Bonds for the Long Run?

The Rate of Return on Corporate Bonds in Belgium, 1838–1939*

Kevin Van Mencxel†
University of Antwerp

Jan Annaert‡
University of Antwerp & Antwerp Management School

Marc Deloof§
University of Antwerp & Antwerp Management School

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Abstract

We investigate corporate bond returns for the period 1838–1939 by compiling a unique new database of 201,000 monthly observations of bonds traded on the Brussels Stock Exchange. The value-weighted annualized total rate of return, net of coupon defaults and taxes, is 4.35% in nominal terms and 2.81% in real terms. Estimates of average returns show corporate bonds outperformed equities during the entire nineteenth century. The risk-adjusted performance of corporate bonds based on Sharpe ratios exceeds that of equities and sovereign bonds during the corporate bond market's first centennial. Our findings make a case for corporate bonds as best performing asset class over the longue durée within early financial market history.

Keywords: Indices, Long-Run Returns, Corporate Bonds, Historical Bond Markets, Data Bias

JEL Codes: G11, G12, N23, N24

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†Corresponding author. University of Antwerp. **E-Mail:** Kevin.VanMencxel@uantwerpen.be.

‡University of Antwerp and Antwerp Management School. **E-Mail:** Jan.Annaert@uantwerpen.be.

§University of Antwerp and Antwerp Management School **E-Mail:** Marc.Deloof@uantwerpen.be.

I. Introduction

Economic historians have long recognized the importance of corporate bonds in firms' capital structures and investors' portfolios (Baskin and Miranti, 1997; Goldsmith, 1958; Hickman, 1958). However, remarkably little is still known about the long-run development and investment performance of the corporate bond market. Historically, the lack of credible information on the quotes and coupons of bonds has been a major impediment to the analysis of long-run corporate bond returns. These data only became available in the last decade of the twentieth century with the emergence of public datasets, and are only available for a very limited sample of industrialized nations (Bekaert and De Santis, 2021; Bessembinder *et al.*, 2008). Recently, Doeswijk, Lam and Swinkels (2020) supplemented these existing indices with nondigitalized OECD books since 1960.

Although the stylized facts on corporate bond returns since the second half the twentieth century are well established, only a handful of studies have analyzed corporate bond returns prior to WWII.[1] These studies typically consider US and UK markets, rely on small cross-sections dominated by railroads despite the importance of new industries during the Second Industrial Revolution and large-scale railroad nationalizations starting in the 1860s (Bogart, 2009), and focus on *contractual* rather than *realized* coupon payments (Giesecke *et al.*, 2011; Muir, 2017). What remains missing are studies that incorporate the effect of industrial diversification potential and coupon payment defaults to provide a systematic description of how corporate bonds performed over the longer run, especially for an international setting outside of the US and the UK.

In this paper, we address this gap in the literature by hand collecting novel corporate bond data at a monthly frequency from the Brussels Stock Exchange (henceforth BSE) between 1838 and 1939. We focus on Brussels rather than other minor exchanges such as Antwerp seeing Brussels was the stronghold of industrial securities in Belgium (Veraghtert, 1992). From a historical perspective, Belgium is an interesting case for studying the long-run average investment performance of corporate bonds for several reasons.

First, as Belgium became the first nation on the European continent to industrialize in the first half of the nineteenth century, the BSE developed early (Bairoch, 1982). Belgium underwent major social, legal, and technological changes during the period of our study that affected the demand for and supply of corporate bond capital. This makes the development of our series of returns for the period all the more interesting. On the demand side, the prosperous middle classes were increasingly seeking an alternative to sovereign bonds for

[1] Notable examples are Cowles (1939), Ibbotson and Sinquefield (1976), Snowden (1990), and McQuarrie (2020) on the US corporate bond market and Coyle and Turner (2013) on the UK corporate bond market.

their savings, spurred by the declining sovereign bond yields from the second half of the nineteenth century (Van de Velde, 1944, p. 115–17). On the supply side, legislators increasingly loosened governmental interference as was custom in the conservative Napoleonic system based on the French civil code (1804) and French commercial code (1807) by liberalizing incorporation law in 1873.[2] The goal of the laws was to intensify financial trade and encourage corporate capitalism (Buelens, De Smedt and Willems, 2014).

