European Review of Economic History, **00**, 1–31
doi:10.1093/ereh/heae009

Can managers successfully deceive investors? Media attention and market manipulation during the Panama scandal

MIGUEL ÁNGEL ORTIZ-SERRANO* AND GERMÁN FORERO-LAVERDE**
**Economics and Business History, Department of Economics, CUNEF University of Madrid, Spain, miguelangel.ortiz@cunef.edu*
***Faculty of Governmental Finance and International Relations Economics, Universidad Externado of Colombia, Bogotá, Colombia, german.forerol@uexternado.edu.co*

This paper explores how the Panama Company stock price incorporated fake positive news planted by company managers in French newspapers during the spring of 1888 to bait investors into an upcoming securities issue. The results show that news about the Panama Company only had firm-specific effects, making the firm's main stock more volatile while keeping constant expected returns. This suggests that investors considered the new debt issue a risky operation. Finally, we find a non-contemporaneous positive effect of future news on present stock returns, suggesting an unlawful exploitation of asymmetric information by investors privy to the publication of fake news.

1. Introduction

The idea of misleading information in the media is not new. Throughout history, the ample scope of newspapers, TV, and the Internet has been exploited to manipulate information and influence public opinion while promoting political, economic, or social interests. In the early twentieth century, newspaper directors and journalists were already using the threat of badmouthing to extract rents or benefits from different targets (Bignon and Flandreau 2011). Regarding the incorporation of information in stock prices, Ferguson et al. (2015) studied the influence of tone and volume in UK newspapers on stock returns, finding that both positive and negative news had a strong effect on firms' value in 1981–2010. This highlights the link between innovations in information and investor decision-making. Kogan et al. (2021) found that fake news has an impact on the behavior of asset prices by increasing their volatility, which suggests that markets do have the ability to discern the effect of fake news.

This paper explores the way financial markets incorporated widespread fake news in stock prices by exploiting a historical event: the issue of the *obligations à lots* (debt securities) by the managers of the *Compagnie Universelle du Canal Interocéanique de Panama* (henceforth, the Panama Company) on 26 June, 1888. As shown by Ortiz-Serrano and Forero-Laverde (2020), there was a massive pay-to-play scheme in which the company's management paid journalists and journal directors to publish fake positive news about the firm's performance. The scandal exposed a vast network of corrupt connections between politicians, journalists, and the firm's managers, who made extensive use of checkbook journalism and lobbying to ensure favorable coverage for the enterprise. Moreover, it contributed to the discrediting of republican parties (Celestin and Dalmolin 2007, p. 117) and sparked a wave of anti-Semitic sentiment throughout the country (Do et al. 2024).

The question we pose is whether the fake news campaign advanced by management was able to deceive investors into buying the upcoming issue of securities or if markets were able to discern the hoax and act accordingly. In this work, we expand upon previous findings in four distinct ways. First, we show that the fake news campaign had an impact on only the Panama Company's stock and did not affect other companies in the same industry. Second, we show that, during the fake news period (23 April–26 June, 1888), there was a decoupling between the Panama Company's stock and the other securities issued by canal companies, as the former became riskier when compared to the market index and the latter faced a lower market risk. Third, we observe that the incorporation of news into the model increased the volatility of the Panama Company's stock without resulting in higher average expected returns. This suggests that the market did not react to the news as the company managers expected. Instead, the market viewed the new debt issue as increasing the company's risk. This result indicates that markets were able to discern properly between true news and fake news planted by management in the media. Finally, we find a non-contemporaneous effect of future news on present stock returns, which points to the possibility of an unlawful exploitation of asymmetric information by manager-investors privy to the publication of fake news, who may have engaged in insider trading.

We contribute to the literature by providing new evidence on the way financial markets incorporate innovations in information, and whether or not they are able to discern between true and fake news about a company's behavior. This historical approach, as opposed to a contemporary analysis on a given security, allows several confounding factors to be eliminated. To begin with, traders in global markets today can protect themselves from fake news by relying on reputable information sources such as Reuters, Bloomberg, or the Financial Times. Additionally, the prevalence of algorithmic (computer-based) trading and the fact that traders typically do not base their decisions on social media information reduces the likelihood of fake news significantly affecting global markets. Moreover, even if private investors and households were influenced by fake news, their impact on market prices remains negligible given their relative relevance.

The rest of this paper is structured as follows: Section I introduces the historical context. Section II analyzes the existing literature on financial markets and media coverage. Section III describes the dataset and provides stylized facts about the event of interest. Section IV presents methodology and main results and shows how including media variables improves the explanatory power of the models. Section V concludes.

2. Historical background

The Panama Company broke ground in 1880. Following the completion of the Suez Canal, Ferdinand de Lesseps promoted a new and more ambitious project to enhance overseas international trade and strengthen France's prestige (Bouvier 1964, pp. 34–35). Figure 1 displays a technical map from 1885 depicting the design of the works as originally envisioned in 1880, outlining the breakdown of the project in operational zones designated for each region. The decision on the type of canal was a subject of debate from the outset, ultimately resulting in the selection of a sea-level canal, which was later replaced by a sluicegates canal in 1887 due to escalating costs associated with the original option (Mollier 2014).

In 1880, Ferdinand de Lesseps assured investors that the costs of the entire project would not exceed 500 million francs. To promote the initial stock offering, the company allocated

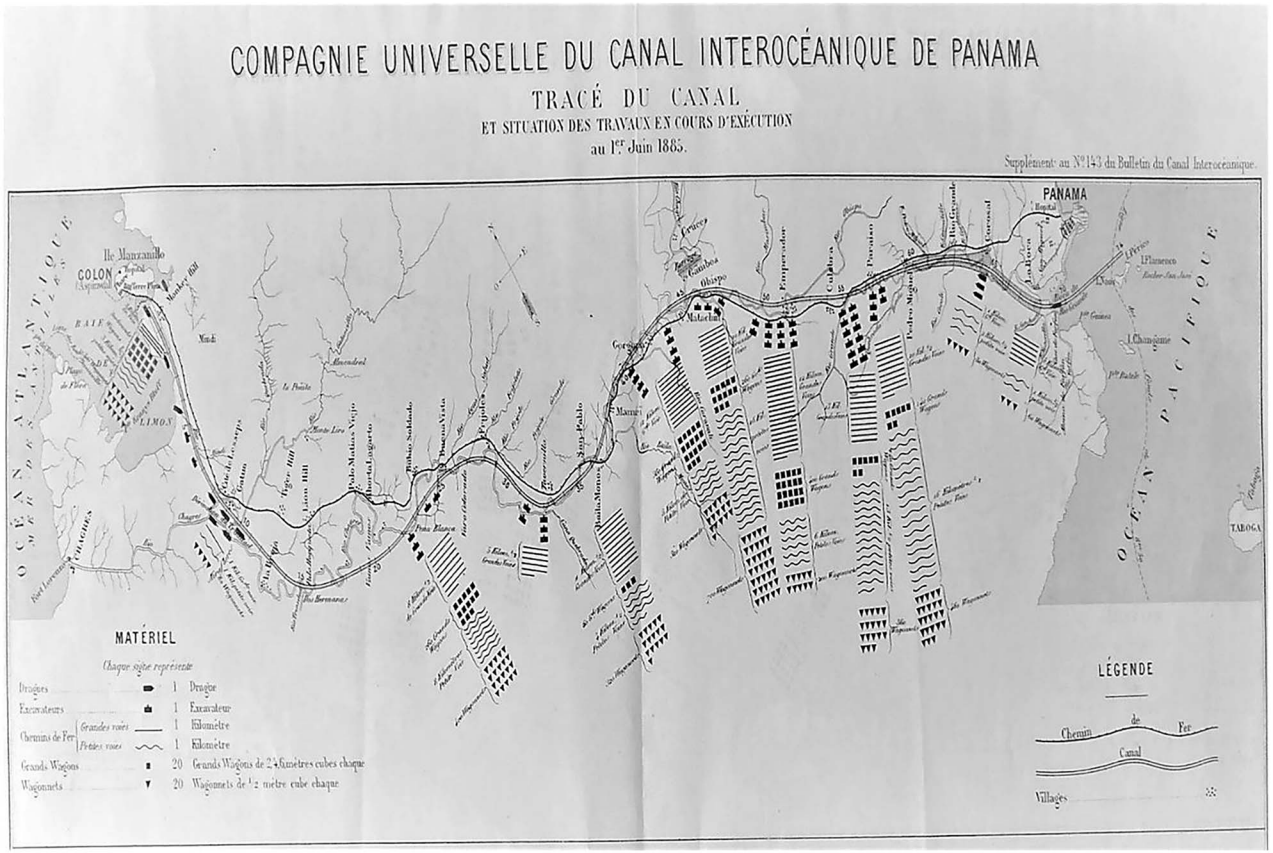

Figure 1. *Technical map of the operations in the Panama isthmus, describing each working section.*

Table 1. *Economic forecasts for the Suez and Panama Companies*

Expected dividends and prices					
		Suez Company		Panama Company	
Percent yearly growth	Year	Dividends	Stock Price	Dividends	Stock Price
10 percent	1886	42.4	1,060	101	2,531
	1887	46.78	1,169	116.75	2,920
	1888	51.16	1,279	135	3,375
	1889	55.54	1,388	154.90	3,862
	1890	59.92	1,498	176.50	4,412
5 percent	1891	64.30	1,607	188.75	4,720
	1892	68.68	1,717	201	5,025
	1893	73.06	1,826	214.75	5,370
	1894	77.44	1,935	229	5,725
	1895	81.82	2,045	224	6,100
Expected traffic and yearly revenues					
		Suez Canal		Panama Canal	
Percent yearly growth	Year	Traffic in tons	Revenue generated	Traffic in tons	Revenue generated
10 percent	1886	71,080,000	192,000	110,500,000	303,000
	1887	75,460,000	204,000	121,800,000	334,000
	1888	79,840,000	216,000	133,880,000	367,000
	1889	84,220,000	228,000	146,945,000	403,000
	1890	88,600,000	240,000	161,500,000	442,000
5 percent	1891	92,980,000	252,000	169,620,000	465,000
	1892	97,360,000	264,000	177,915,000	487,000
	1893	101,740,000	276,000	187,030,000	513,000
	1894	106,120,000	288,000	196,480,000	538,000
	1895	110,500,000	300,000	206,380,000	565,000

Source: Archives du Crédit Agricole. Cote: DEEF 2371–1.

800,000 francs and conducted an extensive advertising campaign (Bourson, 2000; p.17), which involved widespread distribution of brochures, circulars, booklets, and numerous advertisements in the French mainstream press. The project was expected to yield significant profits from its outset, with further increases projected upon its anticipated completion around 1886–1888. The top panel of table 1 displays dividend expectations and stock prices for the Suez Canal Company versus the Panama Company. The bottom panel compares traffic and revenue projections made by the firm's managers.

