Peer-reviewed version available at Int. J. Financial Stud. 2018, 6, 48; doi:10.3390/ijfs6020048

Article

Sovereign Adaptive Risk Modeling and Implications on the Eurozone GREXIT case

Morgan Escalera ‡ and Wayne Tarrant *

‡ Rose-Hulman Institute of Technology; escaleramorgan@gmail.com
* Department of Mathematics, Rose-Hulman Institue of Technology, tarrant@rose-hulman.edu; Tel.: +1-812-877-8720

Abstract: In the wake of the 2008 financial crisis, the Financial Stability Board (FSB) and the Basel Committee on Banking Supervision (BCBS) created a list of Systemically Important Financial Institutions (SIFIs) with the intention of determining which financial institutions were important enough to the global market that their failure would result in systemic collapse. In this work we create a model that modifies the BCBS's five indicators of size, interconnectedness, cross-jurisdictional activities, complexity, and substitutability and applies these measures of systemic stress to governments. The original application of the model is to track the systemic interdependence of the Eurozone, with particular emphasis on the case of Greece. We anticipate this model can be used in regional fiscal situations beyond the Eurozone.

Keywords: Systemic risk - sovereign default - Grexit

1. Introduction

The financial markets experienced some of the worst activity in recorded history during the global recession that began with the housing bubble crash in 2007. In the wake of that financial catastrophe, a new understanding of large corporations emerged, best summed up by former Chairman of the Federal Reserve Ben Bernanke. In an interview with CBS he said, "Many of the vulnerabilities that amplified the crisis are linked with the problem of so-called too-big-to-fail firms. A too-big-to-fail firm is one whose size, complexity, interconnectedness, and critical functions are such that, should the firm go unexpectedly into liquidation, the rest of the financial system and the economy would face severe adverse consequences." [24]

In the aftermath came the realization that governments relied upon the foundation of certain financial institutions that had been acting with little accountability and which were on the cusp of failure during the crisis. In order to better combat this threat to the stability of global finance, the Financial Stability Board (FSB), along with the Basel Committee for Banking Supervision (BCBS) drafted a methodology to determine what constitutes Globally Systemically Important Banks (G-SIB), which changed in later reports to Systemically Important Financial Institutions (SIFI). They suggested more stringent requirements for those institutions so that any future financial crises would not cause them to fail. It is important to mention that their determination of what is systemically important is done on a Loss Given Default (LGD) basis instead of the more popular Probability of Default (PoD) basis. The LGD viewpoint measures how bad things can get when they get bad and not just the probability that things will get to an indeterminate level of bad. This methodology was chosen by the BCBS because the intent of systemic importance was an accounting of the systemic risk of the financial institution should we already be in crisis and not just a probability of actually going into crisis. [1] While both the FSB and BCBS are purely advisory bodies, many of the largest nations in the world have adopted their guidance into law.

The BCBS published reports on their methodology beginning in 2009, with further reports on a biannual basis. The BCBS separated their method of determination of SIFIs into 5 distinct indicators. These indicators are Size, Interconnectedness, Cross-Jurisdictional Activities, Complexity,

Peer-reviewed version available at Int. J. Financial Stud. 2018, 6, 48; doi:10.3390/ijfs6020048

and Substitutability. They were chosen specifically to encompass the many different facets that could contribute to the systemic importance of any given financial institution. The definitions of these indicators as defined by the BCBS can be found in their report. [1]

Each of the five indicators were broken up into a series of sub-indicator categories. Equally weighted under cross-jurisdictional activity were cross-jurisdictional claims and liabilities. For size the criteria was just the total exposure as defined by the Basel III ratio. Interconnectedness put equal weight on three categories: securities outstanding, intra-financial system assets, and intra-financial system liabilities. For substitutability assets under custody, payments activity, and underwritten transactions in debt and equity markets were all given equal treatment. As for complexity, the committee measures the notional amount of OTC derivatives, Level 3 assets, and trading and available for sale securities. [1]

The methodology for assigning a value for an indicated company is as follows:

"For each bank, the score for a particular indicator is calculated by dividing the individual bank amount (expressed in EUR) by the aggregate amount for the indicator summed across all banks in the sample. This amount is then multiplied by 10,000 to express the indicator score in terms of basis points. For example, if a bank's size divided by the total size of all banks in the sample is 0.03 (i.e. the bank makes up 3% of the sample total) its score will be expressed as 300 basis points. Each category score for each bank is determined by taking a simple average of the indicator scores in that category. The overall score for each bank is then calculated by taking a simple average of its five category scores. The maximum total score, i.e. the score that a bank would have if it were the only bank in sample, is 10,000 basis points (i.e. 100%)...

