



REGULATION OF THE FINANCIAL SYSTEM IN THE REPUBLIC OF CONGO

Franchel Mbon Issie*¹ 

¹ Beijing Jiaotong University, School of Economics and Management, Beijing, China

ABSTRACT

After the 2008 subprime crisis, financial institutions in the Congo (Brazzaville) underwent a series of significant adjustments and reforms in line with their regulatory traditions of systemically important financial institutions, the evolution of the regulatory system, and the country's financial development needs. This paper needs to analyze and study financial regulation in the Republic of Congo. This paper mainly analyzes the current situation of the financial regulatory system of the Republic of the Congo (Brazzaville), finds the problems in the financial regulatory system, collects accessible financial data and financial indicators, and constructs the financial regulatory system of the Republic of the Congo (Brazzaville) with principal component analysis. This paper uses the GARCH-CoVaR model to assess the contribution of banks' systemic risk in Congo Brazzaville. Then, it constructs a risk assessment system for Congo based on the indicator method. The results show that banks' systemic risk is not limited to the systemic risk of individual banks. The systemic risk of banks in the Republic of Congo mainly originates from six major banks: the Central Bank of the State of Congo, the Bank of Congo, the Bank of Commerce and Credit of Congo, the Savings Bank of Congo, the Central Bank for the Development of Central African States, the Central Bank of Africa, and the Central Bank of Africa.

Keywords: *Financial supervision, Financial Regulation index, Regulatory system, Principal component analysis.*

ARTICLE INFO

Received: June 28th, 2023

Revised: July 17th, 2023

Accepted : November 5th, 2023

Online: December 7th, 2023

*Correspondence:
Mbon Issie Franchel

E-mail:

franchelmbonis@gmail.com

ABSTRAK

Setelah krisis subprime tahun 2008, lembaga keuangan di Kongo (Brazzaville) mengalami serangkaian penyesuaian dan reformasi yang signifikan sejalan dengan tradisi peraturan mengenai lembaga keuangan yang penting secara sistemik, evolusi sistem peraturan, dan kebutuhan pembangunan keuangan negara tersebut. Tulisan ini perlu menganalisis dan mempelajari regulasi keuangan di Republik Kongo. Penelitian ini terutama menganalisis situasi terkini sistem regulasi keuangan Republik Kongo (Brazzaville), menemukan permasalahan dalam sistem regulasi keuangan, mengumpulkan data keuangan dan indikator keuangan yang dapat diakses, dan menyusun sistem regulasi keuangan Republik Kongo (Brazzaville). Kongo (Brazzaville) dengan analisis komponen utama. Penelitian ini menggunakan model GARCH-CoVaR untuk menilai kontribusi risiko sistemik bank di Kongo Brazzaville. Kemudian, mereka membangun sistem penilaian risiko untuk Kongo berdasarkan metode indikator. Hasilnya menunjukkan bahwa risiko sistemik bank tidak terbatas pada risiko sistemik masing-masing bank. Risiko sistemik perbankan di Republik Kongo terutama berasal dari enam



bank besar: Bank Sentral Negara Kongo, Bank Kongo, Bank Perdagangan dan Kredit Kongo, Bank Tabungan Kongo, Bank Sentral untuk Perkembangan Negara-negara Afrika Tengah, Bank Sentral Afrika, dan Bank Sentral Afrika.

Kata Kunci: Pengawasan Keuangan, Indeks Regulasi Keuangan, Sistem Regulasi, Analisis Komponen Utama.

JEL: G2; G21

To cite this document: Issie, F. M. (2023). Regulation of the Financial System in the Republic of Congo. *JJET (Journal Ilmu Ekonomi dan Terapan)*, 8(2), 297-311. <https://doi.org/10.20473/jjet.v8.v2.47074>

Introduction

The Republic of Congo, or Congo-Brazzaville, is a member of the six countries of the Central African Economic and Monetary Community (CEMAC). In 2007, the financial markets and financial institutions in Congo-Brazzaville experienced many problems. High-end finance appears to be an engineering game with high systemic risk financial institutions, where profits and losses can be large (due to so-called leverage) and where the failure of a few large financial systemic institutions (investment banks, securities firms, insurance companies) whose failure could cause serious damage to the global economy. Subprime lending based on subprime mortgages appears profitable for those who can charge upfront fees. The deeper roots of the crisis may lie in the development of the financial markets in the Republic of Congo since the 1980s. Banks held deposits in the traditional Congolese financial market, collected savings, and provided loans. Voluntary and mutual self-regulation is necessarily involved and easily explained, as banks lend to each other. Every bank in Congo is willing to do so as long as it is convinced that another bank is not taking too much risk in its financial operations. Whether a bank should take more risk than its acceptable peers would no longer qualify for interbank lending. A “modest” form of supervision would suffice in such a self-regulatory system. The financial markets in the Republic of Congo have changed dramatically in recent years. New financial institutions have emerged to handle banking, insurance, and securities operations. Hedge funds, investment banks, and similar institutions deal with innovative and highly leveraged financial products. In this heterogeneous system of traditional and innovative banks, the lack of self-regulation can easily undermine mutual trust. Once trust is lost, financial markets will stop lending. This has devastating effects on an economy that depends on credit for growth.

