An analysis of Puerto Rico's bank failures through an event study

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Abstract

This study aims to analyze the effect of news events on the returns of Puerto Rican banks before the closing of three of them on the same day. The commercial banks in Puerto Rico and the financial sector occupied a second position regarding their economic contribution to the Gross Domestic Product. The event study methodology as a statistical technique employed in the study is, first, to relate events in the progression of each bank's failure to abnormal performance of its stock price and then secondly, to examine any abnormal performance of the data corresponding to Puerto Rican commercial banks, including the three failed banks, at the closing. This study contributes to the academic finance literature on event study methodology to measure the effect of the closure of three banks in a Latin American country subject to its regulatory system and oversight from the United States bodies. The results suggest that the failures signaled an unexpected deterioration in the operating and regulatory environments by affecting the returns. The investor's response reflected by falling stock prices can be considered a normal reaction to an unfavorable signal rather than a contagion effect. These results are helpful for regulators in identifying and developing measures to safeguard financial stability.

Keywords: bank failure, contagion effect, event study, financial institution

Introduction

Puerto Rico's banking system is subject to its regulatory system under the Office of the Commissioner of Financial Institutions (OCIF, by its Spanish acronym), as well as oversight from two U.S. regulatory bodies: The Federal Reserve System, and the Federal Deposit Insurance Corporation (FDIC). In several ways, Puerto Rico has features that make it a strong— and potentially highly competitive territory — in the economy; since it is open and is favorably located, occupying a central position in the Caribbean which also provides a gateway between the U.S. mainland and Latin America.

According to the Business Cycle Dating Committee (2010) of the National Bureau of Economic Research (NBER), the economic recession started in December 2007 and was abetted by the worst United States financial crisis since the Great Depression. It was triggered by the mismanagement of financial innovations involving subprime residential mortgages and the bursting of the housing price bubble.

As presented by González (2010), most Puerto Rican banks entered the financial crisis in a weak condition, given that several of the island's banks confronted deep problems related to the valuation and accounting of complicated derivative contracts and loan sales that went bad in 2005. In addition to the recession, low household income, high unemployment, fierce competition for loans, and steep losses on soured real-estate deals contributed to the crisis.

As presented in Figure 1 during the savings and loan crisis of the 1980s, more than 100 banks failed every year between 1982 through 1992; with 470 and 534 failing in 1988 and 1989 respectively. The comparison of the two crises: the savings and loans in the 1980's and the Financial Credit in the 2008's is difficult, given that the total number of institutions is different for both periods. During the past 20 years, the number of banks has declined. There were over 15,000 institutions during most of the 1980s and just over 7,500 during the latter half of the 2000s. The banking industry has consolidated as managers seek economies of scale and the use of technology to offer services across different geographic markets.
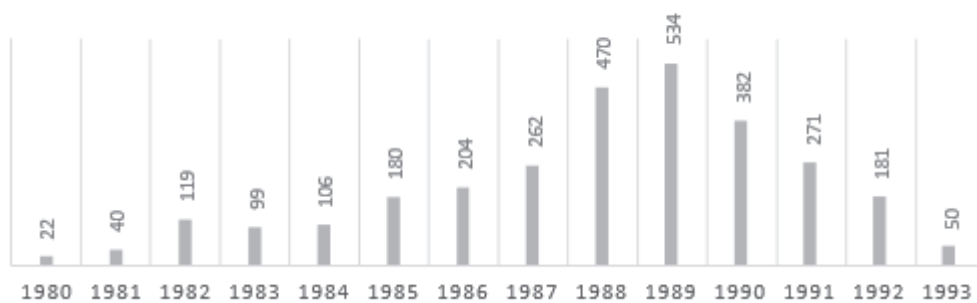
Figure 1. Total Number of Bank Failures in the U.S.A. by FDIC 1980-1993. Source: Author's elaboration with FDIC data.