Despite the optimistic projections, however, the company faced liquidity shortages from the moment the works were launched. Hamza and Abdel-Latif (2003) suggest that de Lesseps's reputation and tactics, which were successful in Suez in 1859, were less effective in this case because the world's economic configuration had undergone substantial changes by then, transitioning from an economic landscape characterized by significant infrastructure projects (railways, docks, etc.) to one marked by the dominance of extractive industries and the growth

Table 2. *Security issues since 1881 to March 1888 (in francs)*

Date of Issue	Number of titles	Price paid in the market	Income generated
7 September, 1882	250,000 shares of 500 francs. 5 percent.	437.5 F	109,375,000
3 October, 1883	600,000 shares of 500 francs. 3 percent.	285 F	171,000,000
25 September, 1884	478,762 shares of 500 francs. 4 percent.	333 F	145,190,000
3 August, 1886	458,802 'Obligations Nouvelles' of 1,000 francs. 3 percent.	450 F	206,460,000
26 July, 1887	258,887 'Obligations Nouvelles'. 2nd series of 1,000 francs. 3 percent.	440 F.	113,910,000
14 March, 1888	350,000 'Obligations Nouvelles'. 3rd Series of 1,000 francs. 3 percent.	460 F	35,031,000

Source: Jean Bouvier (1964, p. 81).

of the financial sector (Esteves 2011). The progressive colonization of overseas territories in Africa and Asia, for instance, might have fostered opportunities to invest in markets that were more cost-effective and held the potential for greater profitability than Latin America.

According to Degos and Prat Dit Hauret (2008), three factors contributed to the failure of the Panama Company. First, credible studies on the operational hurdles of the project were not effectively conducted. Second, the original budget did not account for events that would increase operational costs, such as the acquisition of the Panama Railway Company for 90 million francs (Courau 1932, p. 145). Third, the construction took place during a period of deteriorating economic conditions in France, which began in 1882, and that may have curtailed risk-averse investors from participating in risky endeavors. Table 2 shows that the firm had issued stocks and bonds almost every year since its establishment, which, according to Bouvier (1964, p. 81), was symptomatic of rising costs and managerial difficulties.

Moreover, the high mortality rate among workers impacted the Panama Company's reputation, with an estimated 5,600 to 22,000 men reported as deceased between 1881 and 1889, according to Chastel (1992). These numbers were widely underreported, which led to widespread criticisms[1] and ultimately may have deterred investors from funding the operation. In 1886, as failure to meet initial forecasts became obvious, the French government dispatched an official to assess the feasibility of the project, resulting in the renowned *Rapport Rousseau*,[2] which revealed that the works had only cleared 6 percent of the land from the main geographical obstacle, the *Culebra Massif*, and was suffering from considerable delays in other

[1] Aristide-Paul Blanchet. 1882. La lumière sur Panama [Texte imprimé]: analyse et critique du rapport lu par M. Ferdinand de Lesseps à l'assemblée générale des actionnaires de la *Compagnie* du canal, le 29 Juin 1882.

[2] This document, available upon request, consists of a report written from "*l'expert* Rousseau" to the French parliament, where he provides extensive information about the advances at the isthmus and the potential solutions to successfully finalize it. It was obtained from the Archives of BNP Paribas, Cotes: 73AH/399 & 73AH/398. A. Rousseau, 1886. *Rapport présenté au ministre des Travaux publics par Armand Rousseau sur sa mission à Panama*, Canal de Panama, Paris, May et Motteroz.

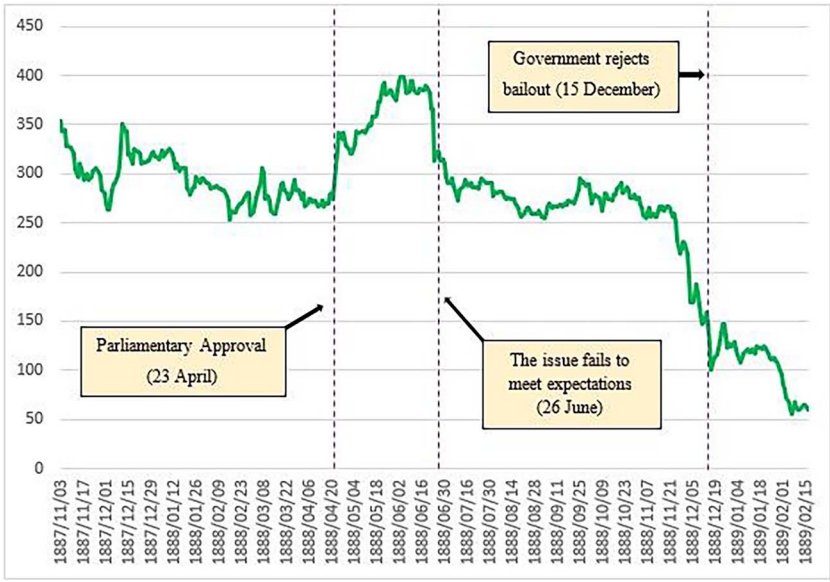

Figure 2. *Price trend of the Panama Company's main stock, 1 November, 1887–15 February, 1889.*

areas. The report concluded that the project would require an additional 3 billion francs to cover all expenses and take approximately 12 more years to complete.

Ferdinand de Lesseps acknowledged that the project needed to undergo changes and commissioned Gustave Eiffel to design a new canal project with sluice gates. By using his political connections (Bouvier 1964), de Lesseps managed to obtain the necessary governmental approval for a bonds issue, known as the *bons-à-lots*. Immediately after obtaining that authorization on 23 April, 1888, the Panama Company allocated substantial amounts of money to supportive generalist newspapers who would disseminate positive information about the firm.[3] This was meant to encourage prospective investors to subscribe to the upcoming bonds issuance. However, the operation, planned for 26 June, 1888, failed to attract sufficient investors to rescue the project. After this failure, rumors of a potential French government intervention to rescue the project began circulating, which could partially explain the stability of the Panama Company's stock until mid-November. However, as this possibility diminished, the stock plummeted, ultimately leading to the company's bankruptcy on 15 December, 1888, as shown in figure 2.

During the trial against the company's directors in 1893, the investigation revealed an abnormal increase in advertising expenses between 14 March and 24 June, 1888. These expenses rose from around 5 million francs to over 30 million francs. The primary contemporary document summarizing this investigation, the *Rapport Vallé*[4] (1893), directly

[3] Mollier (2014) provides an extensive explanation about the strategy followed by the Panama Company concerning the funding of the general press, and how the massive sums mobilized by the firm affected its financial stability (see chapter XI, pp. 353–399). The author utilizes information from the Rapport Vallé (1893), a document covering the official investigation against the managers of the Panama Company that demonstrated the existence of a corrupt network that involved the directors of the main French newspapers.

implicated the French press in the corruption network created around the issue of 26 June, 1888. The media was accused of intentionally disseminating false information with the sole purpose of deceiving potential investors and concealing the financial, operational, and managerial challenges faced by the company. Moreover, this document alleged that newspaper directors had received abnormal sums of money from the firm's managers, who attempted to manipulate the market and investors' perceptions to favor the issue of 26 June.[5]

3. Literature review

The media's significance extends beyond its capacity for dissemination. It encompasses associations among media executives, CEOs, major corporations, and politicians, which are often hidden to prevent potential legal and reputational consequences. Stiglitz (2014) argues that a critical press can aid market participants in their decision-making processes by providing the most accurate information possible. Dyck and Zingales (2002) explored the factors influencing corporate behavior among media managers. They found that press freedom can exert a positive influence, leading CEOs to be more responsive to small shareholders' concerns and to prioritize business ethics, thereby avoiding corrupt practices. Similar findings were made by Dyck et al. (2008), Kuhnen and Niessen (2012), and Dai et al. (2015). Furthermore, Peña-Martel et al. (2018) addressed the relationship between the media and firm governance, finding that a high degree of media exposure promotes informativeness and transparency. Similarly, Conrad et al. (2002) studied the long-run trend of stock performance amid bad and good news, using earnings announcements for 1988–1998 in the United States, finding that stock markets react more to bad news during 'good times', while its predictive power decreases during economic downturns. Recent studies have identified that the media operates as a transmission channel for information related to ESG (environmental, social, governance) investments onto a firm's performance in the stock market (Bissoondoyal-Bheenick et al. 2023).

However, disinformation can lead to undesirable outcomes. Journalists may propagate false news due to economic interests, personal beliefs, and editorial stances. Djankov et al. (2003) examined media ownership in a sample of 97 countries, finding a positive relationship between public-owned media and low degrees of press freedom, although they acknowledged that the results might vary if a more extensive database were available. Gehlbach and Sonin (2014) offered a theoretical framework to examine the motivations behind government control of the media to produce biased information in favor of its interests, drawing on post–Soviet Russia as a contemporary illustration. Baron (2006) showed that even in competitive markets with low ownership concentration, bias can persist if journalists prioritize their own interests or if newspapers are subjected to pressure from lobbyists.

Since media bias is not limited to autocratic regimes, it might be also an important factor in liberal democracies, where governments may use it as a tool to spread their ideas and shape people's political preferences. Durante and Knight (2012) focused on the effects of management changes in public television in Italy following the 2001 parliamentary elections, when Silvio Berlusconi's party emerged victorious, which revealed a notable shift toward political conservatism in the public media.

[4] Available in Gallica, the online repository of the National Library of France (BNF): n.
[5] Series: *DEEF 2371–1* and *DEEF 2371–2*, Crédit Agricole.

Some authors have addressed the role of the media in predicting stock returns and fluctuations in financial markets. Tetlock (2007) addressed the effect of the media's tone on stock market variations, aiming to capture and quantify "investors' sentiment" to estimate the predictive power of pessimistic news on future stock price changes. Garcia (2013) found that the media had a significant predictive power over next-day stock returns on the New York Stock Exchange during the twentieth century. This aligns with Shiller (2000 & 2015) hypothesis concerning the media's role in modern societies, which suggests that the media's tone affects investors' mentality especially during periods of economic turmoil.

As in modern financial markets, media bias may have played a significant role during the nineteenth and twentieth centuries. Nonetheless, there is no consensus in this field, and results vary depending on the historical context or the specific subject of analysis. Campbell et al. (2012) used media coverage as a proxy for sentiment to examine its impact on stock market performance during the British Railway Mania in the mid-nineteenth century. They found that the mainstream press had little effect on investors' decisions during this financial bubble. Likewise, Turner et al. (2018) investigated the long-run role of the media in the London Stock Exchange during the nineteenth century. They found a non-significant relationship until the 1840s, when the press became the primary source of information in British society. According to Bignon and Miscio (2010), in early twentieth century France, the directors of financial newspapers were well aware that their outlets had a large scope and therefore were very selective when publishing biased information. In fact, this bias may have positively contributed to the further development of the Paris Stock Exchange. Contemporary sources such as Lajeune-Vilar (1895) suggest that editors expressed the views of those who funded or sponsored them, even using undisclosed financial incentives to disseminate biased and misleading information (pp. 14–22).