The Republic of Congo has met on reforms to revise the Republic of Congo’s financial governance system. It seeks to establish a Republic of Congo early warning system to identify and mitigate future risks, effective cross-border oversight of large Republic of Congo firms, and mechanisms for cooperation and coordinated action in the event of a crisis. This paper examines the position of intergovernmental and governmental agencies in the supervision of financial markets. This paper argues that the 2008 financial crisis also exposed a crisis in Congolese institutions responsible for financial market regulation and that a dedicated international and national oversight system is necessary and politically feasible. We explore this approach, using non-equilibrium theory to construct the conditions for a stable international financial system. Financial development: One of the profound changes in development economics in recent decades has been the renewed interest in, and growing contribution to, the role of the financial system in economic development. While there are clear positive effects between financial depth and economic growth, the factors determining financial development and how financial markets develop are not yet fully understood.

Analyzes the changes in systemic banking risks in the Republic of Congo after 2008 from a legal perspective and argues that the key points of its reform are institutional restructuring and power strengthening. summarizes the new structure of systemic financial institution regulatory reform in the post-crisis era in Congo, pointing out that the reform focuses on two main axes: adjusting the traditional strict sectoral regulatory model and expanding the regulatory authority of financial institution regulators, and the reform of the sectoral regulatory model reflects the transformation of the Republic of Congo from sectoral regulation to a target regulatory model. Systematically analyzes the evolution and systemic importance of the legal system for regulating financial institutions in the Republic of Congo from a financial law perspective. The Economic and Monetary Community of Central Africa (ECCAM), where Congo is located, is a former French colony, and its regulatory system for financial institutions is modeled on that of France, which is currently unmodified. In the current economic and monetary crisis context, there are increasing demands for monetary and banking systemic risk reforms. Based on the above analysis, this paper examines the changes in the systemic risk of banks in Congo based on the latest developments in the systemic analysis of banks contributing to the regulation of financial institutions in Congo, which can not only improve the understanding of and the system of banking institutions in Central Africa but also shed light on the reform of the regulatory system of systemically important banking institutions in less developed regions. Based on the above, we can understand that the risk of failure posed by the double-edged sword of the banking system needs to be studied in conjunction with theoretical and empirical evidence.

Finally, we will propose policy measures to prevent and control systemic risks so that the banking system can serve the Republic of Congo's economy more safely and effectively. The focus is on the general framework. Should the Republic of Congo's regulators adapt to the complexity of international financial markets, or does the Republic of Congo need international regulators? To what extent are the regulators of Congolese financial institutions prepared to deal with fluid global financial markets? If the Republic of Congo regulators are to be held accountable, which the Republic of Congo institutions are competent and contributing to the financial system? The rest of our paper will be conducted at three levels: the literature review, the methodology, the discussion, conclusion and recommendation,

Literature Review

The financial system includes the banking sector, other financial intermediaries, financial markets, and the systemic risk that arises from certain events in the financial system, which often occurs if no appropriate countermeasures are taken. The financial system faces several types of risk: Credit risk or default risk, interest rate risk, which corresponds to the random nature of income and returns associated with variations in interest rates. and returns associated with changes in interest rates; market risk, which is induced by the instruments that banks create to protect themselves against credit risk. Systemic risk is not only a financial risk but also a normal financial shock that has a negative impact on the real economy. A strong negative externality that destroys the financial system causes an economic shock that translates into a systemic shock. Externalities are an important definition of systemic risk; systemic risk occurs first in the financial system and then in the economy. [Bris and Cantale \(2004\)](#) use a system in which there is control between the regulator and the bank and an agency problem between the actor and the bank. From a macroprudential perspective, individual institutions may appear sound, while the financial system as a whole is unsound. Several authors are concerned with the regulation of the financial system and, more specifically, the role of banks in the economic development process of a country. [Acharya \(2009\)](#) relates

systemic risk to regulatory theory. According to the former Banking Commission, systemic risk is defined as the failure of one large institution, leading to the failure of others and causing severe disruptions in the banking and financial system through contagion effects. Systemically important financial institutions (SIFIs) are typically required to maintain a limited capital buffer to respond to severe financial conditions, with advice on identifying SIFIs, assessing metrics, and strengthening supervision. Collaborate with other international and national financial institutions to improve the identification of SIFIs. Inspect, monitor, and manage systemically important financial institutions (SIFIs). Systemically important financial institutions (SIFIs) will have identification, supervision, and policies. Systemically Important Financial Institutions (SIFIs), sets out several policy measures for systemically important financial institutions.

The regulation of the financial system can arise from a contagion triggered by exogenous or endogenous shocks to the financial cycle through the interaction of credit and asset price movements. The European Central Bank defines systemic risk as the risk of financial instability, the propagation of which could disrupt the functioning of the financial system to the extent that economic growth and welfare could be seriously jeopardized. [Mishkin \(1995\)](#) defines systemic risk as the possibility of sudden, unforeseen events in financial markets that prevent the effective transmission of information through channels. As a result, market participants cannot use the channels to finance and identify investment opportunities effectively.

