

## Article

# Analysis of Systemic Risk on the Financial Performance during the COVID-19 Pandemic: The Case of the Colombian Banking Industry

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**Abstract:** This study seeks to analyze the financial performance of the Colombian banking industry during the COVID-19 pandemic. The frame of reference is based on the concept of systemic risk; concerning this, the pandemic is conceived as an external shock, which impacted the dynamics of the banking industry. To conduct this study, a descriptive-correlational scope is proposed, from which an analysis of different accounting items related to the banking business is made and validated by expert judgment. The analysis horizon covers six years, but the focus is placed on March 2020, when COVID-19 was declared a pandemic by the World Health Organization (WHO). For this purpose, a longitudinal design is proposed, which analyzes the time series describing the behavior of some relevant items in the management of the banking business, such as operating revenue, provisions, interest on deposits and drawings, valuation of trading derivatives, and technology-related expenses. In addition, these items' correlation with banking establishments' performance is analyzed. The results of the study show that during the pandemic period, there was a significant increase in the level of volatility in the foreign exchange market, which impacted the operating revenue of banking establishments. It is concluded that, although exchange rate volatility affected the results of the banking industry, the main factor related to the financial performance of Colombian banks is their business itself, i.e., revenue from the loan portfolio and the quality of the loan portfolio. Therefore, systemic risk must be addressed regarding its implications on banks' main profit drivers, such as portfolio revenue, cost of deposits, and provisions. Based on the above, it is recommended that Colombian banking establishments make greater efforts to diversify their sources of income to reduce their exposure to systemic risk situations.

**Keywords:** banking establishments; financial results; pandemic; COVID-19; financial derivatives; systemic risk



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## 1. Introduction

The Colombian banking sector has been characterized by its solidity and relevance for the development of the country's productive apparatus. However, during the last five years of the 2010–2020 decade, the sector was involved in a period of relative stagnation, which contrasts with the accelerated growth observed during the first years of the new millennium. This deceleration process is explained by fiscal austerity, the fall in commodity prices, and especially the fall in oil prices, which has had significant repercussions in Colombia, given its excessive dependence on revenues from the mining-energy sector [1]. This was followed by the pandemic period, which generated the worst recession in Colombian history [1]. Central banks had to adopt measures to cope with the effects of the crisis.

In the Colombian case, these were countercyclical measures aimed at favoring economic reactivation. The other factor of concern was the excessive volatility in the markets, especially the foreign exchange market. During the COVID-19 pandemic, central banks intervened in foreign exchange markets to improve liquidity and limit volatility [2]. In Latin America, and particularly in the case of Colombia, foreign exchange swap programs were expanded, and forward non-delivery operations were carried out to reduce exposure to foreign exchange risk [2].

The economic and social consequences of the COVID-19 pandemic were the order of the day; therefore, Colombian banks had to adopt some relief measures to cope with the deterioration of the financial capacity of their customers. In the Colombian case, benefits had to be granted to more than 11 million debtors with credits equivalent to 20.89% of the GDP [3]. Most of these benefits were assigned to the commercial portfolio (credit for companies) and the consumer portfolio (purchases of goods and services). Based on information reported by financial institutions in December 2021, an approval rate of 86.1% is evidenced, which demonstrates the appetite for risk and the willingness of banks to finance business activities [4].

Relief measures and governmental policies implemented during the pandemic were crucial to mitigate the negative impact on the financial sector [5]. In this scenario, the Financial Superintendency of Colombia issued External Circular 022 of 2020, in which instructions were given to credit institutions regarding risk management and attention to debtors. The circular establishes some guidelines such as the Debtor Assistance Program (PAD), which requires credit institutions to adopt measures to provide structural solutions to debtors affected by COVID-19. In addition, it establishes the possibility of creating a General Interest Provision on the interest accrued and not collected during the grace periods and extensions granted. Due to the above, an increase in the portfolio at risk was revealed during March 2020, which was considerably greater than expected, as well as an increase in the probability of intervention by the regulator during April 2020 [6]. This situation influenced banks' solvency levels, which may have led to distrust on the part of market agents and affect credit ratings.

The COVID-19 crisis led banking establishments to put their financial platforms at the service of the assistance programs implemented by the government; for example, the government contracted Davivienda, Colombia's third largest bank, to manage the payment of Familias en Acción, a benefit targeted at the poor and vulnerable population. Beneficiaries withdraw the money through a mobile application, for which they can present the code at one of the bank's branches through one of its correspondents [7]. In addition, it stands out among the strategies of Colombian banks to face the crisis, such as accelerating credit disbursements, improving service delivery with an emphasis on digital channels, and prudential support for aid programs [3]. Banks also had to face social pressure. In this sense, some citizens showed distrust and rejection, associated with the cost of commissions for banking services [8].

The restrictions associated with the COVID-19 pandemic generated drastic changes in the operations of companies in different industries. In the United States, i.e., "some local governments began to impose stay-at-home orders, business closures, online education and, in general, mobility restrictions on people" [9]. In Colombia, on the other hand, there were restrictions on all economic activity, with some exceptions such as pharmacies, banks, and supermarkets [10]. To face the challenges of the pandemic, many companies had to make their operations more flexible, adopting alternatives to develop their economic activity, enabled by information and communication technologies. Teleworking arrangements were implemented, and e-commerce and the provision of services through digital assistance, in areas such as health or education, intensified. In addition, the inhibition of social activity dynamics also led to changes in purchasing habits, resulting in a drastic movement of consumers to online channels, with the consequent response of companies and industries [11].

Although the COVID-19 crisis has encouraged banking establishments and other financial institutions to make changes in their operating models and take advantage of technologies that facilitate the provision of services, these changes represent a serious challenge, not only from an operational point of view but also from a cultural point of view. For example, electronic payments intensified with the COVID-19 pandemic, but these digital solutions also carry many security threats [12]. Added to this, many customers were used to physically traveling to the bank branch, and suddenly asking them to do their transactions online might seem too much of a challenge, even more so when the context was imbued with uncertainty in all aspects [13]. In any case, although digital banking today faces threats and restrictions that must be addressed and overcome, it cannot be overlooked that it is a promising and already predominant channel for providing financial services, making it key for banking establishments to increase their market share [14].

In addition to the efforts in terms of investment and costs to cope with the constraints that the pandemic imposed on their traditional operating model, banks also had to face other types of difficulties, such as reduced revenues, customer share, portfolio deterioration, and, in general, the consequences associated with global social, political, and economic uncertainty. Banks generally face a wider range of risks, and a situation such as the pandemic can exacerbate them, generating liquidity shortages, reduced credit, falling investment returns, and an increase in non-performing loans and default rates [15]. In addition to the above, banking establishments have high exposure, resulting from their positions in high-risk assets, such as financial derivatives. In June 2021, the Bank for International Settlements reported a deterioration in gross value in the interest rate derivatives and Forex market, with a drop of 21% and 24%, respectively, bringing the market to 2019 values.

The stability of the financial system is a matter of great importance in the context of emerging countries since the good performance of credit institutions and other financial institutions generates confidence among market agents and the possibility of promoting sustainable projects in different sectors. In addition, many initiatives related to social and environmental sustainability have been favored by a change of mentality in the financial industry during the 2008 crisis. Therefore, the financial system is in transition to address the lessons of the financial crises and help the formation of a greener and more sustainable economy [16]. Currently, financial institutions, and particularly banks, play a vital role in the environment by assisting in the development of a low-carbon, robust, and successful economy [17]. However, these initiatives could be compromised in the presence of a systemic risk event, affecting the financial performance and solvency of banks.

Considering the above, an analysis of the financial results of banking establishments during the period of the COVID-19 pandemic is carried out below. For this purpose, a longitudinal design is adopted, with which the time series of some of the main items related to economic and financial performance are analyzed, such as operating revenue (OR), Profit and Loss for the year (PL), Valuation of Trading Derivatives (VTD), Loan Portfolio Income (LPI), Restatement of Foreign Currency Assets (RFCA), Interest on Deposits and Drawings (IDD), and Information Technology Expenses (ITE). The analysis is carried out in the Colombian financial sector, particularly, studying 25 banking establishments. The traceability of the items and indicators was carried out from March 2015 to December 2021.

The study shows contributions to the banking industry and financial markets. First, it addresses the impact of a systemic shock derived from a public health problem on the results of banking establishments. Secondly, the phenomenon is studied in the context of emerging economies, where major changes and economic turbulence are being experienced [18]. Third, the behavior of the exchange rate and its relationship with the operating results of banking establishments during the crisis is analyzed, considering the concern of central banks to alleviate volatility pressures during the pandemic [2]. Furthermore, the behavior of expenditure items related to information technologies is studied to analyze the efforts made by Colombian banking establishments to face the challenges of the crisis, based on the benefits offered by the technological platforms.

## 2. Literature Review

The COVID-19 pandemic affected the economic activity of many sectors and significantly impacted their results. In the banking sector, i.e., the limitations on its operation, due to social distancing and capacity control, as well as the closures or restrictions on the development of certain economic activities and their effect on the solvency of its customers, had repercussions on its results.

The pandemic had significant economic and financial repercussions, which are manifested in the volatility of exchange rates, capital market performance, and interest rates. For example, a study in South Korea found a relationship between the number of reported cases of COVID-19 and volatility in the stock market, with consequent depreciation of the local currency [19]. In emerging economies, stock markets were more volatile during the pandemic period [20]. However, controlling volatility does not seem to be a simple task, especially when the market does not respond to discretionary intervention policies [21].

Salehbhai and Jariwala [22] found a negative relationship between the inflation level with the exchange rate and a positive relationship with the bank interest rate. The authors recommended efficient monetary intervention by the government to stabilize rates and relieve pressure on the local currency. However, Kuncoro [21] argued that interest rate policy and bank intervention fail to reduce exchange rate volatility. Therefore, structural measures are required from the monetary authority, with clear goals that are prolonged over time. Given the impact that the exchange rate can have on the performance of banking establishments' positions, the central bank's monetary and exchange rate policy should be carefully monitored.

Regarding the results of banking establishments, some studies have analyzed the pandemic's effect on banking establishments' stock market results. For example, the pandemic on the market valuation of assets related to the banking sector, and when the market stress began in February, bank stock prices fell at the same pace as the general market; this deepened in April, with the banking sector being one of the most affected in the economy [23].

The prices of banking stocks around the world also were impacted by the COVID-19 pandemic. Following the large drop in global stock prices, bank stock prices underperformed local stock markets and domestic non-financial firms. Using a multifactor analysis model incorporating global and local factors shows that stock returns during March and April are abnormally low, with an average weekly return of  $-1.04\%$  [24].