...Banks that have a score produced by the indicator-based measurement approach that exceeds a cutoff level set by the Committee will be classified as G-SIBs. Supervisory judgment may also be used to add banks with scores below the cutoff to the list of G-SIBs...

...It should be noted that the number of G-SIBs, and their bucket allocations, will evolve over time as banks change their behavior in response to the incentives of the G-SIB framework as well as other aspects of Basel III and country-specific regulations." [3]

2. Methods

It is the purpose of this paper to modify the methodology used by the FSB and BCBS in order to apply it to sovereigns instead of financial institutions, with the intention of identifying countries which are systemically important. This systemic importance is relative to a specified financial system, whether solely their immediate neighbors or the global financial system. The work is done in the same mindset as the original BCBS report. However, financial institutions and governments differ in significant ways. We alter the FSB/BCBS criteria while trying to retain the perceived intent of their work.

This project was originally inspired by the situation developing in Greece during the summer of 2015 and the possible effect that it could have on the members of the Eurozone. Greece was faced with a debt crisis from which it seemingly could never escape, a large budget deficit, collapsing market assets, low bond confidence, high unemployment, massive proportional government spending, and few further means of foreign aid. The Greek public resigned itself to its fate, with bank runs taking place. Analysts of the situation proposed the inevitability of a Greek financial collapse, and governments who loaned Greece money that hinged on recovery were facing taking fractions of what they lent or nothing at all. The most likely scenario of Greece's default would be total Greek bankruptcy accompanied by its exit from the Eurozone fiscal union, popularly referred to as the "Grexit."

Much of the speculation surrounding the Greek financial crisis concerned what a Greek default would trigger in the Eurozone's financial system and beyond. Especially concerning was the effect that a Greek default would have on other troubled economies in the Eurozone such as Portugal, Spain, and Italy. While this model, especially in this first iteration, will not give an absolute determination

Preprints (www.preprints.org) | NOT PEER-REVIEWED | Posted: 17 April 2018 doi:10.20944/preprints201804.0224.v1

Peer-reviewed version available at Int. J. Financial Stud. 2018, 6, 48; doi:10.3390/ijfs6020048

of what the extent of a Greek default would entail, it will at the very least speak to the relative fiscal importance of Greece in the Eurozone.

The new model devised for the failure of countries, dubbed the Adaptive Country Exposure Model (ACEM), uses the same five indicators of the FSB/BCBS report. However, because of the differences between countries and companies, it is necessary to modify the methodology that determined each of the five indicators.

Before such a model can be properly undertaken, we must first believe the assumption that a country can default. Although sovereign default is an historical fact, many may object to default in today's world economy. When a sovereign is part of a fiscal union it is particularly important that this assumption must hold for every country in the region of consideration. This may be a strong or weak assumption depending on the region and the viewpoint of the audience. Please note that we do not attempt to analyze the political ramifications of a country's default.

The BCBS methodology was frustrating in its simplistic approach to the mathematical bases for each of the indicators and the fact that equal weights were, seemingly arbitrarily, assigned to each of the five indicators. Preliminary findings suggested that a higher importance on the indicators of size, interconnectedness, and complexity would be best at the expense of the other two indicators. The highest importance would be assigned to interconnectedness due to the systemic impact of a highly interconnected country defaulting. The indicated country, and the system itself, may be defined at the discretion of whomever is utilizing the model.

We compute two different scores for each of the countries. The first is a SIFI-based score in which we weight all five categories equally, following the methods of the BCBS and FSB. We then compute a modified score, in which we have different weights for each of the five categories based upon relative importance of the scores for countries. In this situation we place a weight of 35% on interconnectedness, 25% on size, 15% apiece on cross-jurisdictional activities and substitutability, and 10% on complexity. For the stability of a system, interconnectedness is clearly the most important with size second. It is also notable that interconnectedness focuses on a LGD basis, while the others deal with only PoD calculations. Since we had the most difficulty emulating the complexity calculation from the SIFI documentation, we felt this should see the smallest weight.