As shown in Figure 2, the bank failures reappeared in 2008, with 25 failures, after almost 15 years of being relatively quiet. Only in 2009 and 2010 were more than 100 bank failures during the subprime financial crisis. The failures represented a challenge for the FDIC, which dealt with more than 521 bank failures from 2000 through 2013; 157 occurred in 2010, representing 30.13 percent of the total. Regarding the percentage of failures during both periods, the most significant bank failures were registered between 1988-1990 and 2009-2011. In 2010, of 157 bank failures assisted by the Federal Depository Insurance Corporation (FDIC), Westernbank and R-G Premier Bank were ranked the two largest banks in amounts of deposits and assets, and Eurobank occupied the ninth position.
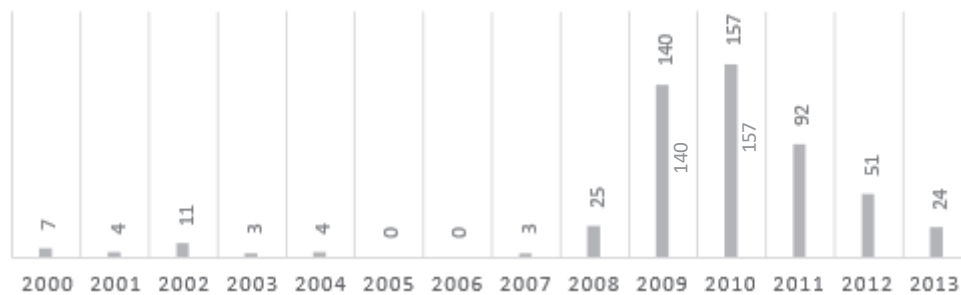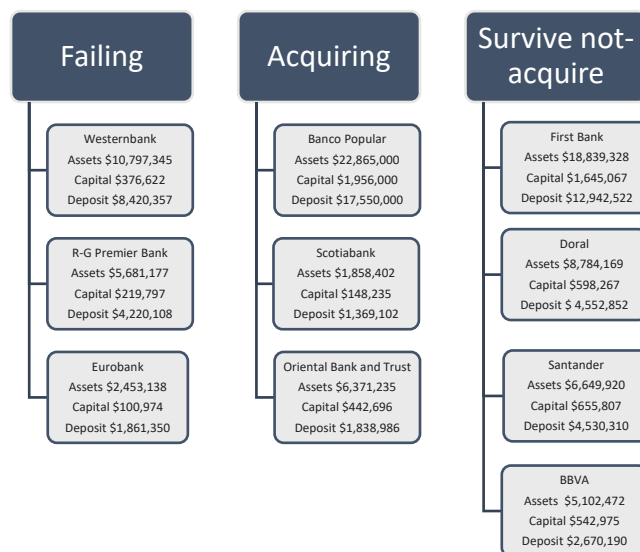

Figure 2. Total Number of Bank Failures in the U.S.A. by FDIC 2000-2013 Source: Author's elaboration with FDIC data.

The debate for the need for banking regulation and supervision depends officially on whether there is contagion risk in banking. Contagion risk – also called systematic risk – is the risk that financial difficulties at one or more banks spill over to many banks or the financial system as a whole. The empirical results of a study by Schoenmaker (1996) indicate a contagion risk in banking. An initial failure could generate further failures without intervention by the authorities. He claims that public intervention is vital in the form of emergency assistance in times of crisis. It is arguable that the banking sector, as a recipient of this liquidity support, should be regulated and supervised.

While Puerto Rico's bank failures did not have the same scale of impact as major U.S. mainland bank failures, they did contribute to a sense of instability in financial markets. The situation highlighted vulnerabilities in regional banking systems. With the bank failures in Puerto Rico, of its seven commercial banks, four remained, and as a result, three of the seven firms listed on Wall Street were eliminated. This consolidation has been the first step to rebuilding the system and the economy. The systemic approach to the consolidation will allow an orderly change in the sector. The assisted transactions provide income and capitalization as FDIC intervention is considered a healing element to the banking industry. Bankers hope that consolidation will lead to less cutthroat competition for loans. More importantly, they hope merging will assist banks in lowering their reliance on deposits from institutional investors, which come and go while strengthening deposits from more stable local customers.

Figure 3 presents the Puerto Rican banking system and its assets, deposits, and capital, expressed at $000 as of March 31, 2010. Popular Inc. (BPOP), the island's largest bank by assets, bought Westernbank, the largest of the three

and with the most construction loans. Bank of Nova Scotia (BNS) bought R-G Premier, and Oriental Financial Group Inc. (OFG), the island's second-smallest bank, acquired Eurobank. The failures marked the first bank collapse in Puerto Rico in at least 15 years. In 2010, of 157 bank failures assisted by the Federal Depository Insurance Corporation (FDIC), Westernbank and R-G Premier Bank were ranked the two largest banks in amounts of deposits and assets, and Eurobank occupied the ninth position.