On the other hand, some articles have emphasized accounting metrics to evaluate the performance of banking establishments during the pandemic period. Such is the case with changes in Islamic banks' income due to the COVID-19 pandemic [25]. This generated an environment of unprecedented panic and uncertainty on different commercial activities and led the world economy into a period of depression. A panel data model with two-way fixed effects was applied to analyze the pandemic's effect on the income of banking establishments. The results showed that the pandemic impacted the financial income of banks, offset by other non-interest income sources, such as banking services, which were less affected by the pandemic [25].

Also, some market and competitiveness measures of the sector during the crisis period were analyzed from 31 December 2019, until 31 March 2020. The results showed that loan loss provisions, net fees, and commissions relative to operating revenue, and the ratio of liquid assets to total assets statistically affected financial performance [26].

The above highlights the need to monitor some relevant metrics in bank management, to address the factors that make it possible to prepare for the vicissitudes of a systemic crisis. In this regard, Rawlin et al. [27] classified macroeconomic and microeconomic factors. The former has to do with general aspects such as interest rates, exchange rates, and inflation. In contrast, the second group includes aspects that are characteristic of the banking business and that have a key impact on its results, such as the level of diversification of income sources, asset quality, cost control, and the productivity of the workforce [27].

Mamo et al. [28] analyzed the performance of banking establishments in the context of emerging countries. The authors analyzed performance inducers, separating those related to macroeconomic aggregates from those specifically related to bank performance. The authors found that exchange rate volatility hurts commercial bank performance. At the microeconomic level, high levels of leverage also showed a negative effect on performance. Meanwhile, efficiency in the use of assets, cost management, and commercial effectiveness have a positive and statistically significant effect on the performance of banks.

Bernardelli et al. [29] identified some factors that are relevant for investors and that may have an impact on the share price of the banking industry. According to the author, markets seem to react to the level of capital solvency and liquidity of banks. In addition, portfolio concentration and the level of exposure of assets to the exchange rate have also been shown to be relevant factors for investors' decision-making in a pandemic context.

Other studies have analyzed the pandemic's effect on banking establishments' competitive performance. In addition to including financial variables, other variables related to operational efficiency or their performance in the market have also been considered. In this regard, the effect of market efficiency and competition on the performance of banks in the Middle East and North Africa region was analyzed. It was highlighted that the risk and performance concerns of banks were accentuated due to the COVID-19 pandemic. Thus, this juncture offers a better experiment to study bank performance than previous crises, as the COVID-19 shock was plausibly exogenous for both lending institutions and borrowers [30].

Because of COVID-19, cash began to dry up, and borrowers faced difficult situations that limited their ability to repay loans, which implies an increase in credit losses in the form of non-performing loans and higher risk exposure [31]. The findings show that an increase in market competitiveness (as measured by the Lerner index) increases risk-taking, due to the loss of power over the industry and franchise value. Efficiency is understood as the ability to raise money, improve profitability, and create value and is approximated in the study using data envelopment analysis (DEA). Given the above, the findings also evidence a positive association between efficiency and profitability, as well as a reduced effect of this efficiency, when the level of competition in the market increases [30].

To address the pressures of the COVID-19 pandemic, many banking establishments made use of information technologies to optimize the delivery of their services and overcome accessibility problems, resulting from restrictions imposed by governments to prevent the spread of the virus. In the run-up to the COVID-19 pandemic, the development of innovative technologies such as Artificial Intelligence, the Internet of Things, Blockchain, the growth of FinTech, and the presence of social networks have influenced the financial market and the availability of services for consumers [32].

The confinement caused serious macroeconomic affectation for many countries, negatively impacting the social and ecological sphere. However, at the same time, there was an accelerated growth of new digital technologies, where opportunities were seen to minimize the negative consequences of the crisis, so that "digital financial inclusion has become a key aspect of household and SME resilience" [32]. To measure the impact of COVID-19 on technology engagement, the authors constructed a digital inclusion index. The results show that digital financial inclusion correlates with the World Bank's ranking of countries by income level. Furthermore, the COVID-19 pandemic incentivized more active use of technology by the population to make online purchases or pay bills [32].

Some studies have related the adoption of technologies and the performance of banking establishments. In this sense, the adoption of information technologies in banks during the COVID-19 pandemic and its effect on performance was analyzed [33]. During the COVID-19 pandemic, banks with higher technological capabilities experienced higher deposit inflows [34]. The returns of commercial banks whose shares are listed on the major U.S. financial markets were analyzed. Technology adoption was measured as the ratio of technology expenditures to total operating expenses. The results show that IT investments acted as a shield against market turbulence [33].



The conditions imposed by the pandemic have led the population to conduct more transactions through digital platforms, which has accelerated the adoption of banking and financial digitization [35]. This study considered some accounting measures of performance such as the ROA, ROE, and the ratio of Non-Performing Loan Portfolio to Total Portfolio, but as a function of some indicators of technological capabilities, such as the number of ATMs, the number of security certificates, or the use of the internet. The regression model results show the negative effects of COVID-19 on ROA and ROE. In addition, the banks' results were influenced by server security and internet banking usage. It is concluded that, during the pandemic, bank performance and digitization were highly correlated [35].

The adoption of information technologies in the financial sector has also generated a contribution to the development of initiatives that promote sustainability in its different dimensions. In this matter, a new construct appears in the financial industry called value-based banking, which is based on the principle that banking activity is a combination of responsibility to society and obtaining reasonable profits [36]. Some works have addressed this issue, taking as a line of reference the Islamic law, Shari'ah, which is based on similar principles such as the idea of driving a value-based economy and social justice [36,37]. Related concepts such as community banking, ethical banking, and green banking appear within the framework of value-based banking [36].

Some studies have shown how digitalization in the banking industry has favored the development of projects with environmental impact in the banking context. Initiatives such as online banking generate an important ecological contribution to the extent that they reduce paper consumption and fuel consumption associated with user travel [17]. Ayead and Al-Tameemi [38] suggested how technological advances can be used to develop environments in banking buildings that are more environmentally friendly. In addition, innovative financial instruments have recently been developed that favor access to funds for the development of environmentally sustainable investment projects [39]. The above makes evident the effort of banking entities to develop their business activities within a framework of sustainable finance where investments and loans impact economic, social, and environmental factors [16].

Therefore, a context of uncertainty and the eventual materialization of the adverse effects of systemic risk can hurt the sustainability programs of financial institutions. In this regard, burdensome regulations can have critical repercussions on the purpose of promoting a sustainable green financial environment during a period of turbulence [40]. Although green initiatives can have favorable effects on banks, more education is required to better leverage the contribution of bank staff [39]. Regarding the social impact, the pandemic made evident some issues that should be considered in the digital trans-training agenda, such as the problem of security and privacy of users and the costs related to remote working conditions [41].

The studies mentioned above address the effect of some macro and microeconomic variables on the financial results of banking establishments. However, there is no in-depth discussion of the impact that systemic risk may have on the operational efficiency of the banking business during periods of crisis. In this sense, this paper contributes to the understanding of the effect that a crisis can have on the financial results of credit institutions. By analyzing systemic risk in the context of a pandemic, we seek to shed light on the potential challenges faced by banks in terms of operational continuity, liquidity, and asset management.

As discussed above, one particularity of the COVID-19 pandemic, as a scenario for understanding the performance of banking establishments, is its exogenous nature. [29,30,33]. This means that shocks may affect the real economy or the financial system but are not themselves caused by economic or financial forces [30]. Thus, the question arises as to how a phenomenon external to the market can have relevant implications on the market. In other words, it questions how exogenous factors related to systemic risk, can affect different markets and the agents participating in them.

The conceptual framework on which this study is based is that of systemic risk, where financial contagion is one of the most characteristic aspects. A discussion of this concept was developed by Davidson [18]. Elements such as the presence of a shock, the links that facilitate its transmission, and the consequent crisis are highlighted. Some theories explain how this contagion can occur. One of these theoretical lines is that of financial interconnectiveness, which points out that the causes are fundamental, i.e., related to common shocks, trade links, and problems transmitted in the financial network. However, contagion can also occur through investor behavior, including liquidity problems, incentives, information asymmetries, and investor reevaluation [42].

Concerning the COVID-19 crisis and its impact on the stability of the financial system, the causes attributed to it are essentially fundamental. In a highly integrated world, a crisis in one country can have financial effects on other countries [32]. In the case of the COVID-19 pandemic, the public health emergency originated in China but quickly spread to other parts of the world, with a corresponding effect on society and the stability of the financial system. Such shocks lead to an increase in bank tail movements and can trigger the collapse of entire financial systems [43].

The trigger for systemic risk can be an exogenous shock, i.e., the vulnerability of banks to economic downturns [44]. However, this is not the case with COVID-19, since it was a public health issue that had repercussions in the economic and social sphere, on a global scale. Banking establishments play an important role in the effects of systemic risk, which implies a higher level of difficulty in managing the phenomenon since many of these institutions are in many countries [45]. Therefore, this intricate interconnection of financial institutions, at a global level, leads to a greater exposure of economies to risk, even more so when the COVID-19 pandemic has given evidence that even situations outside the financial markets can put the entire system under stress.

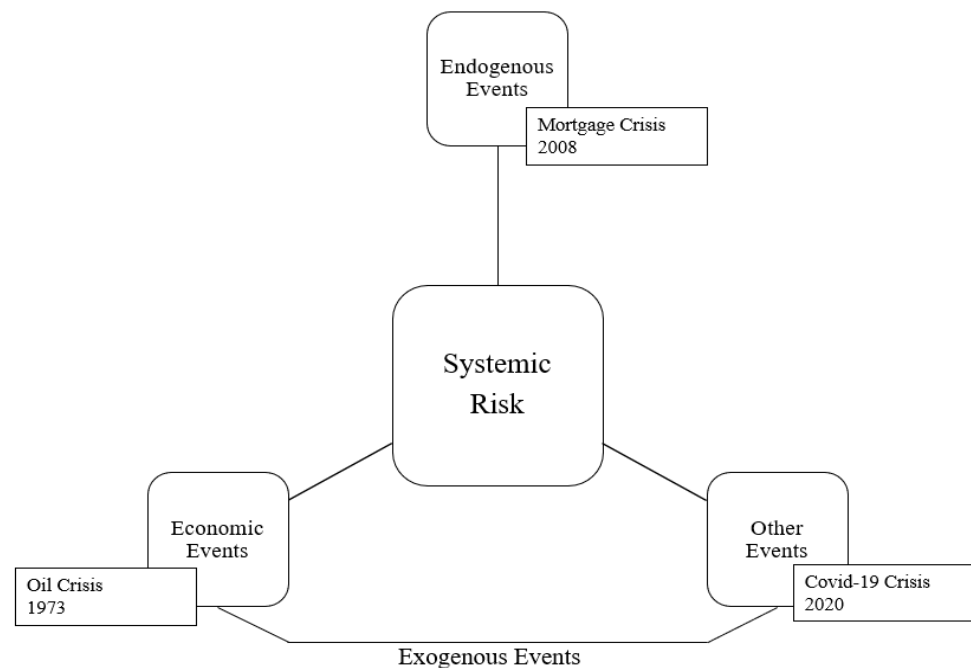
There is no single definition of systemic risk; however, it can be understood as the risk derived from a systemic event, i.e., one that can systematically affect a significant number of intermediaries or important markets [44]. It is stated that systemic risk materializes when an exogenous shock causes the failure of an entire industry or economy, i.e., a complete failure of the entire system [46]. In the financial context, this is a cascading failure, given the complex linkages within the system, which can have severe recurrences in the economy. The term systemic risk began to be widely used in the mid 1980s, due to a sharp increase in the need for the world's leading banking systems to manage risk [44]. Today, systemic risk is understood as the probability of occurrence of large-scale negative events. Events caused by both exogenous (global or local) shocks occurring outside the financial system and endogenous shocks occurring within the financial system itself affect the activities of intermediaries and markets [47].