The financial system is the component of a country's financial and monetary system. The financial system consists of markets and institutions designed to transfer funds from lenders to borrowers through direct and indirect financing ([Cargill, 2017](#)). According to [Santos \(2001\)](#), there is a risk of systemic crisis and the inability of savers to control banks. [Acharya \(2010\)](#) approach uses stock returns as a theoretical basis for measuring systematic risk. [Freixas et al. \(2000\)](#) model systemic risk in the interbank market. They find interbank credit lines can cope with liquidity shocks while reducing reserve costs. The premium banks must pay in the M&A mechanism to obtain Too-big-to-fail status in the context of the Too-big-to-fail problem. In their review of measures of systemic financial risk, [Borri and Di Giorgio \(2021\)](#) also find that large banks contribute more to systemic risk. [Thomson \(2009\)](#) The stability of a systemic financial institution directly affects the entire financial system, the institution's importance should be measured, and many other factors besides size must be considered, such as complexity, correlation, etc. [Cont et al. \(2013\)](#) analyze a banking network's response to an institution's failure from a non-equilibrium context. [Lehar \(2005\)](#) defines a systemic crisis as an event in which many financial institutions fail simultaneously. [Adrian & Brunnermeier \(2011\)](#) uses the financial system's conditional value at risk (CoVaR) to assess systemic risk, showing that the CoVaR approach can assess a financial institution's overall systemic risk contribution and the contagion effect of risk in the financial network. [Wagner \(2010\)](#) and [Ibragimov et al. \(2011\)](#) argue that diversification can reduce firm-specific idiosyncratic risk but increase the risk of systemic failure. [Chen et al. \(2021\)](#) find that stringent banking regulation exacerbates banks' capital shortages, increasing systemic banking risk. [Lehar \(2005\)](#) proposed the probability of default of financial institutions based on the Merton model as a measure of systemic risk. [Martinez-Jaramillo et al. \(2010\)](#) argue that the main cause of default risk generation is the contagion effect, where the risk of one bank can be transmitted to the entire banking system through interbank lending linkages and is the root cause of risk generation. [Zhang et al. \(2021\)](#) studied the impact of bank liquidity creation on systemic risk using a sample of Chinese listed banks and found that large liquidity creation increases systemic risk. other study argued that a countercyclical mechanism should be established to reduce systemic financial system risks.

On the other hand, there is study elaborated that the financial system regulatory framework emphasizes the coordination among the central bank, CBRC, CIRC, SEC, and other departments in terms of regulation so that the implementation of policies can achieve the desired effect. Quantitatively analyzed the systemic risk and risk volatility of 18 large U.S. banks by studying the relationship between financial system regulation and systemic risk. The third method [Gonzales-Hermosillo \(1999\)](#) uses is comparing the bank's liability coverage ratio with a given threshold. These failures lead to the need to regulate the system and ensure compliance. The G20 has put the issue of systemic institutions on the agenda of financial regulators, calling for introducing specific standards commensurate with the likely cost of failure to regulate the activities of the largest financial institutions. The aim is clearly to end the moral hazard associated with institutions that are too large or interconnected because of the risks they pose to the financial sector and the real economy. [Dowd \(1996\)](#); [Santos \(2001\)](#) are other proponents of bank regulation who argue that free markets allow banks to behave optimally and, therefore, do not require regulation. The 2010 Basel Accord imposed stricter capital adequacy requirements on banks, increasing their ability to respond to systemic crises and thus reducing their credit capacity. Combined with complex financial instruments, banks accumulate a high potential for systemic financial risk in times of economic crisis. [Bris and Cantale \(2004\)](#) use a system in which there is control between the regulator and the bank and an agency problem between the actor and the bank.

Data and Research Method

The research in this paper adopts a comprehensive analytical approach, which consists of the following: First, this paper adopts the literature search method to collect the relevant literature on the theory of systemic risk contribution of banks in Congo and the regulation of systemic financial institutions (SIFIs) in Congo and the EU and adopts the logical reasoning and inductive method to sort out the relevant data in the literature, argue the problems related to the regulation of systemic risk contribution of banks, and propose corresponding countermeasures. Second the comparative method. Based on the system of assessing the effectiveness of the systemic risk contribution of banks, the principal component analysis is used to conduct a comparative analysis of the effectiveness of the supervision of financial institutions in Congo to identify the commonalities and differences in the systemic risk contribution of banks and their effectiveness in Congo and reveal the reasons for them. Systemic financial institutions aim to increase their capacity to absorb losses and reduce their likelihood of insolvency in the event of a financial institution crisis in the Republic of Congo. Third, the systemic risk of banking institutions is measured by constructing a GARCH-CoVaR model, which measures the systemic risk of financial institutions, and constructing a GARCH model can better measure the contribution of systemic risk in the Congolese banking system.