Failing	Acquiring	Survive not-acquire
Westernbank Assets $10,797,345 Capital $376,622 Deposit $8,420,357	**Banco Popular** Assets $22,865,000 Capital $1,956,000 Deposit $17,550,000	**First Bank** Assets $18,839,328 Capital $1,645,067 Deposit $12,942,522
R-G Premier Bank Assets $5,681,177 Capital $219,797 Deposit $4,220,108	**Scotiabank** Assets $1,858,402 Capital $148,235 Deposit $1,369,102	**Doral** Assets $8,784,169 Capital $598,267 Deposit $ 4,552,852
Eurobank Assets $2,453,138 Capital $100,974 Deposit $1,861,350	**Oriental Bank and Trust** Assets $6,371,235 Capital $442,696 Deposit $1,838,986	**Santander** Assets $6,649,920 Capital $655,807 Deposit $4,530,310
		BBVA Assets $5,102,472 Capital $542,975 Deposit $2,670,190

Figure 3 - Puerto Rico banking system data as of March 31, 2010, Source: Author's elaboration with FDIC data.

As a result, on April 30, 2010, after five years of crisis in Puerto Rico's banking industry, the Office of the Commissioner of Financial Institutions ordered the closure of the three insolvent commercial banks: W Holding Co. Inc.'s Westernbank (WHCI), R&G Financial Corp.'s R-G Premier Bank (RGFCQ) and EuroBancshares Inc.'s EuroBank (EUBK) collapsed mainly under the weight of bad real-estate loans. The assisted transactions by the FDIC and regulators sought to repair the island's banking system and provide support for its ailing economy.

Table 1 below shows the assets, deposits, capital, and net income percentage of failing, acquiring, and surviving (not acquired) banks as of March 31, 2010. As noted, the three closing banks held about $21 billion in assets, about a fifth of the assets, and almost 24% deposits of $60 billion of the 10 banks headquartered on the island. Since 2010, four commercial banks out of the ten actives in the country closed with the intervention of the FDIC. As mentioned by Monahan (2015), however, the resilience of the surviving banks has led them to pursue a growth strategy through acquisitions and make their operations more efficient through electronic banking.

Table 1 Statistical Banks Data for Failing, Acquiring, and Survive (not acquire)

Banks	Asset	Deposit	Capital	Net income
Failing	21.18%	24.19%	10.43%	80.70%
Acquiring	34.78%	34.62%	38.09%	-12.05%
Survive (not acquire)	44.04%	41.19%	51.48%	31.35%

Source: Author's elaboration with FDIC data.

Literature review

According to Kaufman (1994), a bank failure is likely to cause more serious contagion effects than the failure of any other type of firm. The banking literature has identified two types of contagion effects, conditioned upon the type of information: pure or industry-specific contagion and firm (bank)- specific contagion.

A study by Aharony and Swary (1983) examined the possible relationship between the specific cause of a large bank failure and any contagion effect. They distinguish between pure (industry-specific) and noisy (firm-specific) contagion. The former, pure or industry-specific contagion means that regardless of the cause of bank failure, its effect would spill over to other banks. It is said to occur when negative information – such as fraud or losses on specific risk investments - about one or more firms in an industry adversely affects all other firms, regardless of differences in the financial condition or that they have few, if any, characteristics in common with the first firms other than being in the same industry. Industry-specific contagion is sometimes referred to as non-informational contagion and is viewed in literature as an irrational response.

The noisy (firm or bank-specific) contagion is sometimes called informational contagion and is viewed as a rational response. Caldentey and Vernengo (2023) found that the degree of belief in the potential insolvency of a financial institution based on financial information is why runs happen. Runs are endogenous to the financial conditions of a financial institution. It occurs when new information about one or more firms affects other firms with one or more characteristics shared with the first firm. If one bank fails, other banks with a similar asset and liability structure – vulnerable to the same economic shocks- may also face a run. According to Kaufman (1994), the runs and contagion resulting from the failure of firms are feared more in banking than in other industries because of their perceived quickness and broader adverse impact within the industry.