As shown in Figure 1, systemic risk can originate in the financial system, in the real economy, or even be caused by events outside economic relations. Unlike previous crises, which had a fundamentally endogenous character, the crisis caused by the COVID-19 pandemic was exogenous. Therefore, it requires further studies of the main interrelationships and interdependencies of systemic risk formation in the banking sector [47]. Although the COVID-19 situation was exogenous, macro-prudential regulatory frameworks are now in place to closely monitor and respond to such shocks. In March 2020, the Basel Committee on Banking Supervision coordinated policy and supervisory responses to COVID-19, recommending a variety of regulatory and supervisory measures for member jurisdictions [48].

Regulatory measures implemented after the 2008 global crisis have made banks more resilient to the negative impacts of these shocks, and banks may have benefited from different forms of government support and access to central bank refinancing [43].

Despite the regulatory and control measures adopted in the banking system to face crises, the COVID-19 shock generated turbulence in the markets, affecting the share price of most banks; however, unlike what happened in the 2008 crisis, banks were able to cope with the situation [46]. A key aspect of this resilience depends on legal certainty and institutional

strength. In addition, a favorable regulatory environment can help reduce the adverse effects of pandemic shocks on the banking system's stability [43]. Although empirical results show a sharp increase in systemic risk during the COVID-19 period, flattened systemic risk curves were exhibited by the end of April 2020, which can be attributed to policy responses [48]. In conclusion, the systemic crises before the pandemic have allowed the consolidation of a set of experiences, the lessons learned from which have facilitated the deployment of strategies to confront the COVID-19 crisis. However, these responses do not derive solely from government policies; banks have also responded actively to the challenges related to the pandemic, i.e., by strengthening their IT infrastructure to address operational risk.



**Figure 1.** Causes of systemic risk. Note: relationship of the different sources of systemic risk. Source: own elaboration.

Therefore, this study analyzes data obtained directly from the financial statements of the banks to analyze the specific items that have been most affected by the COVID-19 situation. In the study by Mateev et al. [30], some accounting measures of performance were studied, but the analysis concentrates on profitability measures and measures relating market value to book value, such as Tobin's Q. In contrast to other studies that have analyzed the effect of the pandemic on bank performance from market performance measures, such as stock price, bond rate spreads, CDS spreads, or credit ratings [23,24,26], as the market price has a close relationship with valuation, it is a formidable performance measure; it is considered a metric that provides an overview.

Therefore, this study disaggregates, to a greater extent, the items of the income statement, which are what determine the profits and, hence, the profitability of banking establishments. Other studies have also analyzed the problem of digitalization and its impact on the results of banking establishments [33,35]. In contrast, this study analyzes the importance of these technologies during the crisis period, analyzing specific items of the financial statements.

### 3. Methods and Materials

The study was developed with a mixed approach, applying the hypothetical deductive method with a descriptive scope in four phases: (1) descriptive analysis, (2) correlation analysis, (3) exchange rate volatility analysis, and (4) validation by expert judgment. According to Thomas (2021), this type of study is ideal for describing a situation or area of interest in an objective and precise manner, the results of which can serve as a basis for



conducting detailed experimental studies. This study descriptively analyzes the financial performance of Colombian banking establishments during the COVID-19 pandemic period. A longitudinal design was applied, making use of time-series graphs, to characterize the behavior of some accounting items and financial measures during that period. The descriptive exercise is complemented with a correlational analysis to examine the association between the items and explain the behavior observed in the graphs.

Correlational studies make a significant contribution to understanding human phenomena and have driven scientific research in all forms and social disciplines [49]. In quantitative research, it is desirable to establish how and why things vary; as well as to demonstrate the association between variables, and the direction and strength of the relationship [50]. Correlation plays an important role in understanding systemic risk. For example, it analyzes the correlation dynamics between return series, since the correlation between stocks and stock indexes can serve as an indicator of increased systemic risk [51].

Pastorino and Uberti [52] performed an empirical comparison of alternative systemic risk measures based on correlations. Chen [53] showed how correlation-based measures work well in a descriptive context. Moreover, correlation has also been applied to analyze critical performance factors in the banking industry [54–56]. Therefore, the application of correlational analysis is justified to understand the factors that indicate the performance failure of Colombian banking establishments, taking into consideration a variable of a systemic nature, such as the volatility of the exchange rate.

The information was extracted from the open data portal of the Financial Superintendency of Colombia, specifically, the reports of the Financial Statements of the country's banking establishments. According to the Organic Statute of the Financial System, Decree 663 of 1993, the financial and insurance system in Colombia is made up of credit establishments, financial services companies, capitalization companies, insurance companies, and insurance and reinsurance intermediaries. Within the credit establishments, banking institutions are specifically identified, which are "financial institutions whose main function is the collection of funds in bank current accounts, as well as the collection of other demand or term deposits, with the primary purpose of carrying out active credit operations" [57]. Given the above, the sample will consider only those entities that strictly comply with the provisions of the regulations.

By compiling the accounting information published in the portal, a panel was structured, which includes the information of 25 Colombian banks, with monthly data, for a period from March 2015 to December 2021. There are currently twenty-eight banks operating in the country; however, three of these banks started operations recently, so they have relatively less information than their peers.

Although how the sample was selected may suggest convenience in the process, the approach is justified to the extent that the excluded banks did not report information during the period of analysis, since they started operating in 2021. In general terms, the sample of 25 banks is representative of 100% of the population, since it is equivalent to all the entities that comply with the regulator's conditions to operate as banking establishments in Colombia during the entire period of analysis.

Additionally, the information began to be captured in March 2015, since during the first two months of that year, not all banks had reported information. Although the time horizon covers more than six years, this study aims to analyze the trend of the items during that period and to show whether drastic changes were associated with the COVID-19 crisis; specifically, during March 2020. The items under analysis are described below:

The information on the items presented in Table 1 was consolidated at the industry level. For this purpose, the monetary value corresponding to each of the items under analysis was added one by one and averaged. In this way, there is only one series for each of the items, for 81 periods under analysis, which represents the average behavior of the banking industry. Since the income statement accounts are reported by the banking establishments under a cumulative model per year, to calculate the flow corresponding to the period, the difference with the immediately preceding period is established. The data

corresponding to March 2015 is lost and, therefore, the series are graphically represented from April of that year.

**Table 1.** Study variables.

Abbreviation	Item	Definition
OR	Operating Revenue	Groups account that generates economic benefits to the entity.
PL	Profit and Loss	Profit or loss at the end of the fiscal year with which the profit or loss of the entity is established
LPI	Loan Portfolio Income	Records the interest earned by the entity on resources placed through the portfolio.
PR	Provisions (Impairment)	Expenses incurred for provisions are determined by the amount, related to its loan portfolio.
VTD	Valuation of Trading Derivatives	Records the gain/loss of derivative contracts, resulting from their valuation at market prices. Accounts: 4129–5129.
RFCA	Restatement of Foreign Currency Assets	Record gain/loss on restatement and realization of assets in or denominated in foreign currency. Accounts: 4135–5135.
IDD	Interest on Deposits and Drawings	Value of interest incurred by the entity on funds received as deposits and drawings.
EDP	Electronic Data Processing	Operating expenses incurred for Electronic Data Processing.
MRCE	Maintenance and Repairs of Computer Equipment	Expenses incurred for maintenance and repairs of computer equipment.
AIASA	Amortization of Intangible Assets—Software and Applications	Amortization of intangible assets related to computer software and applications during the year.
DCE	Depreciation of Computer Equipment	Depreciation calculated by the entity on a cost basis, related to computer equipment.
TRM	Representative Market Rate (TRM—Spanish abbreviation by the Banco de la República de Colombia).	Colombian pesos required to buy one dollar are calculated based on the purchase and sale of foreign currency between financial intermediaries.

Note. definitions adapted from the Single Chart of Accounts of the Financial Superintendency of Colombia [58]. Source: own elaboration.

The graphic processing of the series was carried out using Microsoft Excel 2021, while the correlation analysis and the adjacent normality test were carried out using SPSS v.20.

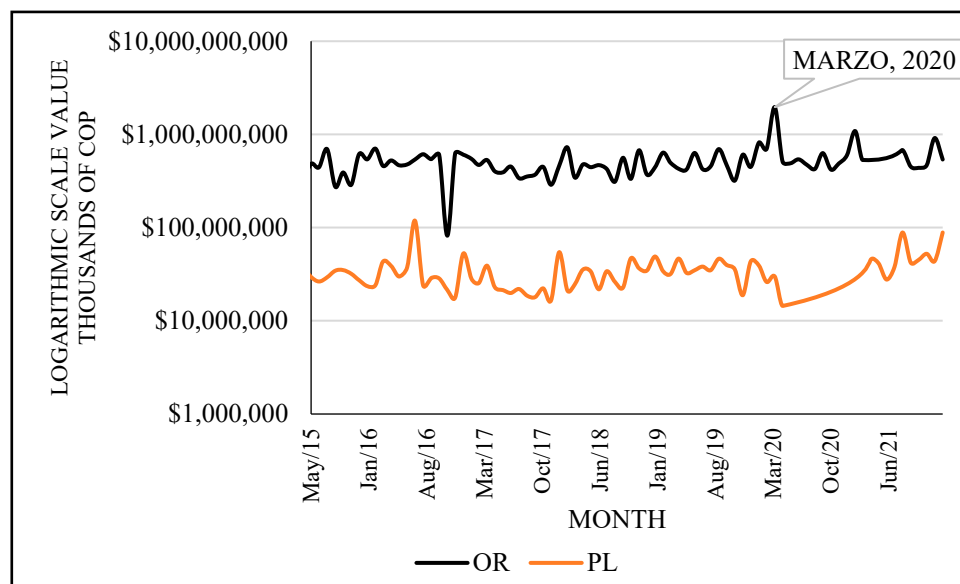
Finally, to give robustness to the correlation analysis, the results were contrasted through validation by expert judgment. For this purpose, a search for experts was carried out, with the requirement of having worked as a manager or economic analyst in Colombian banking establishments during the period of the study. Expert judgment is considered to generate a valuable contribution, since experts usually have greater knowledge of the object of study due to their contextual understanding and ability to interpret complex data or analyze patterns and trends. Experts allow an integrative assessment, as they synthesize and communicate elements that allow a better understanding of socially important issues [59]. Expert judgment can be valuable as a tool to understand the dynamic nature of the banking business since external conditions can lead to profound changes in how the entity's assets are managed [60].