4. Data and stylized facts

We explore how the Panama Company stock price incorporated fake positive news planted by company managers in French newspapers during the spring of 1888 to bait investors into an upcoming securities issue. We want to test whether increases in the volume of positive news about the Panama Company, as well as a consistent improvement in the tone of said news, had an impact on the behavior of the stock's price as expected by the company's management. Fake news were planted to make the stock price increase, remain high, and thus attract new investors into the upcoming stock issue of 26 June, 1888. To test the impact of news tone and coverage on the daily stock return, we will run different specifications of the capital asset pricing model (CAPM). In what follows, we describe the data required to structure the different models we present in the paper.

5. Economic data

As in Ortiz-Serrano and Forero-Laverde (2020), we expanded on the database from Ortiz-Serrano (2018),[6] composed of 73 liquid stocks from the Paris Stock Exchange (also known as the *Paris Bourse*), to have enough data for the period before the issue of the

[6] See the appendix of Ortiz-Serrano (2018) for a broader explanation of the economic and firm-specific characteristics of the stocks included in the dataset.

bons-à-lots.[7] Daily spot prices were obtained from official bulletins (*Bulletins de la Cote*) published by the *Compagnie des Agents de Change* and available at the National Library of France (BNF). Data on the nominal and paid capital, dividends, and composition of boards of directors were obtained from shareholder annual reports (which are available in the archives of *Crédit Agricole* and belong to the historical collection of *Crédit Lyonnais*) and stockbrokers' yearbooks (*Annuaires des Agents de Change*, which are available in the archives of the *Service des Archives Économiques et Financières*). The detailed list of references is outlined in the Appendix, and all the documents are available upon request. In general, the Paris Stock Exchange spreadsheets provide extensive daily trading information for each stock, including the price of each economic transaction. When a stock was not traded on a particular day, the corresponding space for transaction records remained blank. The stocks' liquidity was measured, as in Ortiz-Serrano (2018), by creating a dummy that takes a value of 1 when a stock has been traded at least once in a day (i.e., there is at least one price on the spreadsheet of Compagnie des Agents de Change).

The Paris Stock Exchange has historically been considered an illiquid market because of the civil law origins of the French financial framework (Lagneau-Ymonet and Riva 2018). However, with the legalization of forward operations in 1885, the Paris Bourse soon became a dynamic place that involved a rising volume of economic transactions, especially in the forward market, which accounted for four times contemporary French GDP in the early twentieth century. The same trend was followed by the spot market, where volumes had been growing steadily since the late 1890s.[8]

Our time period therefore encompasses an emergent market, characterized by rising liquidity but with trading volumes far below that of the early twentieth century. In 1888, there were two financial markets in Paris: The first was the *Marché Officiel* (the official market, also known as *Le Parquet* or *La Bourse*), managed by the aforementioned stockbrokers' organization Compagnie des Agents de Change. Around 300 stocks were traded at the Paris Bourse, without accounting for French and other countries' sovereign debt, municipal debt, and bonds. There was a second unofficial market, the *Marché en Banque* (or *La Coulisse*), which was not subject to any regulation, unlike *Le Parquet*. In terms of relative significance, *La Coulisse* was more liquid, as more operations were conducted there than at the official market. This situation persisted until 1898, when new regulations were enacted to limit the activities of the unofficial market, consequently enhancing the relative prominence of the official market (Hautcoeur et al. 2023). We chose to restrict our data gathering to the official market because daily data availability on both markets is severely restricted and because the Panama Company stock was mainly traded in that market.

Stocks whose information was not fully accessible in archives were dropped (e.g., if we had no information on the composition of the board or details on firm-specific characteristics). Whenever feasible, we incorporated stocks that demonstrated relatively high liquidity. On average, for the year 1888, our 73 stocks maintained a liquidity rate of 70 percent (i.e., they were traded on approximately 70 percent of the days), while the market, during the same period, exhibited an average liquidity of around 30 percent. The differences in market liquidity can be attributed to secondary stocks, which were species issued by companies that already had primary shares in circulation and opted for issuing a second or third batch of

[7] In this paper, we use only data from 1 November, 1887 to 31 October, 1888 to avoid including the noise from events that happened after the government informed the market that it would not rescue the Panama Company.

[8] Lagneau-Ymonet and Riva (2018) and Hautcoeur, Rezaee, and Riva (2023) provide extensive information about stocks' liquidity in the Paris Stock Exchange for the period 1870–1914.

Table 3. *French newspapers receiving abnormal payments, 1880–1888*

Newspaper's name	Total amount (in francs)
Le Moniteur Universel	123,757
Le Gil Blas	163,400
Le Gaulois	189,000
La France	255,000
Le Figaro	408,100
L'Événement	141,500
Le XIXe Siècle	176,600
Le Télégraphe	194,049
Le Temps	119,000
Le Petit Journal	560,105
Le Petit Parisien	88,000

Source: Mollier (2014), pp. 384–386.

shares with different characteristics.[9] Companies such as the Panama Company also used this type of stocks, which were, in general, less liquid than their primary stock. In this paper, we focus only on primary shares to calculate the market index, which is value-weighted every day.[10]

Since we are addressing a new issue of securities, one may wonder about seniority in the Paris Bourse. While this factor may have played a relevant role during the interwar decades, it is challenging to obtain information about this concept for the period under analysis. The *Annuaires des Agents de Change* typically included details on each firm's issuance, such as volume of securities issued, dividends and coupons shared, type of assets issued to the Paris Stock Exchange, etc. However, seniority and scope were not generally considered in this source. In line with this, the securities to be issued on 26 June, 1888, did not have any kind of seniority in comparison to previously issued assets.

6. Newspaper data

To test the role of the press during the campaign promoting the bons-à-lots, we compiled daily information from four important newspapers: *Le Figaro, Le Petit Journal, Le Temps*, and *Le Gaulois*. According to contemporary sources (*Rapport Vallé*, 1893), these newspapers were part of a corrupt network, and their directors received abnormal payments to publish fake positive news about the Panama Company, disseminating a significant amount of intentionally fabricated information to influence investors' decisions. Mollier (2014) presents updated estimates about the amount received by each of these newspapers from 1880 to 1888, as depicted by table 3.

One might be concerned about the scope of these periodicals throughout the entire France. Unfortunately, as mentioned by Bignon and Miscio (2010), there are no reliable and complete sources on the circulation of our chosen periodicals for the period 1885–1895.

[9] Hautcoeur et al. (2007) offer an interesting discussion about these kinds of secondary shares.

[10] Ortiz-Serrano (2018) provides a broad explanation of the inclusion of the 73 stocks and a more detailed analysis of the firm-specific characteristics, by including the variables' construction, stylized facts, summary statistics, liquidity by firm, political affiliation, etc.

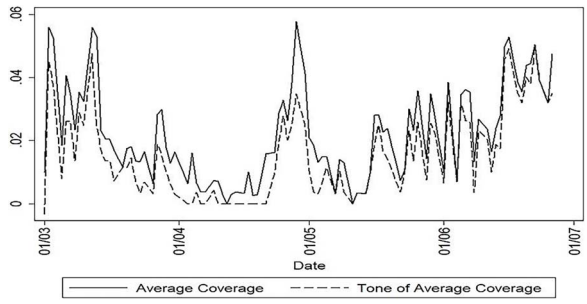

Figure 3. *Evolution of the average news coverage and average tone in the news, 1 March, 1888–1 July, 1888.*

However, Bellanger (1972, p. 234) shows that, even in 1880, these newspapers were already being highly circulated and that these numbers continued rising during the last quarter of the nineteenth century. Information about newspapers was compiled from the BNF online repository, Retronews. Nevertheless, given the difficulty of using OCR or any digitizing process, it was necessary to employ a time-consuming process that involved reading each newspaper and manually creating two series measuring the intensity and tone of coverage for the Panama Company in the media. The data-gathering process and the construction of the series is detailed in Ortiz-Serrano and Forero-Laverde (2020). The coverage series averages the percentage of paragraphs dedicated to the Panama Company in the four periodicals in a given day. The tone series averages the differences between positive paragraphs and negative paragraphs as a percentage of total coverage for the company in the four periodicals for a given day. Figure 3 presents the evolution of both series, showing that, in general, the tone of news concerning the Panama Company was positive in our four chosen newspapers, excluding the first days of March, 1888.

7. Methodology and results

The go-to methodology in the event study literature is the difference-in-difference approach, which allows for the comparison of a treatment group and a control group before and after a shock. However, the implementation of this methodology presents two important challenges. First, the method requires a stock or portfolio, a control group, that presents a parallel trend to that of the Panama Company before the treatment date (23 April, 1888). Second, the series employed to measure news should have only a firm-specific impact and be uncorrelated with both the industry and the general market. To address these issues, we used data for the trading days between 2 November, 1887 and 31 October, 1888 to build two portfolios of stocks from industries comparable to the Panama Company: the canal and the railroad industries.

The first set, the canal portfolio, was composed of two canal industry firms: the *Canal Maritime de Corinthe* and the *Compagnie Universelle du Canal Maritime de Suez*. There were more canal firms listed on the Paris Stock Exchange between 1887 and 1888; however, they presented reduced trading activity, causing us to exclude them.[11] Moreover, 98 percent of the portfolio comprised shares of the Suez Canal Company. Given that both firms belonged to

[11] *Compagnie Nationale des Canaux Agricoles, Canal de la Bourne, Canal de Pierrelatte*, and *Canal de Sambre à l'Oise*.

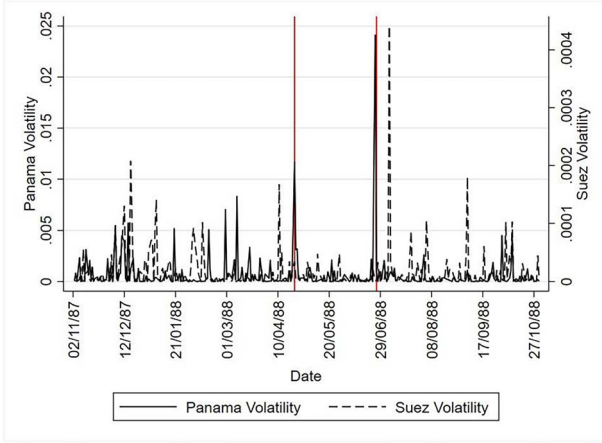

Figure 4. *Volatility of Panama Company and Suez Company stocks, 1 November, 1887–31 October, 1888. The left axis quantifies the volatility of the Panama Company's stock, whereas the right axis measures the volatility of the Suez Company's stock. The use of this dual-axis approach results from substantial percentage fluctuations in the price series of the Panama Company within the period of study. This procedure allows to correctly illustrate the magnitude of price fluctuations for the Panama Company's stock.*

Ferdinand de Lesseps, one may raise the question of whether both stocks might have exhibited similar trends. Consequently, we calculated the square of the daily returns for both stocks, which, according to Campbell et al. (1997), serves as a proxy for volatility if the average daily return is close enough to zero.[12] Results are presented in figure 4.