Model

GARCH-CoVaR model-based assessment of risk contribution of Congolese banks

Building the CoVaR model Traditionally, value-at-risk (VaR) is the main method to assess market risk, which represents the maximum loss of an asset or portfolio over some time in the future. The condition of risk assessment (CoVaR) is mainly used to determine the risk weight of the entire financial system when a financial institution is in crisis. In this way, it is the systemic financial institution in crisis that generates the key element of propagation strength. We can compare the risk propagation of the two banks to build the basis of the CoVaR model and briefly describe it as follows:

A regression model at the 1-q confidence level for financial institution i on financial institution, j is established to examine the risk externalities of financial institution i on financial institution j. The quantile regression model equation is:

$$R_q^j = \alpha + \beta R_i + \varepsilon \quad (1)$$

from VaR we obtain:

$$VaR_q^j = \alpha + \beta R_i \quad (2)$$

From CoVaR it can be obtained that for bank j, the loss degree in the bank is VaR, then it can be seen that the conditional value at risk at the 1-q confidence level is

$$P(X^j \ll CoVaR_q^{j/i} | X^i = VaR_q^i) = q \quad (3)$$

In kicking out bank j's own risk, the value of spillover risk can be obtained as:

$$\Delta CoVaR_q^{j/i} = CoVaR_q^{j/i} - VaR_q^i \quad (4)$$

If the contribution of individual financial institutions to the degree of systemic risk, the model is changed to:

$$\Delta CoVaR_q^{sys/i} = CoVaR_q^{sys/i} - VaR_q^{sys} \quad (5)$$

CoVaR is calculated for systemic financial institutions in Congo-Brazzaville and modeled using the GARCH model as follows:

$$\begin{aligned} R_t^j &= \gamma^j + \alpha_p^j A_p(L) R_{t-1}^j + \alpha^j S_{t-1} + b_q^j B_q(L) \varepsilon_t \\ \alpha_t^2 &= \delta + \beta_0^j \varepsilon_{t-1}^2 + \beta_1^j \alpha_{t-1}^2 + \beta_2^j S_{t-1}^2 \end{aligned} \quad (6)$$

where R_t^j is the stock return of j, α_t^2 is the variance and $A_p(L)$ and $B_p(L)$ is the lag factor and S_{t-1} is the state variable. Therefore, the maximum loss of systemic financial institutions in

Republic of Congo is : $VaR_{q,t}^j$:

$$VaR_{q,t}^j = \hat{R}_t^j + Q(q) \hat{\alpha}_t \quad (7)$$

as the significance criterion is -1.645 at 5% level of significance. Similarly extending the GARCH model between two in republic of Congo systemic financial institutions and adding as an influence factor, one obtains :

$$\begin{aligned} R_t^{sys} &= \gamma^{sys} + \alpha_p^{sys} A_p(L) R_{t-1}^{sys} + \theta^{sys/j} R_t^j + a^{sys} S_{t-1} + b_q^{sys} B_q(L) \varepsilon_t \\ \rho_t^2 &= \delta^{sys} + \beta_0^{sys} \mu_{t-1}^2 + \beta_1^{sys} \rho_{t-1}^2 + \beta_2^{sys} S_{t-1} \end{aligned} \quad (8)$$

Empirical Test

First, the return is defined by taking the first-order difference of the daily closing price and then reducing it to a percentage form.

$$R_t = 100\% h (p_t / p_{t-1}) \quad (1)$$

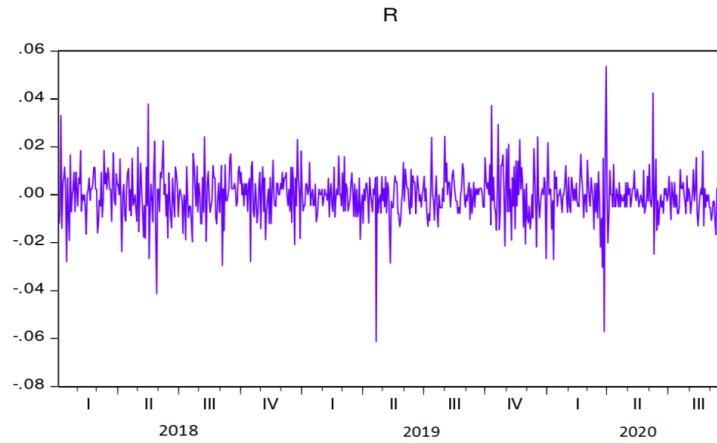


Figure 1: Graph of the Fluctuation of the Yield Series of Bank of Central African States in Congo

The test results show that all return data reject the initial hypothesis at 95% and 99% confidentiality levels, and the return time series data are considered regularized. They can be directly used to build GARCH and CoVaR models. Here, the regularization is examined for the Central African National Bank component of Congo. The figure below shows the return volatility of the Congo branch of the Bank of the State of Central Africa, for which a square root test was performed, with the following results. The table shows that the data is smooth at a 99% confidence level.