Now, the new model can be defined. Important definitions are as follows:

1. Cross-Jurisdictional Activities

An analysis of a country's foreign liabilities to gain an understanding of the extent to which the country in question exists as a regional or global presence instead of a domestic one, calculated as:

- Proportion of debt money lent by surrounding countries divided by the total amount of loans to the indicated country presently outstanding
- This indicator is partially applicable to the substitutability indicator and as such should be completed first

This follows the committees' work almost completely.

2. Size

The gross earnings of the country in proportion to its total debts, as well as its market share in the financial system. In addition, there is an added penalty to the size calculation should a country fail the Basel III leverage ratio.

- Combination of several metrics
  - Proportion of Equity assets in relation to the GDP of the indicated country
  - Market Share of the indicated country in the system
  - $size = \frac{Revenue\ Entity}{Revenue\ System} * (Members\ System) * \frac{Exposure\ Liability}{GDP}$

- If the indicated country falls underneath the standards set by the Basel III structure, then the value will be multiplied by a factor. We have chosen 2 as this factor, but future data may imply a different choice is better.

Again, this was very easy to adapt from the SIFI calculations.

3. Interconnectedness The effect a default of a country would have on surrounding countries and the possible problems that would emerge from such an event. This would be an accounting of the debt structure of the indicated country within the system as well as any regulatory actions that would have to be taken as a result of the indicated country's default.

- Simulation of the default exposure on neighboring governments and financial institutions as a direct result of the failure of the indicated country's government
- This would be surmised by a series of weighted directed graphs, a simplified version of the counterparty interactions of national banks
- In pseudocode a single iteration for one node follows:

For i=1 to N do

If CAI(capital assets of institution)$-DE$(default exposure)≥ 0 but fails the Basel III structure then "1"

If $CAI - DE \geq 0$ and passes the Basel III structure afterward then "2"

If $CAI - DE < 0$ then "3"

Sum "3" cases $3_1, 3_2, \ldots, 3_k$ and rank them by quantity $(CAI - DAE)$

For highest rank, apply Regulatory Funds V_n to each case "3" until they qualify as "1"

If no more "3" cases remain, apply V_n to "1" cases

If V_n is limited, add international claims of second country to DE

End

- Understand that "3" cases are the most unstable and face impending bankruptcy, while the "1" cases are considered not financially viable by an objective deterministic source, but are not as troubling
- Regulatory Funds are those in place by bodies of leading countries or partially outside of the system.
- Only $\frac{3}{4}$ of those funds are available (arbitrarily chosen) so as to leave some in reserve for any future defaults in the system.
- Critical value at the end of the summation will be a 15% loss of the initial Total systemic Assets
- N would represent as many central banks or governments as are in the area under consideration
- This process would have to be run many times through to generate a steady state value for the process.
- This indicator is unique from the other indicators for two important reasons. Firstly, it is not understood as a correlated value of systemic importance, but rather a direct calculation of the LGD of the indicated country. Secondarily, it is also possible that this indicator affects other ones recursively in the case of a complete default of the system.

Here we tried to get at the calculations that the committees wanted to perform. The committees sought to capture the linkages to other entities, both direct and indirect, in order to understand how a financial stress of one company would affect others in their industry. We sought to do something similar on the sovereign level.

We calculated interconnectedness by looking at the amount of debt that a country holds for other countries vs. the amount of debt it has outstanding. Since our goal is to see what would happen should a country default, it is important to us to look beyond the first order effects. Should Country A default, it may leave Country B short to return what it owes to Country C. This kind of domino effect must be investigated to determine just how interconnected a country is on a relative basis. This is why we had to reach a steady state before being willing to report this as the true value of a country's interconnectedness.

4. Substitutability The amount of domestic expenditure will be calculated as a percentage of the country's tax base, as well as on a per capita basis comparable to neighboring countries.

- Several metrics are possible to use in the hope of understanding true domestic tax expenditure. Alternates and Corollaries could be: Domestic liability dollarization, which takes into account the debts that a citizen holds internally (per http://chartsbin.com/view/34074), Unemployment, a measure of the work force collecting from taxes instead of paying into it (per http://databank.worldbank.org/)
- The most comprehensive metric of the list was Final Consumption Expenditure, both as a proportion of the specified countries' GDP and on a per capita basis.