According to Ben et al. (2023), a crisis in one country spreads to other countries regardless of their economic situation. Therefore, to ensure the stability of a financial system and protect countries from future crises, policymakers must implement isolation strategies for countries prone to a contagion effect that minimize their sovereign solvency risk and mitigate contagion.

A study by Brewer et al. (2003) established that not all banks were equally affected by the failures. This suggests that the market could differentiate among banks in its response to the failures, so any contagion from the failures to other banks was rational and information-based. In a world with imperfect information, runs on other banks can be triggered by perceived similarities (not necessarily actual ones) with the failing bank.

Given the changes in the banking environment over time, contagion effects could be conditioned on the characteristics of the failing bank and the banking environment at that time.

Most failures occurred for reasons other than runs, e.g., local economic recessions, poor management, fraud, etc. Recent research by Rojas (2023) related to Silicon Valley Bank indicates that for the majority of emerging markets, where previous episodes of banking crises were devastating, it is crucial to promptly correct deficiencies and allow their central banks to use the interest rate tool to fight inflation without fearing significant disruptions in their financial systems.

The valuation effects could be attributed to the fear of a bank running from any source of information about the bank asset revealed by an event. Concerning the valuation effects attributed to the fear of a bank run, the contagion effects can develop from random shocks that induce some depositors to run, say, withdraw funds for deposits at other banks or currency at full and on time even when no fundamental change in a bank's prospects has occurred. The introduction of the Federal Deposit Insurance Corporation in 1934 reduced the probability and the size of a run on a bank.

The runs are seen as the primary mechanism that spreads the germs of failure contagion and may be the consequence rather than the cause of insolvency. In the last few years, the runs have not resulted in an automatic suspension of an economically insolvent bank. The banks have gone through a transition process that allows them to maintain operations until the failure has been legalized and executed by the corresponding agency.

Materials and Methods

The event study methodology, a statistical technique for analyzing the pattern of stock prices and returns when a particular event occurs, has been the predominant tool for determining the effects of an event on their security returns. One main role of event study testing is in studies related to market efficiency. Under the efficiency hypothesis, new information should immediately, without delay, be fully reflected in stock prices.

The announcement of a significant event will be reflected in negative abnormal returns generated by adverse movements in the stock price in all firms in the sector affecting the firm's values. In efficient capital markets, the spillover of the effects of negative news affecting one firm or group of firms is known as the contagion effect. If this unanticipated and unfavorable information has a contagion effect, it should immediately be reflected in the stock prices of other solvent banks.

Several studies, such as Aharony and Swary, (1983) and Kaufman (1994) have measured the breadth of spillover from a bank failure by the shareholders of the surviving banks as evidenced in share returns. Using stock market data,

these studies examine the post-announcement share performance. Negative abnormal returns are an indicator of contagion effects. Following the earlier-mentioned distinction between industry-specific and firm-specific contagion, Kaufman found only some support for the latter in these empirical studies. An initial failure does not cause further failures directly. However, information about the first or first few banks in difficulties reveals information about (some) other banks. This methodology was applied in a study to measure whether financial markets react positively or negatively to announcements of Puerto Rican bank failures. The study measured the contagion effect on Puerto Rico's banking, including the failing, acquiring, and surviving banks.

Since this study seeks to detect any contagion effect of banks that ultimately failed, any adverse firm-specific information observed before the formal failure of those banks is considered a critical event. The critical event date is the earliest possible date of public knowledge. Brewer et al. (2003) concluded that the market value of customers of the failed banks was adversely affected at the date of the failure announcement. The search for critical events was conducted five years before the failure date and obtained by the *Wall Street Journal (WSJ)*. Dates of events in the progression of each bank failure and brief descriptions were provided in chronological order in Table 2. The symbols represent RGFCQ for R-G Premier Bank, DRL for Doral Bank, BNS for Scotiabank, WHCI Westernbank, and EUBK Eurobank. The daily return data for each bank were obtained from the Center for Research and Security Prices (CRSP) from January 2004 to May 2010.