#### 4. Results

First, a descriptive analysis was applied related to the behavior of the monthly time series of the accounting and financial items under analysis. The focus was placed on March 2020, since during that period the “World Health Organization (WHO) declared that COVID-19 is a global pandemic outbreak” [15]. In this way, we sought to have a better

understanding of the factors related to revenue and profit generation in the Colombian banking sector during the pandemic period.

As shown in Figure 2, the behavior of the series during March 2020 was unusual in the sense that there was a peak in revenue generation (OR), but also a correction in profits (PL). According to the observable behavior in the graph, the cyclical effect related to the pandemic can be evidenced. A priori, the behavior seems puzzling, because, in the month in which most revenues (OR) were generated, there was also a relatively low level of profits (PL). However, as shown below, this result depends largely on the specialized operations carried out by some credit institutions related to positions in financial derivatives or foreign currency operations.

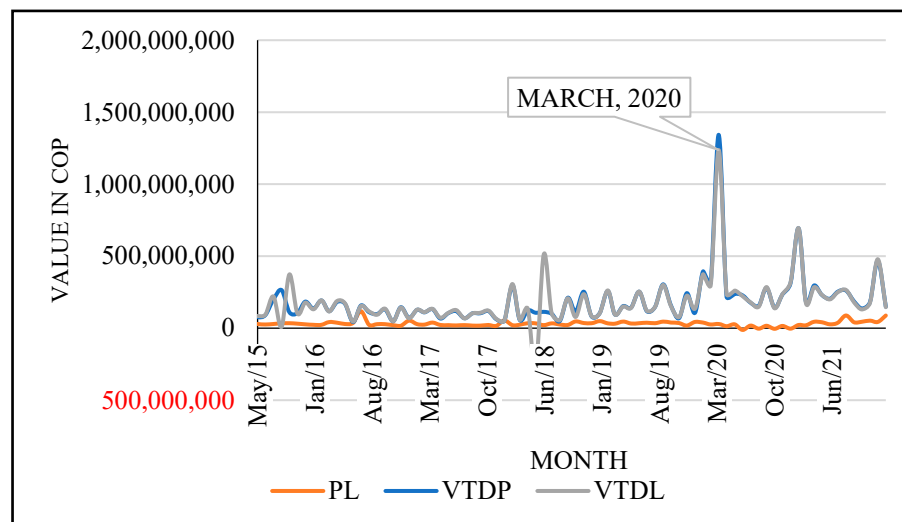


**Figure 2.** Revenues and Profits in Logarithmic Scale. Note: based on data from the Financial Superintendency of Colombia [61]. Source: own elaboration.

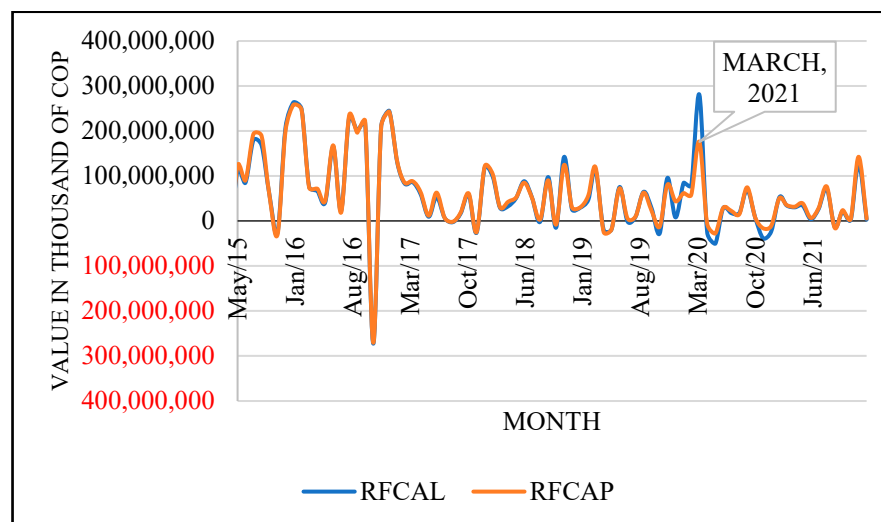
Figure 3 shows the behavior of the Gain on the Speculation Valuation of Trading Derivatives ( $VTD_P$ ) and Loss on the Valuation of Speculation of Trading Derivatives ( $VTD_L$ ) accounts. The first of these items is treated in accounting terms as revenue, which explains the peak in operating revenue (OR) obtained by the banking establishments during the crisis period. However, as can be seen in the graph, this account has a high correlation with the loss account, which is treated as an expense and offsets the high revenue from the valuation of speculative derivatives. This behavior is generalized in the series, although during March 2020, it was observed that the winning positions exceeded the losing ones, by 8.53%, which represents for the banking industry a little more than MXN 105 billion (approximately USD 25.8 million at the exchange rate at the end of March 2020). This trade-off between winning and losing positions can be explained by the fact that “part of the interbank operations of international banks implies that they have to adjust their inventory positions of different currencies” [62]. Banks’ Net Gains and Loss (PL) series does not show a pattern of association with the performance of derivatives positions; therefore, these positions influence the operating revenue (OR) but not the profits earned by banks.

As shown in Figure 4, another item contributing to the increase in revenue during March 2020 is the gain related to the Restatement of Foreign Currency Assets ( $RFCAP$ ). However, it is evident from the graph that this gain was offset by the item of losses ( $RFCAL$ ) for this concept, with which it has a high correlation, but which, for the period in question, considerably exceeds the gains. This difference is approximately 60% and represents a little less than MXN 105 billion for the Colombian banking industry. The difference has an impact on the profits obtained by the banking establishments, in this case, with a deterioration. It is worth mentioning that at the beginning of the year 2020, the quotation of the dollar

was below the COP 3300 band; however, during the first semester of that year, there was an abrupt rise in its quotation, reaching the barrier of COP 4100 in March. This significant change in trend may explain the mismatch in the positions with a Valuation of Trading Derivatives (VTD) and in the profits resulting from the Restatement of Foreign Currency Assets (RFCA).

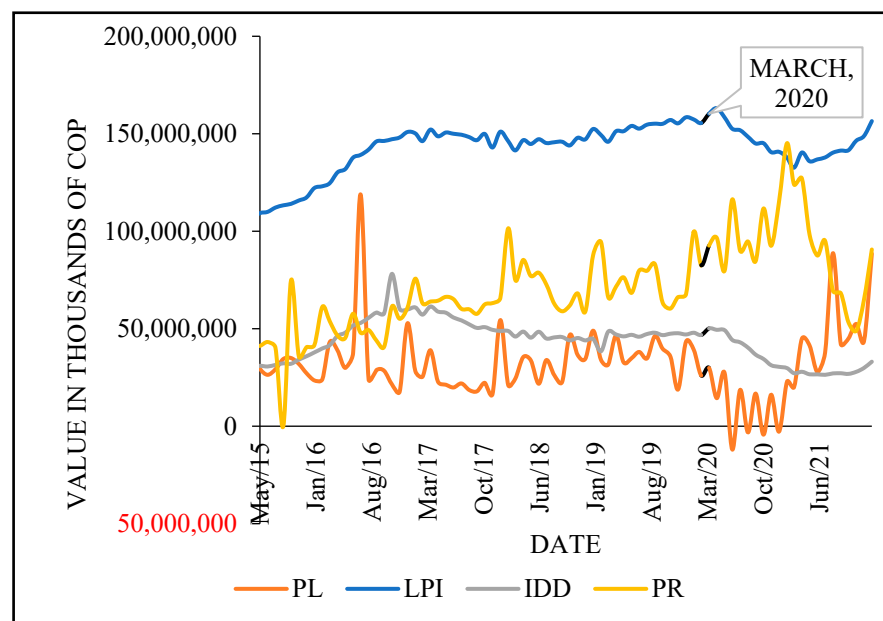


**Figure 3.** Profit vs. Gains and Losses on the Valuation of Trading Derivatives. Note: based on data from the Financial Superintendency of Colombia [61]. Source: own elaboration.



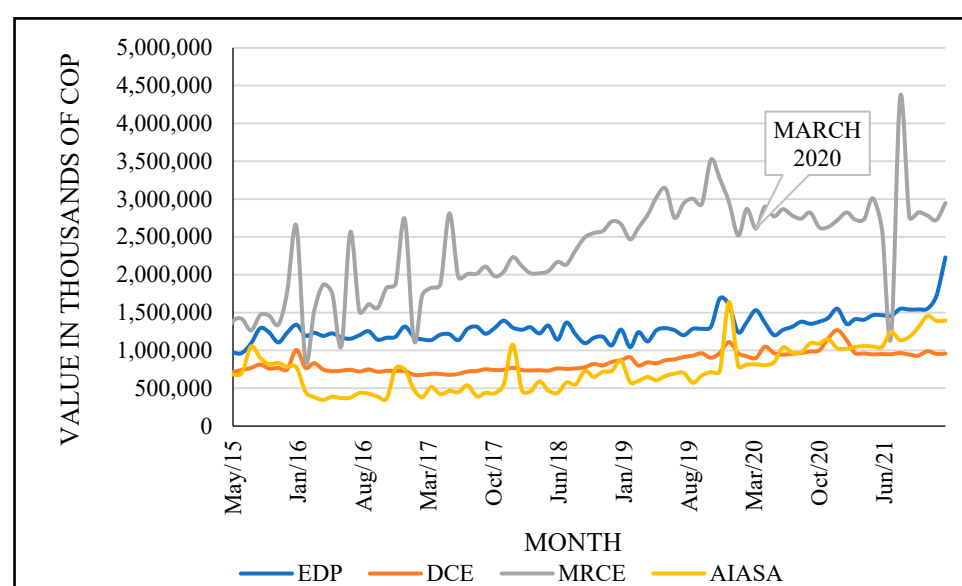
**Figure 4.** Profit vs. Gain and Loss on changes in Foreign Currency Assets and Liabilities. Note: based on data from the Financial Superintendency of Colombia [61]. Source: own elaboration.