Table 1: Smoothing Test

Null Hypothesis: R has a unit root				
Exogenous: None				
Lag Length: 0 (Automatic - based on SIC, maxlag=19)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			-29.9524	0.0000
Test critical values:	1% level		-2.568237	
	5% level		-1.941272	
	10% level		-1.616398	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(R)				
Method: Least Squares				
Date: 01/22/20 Time: 22:28				
Sample (adjusted): 1/05/2018 9/19/2020				
Included observations: 707 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
R(-1)	-1.118758	0.037351	-29.95242	0.0000
R-squared	0.559615 Mean dependent var		2.87E-05	

Before establishing the GARCH, the AIC and SIC information criteria are tested, and the lag order (p,q) is judged to be (1,1) more appropriate. After simulation using Eviews 7.0, the contribution of each bank to systemic risk is obtained. And using the relative indicator i.e., the specific statistical results are shown in the table 1.

Table 2: Systematic Risk Contribution of the GARCH-Covar Model for Listed Banks in Congo

Banks	$100\% \Delta CoVaR_{q,t}^{sys/i}$
Bank of Central African States of Congo	21.56%
Bank of Congo	28.20%
Congo Commercial Credit Bank	28.84%
Congo Debt Bank	27.60%
Central African States Development Bank	18.71%
Sino- Congolese Bank for Africa	16.43%

Finding and Discussion

This paper uses market price data to build a dynamic CoVaR model to examine the systemic risk present in Congolese commercial banks was found after the implementation of a risk control system that:

(1) The systemic importance contribution of these banks is high, especially for BOCA and Banque du Congo, which have a much higher systemic impact than other banks, and the risk spillover and contagion effects are smaller for medium-sized joint-stock banks.

(2) The traditional approach to systemically important commercial banks generally uses size as the main measure of balance sheet and assets. Still, analysis of the data suggests that while the size is a dominant factor, financial institution-specific risks (manifested as $VaR_{q,t}^j$) also significantly impact systemic risk.

(3) Although there is much behind commercial banks that do not meet traditional criteria, data analysis suggests that size is the determining factor for the four major systems.

Empirical Test

Six banks that occupy the main banking operations in Congo were selected and analyzed based on financial data for the fiscal year 2020; the six banks, specifically the Banque des Etats d'Afrique Centrale, Banque du Congo, Banque du Commerce et de Cr dit du Congo, Banque des Debts du Congo, Banque de D veloppement des Etats de l'Afrique Centrale, and Banque Centrale Africaine. Since all indicators of the financial system have different units and measures, they had to be processed for uniform measurement. First, they are normalized by transforming all financial data with different criteria into dimensionless indicators on a closed interval [0, 1]. The normalization treatment used in this study is linear, i.e., the difference between each indicator value and the minimum value of that group of indicators.

$$Y_i = \frac{X_i - \min(X_i)}{\max(X_i) - \min(X_i)}$$

The following results were obtained:

Table 3: Results of The Evaluation of the Congo Systemically Important Bank Indicator Methodology

Sort by	Banks	Scale	Relevance	Irrelevance	Complexity	Summation
1	Central African State Bank of Congo	0.0025	0.190261	0.25	0.216193	0.906453
2	Bank of Congo	0.00172205	0.247916	0.170654865	0.156982	0.757758
3	Congo Commercial Credit Bank	0.18218	0.085591	0.175636219	0.088956	0.218681
4	Congo Debt Bank	0.057064	0.054167	0.051379035	0.05607	0.166593
5	Central African Bank for National Development	0.026503	0.080783	0.020185864	0.039121	0.129854
6	Sino- Congolese Bank for Africa	0.033217	0.024773	0.036033199	0.035831	0.107492

It is clear from the results that the Bank of Central African States of Congo, Bank of the Congo, and Bank of Trade and Credit of Congo have much higher systemic importance than other commercial banks, with the BND branches scoring highest on two indicators: size and irreplaceability. Absolute systemic importance. Congolese banks have a high correlation index, which generally pushes up their overall systemic importance assessment. After considering the operations carried out, the Bank of the Congo can surpass the Bank of Central African States in terms of systemic importance, which explains why the Bank of the Congo's name is the first to appear on the list of global systemically important banks. Banque du Congo, the Development Bank of the Central African State, and the Central African State are also potentially systemically important financial institutions.

Table 4: Indicator Framework for Financial Regulation in Congo-Brazzaville

Tier 1 indicators	Secondary indicators
Financial stability	GDP growth rate (x1)3
	Inflation rate (x2)4
	Real Effective Exchange Rate Index (x3)6
	Percentage of M2/GDP (x4)5
Financial development	Bank capital margin (ROE) (x5)11
	Private sector credit as a percentage of GDP (x6)2
	Bank capital to asset ratio (x7)12
	Bank non-performing loan ratio (x8)1
Consumer Protection	Stock exchange market capitalization as a share of GDP (x9)7
	Level of rule of law (x10)10

This paper develops 10 financial regulatory indicators to construct the financial system's regulatory framework in Congo-Brazzaville to measure the level of financial regulation in Congo-Brazzaville.