The committees hoped to ascertain the extent to which other institutions could provide materially the same services at a similar price in a similar amount of time to the institution under consideration. We sought to find the notional amount that countries provide that would not be easily replicated by the private sector as a complement to what the committee desired to calculate.

Here we view substitutability in the sense of which services the country provides to its citizens. Does the country take a larger role than its neighbors? Does it do a lot more than the private sector? If the government were no longer able to function because of fiscal problems, how difficult would it be to substitute for them?

5. Complexity The relative stability of the country as defined by the consumer market. This is done by compiling the valuation of the indicated country relative to the systemic average scaled appropriately. This will be where any market action would be taken into account as well.

In the SIFI criteria, this measure attempts to determine just how complex are the financial instruments that a financial institution holds. Although the committees look only at derivatives that are centrally cleared, they also look at illiquid or difficult to value assets (Basel Level III assets). We have to come up with something that approximates this kind of riskiness for a sovereign. One reasonable proxy for the riskiness is the market's opinion of a country's riskiness, spreads on Credit Default Swaps. We use these data to find implied annual probabilities of default.

3. Results

3.1. Greece

As was stated above, the situation that was afflicting Greece, the "Grexit", was the inspiration for the model and as such was its first test case. For most of the statistics, the annual reports of the appropriate central banks, World Bank [26] and CIA World Factbook [27] were used to generate the necessary metrics. For these scores we used our unequally weighted version of the score. Cross-Jurisdictional Activities: For this section, statistics for External Debt and Public Debt were found using the CIA Factbook and applied for each of the members' states of the Eurozone.

Size: The relevant revenue stream for each of the Eurozone members was found to be the tax base to accede to the logic posed in the definition of the size indicator. The Tax Base and GDP numbers for

the member states were found in the World Databank and the Total Debt and capital reserve numbers were found in the CIA Factbook

Interconnectedness: In order to best approximate the strain that would be placed upon the Eurozone members as a direct result of Greece's default, proportional quotas were found within the three major lending bodies in the situation: the IMF, the ECB, and Eurozone states. Less than obvious counterparty interaction between central banks, such as the TARGET2 payment system, were also taken into account and added to the default exposure of Greece.

Substitutability: Final Consumption expenditure data, both per capita and as a percentage of the Eurozone members' GDP, was found in the World Databank

Complexity: CDS spreads come from S&P CapitalIQ.

RESULTS OF THE GREECE TEST CASE AS OF 7/30/15:

Table 1. Greece's Cross-Jurisdictional Activities

Mean	Std Dev	standard score	Systemic Importance
0.54741	0.2996	-0.3072	44.88

The cross-jurisdictional activities index (Table 1) indicates that Greece operates slightly less than the systemic average on foreign soil, holding its debt more in domestic markets. While the definition of the indicator would identify this as systemically less important, the unique case of the Eurozone's financial systems, where much of the foreign debt is hidden and public debt can be transferred to foreign entities, dampen the little indication that this category would have on sovereigns.

Table 2. Greece's Size

Mean	Std Dev	standard score	Systemic Importance
3.30966	4.0575	-0.36653	43.89

The size indicator (Table 2) implies that Greece as a country is proportionally a smaller financial presence than the systemic average, which is logically coherent. Even with the penalty as a result of failing the Basel III Leverage Ratio, their miniscule size determined the point value. It is important to understand that the standard deviation of this indicator is massive proportional to the mean. This is indicative of the great financial disparity within the Eurozone.

Table 3. Greece's Interconnectedness

Number of simulations	mean default	max default	mean assets lost (bn)	Systemic Importance
250	0.26	8	1060	23.46

The results of the interconnectedness simulations (Table 3) indicate that Greece's default leveraged in the worst possible way would result in the potential default of 8 system members within the Eurozone.

In the most recent estimation of the umbrella debt funds, the relevant regulatory bodies have sufficient funds to save the 8 system members without drawing on their external claims within the rest of the system, thus determining that Greece is not systemically important by the standard set in ACEM. However, it is important to note that approximately 560 billion euros of the 750 billion euros available would have to be used to stop the bleeding that a Greek default and/or Grexit would cause. Umbrella funds for the entire Eurozone would be used to stabilize the region in the event of a "Grexit," thus making the rest of the member states extremely fragile to further financial distress.