Figure 5 shows the behavior of some items related to the financial intermediation activity of banking establishments. As can be observed in the series, although during the pandemic period, the income related to interest collected on their loans (LPI) was on the rise, there was also a significant increase in loan loss provisions (PR), which was maintained during 2020. This means that the credit quality of the portfolio of Colombian banking establishments deteriorated during the pandemic period, which, in turn, had an impact on the profits they reported during 2020. On the other hand, the interest paid on deposits and receivables (IDD) decreased during the crisis period; however, as can be seen in the series representing profits (PL), such relief was not enough to avoid the negative effect on their results.



**Figure 5.** Profits and Loss, Loan Portfolio Income, Interest on Deposits and Drawings, and Provisions. Note: based on data from the Financial Superintendency of Colombia [61]. Source: own elaboration.

Figure 6 shows the evolution of expenses related to information technology, considering items such as expenses related to Electronic Data Processing (EDP), Depreciation of Computer Equipment (DCE), Maintenance and Repairs of Computer Equipment (MRCE), and Amortization of Intangible Assets—Software and Applications (AIASA). In general, there is an upward trend in the series representing the expenses related to these items, which may be motivated by a greater investment in information technology, which may result in higher expenditures for depreciation (DCE), maintenance (MRCE), or amortization (AIASA), or higher period expenses related to electronic data processing (EDP). Regarding the period at the beginning of the COVID-19 crisis, although the series shows a slight trend correction in some items, gradually, the series returns to the upward behavior observable before the pandemic.



**Figure 6.** Technology-related expense (TRE) items. Note: based on data from the Financial Superintendency of Colombia [61]. Source: own elaboration.



To complement the descriptive analysis proposed in the first phase of the methodological process and to advance to the second phase, a correlation analysis was applied between the different items under study to analyze the level of association, especially with the income statement and the results for the period (PL). The purpose of this procedure was to recognize the general level of association of the items and to analyze if, in March 2020, there was an atypical behavior according to the observable evidence in the series presented in the previous section. Before performing this analysis, the Kolmogorov–Smirnov and Shapiro–Wilk normality tests were performed (Table 2).

**Table 2.** Test for normality of variables (percentage variation).

Item	Kolmogorov–Smirnov			Shapiro–Wilk		
	Statistic	df	Sig.	Statistic	df	Sig.
OR	0.203	80	0	0.634	80	0
PL	0.298	80	0	0.599	80	0
MRCE	0.278	80	0	0.595	80	0
EDP	0.065	80	0.200 *	0.982	80	0.319
AIASA	0.196	80	0	0.794	80	0
VTD <sub>P</sub>	0.176	80	0	0.812	80	0
VTD <sub>L</sub>	0.327	80	0	0.277	80	0
RFCA <sub>P</sub>	0.276	80	0	0.601	80	0
RFCA <sub>L</sub>	0.274	80	0	0.504	80	0
LPI	0.058	80	0.200 *	0.989	80	0.704
IDD	0.103	80	0.036	0.863	80	0
PR	0.127	80	0.003	0.912	80	0

Note: normality test applied with SPSS v.20 data exploration tool. Source: own elaboration. \* This is a lower bound of the true significance.

The percentage difference of the values corresponding to each of the variables concerning the data for the immediately preceding period was calculated. According to Bonett and Wright (2000), if the bivariate normality assumption cannot be justified, Kendall's or Spearman's correlations should be considered. The Rho coefficient was applied, considering its low sensitivity to outliers.

Table 3 confirms the association between the Valuation of Trading Derivatives (VTD) items, both gaining (VTD<sub>P</sub>) and losing (VTD<sub>L</sub>) positions, with the percentage change in the operating revenue (OR) of banking establishments. However, there is no evidence of a statistically significant correlation of these items with the percentage change in the Profit and Loss (PL) item. In contrast, there is a moderate and statistically significant correlation between the percentage change in Loan Portfolio Income (LPI) and the percentage change in Profit and Loss (PL), at a significance level of 1%, which confirms the importance of the core business of banking establishments on their financial results. Provisions have a moderate but statistically significant level of correlation with the percentage change in operating revenue (OR). This implies that the variation in the level of income also corresponds to a variation in provisions for portfolio impairment. The results do not show a statistically significant association of percentage changes in IT-related expenses concerning the revenue (OR) or results (PL) of Colombian banks. Finally, there is a statistically significant correlation between the percentage variation of the exchange rate (TRM) with the revenue of Colombian banks.

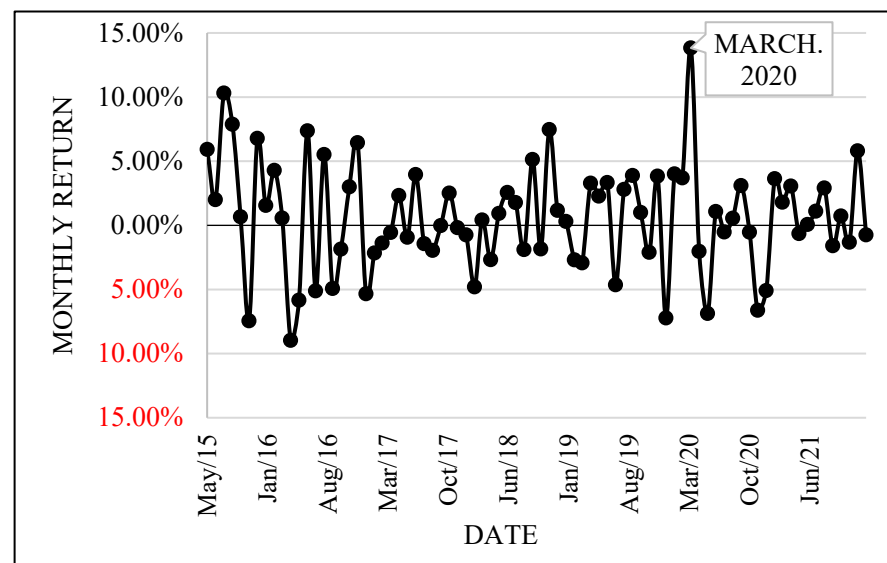
For the third phase of the methodological process, an exchange rate volatility analysis was applied. Figure 7 shows the variation of the TRM, which, in March 2020, presented the most significant increase of the study period, reaching almost 15%, which strongly affected the operations carried out by Colombian banks in foreign currency. This situation may be attributed to the uncertainty of investors regarding the performance of the currency in the short term, considering the world economic slowdown scenario caused by COVID-19. Volatility is a key determinant of systemic risk [43]. Some studies have shown that during the COVID-19 pandemic, stock market returns were affected, while there was an increase

in volatility [15]. For example, it was observed that systemic risk was relatively stable until March, at which point there was a sharp increase, especially in the middle and end of the month, when the highest value was reached [48]. In addition, the announcements of the measures adopted by the central bank to control the shock produced by the pandemic reached its peak in March 2020 [2].

**Table 3.** Correlation analysis.

Item	OR	PL	MRCE	EDP	AIASA	VTD <sub>P</sub>	VTD <sub>L</sub>	RFCA <sub>P</sub>	RFCA <sub>L</sub>	LPI	IDD	PR	TRM
IO	1												
PL	−0.04	1											
MRCE	−0.08	0.106	1										
EDP	−0.08	0.059	0.152	1									
AIASA	0.008	0.144	−0.06	0.069	1								
VTD <sub>P</sub>	0.742 **	−0.07	−0.12	−0.12	−0.01	1							
VTD <sub>L</sub>	0.782 **	−0.08	−0.14	−0.18	0.012	0.848 **	1						
RFCA <sub>P</sub>	0.147	0.183	−0.22	0.04	−0.18	0.17	0.111	1					
RFCA <sub>L</sub>	0.08	0.182	−0.272 *	0.136	−0.267 *	0.085	0.029	0.868 **	1				
LPI	0.224 *	0.439 **	0.137	−0.03	0.161	0.095	0.112	0.087	0.06	1			
IDD	0.215	0.286 *	0.06	−0.12	−0.11	0.226 *	0.192	0.167	0.117	0.775 **	1		
PR	0.316 **	−0.11	−0.242 *	−0.02	−0.13	0.217	0.269 *	−0.01	0.051	0.21	0.266 *	1	
TRM	0.378 **	−0.07	−0.04	0.163	−0.01	0.252 *	0.201	0.171	0.123	0.136	0.167	0.18	1

Note. Spearman's Rho statistic was applied with SPSS v20. Source: own elaboration. \*\* Correlation is significant at the 0.01 level (2-tailed). \* Correlation is significant at the 0.05 level (2-tailed).

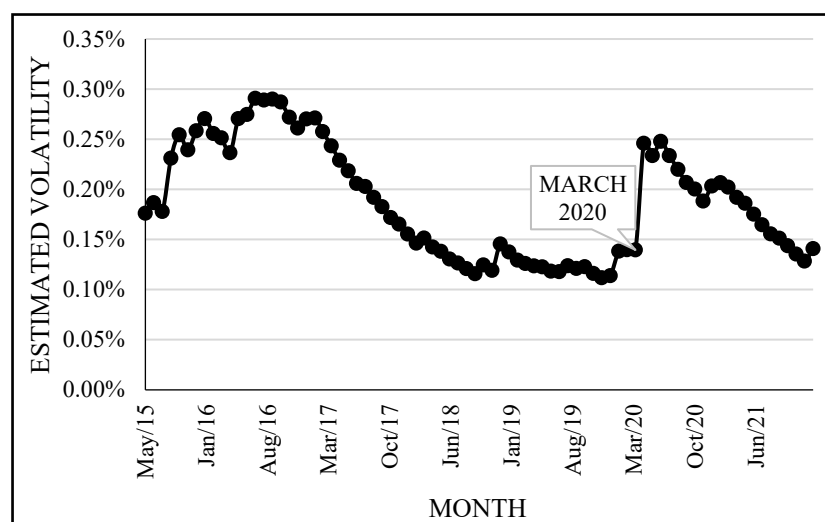


**Figure 7.** Variability of the monthly return of the TRM. Note: Information extracted from the Banco de la República database. Source: Own elaboration.

Meanwhile, in Colombia, to control the infection rate because of COVID-19, the national government adopted restrictive measures, which began to be implemented in March 2020 [5]. Thus, quarantine periods, capacity control, social distancing, and trade restrictions, among other factors related to the pandemic, created an environment of uncertainty, which affected the decisions of agents in the financial markets. In Colombia, the dollar is the reference currency for the development of foreign trade operations and the most traded currency worldwide; it is considered a haven asset, which is an investment incentive for the agents participating in the foreign exchange market to protect themselves against the exacerbation of the uncertainty derived from the crisis. In this scenario, investors are expected to take positions in assets considered safe, such as the dollar, generating abrupt

changes in its price, as shown in Figure 7, which demonstrates the turbulence attributed to the effect of the coronavirus on world markets [63].