Table 2 - The Events and Description in the Progression of Each Bank Failure

Event order	Event day	Bank Symbol	Critical Event Description
1	12/9/05	RGFCQ, DRL, **BNS**	Imminent financial restatements by three Puerto Rican banks under investigation by the SEC.
2	3/2/06	RGCFQ, WHCI, DRL, BNS	First BanCorp (BNS) and R&G Financial Corp are under investigation by the SEC for how they accounted for mortgage deals with Doral (DRL). W Holding Co. would write off $8.2 million in earnings after its audit committee reclassified its interest-only (IO) deals with Doral as loans.
3	6/27/07	WHCI	Westernbank's large asset-based loan is impaired, and it believes the collateral deficiency to be at least $80 million on a preliminary basis.
4	3/17/10	RGFCQ, WHCI, EUBK	The Federal Deposit Insurance Corp. seeks buyers for three banks in Puerto Rico.
5	4/29/10	RGFCQ, WHCI, EUBK	Four banks entered bids in a Federal Deposit Insurance Corp. auction that could decide the fate of three troubled lenders in Puerto Rico.

Once the event days were identified, the market model was used to estimate the returns for those banks. The daily abnormal returns were calculated as

$$AR_{i\tau} = R_{i\tau} - \alpha_{i\tau} - \beta_i R_{mt} \qquad (1.1)$$

Where $R_{i\tau}$ is the return on firm i at time τ, R_{mt} is the corresponding return of market at time t, and α_i and β_i are the market model parameters obtained from an Ordinary Least Squares (OLS) regression. The Russell 2000 index was used and obtained from Bloomberg to measure the market return. The market model parameters were calculated using an estimation window of 300 days preceding the first of the five critical events considered from the days -310 through -11. The event period was 21 days.

Therefore, the method employed relates events in the progression of each bank's failure to the abnormal performance of its stock price. The data corresponds to the ten existing Puerto Rican commercial banks, including the three failed banks, at the April 30, 2010, closing date. Daily returns cover 300 days before the first critical event occurred on December 9, 2005, and ten days after April 29, 2010, the date of the fifth event. The daily return data for each bank was obtained from the Center for Research and Security Prices (CRSP) from September 20, 2004 through May 13, 2010.

As previously mentioned, in inefficient capital markets, a failing firm would sustain a large stock price drop then, in which investors observed a substantial solvency deterioration signal. If this unanticipated unfavorable information had a contagion effect, it should have been immediately reflected in the stock prices of other solvent banks. The effect on Puerto Rico's banks during those events was measured. For all the Puerto Rican banks (the acquiring, surviving, and failing portfolio) in addition to the standardized abnormal return (SAR), which was calculated using Boehmer et al. (1991):

$$SAR_{i\tau} = \frac{AR_{i\tau}}{\hat{\sigma}_i \sqrt{1 + \frac{1}{L_1} + \frac{(R_{m\tau} - \bar{R}_m)^2}{\sum_{t=-310}^{-11}(R_{m\tau} - \bar{R}_m)^2}}}$$

(1.2)

Where $\hat{\sigma}_i$ is the security $i's$ standard deviation of the market model abnormal return during the estimation period, L_1 is the number of trading days in the estimation period of security i, and $\bar{R}_m$ is the average market return during the estimation period. For each one of the 21 days in the event window, the cross-sectional standard deviation of the standardized abnormal return is calculated as:

$$\sigma_{SAR_i} = \sqrt{\frac{\sum_{i=1}^{N}\left(SAR_{i\tau} - \sum_{i=1}^{N}\frac{SAR_{i\tau}}{N}\right)^2}{N(N-1)}}$$

(1.3)

The standardized cross-sectional test statistic is therefore:

$$Z = \frac{\sum_{i=1}^{N}\frac{SAR_{i\tau}}{N}}{\sigma_{SAR_i}}$$

(1.4)

The individual standardized abnormal returns are considered cross-sectionally independent and distributed normally. The Central Limit Theorem guarantees that the distribution of the sample average abnormal returns converges to normality, even in the presence of event-induced variance by Boehmer et al. (1991).