Table 4 indicates that Greece spends more domestically than the systemic average, implying that it is systemically important by that metric. Logically, high domestic expenditure makes it more costly for any future governmental authority to step in to the financial situation of the populace. This would

Peer-reviewed version available at Int. J. Financial Stud. 2018, 6, 48; doi:10.3390/ijfs6020048

Table 4. Greece's Substitutability

Mean	Std Dev	z-score	Systemic Importance
76.142	9.076	0.617	60.29

most likely result in payment loss domestically, which would then trigger further financial issues, such as perennial bank fragility, public unrest, and decline in available domestic industry.

The summarized data for the complexity indicator (Table 5) is as follows:

Table 5. Greece's complexity

CDS spread	annual prob of default	score
5003.09	0.45	100

Combining the results of the five indicators into a total systemic importance, it is determined that Greece, while a nuisance to the rest of the Eurozone, is not systemically important. A lack of Systemic Importance in the relative size of Greece as well as the mock default scenario run in the interconnectedness portion were especially crucial to the determination. Complexity was the largest indicator indicating that Greece is systemically important to the health of the Eurozone. The substitutability indicator result was largely in favor of systemic importance, implying that the Greek people would be extremely negatively affected in the result of a Grexit.

The Greek test case listed above contains just a single data point for the systemic importance of the country. We desire to create a time series of Systemic Importance data, but we have been unable to obtain reliable detailed TARGET2 data, despite the request to several sources. Even the European Central Bank was unwilling to provide us with such data.

3.2. Eurozone

Although it is interesting to score Greece, the more compelling question is about which of the nations are most important to the fiscal stability of the Eurozone. Once again the only data point we have is from 30 July 2015, as this is the only date for which detailed TARGET2 data are available. With the appropriate TARGET2 data, we would be able to compute a time series of these Systemic Importance scores. It would be incredibly interesting to see whether the relative Systemic Importance is static, or whether countries change rankings over time. With the information we have, we can tell what the Eurozone Systemic Importance levels were on 30 July 2015.

From Table 6 we can see that Germany and France are far and away the most important countries for the systemic health of the Eurozone. The Netherlands is a clear third. Using the somewhat arbitrary mark of 50 to determine systemic importance, we find that Luxembourg is the only other country to clear that level in our scoring system. It is interesting that just below the score of 50 come two countries with fear about their continuing stability: Italy and Greece, though Belgium is nearly equal in the modified (unequal weight) score for 30 July 2015. It is also interesting that an equally-weighted version of the score has Greece and Luxembourg trading places, with Greece above the mark of 50 and Luxembourg dropping below.

By staring at the chart, we can notice some trends among the scores. The four most systemically important countries were the four that had the largest size. Germany and France also had the highest interconnectivity. The Netherlands' score was bolstered by having the second largest cross-jurisdictional activity. Greece's complexity was the largest pull for it.

Table 6. Eurozone ACEM scores

Country	Size	C-J Act.	Subst.	Complex.	Interconn.	SIFI score	modified score
Austria	47.45	18.87	60.78	0.24	26.46	30.76	33.10
Belgium	52.88	81.08	63.50	0.22	25.57	44.65	43.88
Cyprus	22.36	81.35	51.36	7.59	5.01	33.53	28.01
Estonia	21.00	97.48	15.91	0.64	3.42	27.69	23.52
Finland	30.04	21.51	75.76	0.26	20.32	29.58	29.24
France	98.04	21.87	67.44	0.19	150.42	67.59	90.57
Germany	99.34	39.54	58.02	0.08	198.57	79.11	108.98
Greece	35.70	49.21	65.43	100	23.46	54.76	44.33
Ireland	64.68	15.96	28.92	1.76	39.78	30.22	37.00
Italy	31.68	28.85	59.97	1.64	77.95	40.02	48.69
Latvia	21.27	86.11	30.18	0.51	1.97	28.01	23.50
Lithuania	22.68	55.25	33.23	1.00	11.75	24.78	23.15
Luxembourg	85.52	29.36	39.21	0.22	52.70	41.40	50.13
Malta	23.19	29.36	49.78	1.10	7.01	22.09	20.23
Netherlands	93.32	89.35	53.14	0.13	45.20	56.23	60.54
Portugal	38.45	17.26	52.16	2.14	18.30	25.66	26.64
Slovakia	22.10	14.25	26.39	0.58	7.53	14.17	14.31
Slovenia	21.20	29.49	25.83	1.13	5.67	16.66	15.70
Spain	34.07	18.80	45.35	1.31	42.50	28.41	33.15

4. Discussion

Due to the political situation for a government in default, there may be ramifications that are unnoticed by the purely fiscal ACEM. While these influences are not in the model in any way, they open up avenues for future study on how countries act when there is some fiscal danger in the Eurozone.