Second, the price discovery process of the BSE was argued to be one of the best in the world in this period, whose informative reporting acquired an enviable reputation (Thiebauld, 1905). The Official Quotation List distinguishes between corporate bonds and other securities by reporting security-level data in a separate table. This facilitates the selection of corporate bonds without sovereign backing. This is important as these securities may display risk-return characteristics different from bonds with implicit or explicit government guarantees. Because of less detailed sources, historical datasets for other preeminent corporate bond markets are often not able to make this distinction (see, e.g., Baskin (1988), Baskin and Miranti (1997), and Hautcoeur (1994)).

Third, the BSE's Exchange Commission extracted information on bond quantities from the transcripts of general meetings, lists of bonds to be drawn or redeemed, and balance sheets that companies had to disclose as part of the listing requirements (Thiebauld, 1905). Therefore, the data we examine account for the role of debt buybacks and exchange offers, that allow for the construction of a value-weighted return index that follows the experience of an average investor holding the corporate bond market portfolio.

Fourth, we identify *every* missed coupon payment on a daily basis using a separate section of the Official Quotation List starting with 1873 — data that are almost never available to researchers within historical settings despite its critical importance to corporate bond pricing (Giesecke *et al.*, 2011; Muir, 2017).

Our analysis is based upon a comprehensive novel dataset constructed from hand-collected records from the archive of the BSE. This dataset contains monthly observations on prices, coupons, quantities, and face values on 1,033 corporate bonds listed within the Official Quotation List of the BSE (*Cours Authentique de la Bourse de Bruxelles*) for the period from 1838 to 1939. Uniquely, we augment our price series with monthly data on 301 coupon payment default events in order to account for the losses of investors due to missed or delayed coupons. Company-specific information allows us to examine the issuance and returns of different industries. The availability of records on multiple industries is particularly unique and important. Furthermore,

[2]This law abolished government approval to start a limited liability company, and was complementary to the 1867 reform on stock exchanges in which the government gave up its right to ban companies from trading on the exchange. We refer the reader to Internet Appendix B for detailed information on the liberalization of the BSE.

by considering historical prices over more than a century we are the first to provide a long-term perspective of the price and return dynamics of corporate bonds while avoiding measurement problems as much as possible. Our final dataset comprises more than 201,000 price observations at the bond-month level, and we observe a coupon payment for almost 30,000 bond-month observations. The result is the most ambitious dataset of historical corporate bond debt to date, and it extends the work of Macaulay (1938) and Hickman (1958, 1960) among others.[3]

Our analysis begins by providing a long-term perspective on the growth path of the Belgian corporate bond market. We find that before WWII, the BSE housed a corporate bond market that held the same level of relative importance as observed for the US and the UK — the world's preeminent bond markets. This finding holds when we compare the bond market's capitalization to GDP as well as when we compare to the total corporate securities market capitalization composed of both common stocks and corporate bonds. Our study, thus, offers a fresh assessment of the timing and nature of Brussels' role as an important financial center (e.g., Rajan and Zingales (2003) and Kuvshinov and Zimmermann (2021)) based on novel corporate bond data. We document the early dominance of the railroad and finance industries and the subsequent emergence of many new industries as the number, size, and sectoral diversity of publicly listed corporations increased. Railroads dominated the corporate bond market until the 1870s, when utilities and mining and extraction became the leading industries. Financials represented on average 17.47 per cent and 19.48 per cent in terms of issues and market capitalization, respectively. This result is in line with today's use of bond financing by financials within the euro area (see Gilchrist and Mojon (2018, p. 121)), reflecting a continuing trend from a historical perspective that emerged as early as the 1830s. Related, we are able to provide a novel view of the role of financials within early financial markets as we extend upon recent evidence of their importance as issuers within the historic equity market (Campbell, Grossman and Turner, 2021; Cortes, Taylor and Weidenmier, 2022) by documenting for the first time their importance within the early corporate bond market.