Results

According to Kaufman (1994), the runs and contagion resulting from the failure of firms are feared more in banking than in any other industry because of their perceived quickness and broader adverse impact within the industry. Aharony and Swary (1983) found that the more similar the banks are in size, location, and markets served, the more likely it is that more banks will be affected and/or the intensity of the contagion will increase. They concluded that other factors, such as bank reputation and investor and depositor confidence, may also play a significant role in determining the degree to which the expected failure of other banks may influence a bank. Given the change in the banking environment over time, contagion effects could be conditioned on the characteristics of the failing bank and the banking environment at that time. Most failures occurred for reasons other than runs, e.g., local economic recessions, poor management, fraud, etc. Tables 3 to 6 show the results for the failings, acquiring, surviving-not acquiring, and all the banks of Puerto Rico with the Z standardized cross-sectional test statistic calculated under the Boehmer et al. (1991) model associated with each of the five events. The first column lists the range of days in the event window, and the other columns list the cumulative abnormal returns with corresponding Z-statistics below for each one of the events. The ***, **, and * indicate statistical significance at the 1, 5, and 10 percent levels (two-tail).

As presented in Table 3, except for the first event, the average cumulative abnormal returns are positive; the other four events show statistically significant negative cumulative abnormal returns for the three failing banks: Westernbank, R-G Financial Services, and Eurobank. The events 2 and 5 are the most statistically significant for failed banks. Brewer et al. (2003) concluded that the market value of customers of the failed banks is adversely affected at the date of the failure announcement. In the fifth event, which is related to the announcement of the imminent closure of the three banks, the periods closer to the event show a vital statistical significance. The -3 to +3 announcement period shows excess return averages of negative 34.77% and negative 16.77 % from -1 to +1; both are statistically significant at a one percent level.

Table 3 – Cumulative Standardized Abnormal Returns for Puerto Rico's Failings Banks

Period	Event 1		Event 2		Event 3		Event 4		Event 5	
[-10: +10]	4.87		-0.61		-10.78		-13.40		-15.52	
	2.03	**	(0.25)		(1.47)		(2.45)	**	(0.91)	
[-5: +5]	2.62		-1.38		-9.88		-10.94		-26.83	
	1.96	*	(0.05)		(0.77)		(1.82)	*	(2.09)	**
[-3: +3]	1.51		-0.80		-7.99		-10.38		-34.77	
	1.46		(2.62)	***	(0.06)		(1.85)	*	(2.84)	***
[-1: +1]	0.26		-0.30		-11.01		-9.32		-16.77	
	1.28		(0.84)		(2.24)	**	(2.45)	**	(2.68)	***
[-5: 0]	2.66		-0.13		-9.55		-8.37		-10.81	
	0.85		(3.00)	***	(0.11)		(1.23)		(0.93)	
[+1: +5]	0.04		-1.25		-0.34		-2.57		-37.65	
	1.98	**	(3.21)	***	(1.25)		(1.35)		(2.08)	**

Table 4 shows that for the acquiring banks, the average standardized cumulative abnormal returns for event 2 in the period -1 to +1 are negatively statistically significant at the one percent level, with an average cumulative abnormal return that is negative 1.90%. Meanwhile, for the entire event window of 21 days, the market reacted positively at a five percent level of statistical significance. On the other hand, event 3 shows a negative statistical significance at a 1 percent level with a cumulative standardized abnormal return of 2.46 percent for the window of -5 to +5 days. For the days -5 to +5 surrounding the fifth event, the market model standardized abnormal return is negative 5.75%, and for the day -5 to the announcement day, the average cumulative abnormal return is negative 2.89%, both at a statistical significance of 5 percent level.

Table 4 - Cumulative Standardized Abnormal Returns for Puerto Rico's Acquiring Banks

Period	Event 1	Event 2		Event 3		Event 4		Event 5	
[-10: +10]	-1.66	1.09		-1.89		14.59		-2.25	
	(0.77)	2.35	**	(2.02)	**	2.59	**	(0.49)	
[-5: +5]	-0.53	-1.54		-2.46		10.38		-5.75	
	(0.54)	(0.32)		(2.74)	***	1.29		(2.25)	**
[-3: +3]	-0.27	-2.14		-1.34		6.93		-1.10	
	(0.24)	(2.29	**	(1.07)		0.93		(0.61)	
[-1: +1]	-1.18	-1.90		-0.58		6.05		2.43	
	(0.97)	(3.16)	***	(0.84)		1.19		1.06	
[-5: 0]	-0.08	-0.40		-1.83		6.07		-2.89	
	(0.05)	(1.17)		(1.41)		0.54		(2.09)	**
[+1: +5]	-0.62	-1.14		-0.63		4.31		-2.86	
	(0.75)	(0.80)		(2.52)	**	1.32		(1.05)	