Governments should probably be more swayed by public opinion than financial institutions, so the effects that a catastrophe would have on the public and their response to those effects should possibly be considered when determining the systemic importance of a country, though mathematically explaining this would be incredibly difficult. The devaluation of citizens' assets by a possible shift back to a domestic currency could conceivably be calculated from historical cases of governmental default in the modern age. For the case of Greece up to a 40% loss of value of assets for individual citizens from a shift back to the drachma has been proposed. It is clear that this would lead to significant civil unrest.

It is conceivable that the decisions made by leading politicians during financial crises will cause some volatility, most obviously in the country that would default, but also possibly in neighboring countries. Especially interesting are the effort needed from the leading bodies in the system to restore consumer faith, even in their own countries. Extraordinary measures like quantitative easing and similar fiscal policies would likely be necessary. These policies would then result in the devaluation of a currency compared to all others.

With the issues in Venezuela, we believe a study of South America could be particularly insightful. The situation of North Korea could be an interesting reason to look at the Asian region. The pull of OPEC on the Middle East could lead to some provocative results. And Zimbabwe is one of several African countries that would be compelling to investigate. Again, the major problem in any of these calculations is likely to be obtaining reliable data.

5. Conclusions

In general, this model is as imprecise as its predecessor. During the construction of the model, we were especially dissatisfied with the complexity and interconnectedness indicators. It is the hope of the authors that in later iterations of the model that all of the indicators will become more comprehensive, especially the more involved ones such as interconnectedness and complexity. However, it is with the original intention of the BCBS and FSB model that the value of the ACEM model is found. As advisory

bodies, it is the responsibility of the FSB and BCBS to prepare regulators to contain the damage that would be caused by the default of a SIFI. The ACEM model, while imperfect, aims for the same goal for regulatory governmental bodies, and at the time of this writing there is no superior model which serves the same purpose. With all things, the ACEM model can be improved over time, and to that effect we would be more than happy to receive any ideas from others.

With the centralization of debt around national, public institutions it may become possible that sovereign default will become a real concern, not just strategically but also fiscally. This work is intended as the beginning of a framework describing which nations are systemically important so that the risk to the global financial system can be estimated and hopefully mitigated.

Conflicts of Interest: The authors declare no conflict of interest.