Figure 8 shows the series associated with the calculation of estimated volatility in the TRM, using the Exponential Weighted Moving Average (EWMA) indicator. The figure makes it possible to observe the volatility jump estimated from historical data during March 2020. In this way, the situation of high volatility in the exchange rate (TRM) during the pandemic period becomes evident, the effect of which can be evidenced in the operations of Colombian credit establishments, considering the abrupt change in revenue (OR).



**Figure 8.** Estimated TRM volatility. Note: calculation of estimated volatility, under the EWMA model, from the TRM series; applying a Lambda decay factor of 0.94. Source: own elaboration.

#### *Validity Evidence by Expert Judgment*

The criteria of five expert judges were used to provide recommendations for the improvement of items. The group of experts was composed of three managers and two renowned economic analysts from Colombian banking establishments. First, an e-mail was sent attaching a document presenting the context of the study, as well as the contextualization of the study, as well as the study items. The initial version of the scale was composed of 12 items, as shown in Table 1. Second, based on the observations provided by the judges, the 12 items were confirmed.

## 5. Discussion

In this study, a descriptive analysis of the behavior of different accounting items and financial measures about financial performance items validated by expert judgment has been carried out. The finding that motivates this analysis is the disconcerting relationship between the operating revenue (OR) and Profit and Loss (PL) items during March 2020, when COVID-19 was declared a pandemic by the WHO. During the period in question, it was observed that Colombian banking establishments obtained, on average, a peak in their operating revenue (OR), but at the same time, the profit and loss (PL) were relatively low concerning other historically reported levels. An exploratory exercise of data in the Financial Statements of Colombian credit institutions shows a high representation of the Valuation of Trading Derivatives (VTD) items concerning the profits of the operating revenue (OR). This is an income and expense account where the gains ( $VTD_P$ ) and losses ( $VTD_L$ ) obtained by the banking establishments from their positions in trading derivatives are recorded. The share of this item is so large that it is even greater than that corresponding to the Loan Portfolio Income (LPI).

The analysis of the behavior of the series of gains ( $VTD_P$ ) and losses ( $VTD_L$ ) obtained by banks from their positions in speculation derivatives shows that there is a high correlation between them in such a way that profits are offset by losses. Thus, although the

gains ( $VTD_P$ ) favor the generation of operations revenue (OR), this does not imply a contribution to profits; considering the compensation of the expense account, corresponding to the losses ( $VTD_L$ ) obtained in these operations. However, in March 2020, there was an important change in the Valuation of Trading Derivatives (VTD), which can be attributed to the considerable volatility levels presented in the exchange rate (TRM) during that period.

Although the analysis of correlations between the percentage variation of the variables VTD and TRM does not offer statistically significant evidence ( $p < 5\%$ ) of the association between these variables; the percentage variation of the exchange rate (TRM) has a statistically significant correlation ( $p < 1\%$ ) with the percentage variation of the operating revenue (OR). Therefore, a relationship can be established between the percentage variation of the exchange rate (TRM) with the behavior of the Valuation of Trading Derivatives (VTD) items, based on the correlation that these variables have with the operating revenue (OR).

When analyzing the relationship of the different items with the net results of the banking business (PL), it is evident that those that have a higher level of association with the results of the business are the Loan Portfolio Income (LPI) and the Interest paid on Deposits and Drawings (IDD). Thus, despite the significant weight of the items related to the Valuation of Trading Derivatives (VTD) or Restatement of Foreign Currency Assets (RFCA) in the income statement, the core of the banking establishments in Colombia continues to be financial intermediation since it is the income related to the loan portfolio ( $p < 1\%$ ) and the interest paid to depositors ( $p < 5\%$ )—the factors that present the highest level of correlation with profits (PL).

On the other hand, there is no statistically significant correlation between the percentage variation of provisions and the results for the period (PL). Despite the above, during the pandemic period and subsequent periods, an increase in the level of provisions (PR) of Colombian banking establishments is evident. Portfolio impairment is an important cost that credit institutions must assume; its incidence in the results was induced by the pandemic since borrowers were compromised in their capacity to face the obligations acquired with the bank [22]. Although there is no statistical evidence showing a significant correlation between the variation in provisions (PR) and changes in profits, during the pandemic period, it is observable, at least from a descriptive point of view, that the fall in the profits of banking establishments was related to an increase in provisions.

Concerning the expenses incurred by Colombian banking establishments related to information technology, none of these showed a statistically significant relationship with business performance (PL). Despite the above, there is a growing trend in the series in these technological expenses, especially in those related to software and data processing. The background of this study shows significant efforts by the banking industry to incorporate new technologies into their business models.

Information technologies influence the performance of banks through customer relationships in such a way that they obtain a differential advantage from greater knowledge of their needs, with the corresponding satisfaction and loyalty of their users [26]. In this vein, further work could analyze whether the relationship between IT-related expenditures and financial performance is mediated by the impact that these technologies can have on customer satisfaction. In addition, the impact on long-term financial performance could be analyzed, considering the items related to technology investments that appear on the balance sheet, applying some lags, concerning the financial performance obtained by banking establishments in subsequent periods. In this regard, the case of technologies related to electronic payments, which were boosted by the COVID-19 crisis, can be considered as an example, however, “the elimination of cash is a long-term project” [64].

Finally, this study shows the impact that a systemic phenomenon such as the COVID-19 pandemic can have on the performance of banking establishments. The impact of the COVID-19 pandemic had devastating consequences for some banking and financial institutions, despite the exogenous nature that contrasts with previous crises [47]. Despite being considered an exogenous phenomenon, the uncertainty related to the global socioeconomic outlook generated turbulence in international markets, which led many agents to adopt the

dollar as a haven asset. Thus, the systemic effect of the pandemic can be evidenced on at least two fronts.

On the one hand, the volatility of the exchange rate had repercussions on positions in financial derivatives and assets and liabilities denominated in foreign currency. Volatility is considered an important measure of systemic risk [33]. However, in the case of Colombian banking establishments, such volatility had an impact mainly on operating revenue (OR), rather than on Profit and Loss (PL). In general, banks seem to have learned from the crises, which is consistent with the findings of Rizwan et al. [48], regarding the flattening of the systemic risk curve as of April. On the other hand, the impact of the crisis on the real economy had negative repercussions on the users of the financial system, increasing the risk of non-payment of acquired loans.

## 6. Conclusions

The results of this study show an increase in the level of exchange rate volatility during the pandemic period. This had repercussions on the positions of Colombian banks in operations with financial derivatives, as well as on assets and liabilities denominated in foreign currency. There is a significant correlation between the performance of these instruments and the banks' revenue, generating a significant increase in revenue. However, this increase in revenue was offset by an increase in expenses related to the banks' loss-making positions. Although the effect seems to be offset, the revenue statement of Colombian banks shows that, on average, during the period declared during the pandemic by COVID-19, there was a contraction in the profits reported by Colombian banking establishments.

The situation can be explained by a deterioration in the portfolio, which, although historically, does not present a significant correlation with profits, for the period from March 2020 onward, it can be observed how an increase in provision expenses is followed by a deterioration in the results of Colombian banking establishments. Table 4 shows a summary of the results obtained and their implications for each study variable.

The findings of this research have theoretical and practical implications. First, the study shows that, although the COVID-19 pandemic is considered an exogenous phenomenon, with repercussions on the dynamics of the banking industry, this type of situation ultimately translates into economic concerns, which become evident in the behavior of financial markets. In this sense, the uncertainty related to the pandemic was captured to a certain extent by the international currency market, due to a significant increase in volatility levels. This demonstrates the complexity of systemic risk, which may initially manifest itself as an external situation, but gradually becomes evident in the performance of the economy and financial markets.

Second, in terms of practical implications, this study generates a contribution for managers of financial institutions and for investors who place funds in stocks or bonds issued by banking establishments. The message is that the financial performance of banks depends primarily on the core business of the industry, i.e., financial intermediation. Although systemic risk has important repercussions on their capacity to generate revenue, the influence that such risk may have on their main profit drivers, such as the size, quality, and profitability of the portfolio and the cost of deposits and other liabilities that allow them to finance it, must be evaluated.

In general terms, the pandemic shock posed a serious challenge to the Colombian productive apparatus and the financial system. Banking establishments found relief in the government's support programs to control the economic slowdown and the social impact of the restrictions, as well as the measures adopted by the Colombian central bank, such as the reduction of intervention rates and extraordinary issuances to ensure a flow of liquidity during the crisis. However, given the restrictions on mobility and capacity control in traditional bank branches, banking establishments were induced to maintain the budget allocated to technological expenses and even increase it to support the operation on technological platforms.



**Table 4.** Summary of results.

Variable	Analysis
OR	Operating income increased during the peak of the pandemic; however, this unusual behavior can be explained by the performance of positions in foreign currency-denominated assets and, especially, the value of trading derivatives. Since income from the loan portfolio can be negatively affected during a period of systemic crisis, banks need to diversify their portfolio [27] with non-interest income sources.
PL	In contrast to revenues, the profits of Colombian credit institutions declined significantly during the beginning of the pandemic. This behavior is explained by the restrictions applied to contain the impact of the pandemic in the national territory, which had significant economic repercussions in different sectors. The quality of bank assets deteriorated and the returns associated with the value of foreign currency-denominated assets were offset by loss-making positions. Banks should control the concentration of the portfolio, particularly the mortgage portfolio, to limit exposure to legal risk [29].
LPI	The item showed positive behavior during the pandemic period. However, although the profits obtained through the granting of credit have increased, this does not mean that banks can dispose of these in cash. The economic difficulties faced by many borrowers, as a consequence of the measures taken to contain the pandemic, lead to an increase in credit losses in the form of non-performing loans and increased exposure to risk [31]. In that sense, it is important to consider reasonable alternatives to renegotiate loans, avoiding a significant impact on portfolio quality.
PR	The data show a significant increase in the level of provisions of Colombian banks during the first phase of the pandemic. This demonstrates the impact that the unraveling of the real economy can have on the performance of financial institutions. The non-payment of debtors affected by the pandemic is a situation that cannot be avoided; however, if left unchecked, it can lead to an increase in the number of non-performing loans and the delinquency ratios in a bank [65]. The above has repercussions on the financial results since it is the main source of income; therefore, it is advisable to monitor customers, especially corporate loans.
VTD	This variable explains, in large part, the unusual behavior of banks' operating income during the pandemic period. The trading derivatives of banking establishments are mainly related to operations in the Forex market. In this sense, abrupt changes in the volatility levels of the exchange rate may produce atypical results in derivative positions, which may have an impact on the quality of hedges in foreign currency operations. Given that some studies have shown limitations of central banks to control exchange rate volatility in the short term, it is important to monitor structural factors such as the monetary authority's inflation targets or the level of international reserves [21].
RFCA	Losses related to the restatement of foreign currency-denominated assets considerably exceeded profits during March 2020, which had a significant impact on the financial results of the banking business. The above is evidence of the impact of exchange rate volatility on the results of financial institutions during periods of turbulence. Although central banks adopted measures conducive to improving liquidity levels in the foreign exchange market and controlling volatility [2], prudent supervision of these operations in the banking context is required, since geopolitical events or economic crises could overcome the measures taken by the monetary authority.
IDD	During the pandemic period, there was a reduction in interest paid by banks for deposit operations. This cushioned the pressure on the financial burden handled by the banks but was not enough to offset the unfavorable results in other dimensions of the business. Private banks' returns were affected by interest rate fluctuations and risks. However, some emerging countries may have had difficulty adjusting their monetary policy during periods of crisis given the vulnerability of their capital flows [66]. Therefore, in the event of a crisis, banking establishments should ensure access to sufficient levels of liquidity to cover financing costs while adjusting their cost structures and access to new sources of income.
TRE	Although this study does not show a significant relationship between the budget allocated to information technology expenses and bank performance, it is expected that the positive effects of these efforts will materialize in the long term. To that extent, it is expected that technological investments will have cumulative effects and will have an impact on the flow of benefits expected by banks in the future. In this regard, the adoption of online banking can contribute to improving reputation, customer loyalty, and labor productivity [41]. Much of the value attributable to these resources cannot be captured by traditional accounting metrics.
TRM	The results of this study show that there is a statistically significant relationship between the exchange rate and the operating income of Colombian banks. Some empirical works support this finding [22,27,28], where the impact of the exchange rate on banks' results is evidenced. Currency volatility can have an impact on the valuation of assets and the results of operations denominated in foreign currency. In this sense, the internationalization of the banking business can bring benefits in terms of diversification, but it can also lead to greater exposure to systemic risk. Therefore, it is essential to monitor the evolution of the exchange rate when facing periods of turbulence.

