic network by ascribing an ANP model to it and creating "What if?" scenarios. Hence, this method's novelty character and its sustainable way of identifying and correlating the relevant themes (basic, organizing and global) with the researcher purposes represents an original contribution of the authors to the literature.

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