References

1. "Global Systemically Important Banks: Updated Assessment Methodology and the Higher Loss Absorbency Requirement." Basel Committee on Banking Supervision. July 2013. Available online: http://www.bis.org/publ/bcbs255.pdf
2. Ojo, Marianne. "Leverage Ratio Comparisons: Basel III International Leverage Ratio and the U.S Leverage Ratio, Tier One Capital and Leverage Ratios." SSRN Electronic Journal SSRN Journal. Available online: http://www.bis.org/publ/bcbs270.pdf
3. "Instructions for the End- 2014 G-SIB Assessment Exercise." Basel Committee on Banking Supervision (2014). Available online: http://www.bis.org/bcbs/gsib/instr_end14_gsib.pdf
4. Annual Report 2014. Oesterreichische Nationalbank-Eurosystem, Mar. 2015. Available online: https://www.oenb.at/docroot/flipbooks/AR_2014/ar_2014.html
5. Belgium, National Bank of. 2014 Corporate Report. Mar. 2015. Available online: https://www.nbb.be/doc/ts/publications/nbbreport/2014/en/t2/report2014_t2.pdf
6. "Annual Report 2014." Central Bank of Cyprus-Eurosystem, Apr. 2015. Available online: http://www.centralbank.gov.cy/media//pdf/AR_14_EN.pdf
7. "Annual Report 2014." Eesti Pank-Eurosystem, Apr. 2015. Available online: http://www.eestipank.ee/en/publication/annual-report/2015/eesti-pank-annual-report-2014
8. "Annual Report 2014." Bank of Finland, Feb. 2015. Available online: http://www.suomenpankki.fi/en/julkaisut/vuosikertomus/Documents/VK_EN_2014.pdf
9. France, Banque De. "Annual Report 2013." June 2014. Available online: https://www.banque-france.fr/fileadmin/user_upload/banque_de_france/publications/AR-2013.pdf
10. "Annual Report 2014." Deutsche Bundesbank-Eurosystem, Feb.-Mar. 2015. Available online: https://www.bundesbank.de/Redaktion/EN/Downloads/Publications/Annual_Report/2014_annual_report.pdf?__blobpublicationFile
11. "SUMMARY OF THE ANNUAL REPORT 2014." Bank Of Greece-Eurosystem. Feb. 2015. Available online: http://www.bankofgreece.gr/BogEkdoseis/Summary_Annrep2014.pdf
12. Central Bank Annual Report 2014. Central Bank of Ireland-Eurosystem, June 2015. Available online: https://www.centralbank.ie/publications/Documents/Central%20Bank%20of%20Ireland%20Annual%20Report%202014.pdf
13. Italia, Banca D "Relazione Annuale 2014." May 2015. Available online: https://www.bancaditalia.it/pubblicazioni/relazione-annuale/2014/en_rel_2014.pdf?language_id=1
14. Banka, Latvijas. Latvijas Banka: Annual Report 2014. Apr. 2015. Available online: https://www.bank.lv/images/stories/pielikumi/parlatvijasbanku/gada_parskati/LB_GP_2014_eng.pdf
15. "Annual Report of the Bank of Lithuania 2014." Central Bank of Lithuania-Eurosystem, May 2015. Available online: http://www.lb.lt/annual_report_2014
16. "Annual Report 2014." BANQUE DE LUXEMBOURG-Eurosystem, Mar. 2015. Available online: http://www.banquedeluxembourg.com/BLPortlets-portlet/bankServlet/GedGetFileServiceSvt/pdf/AnnualReport
17. "Annual Report 2014." Central Bank of Malta-Eurosystem. Apr. 2015. Available online: http://www.centralbankmalta.org/annual-reports
18. "Annual Report 2013." De Nederlandsche Bank, Apr. 2014. Available online: http://www.dnb.nl/en/binaries/Annual%20Report

19. "Annual Report 2014." Banco De Portugal. May 2015. Available online: https://www.bportugal.pt/en-US/PublicacoeseIntervencoes/Banco/RelatConselhoAdministracao/Tumbnails%20List%20Template/Activities%20and%20Financial%20Statements%202014.pdf
20. "Annual Report 2014." Národná Banka Slovenska, Mar. 2015. Available online: http://www.nbs.sk/_img/Documents/_Publikacie/AnnualReport/ARNBS14.pdf
21. "Annual Report 2014." Banco D'ESpana-Eurostema. May 2015. Available online: http://www.bde.es/f/webbde/SES/Secciones/Publicaciones/PublicacionesAnuales/InformesAnuales/14/Files/inf2014e.pdf
22. "How Much Greece Owes to International Creditors." Reuters. Thomson Reuters, 28 June 2015.
23. Merler, Silvia. "The Greek Debt-What Creditors May Stand to Lose." The Guardian. 19 June 2015.
24. "Testimony." FRB: –Chairman Ben S. Bernanke–September 2, 2010.
25. "TARGET2 Annual Report 2014." European Central Bank-Eurosystem, June 2015. Available online: https://www.ecb.europa.eu/pub/pdf/other/targetar2014.en.pdf?6521e6b60fe4786b984b722f6d91ce53
26. "Indicators." The World Bank. The World Bank-Working for a World Free of Poverty, Available online: http://data.worldbank.org/indicator
27. The World Factbook. Central Intelligence Agency, Available online: https://www.cia.gov/library/publications/the-world-factbook/
28. "EFSF FAQ." European Financial Stability Facility. Available online: http://www.efsf.europa.eu/attachments/faq_en.pdf
29. "Capital Subscriptions." Capital Subscription. European Central Bank-Eurosystem, 1 Jan. 2015. Available online: https://www.ecb.europa.eu/ecb/orga/capital/html/index.en.html
30. "IMF Members' Quotas and Voting Power, and IMF Board of Governors." International Monetary Fund, Available online: http://www.imf.org/external/np/sec/memdir/members.aspx#U