Source: own elaboration.

Thus, in the banking sector, there was an accelerated transition toward the digitalization of financial services to meet the current situation. The results of the actions carried

out by the banking establishments persist after the pandemic, evidencing a more intense use of electronic platforms and mobile applications for the development of financial transactions, which is expected to continue to evolve as the country recovers from the crisis. Greater adoption of information technologies by banking establishments can have positive consequences in terms of environmental and social sustainability. Digital banking can contribute to the reduction of paper consumption or carbon emissions associated with urban travel. In addition, these technologies can promote financial inclusion by facilitating access to banking services in remote regions or among underserved populations. Advances in IT security and new transactional mechanisms can help to conduct financial transactions efficiently and securely, without the need for costly physical infrastructure.

The results of this study can be considered for their practical implications by public policymakers, institutions, and professionals related to the financial industry. The findings have elucidated the importance of key factors for the performance of banking establishments in times of crisis, such as Loan Portfolio Income, Provisions (Impairment), and exchange rate volatility. Therefore, it is advisable that regulatory and control institutions, as well as banks, design mechanisms to address promptly the effects derived from crises that expose the industry to systemic risk conditions. To this purpose, the design of certain financial instruments or the structuring of insurance policies may be considered, whose rights may be exercised based on factors such as the quality of the banking establishments' portfolios or the commercial performance of their active operations.

The search for new sources of income is also a strategy to reduce banks' exposure to crises; to this end, it is recommended to adopt Fintech innovations to improve efficiency and scope in the provision of banking services. Moreover, the implementation of specific modules to monitor crises in banking information systems can facilitate decision-making by managers and employees, allowing them to respond effectively to the needs of their customers and changes in their consumption patterns.

Although the background highlights the findings of some studies regarding the incorporation of information technologies to boost the performance of the banking industry, the results of this research are not conclusive. Thus, it is expected that further studies will delve deeper into the issue related to the impact of technology on the results of the banking business, for which it is suggested to address some limitations of this research. For example, in this study, a correlation analysis is made between the technology-related expenses of banking establishments concerning their operating revenues and reported profits. Subsequent studies could focus on the investments identifiable in the balance sheet and evaluate whether changes in these items can have an impact on the financial performance of banking establishments in the short, medium, and long term.

Additionally, it is recommended to consider some mediating variables, such as, i.e., the contribution of these technologies in terms of effectiveness in achieving commercial results or market share growth. It is also possible to evaluate their contribution in terms of efficiency, as well as terms of the management of expenses associated with the normal course of business.

In addition to the limitations mentioned above, some restrictions of the methodological design should be considered. The study focuses on some measures of banking establishments' results and expenditures, as well as on exchange rate volatility. However, it is desirable that in subsequent studies, greater emphasis be placed on the causal relationships of these variables and their relationship with relevant balance sheet data and market performance measures. For practical purposes and consistent with the objective of this research, the work concentrated on these items; however, this implies some restrictions of scope and simplification, which could lead to possible measurement errors.

Finally, there is an opportunity to address these issues beyond descriptive data patterns and time series. One of these possibilities is network theory, with which a contribution can be made in this field, to understand the nature of systemic risk, in light of the complex interconnections of the financial system and its relationships with other factors in the environment.

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## References

- Ocampo, J.A. *Una Historia del Sistema Financiero Colombiano 1870–2021*; Asobancaria, Ed.; MNR Comunicaciones y Ediciones S.A.S: Bogotá, Colombia, 2021. Available online: [www.mnredicciones.com](http://www.mnredicciones.com) (accessed on 30 June 2023).
- Cantú, C.; Cavallino, P.; De Fiore, F.; Yetman, J. A Global Database on Central Banks' Monetary Responses to COVID-19. 2021. Available online: <https://www.bis.org/publ/work934.htm> (accessed on 3 July 2023).
- Castro, S.; Vera, A.; Montoya, G. Sistema Financiero Frente al COVID-19. Colombia vs. la Region. Asobancaria, Edición 1243. 2020. Available online: <https://www.asobancaria.com/wp-content/uploads/2020/07/1243VF.pdf> (accessed on 8 July 2023).
- Colombia Financial Superintendency. Cifras de Seguimiento a las Medidas. Medidas de La Superfinanciera Ante Coyuntura Por COVID-19. 2 February 2022. Available online: <https://www.superfinanciera.gov.co/inicio/sala-de-prensa/publicaciones-/medidas-de-la-superfinanciera-ante-coyuntura-por-covid-/cifras-de-seguimiento-a-las-medidas-10103899> (accessed on 8 July 2023).
- Benavides-Franco, J.; Carabalí-Mosquera, J.; Alonso, J.C.; Taype-Huaman, I.; Buenaventura, G.; Meneses, L.A. The evolution of loan volume and non-performing loans under COVID-19 innovations: The Colombian case. *Heliyon* **2023**, *9*, e15420. [CrossRef] [PubMed]
- Rendón, J.; Cortés, L.; Perote, J. Determining the Banking Solvency Risk in Times of COVID-19 through Gram-Charlier Expansions. Documentos de Trabajo CIEF 19593, Universidad EAFIT. 2021. Available online: [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=3928191](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3928191) (accessed on 23 July 2023).
- Londoño-Vélez, J.; UCLA, N.; Pablo, Q.; Nyu, N.; Fajardo, F.; Holloway, K.; Jaramillo, S.; Otálora, M.J.; Serrano, A.; Restrepo, S.; et al. The impact of emergency cash assistance in a pandemic: Experimental evidence from Colombia. *Rev. Econ. Stat.* **2022**, *104*, 157–165. [CrossRef]
- Varón, A.; González, M.; Ramírez, M.P. Colombia: Innovation, trust and emotions during the COVID-19 pandemic. *Manag. Res.* **2020**, *19*, 1–21. [CrossRef]
- Kalenkoski, C.M.; Pablonia, S.W. Impacts of COVID-19 on the self-employed. *Small Bus. Econ.* **2022**, *58*, 741–768. [CrossRef]
- Daniels, J.P. COVID-19 cases surge in Colombia. *Lancet* **2020**, *396*, 227. [CrossRef] [PubMed]
- McKinsey & Company. How COVID-19 Has Pushed Companies over the Technology Tipping Point—And Transformed Business Forever. 2020, pp. 1–9. Available online: <https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/how-covid-19-has-pushed-companies-over-the-technology-tipping-point-and-transformed-business-forever> (accessed on 4 August 2023).
- Khuong, N.V.; Phuong, N.T.T.; Liem, N.T.; Thuy, C.T.M.; Son, T.H. Factors affecting the intention to use financial technology among Vietnamese youth: Research in the time of COVID-19 and beyond. *Economies* **2022**, *10*, 57. [CrossRef]
- Pérez, L.; Lozano, M. La Digitalización Acelerada de la Banca Motivada por el COVID-19. Bachelor's Thesis, Universidad Politécnica de Cartagena, Murcia, Spain, 2021. Available online: <http://hdl.handle.net/10317/9457> (accessed on 30 August 2023).
- Nazaritehrani, A.; Mashali, B. Development of E-banking channels and market share in developing countries. *Financ. Innov.* **2020**, *6*, 12. [CrossRef]
- Xiazi, X.; Shabir, M. Coronavirus pandemic impact on bank performance. *Front. Psychol.* **2022**, *13*, 1014009. [CrossRef]
- Nyikos, G.; Kondor, Z. The Involvement of National Development Banks Promoting Sustainable Finance. *DETUROPE—Cent. Eur. J. Reg. Dev. Tour.* **2022**, *14*, 147–163. [CrossRef]
- Mir, A.A.; Bhat, A.A. Green banking and sustainability—A review. *Arab Gulf J. Sci. Res.* **2022**, *40*, 247–263. [CrossRef]
- Davidson, S.N. Interdependence or contagion: A model switching approach with a focus on Latin America. *Econ. Model.* **2020**, *85*, 166–197. [CrossRef]