We then focus on investigating the performance of investments in corporate bonds by building novel return indices. The total return index of corporate bonds appreciated at a yearly value-weighted average rate of 4.35 per cent in nominal terms from 1838 to 1939, that is equivalent to a real return of 2.81 per cent. This is 344 basis points below the 7.79 per cent average nominal return and 115 basis points below the 3.96 per cent average real return obtained by Doeswijk, Lam and Swinkels (2020) for the modern global corporate bond market since

[3]We refer the reader to Internet Appendix A for detailed information on all data, including sources, used throughout this study.

1960, respectively. Unsurprisingly, coupon distributions represent the main driver of long-run corporate bond returns with capital gains close to zero. Yet, the volatility of total returns is almost entirely due to variability in capital gains.

When evaluating historical financial performance, we find that corporate bonds generate a return that is lower than equities, but higher than sovereign bonds and commercial paper. However, during the nineteenth century (that is, 1838–1900), corporate bonds outperformed equities in terms of average rate of return. What is more, the reward-to-volatility, or Sharpe ratio, of corporate bonds greatly exceeded those of equities and sovereign bonds, even when considering the whole sample period. Examining sub-periods, we find that corporate bonds were the best performing asset class in terms of Sharpe ratio before WWI on a value-weighted basis. In comparison, the interwar period was a horse race between corporate bonds, sovereign bonds, and equities in terms of the best risk-adjusted performance. We confirm that the outperformance of corporate bonds in terms of Sharpe ratio and average rate of return hold when we account for issuer-level differences in idiosyncratic risk by building return series based upon the fixed cross-section of firms that had both corporate bonds and common stocks listed concurrently on the BSE. In addition, we analyze whether idiosyncratic risk varied across sectors (financial *vs.* non-financial companies) and across periods (e.g., recessions *vs.* expansions and financial or banking crisis *vs.* non-crisis) and come to the same intriguing result. In line with this, we find that corporate bonds have a much lower volatility compared to sovereign bonds and equities. This lower volatility confirms the anecdotal evidence detailing the interest of investors in corporate bonds in the nineteenth and early twentieth centuries due to their perceived safety (see, e.g., Van de Velde (1944) and Coyle and Turner (2013, p. 823)). We use major crises as 1875, 1900, and the Great Depression to provide empirical evidence of this point. Overall, the results show that when studying long-run investment performance, corporate bonds are perhaps just as (or even more) interesting to focus on than stocks.

When compared to other studies (Chabot and Kurz, 2010; Cowles, 1939; Ibbotson and Sinquefield, 1976; McQuarrie, 2020; Rezaee, 2012; Snowden, 1990), we find that the Belgian corporate bond market generates lower average returns except when compared to the low-yielding US bond sample of Cowles (1939) and the UK samples of Chabot and Kurz (2010) and Coyle and Turner (2013). This is likely due to the non-occurrence of defaults observed in the respective samples, while almost one out of three bonds in our sample experience a missed coupon payment. When we construct our indices in accordance with extant literature, we find that bonds from the transportation industry had the same average rate of return as the overall corporate bond market but with a

much higher volatility of 12.9 per cent compared to 5.84 per cent for the market portfolio. Hence, focusing on too narrow an index can strongly influence the risk-return relationship. When we use data on *contractual* coupon payments rather than data on *realized* coupon payments based on the 301 bonds experiencing coupon defaults, thereby ignoring the lack of coupon payments, we find an upward bias of 37 basis points per annum for our value-weighted index and 181 basis points for the equally-weighted index. Combined, these highly statistically significant differences alert that the lack of industrial portfolios, credible coupon data, and market capitalization data for the period studied may strongly affect estimates of long-run average corporate bond returns.