During the period of interest (23 April, 1888–26 June, 1888), there were no volatility jumps in either series. When regressing the volatility of the Suez stock on that of the Panama Company, we found that the coefficient (0.0008631) is insignificant and the regression has an R^2 of 0.0019, indicating that both stocks are uncorrelated.

Figure 5 shows the joint evolution of the Panama Company index and the canal index. We use indexes (2 November, 1887 = 100) to make the series levels comparable. The differences in volatility translate to the differences in the range of both time series, which forces us to use different Y axes to observe their behavior.

Particular attention should be paid to the behavior of the graphs in the figure above during three distinct subperiods. The first interval spans the initial date up to the first vertical line (pre-treatment period: 11 February, 1887–22 April, 1888). The second period corresponds to the fake news era (treatment period: 23 April, 1888–26 June, 1888). Lastly, the third phase relates to the post-fake news period (post-treatment period: 27 June, 1888–31 October, 1888). It is important to recall that the two break dates are associated with relevant firm-specific events: On 23 April, the issue of obligations à lots was announced in the market, and, on 26 June, the issue failed. To explore the relationship between the Panama stock and the Canal Index during the three different periods, we performed a Chow test (Chow 1960) on a simple

[12] Average daily return between 2 November, 1887 and 31 October, 1888: Panama Company −0.0825 percent; Suez Canal Company 0.0333 percent.

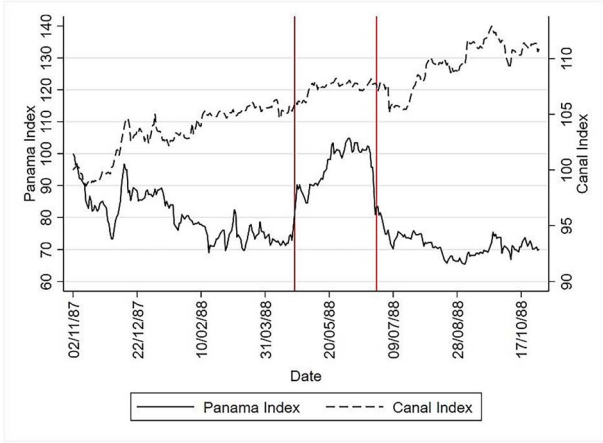

Figure 5. *Evolution of the Panama Company index and the Canal index, 1 November, 1887–31 October, 1888. As in the previous chart, the Panama Company stock index is represented on the left axis, and the Canal index on the right axis. This approach allowed us to display both indices at different levels.*

Table 4. *Relationship between the Canal portfolio and the Panama stock.*

	1	2	3	4
	Full model	Pre-treatment	Treatment	Post-treatment
Canal portfolio	**1.505*****	**1.701*****	2.018	**1.149*****
Constant	−0.001	−0.002	0.002	−0.002
Observations	308	146	55	107
Adjusted R^2	0.052	0.063	0.009	0.064
Chow test Null = no break	Accept			
	Statistic	1.137	*P-value*	0.322

Note: The dependent variable is the excess return of the main stock of the Panama Company, and the main regressor consists of the *Canal Portfolio Index*, composed of 98 percent *Suez Canal* stock and 2 percent *Canal de Corinthe* stock. Coefficients with significance levels $p > 0.1$ *percent*∗, $p > 0.05$ ∗ ∗, $p > 0.01$ ∗ ∗∗.

regression model of the canal portfolio's excess return onto the Panama Company stock's excess return.[13] We define the excess return of a stock or and index as the result of subtracting the risk-free rate as proxied by the period return of the *Rentes* from the period-price-change of the stock expressed as a percentage. Results are presented in table 4.

[13] Chow (1960) describes a statistical test to confirm the equality between coefficients for two different linear regressions. This test for structural breaks in coefficients compares the sum of square residuals from an unrestricted model to the sum of square residuals of several restricted models to verify whether the explanatory power of the restricted and unrestricted models is the same. The null hypothesis is that there is no break in the coefficients. Rejecting the null hypothesis suggests that there is a structural break in the coefficients.

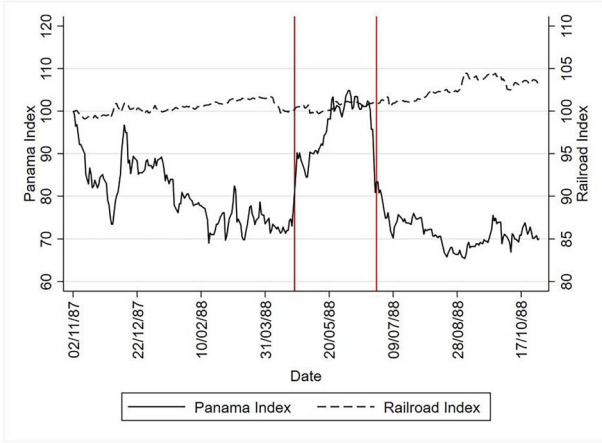

Figure 6. *Evolution of the Railroad index versus the Panama Company stock index, 1 November, 1887–31 October, 1888. The index for the Panama Company stock is represented on the left axis, whereas the Railway index is on the right axis, allowing to display both indices at different levels.*

We observed a strong and significant relationship between the two series during the pre- and post-treatment periods. These were termed as "coupling phases", since the Panama Company stock seems to correlate to industry-specific dynamics. This relationship breaks down only during the treatment period, the "decoupling phase", when the stock followed either firm- or market-specific factors instead of industry trends.

The next step should be, therefore, testing that the correlation between the canal index and the Panama Company stock is not spurious and can be attributed to the fact that they all operate in the same industry and therefore share similar characteristics such as business model, source of profit, or managerial strategies. Consequently, we built a second portfolio of railway companies. The underlying logic is that railroad companies are also infrastructure companies, which are strongly related to trade and tourism and require robust capital investments, but as an industry, railroad companies behave differently from canals and other maritime-related companies. The value-weighted portfolio constructed includes an ample variety of companies with operations all over France and abroad.[14]

We expect that, even though the industries may be similar, the correlation between the Panama stock and the railroad portfolio should be low because they operate in different industries. If true, this will provide indications that the correlation between the canal portfolio and the Panama Company stock is not spurious but rather due to industry-specific characteristics. Figure 6 shows the evolution of the railway portfolio compared with the Panama Company index. Direct inspection of the figure shows that there is little to no correlation between the two series. A univariate regression of the excess return of the railway index onto the excess return of the Panama Company stock shows a small and significant

[14] Companies in this portfolio include *Chemins de Fer Andalous*, *Chemins de Fer Est*, *Chemins de Fer Est Algérien*, *Chemins de Fer Lyon et la Mediterranée*, *Chemins de Fer Midi*, *Chemins de Fer Nord*, *Chemins de Fer Orleans*, *Chemins de Fer Sud France*, *Chemins Fer Departamentaux*, and *Chemins Fer Ouest*.

coefficient, with a low R^2 of coefficient of 0.0278, suggesting that any correlation between both series is spurious.

7.1. An alternative to the difference-in-difference model

Since the difference-in-difference methodology is impractical given data restrictions,[15] we will use the CAPM, as in Lintner (1965), Sharpe (1966), and Black et al. (1972), to explain the behavior of both the Panama Company's excess return and the canal portfolio's excess return. The CAPM is one of the most widely used asset pricing models available in financial theory, with widespread application in academic research, market analysis, and company valuation. The idea is to test whether the individual relationships between the canal portfolio and the Panama Company stock with the market return are stable or change during the three different phases discussed above. As a market factor, we used a value-weighted stock market index, constructed using the daily returns of the 73 liquid stocks in the Paris Bourse in the database. Under the CAPM, the excess return of a stock can be explained as a function of a single risk factor, namely, the behavior of the excess return of the daily value-weighted market portfolio where all but systemic risk is diversified away (Sharpe 1966; Damodaran 2011).

$$r_p = r_f + \beta \left(r_m - r_f\right)$$

Following Dimson (1979), we included lags from one to five periods in the market factor, as in Hollstein et al. (2017) to correct for possible illiquidity and test the different models to see which incorporates the highest volume of information at the lowest cost. The optimality criteria for choosing the number of lags to use is the model that presents the lowest AIC and BIC coefficients. The regression we ran has the following form:

$$\left(r_{canal,t} - r_{f,t}\right) = \alpha + \sum_{k=1}^{n} \beta_k \left(r_{mkt,t-k+1} - r_{f,t-k+1}\right)$$

where r_{canal} is the daily return of the canal portfolio, r_f is the risk-free rate as proxied by the yield of the 3 percent perpetual rents, and r_{mkt} is the return of the market portfolio. Therefore, the dependent variable is the excess return, which represents the difference between the return of a stock$i$ and the variation in the risk-free rate yield, as explained above.[16] This approach will be used in all the models henceforth. We tested different values of k, from $k = 1$ to $k = 6$, and, in models where $k > 1$, Dimson's beta is equal to the summation of β_k for all values of k. We present results for the different models in table 5.

We found that, for both dependent variables, the optimal model only includes the contemporaneous dependent variable, as adding lags does not increase the model's explanatory

[15] The lack of parallel trends in the series before the fake news period between the Panama Company stock (potential treatment variable) and the Canal and Railroads' portfolios (potential control variables) hinders the possibility of performing a *difference-in-difference* analysis. Given the convoluted backstory for the stock even before our period of interest (Ortiz-Serrano and Forero-Laverde 2020), it is unlikely that we can find a candidate series with parallel trends to the Panama Canal stock.

[16] For more information about the set-up of excess returns in corporate finance theory and its uses, we suggest to revisit Campbell et al. (1997).