Table 5 illustrates that events 2, 3, and 5 are negatively statistically significant for the Puerto Ricans surviving without acquiring banks. In contrast, event 1 shows a positive statistical significance at level 5 for the window one day before through 1 day after, when the news was about the imminent financial restatements by R-G Premier Bank, Doral Bank, and Scotiabank, three of the Puerto Rican banks under investigation by the SEC. Doral is a surviving bank in this study. The results of event 1 are similar to those of the acquiring banks in event 4, which presents a positive statistical significance. However, the announcement of event 4, related to the FDIC seeking buyers for the banks in Puerto Rico, does not impact the investors of other banks.

Table 5 – Cumulative Standardized Abnormal Returns for Puerto Rico's Surviving Banks

	Puerto Rico's surviving banks							
Period	Event	1	Event	2	Event 3		Event 4	Event 5
[-10: +10]	-0.43		-0.38		-3.29		1.57	-12.34
	(0.28)		(0.39)		(2.00)	**	0.75	(2.82) ***
[-5: +5]	-0.20		-1.92		-3.79		-1.47	-14.18
	(0.01)		(1.80)	*	(3.32)	***	(0.39)	(2.85) ***
[-3: +3]	0.12		-1.51		-2.60		-1.33	-9.28
	0.32		(2.20)	**	(2.35)	**	(0.79)	(1.82) *
[-1: +1]	1.16		-1.00		-1.10		-1.09	-1.30
	2.19	**	(2.64)	***	(1.21)		(0.71)	(0.71)
[-5: 0]	-1.16		-0.47		-2.82		0.45	-7.16
	(1.44)		(1.31)		(2.70)	***	0.73	(2.67) ***
[+1: +5]	0.96		-1.45		-0.97		-1.92	-7.02
	1.58		(1.25)		(1.97)	**	(1.39)	(1.30)

The failure of a large bank is expected to have a more pronounced adverse impact on other banks because it receives more publicity, and the investors may create fear. Event 5 shows the complete 21-day window where the average cumulative abnormal return is negative 12.34% and statistically significant at the one percent level. It suggests a stronger negative price response for the investors of surviving banks during the fifth event related to four banks that entered an FDIC auction to acquire the three troubled lenders in Puerto Rico.

The five-day windows 5 days before the event had robust statistical significance at the one percent level for the three and five events. The average announcement period returns are negative 14.18% and negative 7.16% for -5 to +5 days and -5 to the event day, respectively, for event 5. In event 3, the average announcement returns are negative 3.79% and negative 2.82%, respectively.

As demonstrated in Table 6, for all of the banks of Puerto Rico, events two and three related to accounting problems, and the fifth event correlated to the closing of the three banks, which are negatively statistically significant at the one and five percent level for various event windows of up until 10 days close to the announcement date; except for event 3 where for the total event window of 21 days, the market model standardized abnormal return is negative 5.12% with a standardized cross-sectional test statistic of negative 2.48 at the 5 percent level. The period of up to five days after the event for event 5, related to the process of auction of the FDIC, showed that stockholders reached abnormal losses of up to negative 15.45% with statistical significance at the one percent level and negative 14.96% at the 5 percent level. The capital market reaction was negative and statistically significant at the one percent level in various events. In the second event, the abnormal losses were 1.06% [-1, +1]. In the third event, the abnormal losses were negative 5.22% [-5, +5] and negative .68% [+1, +5]. In the fifth event, the investors sustained negative 15.45% [-5, +5] and negative 14.47% [-3, +3]. Announcements one and four have no significance level in any period.

Table 6 - Cumulative Standardized Abnormal Returns for Puerto Rican Banks

		Puerto Rican banks			
Period	Event 1	Event 2	Event 3	Event 4	Event 5
[-10: +10]	0.79	-0.30	-5.12	0.99	-10.27
	0.80	(0.05)	(2.48) **	0.66	(1.55)
[-5: +5]	0.55	-1.64	-5.22	-0.76	-15.45
	0.31	(2.17) **	(3.53) ***	(0.26)	(3.03) ***
[-3: +3]	0.42	-1.49	-3.84	-1.57	-14.47
	0.45	(2.30) **	(1.48)	(0.99)	(2.82) ***
[-1: +1]	0.19	-1.06	-3.92	-1.42	-4.82
	(0.22)	(2.92) ***	(2.24) **	(1.29)	(1.64)
[-5: 0]	0.36	-0.35	-4.54	-0.51	-0.49
	0.14	(0.77)	(2.30) **	(0.13)	(1.80) *
[+1: +5]	0.19	-1.30	-0.68	-0.25	-14.96
	0.31	(2.38) **	(2.72) ***	(0.23)	(2.53) **