Our research contributes to a new debate in economic history. The findings are of relevance to new evidence found by McQuarrie (2021) that stocks were unable to outperform bonds in the US during the nineteenth century, thereby going against the premise of 'stocks for the long run' as argued by Siegel (1992).[4] While we do confirm the financial economics maxim that corporate bond returns are lower than the return on equities but higher than the return on sovereign bonds and commercial paper, our findings speak to McQuarrie's (2021) result that fixed income outperformed equities during the nineteenth century. A key difference between our paper and McQuarrie (2021) is that the latter focusses on the entire bond market by taking an equally-weighted average of federal, municipality, and corporate bond indices where we instead specifically focus on the corporate bond market given its elusive past. One key contribution of this paper is that next to evidence based on the aggregate corporate bond market, we collect granular firm-level stock return data to study within-firm investment performance allowing for a more direct juxtaposing of stock and corporate bond returns. We thus shed light on an unexplored side of the corporate bond market's first centennial that enriches the empirical literature on the economic history of the investment performance of corporate bonds (Chabot and Kurz, 2010; Cowles, 1939; Coyle and Turner, 2013; Doeswijk, Lam and Swinkels, 2020; Ibbotson and Sinquefield, 1976; Rezaee, 2012; Snowden, 1990). Therefore, in this paper, we explore a new fundamental dimension of asset allocation within financial history as we make a case for 'corporate bonds for the long run.' To our knowledge, ours represents the first effort to provide a quantitative empirical analysis of the financial attractiveness of corporate bonds within historical financial markets.

Our paper is in the spirit of recent long-run studies of important stylized facts in the asset classes that are subject to the extreme difficulty of obtaining credible long-run data that allow for accurate reconstruction of precise holding period returns (Chambers, Spaenjers and Steiner, 2021; Eichholtz *et al.*, 2021; Meyer, Reinhart

[4] See 'Blind faith in the high equity return cult will lead to disaster', *Financial Times* on 23 February 2021 and 'Sometimes, It's Bonds For the Long Run', *The Wall Street Journal* on 2 November 2018.

and Trebesch, 2022). Relative to the above literature, this paper is the first to (1) compare long-run bond returns with stock returns accounting for issuer-level differences in idiosyncratic risk, (2) adjust historical returns to alleviate data issues and highlight potential upward bias due to the lack of data on coupon payment defaults and taxation, and (3) use a collection of indices at a relatively high frequency (that is, monthly rather than annual observations) to test for salient empirical stylized facts of asset returns.

Further, our paper also relates to a growing literature on the importance of corporate bonds in the evolution of early financial markets (Baskin, 1988; Baskin and Miranti, 1997; Coyle and Turner, 2013; Hickman, 1958, 1960; Macaulay, 1938; Musacchio, 2008). We contribute to this strand of literature by studying an international context outside of the US and the UK — the world's most successful corporate bond markets — and also by incorporating the data on industries other than railroads into our analysis. An additional advantage of our setting is its focus on examining the growth path of the corporate bond market over a sample period that starts at the inception of global corporate bond markets up to the eve of WWII, while other studies start their sample periods when the corporate bond market was already in a mature state.

The structure of the paper is as follows: In Section II, we describe our novel dataset on corporate bonds and provide summary statistics. Section III presents new stylized facts for the historical corporate bond market. In Section IV, we present our empirical analysis of long-term corporate bond returns. We conclude in Section V.

II. Data

A. Data Collection

To investigate the long-term returns on corporate bonds, we need to construct a history of prices. Price data were hand-collected directly from the Official Quotation Lists of the BSE. Our sample period starts in 1838 when the first corporate bond was listed on the BSE. The 1830s is the period when corporate bonds first emerged across leading financial centers (see Rezaee (2012) for France and McQuarrie (2021) for the US) that makes that decade a natural starting point. Our data span until December 1939 given limitations that stem from availability and quality of the material available (Biais and Green, 2019; Baron, Verner and Xiong, 2021, p. 58).