Table 5: Raw Data Table for Financial Regulation Indicators

Variable	2014	2015	2016	2017	2018	2019	2020	2021
X1	2.234	2.078	1.762	1.755	1.892	2.156	2.259	2.771
X2	1.245	3.781	1.964	1.846	3.956	4.269	-0.033	3.245
X3	102.456	103.462	101.359	100.596	107.264	110.952	116.492	109.546
X4	143.954	146.248	144.648	145.159	139.416	130.846	160.746	177.136
X5	0.101	0.127	0.120	0.146	0.177	0.235	0.356	0.364
X6	125.146	122.795	118.896	117.318	109.463	99.845	119.256	129.246
X7	3.230	3.230	3.230	3.400	3.120	2.960	2.880	2.780
X8	21.400	12.200	10.100	8.459	7.624	4.325	3.246	3.250
X9	24.156	38.746	30.569	58.613	101.698	156.849	187.631	159.162
X10	-0.567	-0.463	-0.423	-0.563	-0.432	-0.501	-0.513	-0.519

This paper combines the empirical analysis methods of financial regulation. The literature research found that there are principal component analysis, weighted average method, hierarchical analysis, and so on to analyze the financial regulatory indicator system. Among them, the idea of principal component analysis is to simplify several comprehensive indicators through dimensionality reduction of multiple indicators with correlation, and there is no correlation between the simplified, comprehensive indicators while being able to retain all the information reflected in the original data. Therefore, this paper will take the principal component analysis, combined with the available data, the use of SPSS to standardize the data, and conduct empirical analysis.

Table 6: Data Correlation Coefficients For Financial Regulatory Indicators

		Correlation									
	X1	X2	X3	X4	X5	X6	X7	X8	X9	X10	
X1	1	0.672	0.362	0.640	.993**	0.724*	0.965**	0.789*	-.771*	.992**	
X2	0.672	1	0.667	0.646	0.635	0.724*	0.724*	0.633	-.768*	0.648	
X3	0.362	0.667	1	0.585	0.335	0.738*	0.563	0.687	-.772*	0.346	
X4	0.640	0.646	0.585	1	0.612	0.955**	0.734*	0.714*	-0.923**	0.609	
X5	0.993**	0.635	0.335	0.612	1	0.687	0.964**	0.735*	-0.736*	0.999**	
X6	0.724*	0.724*	0.738*	0.955**	0.687	1	0.828*	0.872**	-0.992**	0.686	
X7	0.965**	0.724*	0.563	0.734*	0.964**	0.828*	1	0.833*	-0.873**	0.964**	
X8	0.789*	0.633	0.687	0.714*	0.735*	0.872**	0.833*	1	-0.898**	0.733*	
X9	-0.771*	-0.768*	-0.772*	-0.923**	-0.736*	-0.992**	-0.873**	-0.898**	1	-0.737*	
X10	0.992**	0.648	0.346	0.609	0.999**	0.686	0.964**	0.733*	-0.737*	1	

**Significant at the 0.01 level (two-tailed).

* Significant at the 0.05 level (two-tailed).

From the matrix of correlation coefficients of the 10 indicators, we can see that the correlation between the indicators is strong, so we need to analyze the data of these indicators by principal component analysis and perform dimensionality reduction to get the valid indicator data.

Therefore, we can say that there is a correlation between the variables and all the variables seem to have minimal or slight correlation.

Table 7: Total Variance Explained

Component	Initial Eigenvalues			Extracted load sum of squares			Rotated Load Sum of Squares		
	Total	Variance Percentage Cumulative	Cumulative %	Total	Variance Percentage Cumulative % Total	Cumulative %	Total	Variance Percentage Cumulative % Total	Total
1	7.756	77.562	77.562	7.756	77.562	77.562	4.627	46.267	46.267
2	1.274	12.745	90.307	1.274	12.745	90.307	4.404	44.040	90.307
3	0.473	4.729	95.036						
4	0.354	3.539	98.574						
5	0.138	1.384	99.958						
6	0.003	0.025	99.984						
7	0.002	0.016	100.000						
8	1.090E-16	1.090E-15	100.000						
9	-2.439E-16	-2.439E-15	100.000						
10	-8.513E-16	-8.513E-15	100.000						

This paper analyzes the results of the total variance explained about the raw data through the SPSS software, giving the variance contribution and cumulative contribution of each indicator, as well as the sum of the squares of the loadings of the indicator of each indicator after the rotation of the maximum variance, The table shows the degree of information represented by each component variable, with the first component accounting for 77.562% of the total information and the second component accounting for 12.745% of the total information. This table shows that only the first 2 eigenroot components are greater than 1. Thus, in this paper, we need to extract the first two principal components just, and the variance contribution of the first two of them can reach 90.307% of the information. Next, we analyze the rotated factor loading matrix.

Table 8: Component Matrix after Rotation

	Component	
	1	2
Zscore(X5)	0.956	0.286
Zscore(X10)	0.952	0.292
Zscore(X1)	0.941	0.336
Zscore(X7)	0.844	0.518
Zscore(X3)	0.054	0.915
Zscore(X6)	0.470	0.857
Zscore(X9)	-0.520	-0.847
Zscore(X4)	0.417	0.785
Zscore(X8)	0.571	0.703
Zscore(X2)	0.464	0.676

Extraction method: principal component analysis. Rotation method: Kaiser normalized maximum variance method.

a. The rotation has converged after 3 iterations.