Conclusion

This study contributes to the finance academic literature on event study methodology to measure whether there is a contagion effect of the closing of three banks in a Latin American country subject to its regulatory system and oversight from the United States bodies. The three bank failures under study are part of the ten commercial banks in Puerto Rico and the financial sector, which occupies a second position regarding its economic contribution to the Gross Domestic Product. A bank failure is closing an insolvent bank by a federal or state banking regulatory agency. Of 157 bank failures assisted by the Federal Depository Insurance Corporation (FDIC), Western Bank and R-G Premier Bank were ranked the two largest ones in amounts of deposits and assets, and Eurobank occupied the ninth position.

The results concerning the announcement that involves Western Bank demonstrate that the more similar the banks are in size, location, and markets served, the more likely it is that a more significant number of banks will be affected. "Banco Popular" is the bank with the most significant assets and deposits in the Puerto Rico banking system. This is not mentioned in any announcement; however, investors reacted differently in events 2 to 5: negative in the second and third, positive in the fourth and fifth, built according to the windows. These are varying levels of statistical significance. These results coincide with other factors, such as bank reputation and investor and depositor confidence, which may also play a significant role in determining the degree to which the expected failure of other banks may influence a bank. This implies that the market was, on the whole, able to differentiate among banks in its response to the failures. Hence, any contagion from other banks' failures was rational and information-based.

The results reflect that the failures signaled an unexpected deterioration in the operating and regulatory environments by adversely affecting the returns of failing banks, which may also improve the competitive conditions for acquiring banks. The investor's response reflected by falling stock prices can be considered a normal reaction to an unfavorable signal rather than a contagion effect. Moreover, by eliminating a significant competitor, the failure of any one bank may work to the benefit of the remaining banks. Thus, the failure of a bank may either adversely affect other banks via contagion or benefit them by reducing competition. Event 4, relating to the announcement about FDIC seeking buyers for three banks in Puerto Rico, was a sign of imminent closure. Thus, it hurt investors of failure and was a positive one for the three banks that acquired, but it did not affect the general system of commercial banks in Puerto Rico or the banks that survived and did not acquire. These results are helpful for regulators in identifying and developing measures to safeguard financial stability.

References

Aharony, J. and Swary, I. (1996). Additional Evidence on the Information-based Contagion Effects of Bank Failures. Journal of Banking and Finance, 20, 57-69.

Aharony, J. and Swary, I. (1983). Contagion Effects of Bank Failures: Evidence from Capital Markets. Journal of Business, 58, 305-322.

Ben Abdallah, N., Dabbou, H. and Gallali, M.I. (2023), "Contagion in the Euro area sovereign CDS market: a spatial approach", Journal of Risk Finance, Vol. 24 No. 5, pp. 614-630.

Boehmer E., Musumeci, J. and Poulsen, A. (1991). Event-Study Methodology under Conditions of Event-Induced Variance. Journal of Financial Economics, 30, 253-272.

Brewer III, E., Genay, H., Hunter, W. and Kaufman, G. (2003). Does the Japanese Stock Market Price Bank-Risk? Evidence from Financial Firm Failures. Journal of Money, Credit and Banking, 35, 507-543.

Caldentey, E. P., & Vernengo, M. (2023). BANK RUNS IN PRACTICE AND THEORY.

Investigación Económica, 82(325), 37–71.

González, J. (2010, May 2). Después del Cierre. El Nuevo Día, Sec. Portada, 10-13. Kaufman, G. (1994). Bank Contagion: A Review of the Theory and Evidence. Journal of

Financial Services Research, 123-150.

Monahan, J. (2015, July 1). Puerto Rico's banks enter survival mode. The Banker.

Schoenmaker, D. (1996). Contagion on Risk in Banking. LSE Financial Markets Group, 86-104.

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