Table 5. *The relationship between the value-weighted market index and the Canal portfolio and Panama Company excess returns, respectively*

	Canal portfolio						Panama Canal stock					
	1	2	3	4	5	6	7	8	9	10	11	12
Market excess return (b_1)	**1.154*****	1.149***	1.149***	1.153***	1.1645***	1.161***	**5.025*****	4.976***	5.039***	5.108***	5.026***	5.038***
L1 Market excess return (b_2)		0.055	0.056	0.056	0.054	0.048		0.399	0.201	0.162	0.170	0.246
L2 Market excess return (b_3)			−0.019	−0.014	−0.018	−0.019			1.345**	1.519**	1.552**	1.498**
L3 Market excess return (b_4)				−0.041	−0.036	−0.033				−1.389*	−1.456*	−1.452*
L4 Market excess return (b_5)					−0.020	−0.027					0.370	0.295
L5 Market excess return (b_6)						0.041						0.685
Dimson Beta	**1.154*****	1.204***	1.187***	1.153***	1.144***	1.172***	**5.029*****	5.376***	6.584***	5.401***	5.663***	6.310***
Constant	**0.000**	0.000	0.000	0.000	0.000	0.000	**−0.001**	−0.001	−0.000	0.000	0.000	0.000
Observations	**308**	307	306	305	304	303	**308**	307	306	305	304	303
AIC	**−2,687.124**	−2,676.503	−2,664.858	−2,653.496	−2,643.159	−2,632.122	**−1,450.636**	−1,443.356	−1,442.904	−1,440.602	−1,434.589	−1,428.66
BIC	**−2,679.664**	−2,665.323	−2,649.964	−2,634.895	−2,620.857	−2,606.126	**−1,443.176**	−1,432.176	−1,428.01	−1,422	−1,412.287	−1,402.664
Adjusted R-square	**0.402**	0.404	0.405	0.405	0.407	0.405	**0.187**	0.188	0.204	0.218	0.214	0.218

CAPM approach using Dimson-Beta specification. Dependent variable: Excess return ($r_i - r_f$). Significance levels $p > 0.1$ *percent*$*, p > 0.05 **, p > 0.01$***. Significant coefficients of interest in bold. OLS regression with robust standard errors. Residual behaves as white noise according to a variety of tests. Preferred model is highlighted in bold.

power. Furthermore, the CAPM has a larger predictive power over the Canal Portfolio than over the Panama Company stock. The lower R^2 for the Panama Canal models indicates that the stock has more firm-specific risk and less market risk. Furthermore, the high value of Dimson's beta in all the specifications of the model indicates that this is a highly volatile stock that, given a market move, will present a delta of about five-fold that of the market.[17]

7.2. The true role of the media in the Paris Stock Exchange

The next step is to test the effect of media coverage on the Panama Company stock compared to its impact on the canal portfolio during the fake news period (23 April, 1888–26 June, 1888)[18] and before (1 November, 1887–23 April, 1888). We will not include the post-fake news period as it is not of interest to answer the research question. Our hypothesis is that the effect of additional coverage and a more favorable tone from the press on the Panama Canal during the fake news period was firm-specific, and should therefore be uncorrelated with other canal stocks. We used the same tone and coverage variables than in our previous work and an additional noisy dates variable—a dummy variable that takes the value of 1 on dates when it is impossible to discern between fake and true news.[19] Concurrently, we performed a Chow test to verify whether there is a structural break in the coefficients after 23 April, 1888.

Results are presented in table 6, which shows that during the fake news period, the beta coefficient for the canal portfolio decreases, in line with the evidence from the tests above. Noisy dates, coverage, and tone variables do not have any explanatory power over the full sample version of the model or any of the subperiods. This provides strong evidence that our news variables are uncorrelated with the industry and are more likely to be firm-related, which is reasonable considering that the fake news campaign was deliberately developed to promote the issue of 26 June, 1888 by improving the Panama Company's reputation.

We now extend on the CAPM model for the Panama Company's excess return to test whether news had an impact on the company's main stock return and whether there was a break in the behavior of the stock on 23 April, 1888. We introduced dummies to account for the *day-of-the-week* effect, as in Dubois and Louvet (1996) and Kiymaz and Berument (2003), excluding Wednesdays to avoid collinearity issues.

[17] After choosing the best specification of the CAPM, we performed a Chow test on it to test for breaks in the coefficients in the three different periods described previously. We observed breaks in both the model for the canal portfolio and the model for the Panama Company stock. It is noteworthy that breaks occur in the canal portfolio model, even though they are linked to news specific to the Panama Company. This indicates that some market-wide event occurred, which is being captured in the model through the breaks. For the Canal portfolio, the treatment period exhibits lower risk, as the beta (0.7957) is substantially lower compared to both the preceding period (1.1543) and the subsequent one (1.3477). Conversely, for the Panama Company stock, the beta during the fake news period (9.3954) exceeds that of the previous period (5.0248) and the subsequent one (3.071). While both models present structural breaks in the coefficients on the selected dates, the changes in coefficients occur in diverging directions, indicating a decoupling effect. The stock for the Panama Company becomes riskier during the fake news period, while the control group—the Canal portfolio—becomes less risky. Results are available upon request.

[18] As specified in Ortiz-Serrano and Forero-Laverde's (2020) study, the importance of such delimitation is consistent with the historical evidence showing that abnormal payments to journalists and bribes took place between these 2 days (*Rapport Vallé*, 1893).

[19] The dates were 14 March, 23 April, 28 April, 8 June, and 26 June, 1888. A more in-depth explanation of the choice of these dates and as a source of true-generating information can be found in Ortiz-Serrano and Forero-Laverde's (2020) study.

Table 6. *The role of the media on the value of the Canal portfolio*

	1	2	3	4	5	6
	Full model	Pre-23 April, 1888	Fake news period	Full model	Pre-23 April, 1888	Fake news period
Market excess return	**0.847*****	**0.963*****	**0.796*****	**0.842*****	**0.939****	**0.803*****
Noisy dates	0.000	−0.000	0.000	0.000	−0.000	0.000
Average coverage	−0.011	−0.018	−0.004			
Average tone				−0.006	−0.009	0.001
Constant	0.000	0.000	0.000	0.000	0.000	0.000
Observations	97	44	53	97	44	53
Adjusted R-square	0.321	0.366	0.288	0.319	0.360	0.288
Chow test null = no break	**Accept**			**Accept**		
	Statistic	0.436		Statistic	0.392	
	P-value	0.728		*P-value*	0.759	

CAPM approach including a dummy for noisy dates, which takes value 1 when it is impossible to discern between true or fake news. Dependent variable: excess return ($r_i - r_f$). Coefficients with significance levels $p > 0.1$ *percent*$*, p > 0.05 **, p > 0.01$***. Significant coefficients of interest in bold. Regression with robust standard errors. Residual behaves as white noise according to a variety of tests.

Results from table 7 show three interesting phenomena. First, there seems to be a high volatility in the market beta for the Panama Company. During the pre-fake news period, beta gravitates around 595–645 basis points. However, for the fake news period, beta increases by about 300 basis points, suggesting that the stock, which was already quite risky by modern standards, became even riskier, moving more than nine times as much as the market.

Secondly, while true news seems to have a statistically significant effect on the full sample model, the impact only remains significant (and positive) during the fake news period. This is a relevant result even though, overall, there is no joint break in the coefficients since the null hypothesis of the Chow test cannot be rejected.

Finally, there are substantial changes in the market and news coefficients before and after 23 April, 1888. While the market coefficient increases after that date, the news coefficient for both coverage and tone becomes negative and statistically significant. It is possible, however, that the model is overdetermined given the number of dummy variables included. Results hold if we remove the *day-of-the-week* controls, given their lack of significance, as can be observed in table 8.

Table 8 is structured in three different parts. The first panel (Models 1–3) includes the CAPM without incorporating any news variables. The second panel (Models 4–6) includes the CAPM with the noisy dates and news coverage variables. The third panel (Models 7–9) includes the expanded CAPM with the noisy dates and news tone variables. Models 1, 4, and 7 use the full sample; Models 2, 5, and 8 use the sample before 23 April, 1888. Models 3, 6, and 9 use the sample from 23 April to 26 June. We cannot reject the null hypothesis for a joint structural break in coefficients in any of the three main specifications. However, the higher R^2 in Models 4 and 7, when compared with Model 1, indicates that incorporating news into the model improves the model's explanatory power by between 6.54 and 7.49 percent. This

Table 7. *The impact of the media attention on the value of the Panama Company*

	1	2	3	4	5	6
	Full model	Pre-23 April, 1888	Fake news period	Full model	Pre-23 April, 1888	Fake news period
Market excess return	7.984***	6.446***	9.423***	7.847***	5.959**	9.365***
Monday	−0.007	0.007	−0.018	−0.005	0.008	−0.016
Tuesday	0.009	0.015	0.003	0.009	0.014	0.004
Thursday	−0.004	0.006	−0.016	−0.004	0.008	−0.017
Friday	−0.003	−0.003	−0.004	−0.002	−0.002	−0.003
Saturday	0.012	0.011	0.010	0.011	0.0101	0.011
Noisy dates	0.027*	0.001	0.036*	0.025*	0.000	0.032*
Average coverage	−0.524***	−0.386	−0.518**			
Average tone				−0.479**	−0.213	−0.506*
Constant	0.012	0.006	0.014	0.007	0.001	0.011
Observations	97	44	53	97	44	53
Adjusted R-square	0.346	0.276	0.459	0.328	0.245	0.453
Chow test null = no break	**Accept**			**Accept**		
	Statistic	0.826		Statistic	0.851	
	P-value	0.583		*P-value*	0.560	

CAPM approach including dummies to control for the day-of-the-week effect. A dummy for noisy dates is included, which takes value 1 when it is impossible to discern between true or fake news. Dependent variable: excess return $(r_i - r_f)$. Coefficients with significance levels $p > 0.1$ *percent*$*, p > 0.05 **, p > 0.01$***. Wednesday excluded to avoid collinearity issues. Significant coefficients of interest in bold. Regression with robust standard errors. Residual behaves as white noise according to a variety of tests

percentage range corresponds to the proportion of volatility of the Panama Company's excess return that can be explained by news once we control for market-specific phenomena.[20]

8. Forecasting the returns of the Panama Company: the explanatory power of the media

This section utilizes various specifications of the CAPM, as displayed in table 8. These involve both the inclusion and exclusion of news variables and the presence or absence of breaks for forecasting the behavior of the Panama Company stock's returns. Subsequently, we compare these results with the observed behavior of the stock in the market.

[20] It is possible, however, that the news coverage or tone variables are proxying for some omitted variable that is further driving the excess returns of the Panama Company's stock. To test for this, we extracted the first three Principal Components (PCs) of the variance–covariance (VCV) matrix of the returns of the 73 companies, as in Tsay (2002) and Henning et al. (2011). Results, available upon request, confirm that even after controlling for the elements that may explain over two-thirds of the variance of the Panama Company's stock, coverage and tone remain as explanatory factors.

Table 8. *The impact of the media attention on the value of the Panama Company, excluding the day-of-the-week controls*

	1	2	3	4	5	6	7	8	9
	Full model	Pre-April 23rd	Fake news period	Full model	Pre-April 23rd	Fake news period	Full model	Pre-April 23rd	Fake news period
Market excess return	**7.239*****	**5.671*****	**9.399*****	**7.695*****	**6.449*****	**9.133*****	**7.629*****	**6.0841*****	**9.074*****
Noisy dates				**0.027***	−0.006	**0.037****	**0.025***	−0.006	**0.034****
Average coverage				**−0.446*****	−0.354	**−0.408****			
Average tone							**−0.433****	−0.2306	**−0.412***
Constant	0.003	0.005	0.000	**0.012*****	0.012**	0.008	**0.008*****	**0.007***	0.006
Observations	97	44	53	97	44	53	97	44	53
Adjusted R-square	0.221	0.187	0.269	0.296	0.225	0.370	0.287	0.199	0.367
Chow test null = no break	**Accept**			**Accept**			**Accept**		
	Statistic	2.524		Statistic	1.073		Statistic	0.997	
	P-value	0.115		*P-value*	0.365		*P-value*	0.397	

CAPM approach including a dummy for noisy dates, which takes value 1 when it is impossible to discern between true or fake news. Dependent variable: excess return $(r_i - r_f)$. Coefficients with significance levels $p > 0.1$ *percent*$*, p > 0.05 **, p > 0.01$***. Significant coefficients of interest in bold. Regression with robust standard errors. Residual behaves as white noise according to a variety of tests.