This matrix gives us information about the two (2) reserved components. From the rotated component matrix, we can see that the first common factor, or the first component, has large loadings in x5, x10, x1, and x8, which indicates that the financial stability indicators and developmental indicators are mixed and can be interpreted as the overall financial situation, whereas in the second common factor x3, x6, x7, and x8 have large loadings and can be interpreted as the financial developmental indicators. It can be found that financial stability indicators are weakly represented in the financial regulatory system.

Table 9: Principal Components and Composite Scores

Year	2014	2015	2016	2017	2018	2019	2020	2021
fac1_1	0.91884	0.36297	1.27215	-0.23295	-1.90123	-0.74979	0.41001	-0.08001
fac1_2	0.75957	0.89172	0.49193	0.56698	0.73462	-0.67399	-1.72583	-1.045
Overall score	0.839205	0.627345	0.88204	0.167015	-0.583305	-0.71189	-0.65791	-0.562505

The table shows the change in the frequency of regulatory intentions of the Congolese financial system from 2014 to 2021, and the numbers represent the scale factors we had to calculate. The general trend of the financial regulation index in the Republic of Congo is a downward trend over time but gradually recovers in 2021. This indicates that the level of financial regulation in the Republic of Congo is in a precarious state, with problems such as weak regulation and lax regulation.

Discussion

The purpose of this study is to collect literature on the institutional theory of the regulation of systemically important financial institutions in Congo-Brazzaville using a literature search. First, the systemic environmental policy of banking in Congo (Brazzaville) is still weak, and this system is linked to the financial and banking system in Central Africa. The banking system in the Republic of Congo is dominated by several large (and sometimes foreign) banks. Of these, foreign banks account for more than 60% of banking operations, and the perception of urban residents is in the form of automatic variables. Therefore, in the first section of this chapter, an analytical assessment of the banking risk contribution of Republic of Congo banking institutions, mainly the six largest banks, based on GARCH and CoVaR models will be conducted to determine whether they can be analyzed as systemic financial institutions. These six banks were selected as the sample for the empirical analysis of this paper, including the Central African State Bank of Congo, the Bank of Congo, the Congo Commercial Credit Bank, the Congo Debt Bank, the Central African Bank for National Development, and the Bank of Central Africa. The normalization treatment used in this study is a linear treatment, which is the difference between the value of each indicator and the minimum value of that group of indicators. Since the subject of this paper is a country, it should contain at least three levels of indicators of the financial regulatory system. Based on the analysis, a total of 10 financial regulatory indicators were developed to construct a systematic regulatory framework for measuring the level of financial regulation in the Republic of Congo banks.

Conclusion

This paper is divided into five chapters. The first chapter is an introduction, which sets out the background and significance of the paper, as well as the content and methodology of the study. Section 2 is a review of the literature the results of the current research on the regulation and development process of systemic banking institutions. Section 3 focuses

on the methodology's current situation and problems in the regulation of systemic banking institutions in the Republic of Congo. Starting from the problems, this paper's main research constructs 6 indicators of banking risk institutions. It uses principal component analysis to derive two principal components that span financial development objectives, financial stability, and protection of banking institution holders. These two principal components were tested to reflect that Congo's systemically important bank risk contribution can effectively achieve financial institutions' regulatory objectives and contribute to the future development of the financial sector in the Republic of Congo. The analysis shows that the systemic risk of financial institutions in the Republic of Congo is weak and that there is no comprehensive financial institution regulatory system to achieve financial stability and development objectives. Therefore, this paper ensures the stability of the financial market by constructing a financial supervision system to implement real-time monitoring of financial market dynamics, identify problems promptly, and develop improved measures. This system has helped to clean up and stabilize the banking sector in the Republic of Congo.

Furthermore, the size and structure of the banking institution system show that, despite the financial integration of the Republic of Congo, there are significant differences in the regulation of the financial system from country to country. This phenomenon can be highlighted by the few indicators we have chosen. However, the banking regulatory reform measures in the Republic of Congo do not allow for the complete elimination of systemic risks in the financial sector. With a very weak financial system, the Republic of Congo should draw on international experience and focus on the following areas, starting with the establishment of macro-prudential requirements: focus on risk factors that may affect the stability of the banking system as a whole, starting with macro-prudential requirements, and adopt a more comprehensive approach. Focus on the supervision of systemic financial institutions and broaden the scope of supervision to ensure a more comprehensive perspective on systemic risk across the CMB market. Another solution is to improve the risk management capacity of financial institutions by strengthening banking infrastructure and improving the management capacity of systemic risk regulators and supervisors. This paper uses the GARCH-CoVaR function and principal component analysis.