19. Hoshikawa, T.; Yoshimi, T. The Effect of the COVID-19 Pandemic on South Korea's Stock Market and Exchange Rate. *Dev. Econ.* **2021**, *59*, 206–222. [CrossRef] [PubMed]
20. Rakshit, B.; Neog, Y. Effects of the COVID-19 pandemic on stock market returns and volatilities: Evidence from selected emerging economies. *Stud. Econ. Financ.* **2022**, *39*, 549–571. [CrossRef]
21. Kuncoro, H. Interest Rate Policy and Exchange Rates Volatility Lessons from Indonesia. *J. Cent. Bank. Theory Pract.* **2020**, *2*, 19–42. [CrossRef]
22. Salehbbhai, F.A.; Jariwala, P.P. An impact of bank rate and inflation rate on volatility of foreign exchange rate in India. *Int. J. Public Sect. Perform. Manag.* **2021**, *8*, 54–66. [CrossRef]
23. Aldasoro, I.; Fender, I.; Hardy, B.; Tarashev, N. BIS Bulletin No 12: Effects of COVID-19 on the Banking Sector: The Market's Assessment. 2020. Available online: [www.bis.org/publ/bisbull12.htm](http://www.bis.org/publ/bisbull12.htm) (accessed on 7 September 2023).
24. Demirgüç-Kunt, A.; Pedraza, A.; Ruiz-Ortega, C. Banking sector performance during the COVID-19 crisis. *J. Bank. Financ.* **2021**, *133*, 106305. [CrossRef] [PubMed]
25. Alabbad, A.; Schertler, A. COVID-19 and bank performance in dual-banking countries: An empirical analysis. *J. Bus. Econ.* **2022**, *92*, 1511–1557. [CrossRef]
26. Mirzaei, A.; Saad, M.; Emrouznejad, A. Bank stock performance during the COVID-19 crisis: Does efficiency explain why Islamic banks fared relatively better? *Ann. Oper. Res.* **2022**, *17*, 1–39. [CrossRef]
27. Rawlin, R.S.; Ramachandran, S.R.; Dev, K. Framework to Optimize Profitability of Private Sector Banks in India. In Proceedings of the 2023 14th International Conference on E-business, Management and Economics (ICEME'23), Beijing, China, 21–23 July 2023; Association for Computing Machinery: New York, NY, USA, 2023; pp. 356–362. [CrossRef]
28. Mamo, W.B.; Feyisa, H.L.; Yitayaw, M.K. Financial performance of commercial banks in the emerging markets. *Corp. Gov. Organ. Behav. Rev.* **2021**, *5*, 244–257. [CrossRef]
29. Bernardelli, M.; Korzeb, Z.; Niedziolka, P. The banking sector as the absorber of the COVID-19 crisis' economic consequences: Perception of WSE investors. *Oeconom. Copern.* **2021**, *12*, 335–374. [CrossRef]
30. Mateev, M.; Sahyouni, A.; Al Masaied, T. Bank performance before and during the Covid-19 crisis: Does efficiency play a role? *Rev. Manag. Sci.* **2022**, *18*, 29–82. [CrossRef]
31. Carletti, E.; Claessens, S.; Fatás, A.; Vives, X. *The Bank Business Model in the Post-COVID-19 World*; Centre for Economic Policy Research: London, UK, 2020.
32. Dluhopolskyi, O.; Pakhnenko, O.; Lyeonov, S.; Semenog, A.; Artyukhova, N.; Cholewa-Wiktor, M.; Jastrzębski, W. Digital financial inclusion: Covid-19. Impacts and opportunities. *Sustainability* **2023**, *15*, 2383. [CrossRef]
33. Dadoukis, A.; Fiaschetti, M.; Fusi, G. IT adoption and bank performance during the Covid-19 pandemic. *Econ. Lett.* **2021**, *204*, 109904. [CrossRef] [PubMed]
34. Kwan, A.; Lin, C.; Pursiainen, V.; Tai, M.; Agarwal, S.; Basten, C.; Bonfim, D.; Brown, M.; Campello, M.; Doerr, S.; et al. Stress Testing Banks' Digital Capabilities: Evidence from the COVID-19 Pandemic. 2021. Available online: <https://www.paymentsjournal.com/fis-need-updated-digital-roadmaps-to-reflect-the-rapid-shift-to-digital-banking-> (accessed on 10 October 2023).
35. Doran, N.M.; Bădîrcea, R.M.; Manta, A.G. Digitization and financial performance of banking sectors facing COVID-19. Challenges in Central and Eastern European countries. *Electronics* **2022**, *11*, 3483. [CrossRef]
36. Tok, E.; Yesuf, A.J. Embedding Value-Based Principles in the Culture of Islamic Banks to Enhance Their Sustainability, Resilience, and Social Impact. *Sustainability* **2022**, *14*, 916. [CrossRef]
37. Hanif, M. Shari'ah-compliance ratings of the Islamic financial services industry: A quantitative approach. *ISRA Int. J. Islam. Financ.* **2018**, *10*, 162–184. [CrossRef]
38. Ayeed, M.H.; Al-Tameemi, O.A. Technologies of Sustainability in Large Banks Buildings. *IOP Conf. Ser. Earth Environ. Sci.* **2022**, *961*, 012099. [CrossRef]
39. Boros, A.; Lentner, C.; Nagy, V.; Tózsér, D. Perspectives by green financial instruments—A case study in the Hungarian banking sector during COVID-19. *Banks Bank Syst.* **2023**, *18*, 116–126. [CrossRef]
40. Fu, W.; Abbass, K.; Niazi, A.A.K.; Zhang, H.; Basit, A.; Qazy, T.F. Assessment of sustainable green financial environment: The underlying structure of monetary seismic aftershocks of the COVID-19 pandemic. *Environ. Sci. Pollut. Res.* **2023**, *30*, 61496–61510. [CrossRef]
41. Kolodiziev, O.; Shcherbak, V.; Vzhytynska, K.; Chernovol, O.; Lozynska, O. Clustering of banks by the level of digitalization in the context of the COVID-19 pandemic. *Banks Bank Syst.* **2022**, *17*, 80–93. [CrossRef]
42. Claessens, S.; Forbes, K. International Financial Contagion. The Theory, Evidence, and Policy Implications. The IFM's Role in Emerging Market Economies. Reassessing the Adequacy of Its Resources. 2004, pp. 1–34. Available online: <https://mitsloan.mit.edu/shared/ods/documents?DocumentID=4943> (accessed on 17 October 2023).
43. Duan, Y.; El Ghouli, S.; Guedhami, O.; Li, H.; Li, X. Bank systemic risk around COVID-19: A cross-country analysis. *J. Bank. Financ.* **2021**, *133*, 106299. [CrossRef] [PubMed]
44. European Central Bank. The concept of systemic risk. *Financ. Stab. Rev.* **2009**, 134–142.
45. Cerutti, E.; Claessens, S.; McGuire, P. Systemic Risk in Global Banking. What Can Available Data Tell Us and What More Data Are Needed? 2012. Available online: [www.bis.org/publ/work376.pdf](http://www.bis.org/publ/work376.pdf) (accessed on 22 November 2023).
46. Borri, N.; di Giorgio, G. Systemic risk and the Covid challenge in the European banking sector. *J. Bank. Financ.* **2022**, *140*, 106073. [CrossRef]

47. Huang, Z. Systemic risk in banking against the backdrop of the COVID-19 Pandemic. *Systems* **2023**, *11*, 87. [CrossRef]
48. Rizwan, M.S.; Ahmad, G.; Ashraf, D. Systemic risk: The impact of COVID-19. *Financ. Res. Lett.* **2020**, *36*, 101682. [CrossRef] [PubMed]
49. Fitzgerald, S.M.; Rumrill, P.D., Jr.; Schenker, J.D. Correlational designs in rehabilitation research. *J. Vocat. Rehabil.* **2004**, *20*, 143–150.
50. Curtis, E.A.; Comiskey, C.; Dempsey, O. Importance and use of correlational research. *Nurse Res.* **2016**, *23*, 20–25. [CrossRef] [PubMed]
51. Zheng, Z.; Podobnik, B.; Feng, L.; Li, B. Changes in Cross-Correlations as an Indicator for Systemic Risk. *Sci. Rep.* **2012**, *2*, 888. [CrossRef]
52. Pastorino, C.; Uberti, P. An empirical comparison of correlation-based systemic risk measures. *Qual. Quant.* **2023**, 1–26. [CrossRef]
53. Chen, L.; Han, Q.; Qiao, Z.; Stanley, H. Correlation analysis and systemic risk measurement of regional, financial and global stock indices. *Phys. A Stat. Mech. Its Appl.* **2020**, *542*, 122653. [CrossRef]
54. Zhou, Z. A Research on Technology Innovation and Efficiency Improvement Correlation with Bank Performance Based on Data Envelopment Analysis. In Proceedings of the 7th International Conference on Intelligent Information Processing (ICIIP'22), Bucharest, Romania, 21–22 November 2023; Association for Computing Machinery: New York, NY, USA, 2023. Article 12. pp. 1–9. [CrossRef]
55. Jaouad, E.; Lahsen, O. Factors Affecting Bank Performance: Empirical Evidence from Morocco. *Eur. Sci. J.* **2018**, *14*, 255. [CrossRef]
56. Daoud, H.E.; Al-Fawwaz, T.M.; Arabyat, Y. The Relationship between IT Investment Levels and Bank Performance: The Case of Jordanian Banking Sector. *Glob. J. Manag. Bus. Res. C Financ.* **2015**, *15*, 64–75.
57. Decree-Law 663, Pub. L. No. 40.820, Diario Oficial. 1993. Available online: [http://www.secretariassenado.gov.co/senado/basedoc/estatuto\\_organico\\_sistema\\_financiero.html](http://www.secretariassenado.gov.co/senado/basedoc/estatuto_organico_sistema_financiero.html) (accessed on 26 November 2023).
58. Colombia Financial Superintendency, Externa Circular 049 of 2012. Modificación al Plan único de Cuentas en Relación con Instrumentos Financieros Derivados. 2012. Available online: <https://www.superfinanciera.gov.co/publicaciones/20142/normativanormativa-generalcirculares-externas-cartas-circulares-y-resoluciones-desde-el-ano-circulares-externas-20142/> (accessed on 26 November 2023).
59. Mach, K.J.; Mastrandrea, M.D.; Freeman, P.T.; Field, C.B. Unleashing expert judgment in assessment. *Glob. Environ. Chang.* **2017**, *44*, 1–14. [CrossRef]
60. Bellini, T. LGD Modelling. In *IFRS 9 and CECL Credit Risk Modelling and Validation*; Elsevier: Amsterdam, The Netherlands, 2019; pp. 155–213. [CrossRef]
61. Colombia Financial Superintendency. Interactue con las Cifras. 2020. Available online: <https://www.superfinanciera.gov.co/jsp/index.jsf> (accessed on 29 November 2023).
62. Cheol, E.; Bruce, R. *Administración Financiera Internacional*, 4th ed.; McGraw Hil: New York, NY, USA, 2007.
63. Diario Portafolio. Precio del Dólar en Colombia Cerró con Alza de 220 Pesos. Portafolio. Economía. 9 March 2020. Available online: <https://www.portafolio.co/economia/dolar-trm-hoy-precio-del-dolar-en-colombia-hoy-9-de-marzo-de-2020-538856> (accessed on 30 November 2023).
64. Bancolombia. *Tendencias Financieras 2021 para el Sector Bancario*; Capital Inteligente: Bogotá, Colombia, 2021.
65. Wahyuni, A.S.; Patittingi, F.; Amaliyah; Yunus, A. COVID-19 Stimulus: Risk Mitigation in Banking Credit Restructuring. *BiLD Law J.* **2022**, *7*, 95–101.
66. Çiçek, S.; Yıldırım, A. The impact of domestic and global factors on individual public, domestic and foreign bank performances in Türkiye. *Cent. Bank. Rev.* **2024**, *24*, 100139. [CrossRef]

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