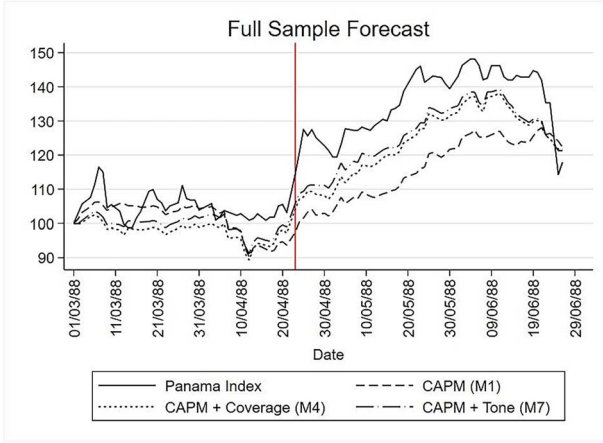

Figure 7. *Evolution of the Panama index versus the forecast from different models, 1 March 1888–01 September 1888. The chart confronts the trend followed by the Panama Company main stock against a series of CAPM forecasts aimed at predicting such trend. This includes M1, the CAPM model only accounting for the market return as the main explanatory variable; M4, which includes press coverage, and M7, which uses press tone as additional regressor.*

8.1. Full sample specification

Figure 7 presents the original behavior of the Panama Company stock index, the CAPM forecast for the index (M1), the forecast for the index including coverage (M4), and the forecast for the index including tone (M7). These series were obtained by calculating the daily returns as forecasted by each of the three models and then constructing an index with value 100 for 1 March, 1888.

The graph shows that the CAPM forecast (M1) consistently underestimates the behavior of the Panama Company stock. While the same is true for models that incorporate the level of news coverage (M4) and their tone (M7), these last two models seem to have a better fit. To verify this, we calculated the deviation of daily returns observed in the Panama stock and those forecasted using the coefficients calculated for each of the three models. This difference corresponds to the error term (residual) from each regression (note that the average value of the series of deviations from the observed price is 0). We then calculated the accumulated deviation (error) of each model vis-à-vis the observed behavior of the Panama Company. The accumulated deviation is calculated as follows:

$$AD_t = \left(\prod_{t=1}^{n} (1 + u_t) \right) - 1,$$

Where AD_t corresponds to the accumulated deviation at time t and u_t corresponds to the residual of observation t calculated as the difference between the observed return for the Panama stock and the predicted value of the return obtained from the model. Results are shown in figure 8.

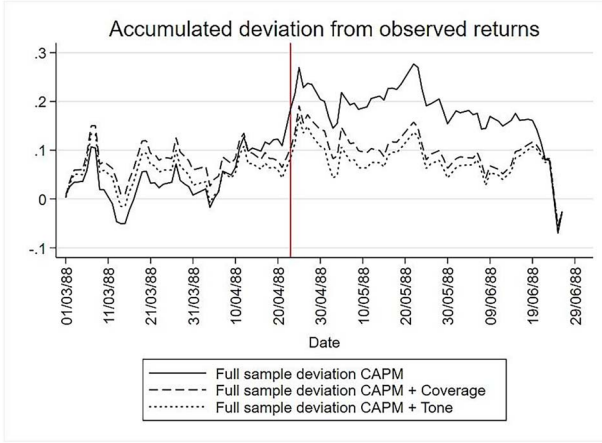

Figure 8. *Accumulated deviation from observed returns, 1 March, 1888–1 September 1888. The present chart illustrates the accumulated error of the CAPM estimates from figure 7 versus the performance of the Panama stock. As can be observed, there is a "decoupling" process between the CAPM and the true returns following the parliamentary approval of 23 April, 1888. The inclusion of news into the forecast models does increase their explanatory power, which is consistent with the results from table 9 to table 11.*

The accumulated error for the CAPM compared to the performance of the Panama stock peaks at 28 percent (average 11.7 percent); for the model that includes coverage, the peak underperformance is 19 percent (average 8.9 percent); and for the model including tone, the peak underperformance is 17 percent (average 6.7 percent). Consequently, models that include some version of the news variable perform better than the standard CAPM, indicating that news (true and fake) does increase the model's explanatory power. It is noteworthy that the accumulated deviation series are consistently above zero during the period of study, which means that all three series forecast lower values of the Panama stock return than those observed in the market.

From an economic perspective, it is apparent that the market was incorporating both types of news into the stock pricing, albeit in different ways, as we will discuss below. An observation must be made concerning the signs of the coefficients for the true news, coverage, and tone variables. While true news has a positive impact on the forecasted return, both tone and coverage exhibit negative coefficients. This suggests that the market penalizes additional coverage (−0.4460) and more positive tone (−0.4334) in the published news. To put it into perspective, an increase of 1 percent in the coverage of paragraphs in a given newspaper is, *ceteris paribus*, associated with a daily return decrease of 0.446 percent, and similarly, a 1 percent increase in positive paragraphs in a newspaper corresponds to a daily return decrease of 0.4334 percent.

To understand the implications of negative coefficients for the fake news variables, we need to analyze the behavior of all coefficients in the different models. Market beta increases when news is incorporated into the model. When coverage and tone are included in the model, market beta increases by 46 and 39 basis points, respectively. An economic interpretation is that the incorporation of news increased the perceived riskiness of the stock in the market, probably due to the added visibility of a company with an overall negative financial and

Table 9. *Average returns and deviations of the three CAPM approaches*

	CAPM (M1)	CAPM + Coverage (M4)	CAPM + Tone (M7)
Average	0.223 percent	0.226 percent	0.225 percent
Standard deviation	1.439 percent	1.665 percent	1.638 percent

Source: Own elaboration from the spreadsheets of the Compagnie des Agents de Change.

operational situation and managed by a team that seemed to be unable to take the project to completion. We found a trade-off between the increased perceived market riskiness of the stock (higher beta) and the negative effect that additional coverage and tone had on the expected market returns. This can be better understood by calculating the first two moments for the series of forecasted returns by each model.

Table 9 shows that, for the full sample, the forecast series of returns by model have roughly the same daily average return. However, the standard deviations of the forecasted returns for models that include news are 20–22 basis points higher than for the standard CAPM.

8.2. Specification with a break on 23 April, 1888

We now perform a similar analysis to the one in the previous section, including the break identified on 23 April, 1888. Following the results in table 8, we compared the evolution of the Panama Canal stock with the predictions using the CAPM, incorporating different betas for the period before and after 23 April, 1888 in Models 2 and 3 (5.6712 and 9.3986, respectively). We incorporated a third series where we forecasted the behavior of the Panama Company stock using the CAPM that incorporates news coverage and a break on 23 April (Models 5 and 6). Finally, we included the model that incorporates news tone and a break on the same date (Models 8 and 9). Forecasts were calculated as described in the full sample specification. Results are presented in figure 9.

We found that before the break, the CAPM forecast overestimates the observed behavior of the company's stock, while it underestimates returns after the break, even though, for the post-23 April period, beta increases by over 420 basis points. As we incorporated the news variables, we found that beta increases before the break and decreases after the break, while both coverage and tone present a negative coefficient, and true news presents a positive and significant coefficient. These outcomes are consistent with our findings for the full sample specification. We then calculated the accumulated deviation of returns in a similar fashion to in the previous section, as shown by figure 10.

Thus, the CAPM outperforms the Panama stock before the 23 April break, leading to a negative accumulated deviation. However, once variables for media coverage are included, this negative coefficient results in underperformance compared to the Panama Company. R^2 decreases during the period before 23 April, indicating that the inclusion of the fake news variable diminishes the model's explanatory power. This implies that the positive tone and coverage of the company before the break were not necessarily reflected in pricing beyond what was already accounted for in the market coefficient.

After the break, we observed the most significant underestimation occurring in the standard CAPM, while the incorporation of news variables enhanced the overall fit of the model. Regarding goodness-of-fit measures, we noticed a substantial improvement in R^2 for models with news variables after 23 April. This provides further evidence that the improved news

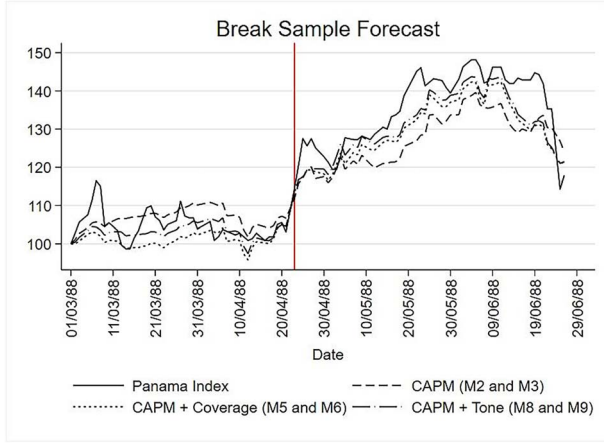

Figure 9. *Evolution of the Panama index versus the forecast from different models, using 23 April, 1888 as a structural break, 1 March–1 July, 1888. The chart depicts the evolution of the Panama Canal main stock in relation to various CAPM forecasts, using the events of 23 April, 1888 as a structural break, and therefore using different betas before and after such date (Models 2 & 3); incorporating press coverage (Models 5 and 6); and introducing press tone (Models 8 & 9). In all cases, the CAPM forecasts overestimated the observed price, which changes after the April 23 break point, at which point these models underestimate it.*

coverage and tone were predominantly integrated into the market's assessment after the authorizing of the bons-à-lots on 23 April. We now calculate the first two moments for the series of forecasted returns by each model, before and after 23 April, 1888.

Table 10 summarizes the main results, which show that, for the period before 23 April, the distributions of return forecasts differ depending on the model employed. The standard CAPM has a higher expected return and lower volatility, which might explain why it overestimates the stock's behavior during the period. Incorporating the news variables decreases the average return and increases volatility during the pre-23 April period. However, these results are not of interest given the low statistical significance of the news coverage and tone coefficients. Results for the fake news period coincide with the findings from the full sample experiment. Average return remains roughly the same regardless of the model used, and standard deviation increases by about 30 basis points when the news variables are incorporated into the model. These findings align with the idea that markets were incorporating the improved coverage and tone during the fake news period—not necessarily as positive news but rather as an indication that the stock was becoming riskier.