Recommendation

The Congo is still far from having a solid systemic risk monitoring and assessment system. Furthermore, the specific nature of financial market development makes replicating the regulatory and risk assessment mechanisms of developed countries in Europe and the US difficult. On this basis, we should also focus on the following points in the future development process. These are regulatory and institutional reforms to ensure sound banking regulation and supervision. A representative bank, such as a central bank that cannot fail, should take the lead in regularly studying the main issues of the banking supervision sector in the Republic of Congo, coordinating and communicating with each other, conducting supervision, clarifying the supervisory responsibilities of different entities and solving the problems of policy coordination and cooperation in the supervision process. Institutions such as the Basel Committee, the IMF, and the EU have developed standards and comprehensive supervisory programs to identify and govern systemically important banks. I Establish and improve the regulatory and response mechanisms for systemic risk in banks. First, the mechanisms inherent in the pro-cyclicality of the Congolese banking system need to be further examined, and appropriate counter-cyclical regulatory mechanisms must be established. In the banking system, while the emergence of risks often occurs during economic down cycles, the accumulation of risks often ends when the economy collapses. Relevant laws and regulations should be introduced soon to cover

financial activities strictly, coordinated, and comprehensively. Rules for implementing laws and regulations on the regulation of financial institutions should be formulated as soon as possible to improve operability and protect public rights. Second, improve and develop regulatory methods. Using advanced internet technology, expertise, and acquired information, we will assess the latest trends and key areas of systemic risk, enter an early warning state, properly guide the financial behavior of financial institutions, and form an organic combination of systematic supervision of financial institutions and financial innovation. Banking institutions in the Republic of Congo need to be strengthened to prevent systemic banking risks and reduce the impact of financial crises on the economy. In terms of effective disposal mechanisms, the Republic of Congo should draw on relevant international standards and the successful experience of systemic banking institutions to establish and improve disposal mechanisms.

References

- Acharya, V. V. (2009). A theory of systemic risk and design of prudential bank regulation. *Journal of financial stability*, 5(3), 224-255.
- Adrian, T., & Brunnermeier, M. K. (2011). *CoVaR*. NBER Working Paper No. w17454.
- Borri, N., & Di Giorgio, G. (2022). Systemic risk and the COVID challenge in the European banking sector. *Journal of Banking & Finance*, 140, 106073.
- Bris, A., & Cantale, S. (2004). Bank capital requirements and managerial self-interest. *The Quarterly Review of Economics and Finance*, 44(1), 77-101.
- Brunnermeier, M. K., Dong, G. N., & Palia, D. (2020). Banks' noninterest income and systemic risk. *The Review of Corporate Finance Studies*, 9(2), 229-255.
- Cargill, T. F. (2017). *The financial system, financial regulation and central bank policy*. Cambridge university press.
- Chen, L., Li, H., Liu, F. H., & Zhou, Y. (2021). Bank regulation and systemic risk: cross country evidence. *Review of Quantitative Finance and Accounting*, 57(1), 353-387.
- Cont, R., Mossa, A., & Santos, E. (2013). Network structure and systemic risk in banking systems. In J. Fouque & J. Langsam (Eds.), *Handbook on Systemic Risk* (pp. 327-368). Cambridge University Press.
- Dowd, K. (1996). *Competition and Finance: A Reinterpretation of Financial and Monetary Economics*. Springer.
- Freixas, X., Parigi, B. M., & Rochet, J. C. (2000). Systemic risk, interbank relations, and liquidity provision by the central bank. *Journal of Money, Credit and Banking*, 32(3), 611-638.
- Gonzalez-Hermosillo, M.B. (1999). *Developing Indicators to Provide Early Warnings of Banking Crises*. *Finance & Development*, 36(002), 36-39.
- Ibragimov, R., Jaffee, D., & Walden, J. (2011). Diversification disasters. *Journal of financial economics*, 99(2), 333-348.
- Lehar, A. (2005). Measuring systemic risk: A risk management approach. *Journal of Banking & Finance*, 29(10), 2577-2603.

- Martínez-Jaramillo, S., Pérez, O. P., Embriz, F. A., & Dey, F. L. G. (2010). Systemic risk, financial contagion and financial fragility. *Journal of Economic Dynamics and Control*, 34(11), 2358-2374.
- Mishkin, F. (1995). Comment on Systemic Risk. *Research in Financial Services: Banking, Financial Markets, and Systemic Risk*. Greenwich, CT: JAI, pp. 31–45.
- Santos, J. A. (2001). Bank capital regulation in contemporary banking theory: A review of the literature. *Financial Markets, Institutions & Instruments*, 10(2), 41-84.
- Thomson, J. B. (2010). On systemically important financial institutions and progressive systemic mitigation. *DePaul Bus. & Comm. LJ*, 8(2), 135-150.
- Wagner, W. (2010). Diversification at financial institutions and systemic crises. *Journal of financial intermediation*, 19(3), 373-386.
- Zhang, X., Fu, Q., Lu, L., Wang, Q., & Zhang, S. (2021). Bank liquidity creation, network contagion and systemic risk: Evidence from Chinese listed banks. *Journal of Financial Stability*, 53, 100844.