8.3. Insiders during the fake news campaign: was asymmetric information exploited?

In scenarios such as the one presented throughout this paper, asymmetric information is naturally present. On the one hand, insiders are planting fake news in the media, with directors and journalists enabling them during the process. On the other hand, investors in the market have no knowledge that fake news is being planted and cannot, *ex ante*, discern whether what is being published is true or not. In this scenario, it is possible that the group with better access to information would try to extract rents from the less informed group. A

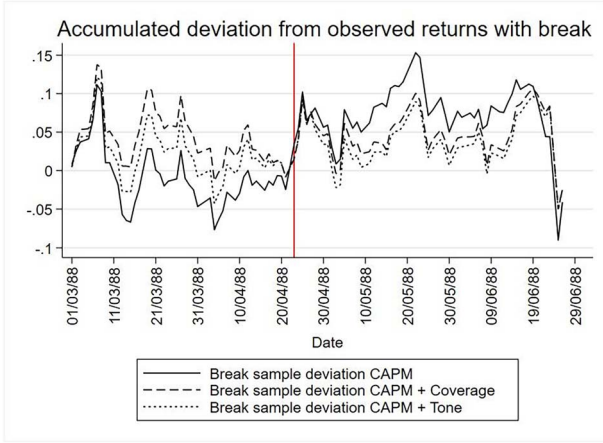

Figure 10. *Accumulated deviation from observed returns using 23 April, 1888 as a structural break, 1 March–1 July, 1888. The chart depicts the evolution of the Panama Canal main stock in relation to various CAPM forecasts, using the events of 23 April, 1888 as a structural break, and therefore using different betas before and after such date (Models 2 & 3); incorporating press coverage (Models 5 and 6); and introducing press tone (Models 8 & 9). In all cases, the CAPM forecasts overestimated the observed price, which changes after the April 23 break point, at which point these models underestimate it.*

Table 10. *Average returns and deviations of the CAPM approaches, using 23 April, 1888 as a structural break*

		CAPM (M2 & M3)	CAPM + Coverage (M5 + M6)	CAPM + Tone (M8 + M9)
Pre-23 April	Average	0.166 percent	0.130 percent	0.13 percent
	Standard deviation	1.052 percent	1.279 percent	1.205 percent
Post-23 April	Average	0.300 percent	0.304 percent	0.304 percent
	Standard deviation	1.740 percent	2.041 percent	2.032 percent

Source: Own elaboration from the spreadsheets of the Compagnie des Agents de Change.

possible mechanism to do this would be to acquire shares before the fake news is published, with the expectation that prices would go up with the dissemination of the news. As prices increase once the news is published, buyers would sell the shares they purchased earlier, turning a profit.

To test whether there is some evidence of this foul play taking place, we ran the CAPM incorporating the news variables of tone and coverage (models 4–9 in table 8) with up to ten leads and lags. This is a way of testing whether the non-contemporaneous behavior of news may explain the current behavior of the stock return. A positive coefficient for a news variable with leads would indicate that future news had a positive impact on current stock returns, and thus may be a first indication of a market manipulation scheme. Figure 11 presents the value of the coefficient and the 95 percent confidence interval for coverage (left column) and tone (right column) with different leads and lags. The top row displays the results for the

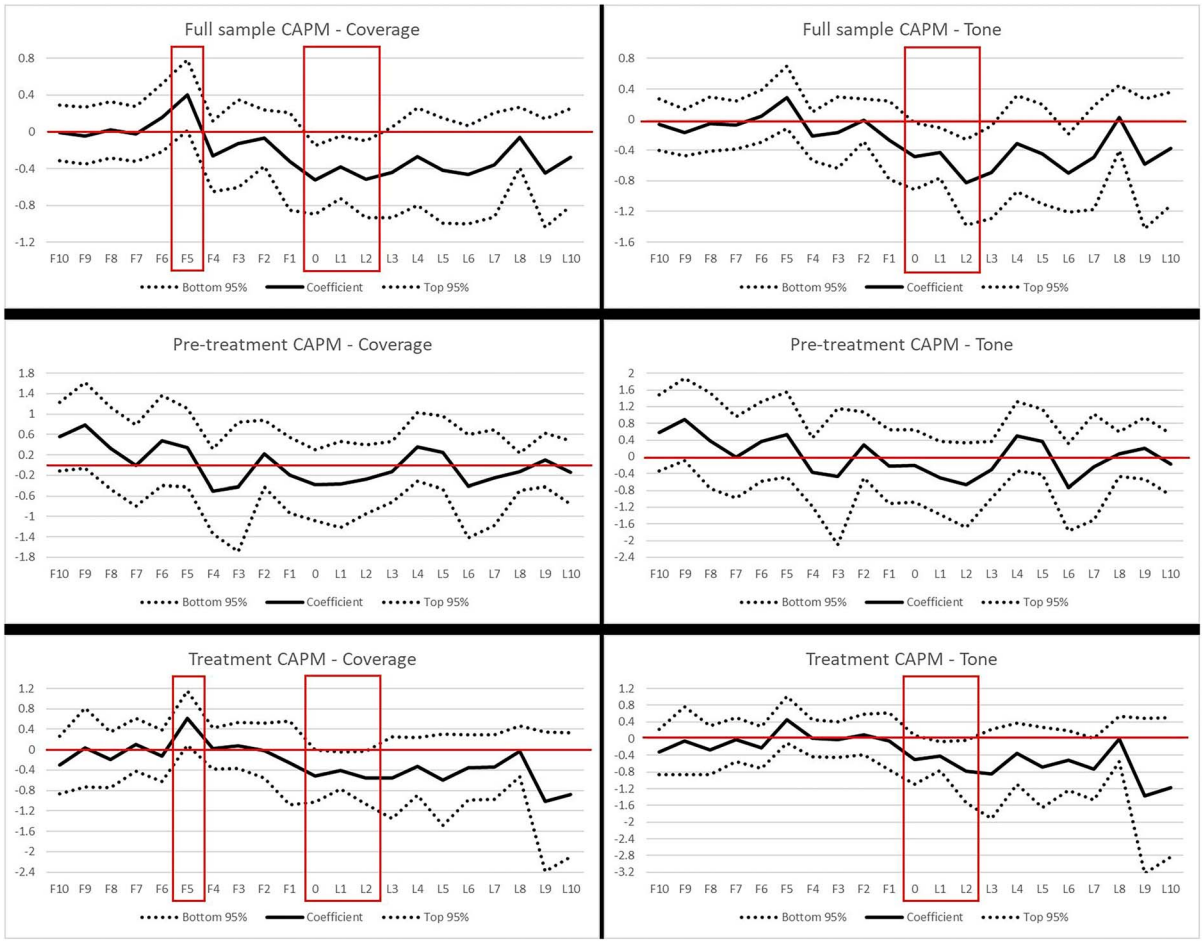

Figure 11. *CAPM estimates including leads and lags. The present figure displays the previous CAPM estimates including those that use press coverage and tone as explanatory regressors, and adding 10 lags in the past and 10 leads in the future of the news variable to observe the non-contemporaneous impact of news on the behavior of returns.*

entire sample, the middle row illustrates the findings for the period preceding 23 April, and the bottom row exhibits the outcomes for the period following 23 April. The continuous line represents the coefficient values, while dotted lines denote the 95 percent confidence interval. Red boxes highlight coefficients that achieve statistical significance.

The results for news coverage during the post-23 April period indicate a negative coefficient contemporaneously and up to two lags, and a positive coefficient with five leads (5 trading days in the future). All other coefficients are statistically insignificant. In the case of tone, we did not find any statistically significant coefficient when we displaced the news variable into the future. While this is not a smoking gun, it does coincide with our predictions that the future behavior of news may have some explanatory power over the present behavior of returns. Our results suggest, then, that fake news was planted for the following week, and a group of insider traders with knowledge of the strategy would buy stocks with the intention of selling them once the news became public, thereby making a profit with the price increase.

It can be argued that the market did not expect positive changes in tone or coverage since the news was fake and did not reflect innovations in information that could be anticipated. Consequently, it is reasonable to assume that someone who purchased stocks before the news came out could be a part of the group of individuals that planted the news. Given the scandal that ensued in 1892 when the pay-for-play scheme between the company's management and journals was discovered, this is a hypothesis that surely has merit for further research.

9. Conclusions

The Panama Company was a pioneer in consistently pressuring the media to enhance its public reputation. While the 1888 issue was not the only instance in which the firm had made abnormal payments to French mainstream newspapers, this time the bribes significantly exceeded previous levels. Given that the daily press was the primary source of information for the majority of the French population, it is reasonable to believe that the Panama Company's managers expected to attract a large number of potential investors, which ultimately would alleviate the financial situation of the firm. The present work addresses the role of news in financial markets, using the events around the failed issue of the Panama Company on 26 June, 1888 as a natural experiment. Particularly, we focus on understanding the explanatory power of the media and how news is incorporated by financial markets. While this work confirms the previous findings of Ortiz-Serrano and Forero-Laverde (2020) regarding the negative—and unexpected—effect of media attention on the return of the Panama Company, our findings go a step further by presenting an asset valuation model that provides further insights.

First, we found that news tone and coverage affected only the Panama Company stock and had no impact on the market or on an industry portfolio for canal companies. Secondly, by using the CAPM, we identified that while the market beta for the canal portfolio decreased, the same coefficient increased for the Panama Company during the fake news period providing some evidence about the decoupling of the Panama company stock from the behavior of similar companies in the industry.

Given that models incorporating news exhibit greater explanatory power than those without news, it can be inferred that the financial markets were indeed incorporating news into the pricing of Panama Company stock. However, this incorporation of news did not result in higher returns; rather, while average expected daily returns remained constant for the fake news period, the impact of news appeared to translate into an increased perception

of risk associated with the stock and consequently more volatile expected daily returns. This suggests that while the markets were incorporating news, they did so with a certain degree of skepticism. They seemed to view the fake positive news as disconnected from the company's real operational and administrative situation, which led to a more volatile expected behavior for the stock.

These findings might be taken as an indication that the market did not believe that the issue of the bons-à-lots was a strong enough move for the company to be able to bring the canal to completion. The stock bore the consequences of such skepticism, as the information could have been construed in a manner contrary to the expectations of the firm's managers. In other words, if investors had placed their trust in the news, the volatility of the Panama Company stock should have decreased due to this campaign. The issue of the bons-à-lots could have been perceived as an advantageous opportunity for investors on the Paris Bourse, potentially resulting in a widespread participation after 26 June 1888. However, an increase in the stock's intrinsic volatility serves as evidence that investors were skeptical about this information throughout the entire period under examination.

A final contribution of this paper to the literature is the suggestion that there were two groups of investors with different amounts and quality of information. Insiders knew that fake news was planted and were privy to the company's true financial situation. Outside investors saw the news published in the media and should, *ex ante*, have no way of discerning whether it was true or false. We tested if, under this scenario, it is reasonable to assume that insiders tried to extract rents from outsiders. We found evidence suggesting that a group of investors was acting on the prevailing markets in expectation of news that would be published 5 days in the future. Given that news published in the future was not related to events that the market could anticipate or discount, we suggest that this is evidence of a possible exploitation of asymmetric information on the part of insiders. Further research should focus on exploring the mechanisms through which these operations could have taken place.

Acknowledgements

We want to thank the editors of the European Review of Economic History for the opportunity to join the 2023 fast-track, and to the participants of the 2022 Congress of the European Historical Economics Society, and the anonymous referees for their useful suggestions. We are indebted to Angelo Riva and Thiebaud Giddey, as well as to all the participants in the workshop on financial scandal at the University of Luxembourg, for allowing us to take part in the research network on financial scandal during the years 2017–2021. We are grateful for all their help and comments during the writing process. Many thanks to all the members of the Economics Department at SciencesPo and the Association Française de Science Économique for their support and helpful comments during the 2023 congress. We are also grateful to the Economic History Society and all the participants in the 2022 congress. We would like to make a special mention of Amir Rezaee, Vincent Bignon, Pilar Nogués-Marco, and Pierre-Cyrille Hautcoeur for their help and guidance during all these years. We thank Yolanda Blasco and all the team from University of Barcelona Economic History Department, as well as we are extremely grateful to María Ángeles Pons, Jesús Mur, and Carlos Santiago-Caballero. Finally, we will always be thankful to the Service des Archives Économiques et Financières (SAEF), the Bibliothèque Nationale de France, and the Archives du Crédit Agricole, with a special mention of Nicolas Gueugneau. We are also grateful to the BNP Paribas historical archives, particularly Roger Nougaret, for their invaluable help during our archival work. All remaining errors are on us.

Supplementary material

Supplementary material is available at the *European Review of Economic History* online.

Data availability

I, Miguel Ortiz-Serrano, co-author, along with Germán Forero-Laverde, of the manuscript "Can managers successfully deceive investors? Media attention and market manipulation during the Panama scandal", ensure that the data used during our research are available for the editors and referees upon request. The dataset that has been built uses public information from archival primary sources, that we have hand-collected and compiled during a long-term process. The sources are listed in the lines below:

- Archives of Crédit Agricole. Paris (France).
- Archives of BNP Paribas. Paris (France).
- Archives of the Bibliothèque Nationale de France (BNF).
- Retronews, the online press repository of the BNF (www.retronews.fr). This online repository was created from Gallica, the online platform of the BNF (www.gallica.bnf.fr).

To ensure transparency in the publication process, the authors are willing to share the dataset and the primary materials collected upon request. These data can be shared while citing the primary sources from which the information was obtained.

References

Baron, D.P. (2006). Persistent media bias. *Journal of Public Economics* **90**, pp. 1–36.

Bellanger, C. (1972). *Histoire Générale de la Presse Française. 3. De 1871 à 1940*. Paris: Presses Univ. de France.

Bignon, V. and Flandreau, M. (2011). The economics of badmouthing: libel law and the underworld of the financial press in France before World War I. *The Journal of Economic History* **71**, pp. 616–53.

Bignon, V. and Miscio, A. (2010). Media bias in financial newspapers: evidence from early twentieth-century France. *European Review of Economic History* **14**, pp. 383–432.

Bissoondoyal-Bheenick, E., Brooks, R. and Do, H.X. (2023). ESG and firm performance: the role of size and media channels. *Economic modelling* **121**, ISSN: 0264-9993. https://doi.org/10.1016/j.econmod.2023.106203.

Black, F., Jensen, M.C. and Scholes, M. (1972). *The capital asset pricing model: Some empirical tests*.

Bourson, P. A. (2000). L'affaire Panama. *Éditions De Vecchi*.

Bouvier, J. (1964). *Les deux Scandales de Panama (Vol. 3)*. Editions Gallimard.

Campbell, J.Y., Lo, A.W. and Mackinlay, A.C. (1997). *The Econometrics of Financial Markets*. Princeton: Princeton University Press.

Campbell, G., Turner, J.D. and Walker, C.B. (2012). The role of the media in a bubble. *Explorations in Economic History* **49**, pp. 461–81.

Celestin, R. and Dalmolin, E. (2007). Scandal and innovation in the Third Republic (1871–1899). In *France from 1851 to the Present: Universalism in Crisis*, pp. 89–126. New York: Palgrave Macmillan. https://doi.org/10.1007/978-1-137-07322-8_4.

Chastel, C. (1992). Histoire des virus : de la variole au sida. Editor: *Société Nouvelle des Editions Boubée* p., ref : 893 ref. Paris.

Chow, G.C. (1960). Tests of equality between sets of coefficients in two linear regressions. *Econometrica: Journal of the Econometric Society* **28**, pp. 591–605.
Conrad, J., Cornell, B. and Landsman, W.R. (2002). When is bad news really bad news? *The Journal of Finance* **57**, pp. 2507–32.
Courau, R. (1932). *Ferdinand de Lesseps : de l'apothéose de Suez au Scandale de Panama*. B. Grasset (ed), 296 p. Paris.
Dai, L., Parwada, J.T. and Zhang, B. (2015). The governance effect of the media's news dissemination role: evidence from insider trading. *Journal of Accounting Research* **53**, pp. 331–66.
Damodaran, A. (2011). *Applied Corporate Finance*. 634 p., 4th Edition, John Wiley & Sons.
Degos, J.G. and Prat Dit Hauret, C. (2008). L'échec du canal de Panama: des grandes espérances à la détresse financière. *Revue Française de Gestion* **34**, pp. 307–24.
Dimson, E. (1979). Risk measurement when shares are subject to infrequent trading. *Journal of Financial Economics* **7**, pp. 197–226.
Djankov, S., Mcliesh, C., Nenova, T. and Shleifer, A. (2003). Who owns the media? *The Journal of Law and Economics* **46**, pp. 341–82.
Do, Q.A., Galbiati, R., Marx, B., and Serrano, M.A.O. (2024). J'Accuse! Antisemitism and financial markets in the time of the Dreyfus Affair. *Journal of Financial Economics*, **154**, 103809.
Dubois, M. and Louvet, P. (1996). The day-of-the-week effect: the international evidence. *Journal of Banking & Finance* **20**, pp. 1463–84.
Durante, R. and Knight, B. (2012). Partisan control, media bias, and viewer responses: evidence from Berlusconi's Italy. *Journal of the European Economic Association* **10**, pp. 451–81.
Dyck, I.J. and Zingales, L. (2002). The corporate governance role of the media. The Corporate Governance Role of the Media (November 2002). NBER Working Paper, (w9309).
Dyck, A., Volchkova, N. and Zingales, L. (2008). The corporate governance role of the media: evidence from Russia. *The Journal of Finance* **63**, pp. 1093–135.
Esteves, R. (2011). The belle epoque of international finance: French capital exports, 1880-1914. Available at SSRN 2024984.
Ferguson, N.J., Philip, D., Lam, H. and Guo, J.M. (2015). Media content and stock returns: the predictive power of press. *Multinational Finance Journal* **19**, pp. 1–31.
Garcia, D. (2013). Sentiment during recessions. *The Journal of Finance* **68**, pp. 1267–300.
Gehlbach, S. and Sonin, K. (2014). Government control of the media. *Journal of Public Economics* **118**, pp. 163–71.
Hamza, M. and Abdel-Latif, M. (2003). The construction of the Suez Canal. *WIT Transactions on the Built Environment,* vol. 65.
Hautcoeur, P.C., Rezaee, A. and Riva, A. (2023). Competition between securities markets: stock exchange industry regulation in the Paris financial center at the turn of the twentieth century. *Cliometrica* **17**, pp. 261–99.
Henning, M., Enflo, K. and Andersson, F.N. (2011). Trends and cycles in regional economic growth: how spatial differences shaped the Swedish growth experience from 1860–2009. *Explorations in Economic History* **48**, pp. 538–55.
Hollstein, F., Prokopczuk, M., and Wese Simen, C. (2017). How to estimate beta? (No. 617). Hannover Economic Papers (HEP).
Kiymaz, H. and Berument, H. (2003). The day of the week effect on stock market volatility and volume: International evidence. *Review of Financial Economics*, **12**(4), 363-380.
Kogan, S., Moskowitz, T.J. and Niessner, M. (2021). Fake news in financial markets. SSRN.
Kuhnen, C.M. and Niessen, A. (2012). Public opinion and executive compensation. *Management Science* **58**, pp. 1249–72.
Lagneau-Ymonet, P. and Riva, A. (2018). Trading forward: the Paris bourse in the nineteenth century. *Business History* **60**, pp. 257–80.
Lajeune-Vilar, A. (1895). *Les Coulisses de la Presse : Mœurs et Chantages du Journalisme*. *A. Charles*.
Lintner, J. (1965). The valuation of risk assets and the selection of risky investments in stock portfolios and capital budgets. *Review of Economics and Statistics* **47**, pp. 13–37.

Mollier, J.Y. (2014). *Le Scandale de Panama*. France: Fayard.
Ortiz-Serrano, M.Á. (2018). Political connections and stock returns: evidence from the Boulangist campaign, 1888–1889. *Financial History Review* **25**, pp. 323–56.
Ortiz-Serrano, M. and Forero-Laverde, G. (2020). Fake news and talking up the market: the case of the Compagnie Universelle du Canal Interocéanique de Panama in 1888. *Entreprises et Histoire* **4**, pp. 27–43.
Peña-Martel, D., Pérez-Alemán, J. and Santana-Martín, D.J. (2018). The role of the media in creating earnings informativeness: evidence from Spain. *BRQ Business Research Quarterly* **21**, pp. 168–79.
Rousseau, A. (1886). Rapport présenté au ministre des Travaux publics par Armand Rousseau sur sa mission à Panama. In *Canal de Panama, Paris, May et Motteroz*.
Sharpe, W.F. (1966). Mutual fund performance. *Journal of Business* **39**, pp. 119–38.
Shiller, R.J. (2000). Irrational exuberance. *Philosophy and Public Policy Quarterly* **20**, pp. 18–23.
Shiller, R.J. (2015). *Irrational Exuberance. Revised and expanded third edition*. Princeton: Princeton University Press.
Stiglitz, J.E. (2014). The media and the crisis: an information theoretic approach. In *The Media and Financial Crises*. Routledge, pp. 168–80.
Tetlock, P.C. (2007). Giving content to investor sentiment: the role of media in the stock market. *The Journal of Finance* **62**, pp. 1139–68.
Tsay, R.S. (2002). *Analysis of Financial Time Series*. New York: John Wiley & Sons.
Turner, J.D., Ye, Q. and Walker, C.B. (2018). Media coverage and stock returns on the London stock exchange, 1825–70. *Review of Finance* **22**, pp. 1605–29.
Vallé, E. (1893). Rapport fait au nom de la Commission d'*enquête* chargée de faire la lumière sur les allégations portées à la tribune à l'occasion des affaires de Panama. https://gallica.bnf.fr/ark/12148/bpt6k1128204#.