Besides prices, the Official Quotation List contains information on coupon rates, coupon type, payment dates, nominal values (which was usually 500 BEF), and number of securities issued per designation. Taxation rates were introduced following the law of 29 October 1919 which took effect in January 1920. Interest income

was tax exempt before January 1920, while capital gains were never taxed during our sample period. Internet Appendix Figure A.1 provides a typical example of how bond prices and quotations were published in the Official Quotation List. We collect end-of-month prices of bonds, that is, the closing prices on the last day of the month. Whenever a given bond did not trade on that day, the previous price was used. To detect data entry errors, we follow Bessembinder *et al.* (2008) and screen inputs on large price movements and extreme reversals defined as an absolute monthly return that has exceeded 20 per cent. This approach involved examining the daily records of the Official Quotation List for data on bonds that had unusually high pricing. Such erroneous records are indicated as *cours modifié* (i.e., 'adjusted price') or *hier cours nul* (i.e., 'wrong price') on the days following the end-of-month price. To further safeguard against data that seem unreasonable, we exclude prices that are less than one cent per Belgian franc of nominal value.

We rely on the NACE (*Nomenclature of Economic Activities*) consistent industry classification built by Annaert, Buelens and De Ceuster (2012). We allow for multiple industries to be included in our sample because economies have enjoyed intensive transformative innovation that dates from the Industrial Revolution and continues through the Golden Age of Invention in the late nineteenth century. Our dataset therefore captures the structural changes in the Belgian economy over the course of the Second Industrial Revolution. In this way we overcome selection issues that plague previous historical research on corporate bonds (e.g., Macaulay (1938) and Snowden (1990)), that relied almost exclusively on railroad bonds, that is, samples tilted toward large historical firms.

In constructing our corporate bond indices, we focus on Belgian-based companies, irrespective of whether they have their main activities in Belgium or abroad. Based on the classifications made by Annaert, Buelens and De Ceuster (2012), we use the following categories: (i) Belgian-owned companies having their most important production facilities in Belgium, (ii) Belgian-owned companies having their most important production facilities abroad, and (iii) Colonial companies (that is, Belgian-owned companies having their most important production facilities in Belgian Congo).

Our dataset differs from those in well-known studies of historical corporate bond markets insofar that we refrain from including sovereign entities in our dataset. Bonds of firms owned by the Belgian state or the Belgian Congo, or whose interest payments and amortization were guaranteed by the state or the colony, were classified as government securities (*Fonds d'État* or *Rentes Belges Directe et Indirecte* in the early period, and *Emprunts Émis ou Garantis par l'État et la Colonie* in the later period) at the start of every daily record. This categorization

gives a clean disentanglement of government-backed securities from private securities in contrast to databases for other countries that struggle to make such a distinction (Baskin, 1988; Hautcoeur, 1994). In addition, we follow Les Dossiers Financiers (1928) and use their eight supplemental volumes to account for acquisitions of (troubled) railroads by the Belgian state given its role as an early adopter of railroad nationalizations (Bogart, 2009). Such operations occurred as early as the 1870s. Consequently, our sample contains all bonds issued by Belgian-based companies on the spot market of the BSE without sovereign backing.

A central challenge for the construction of long-run corporate bond return indices is related to the observation of *realized* rather than *contractual* coupon payments. Indeed, historical missed or delayed coupon data have remained elusive to this day — even more so than price data (Giesecke *et al.*, 2011; Muir, 2017). Most bonds announce their coupon, usually referred to in the bond's name. When coupons are not paid out for some time (during partial defaults), the returns that are calculated by assuming regular coupon payments are often largely overstated. Unique for our setting is that the Official Quotation List reports the data on missed coupon payments from 1873 onwards. This information is shown in a separate table (*obligations des compagnies qui ont des coupons en souffrance ou des coupons suspendus provisoirement*) at the end of each daily price record. Furthermore, coupons were sometimes changed. Changes in coupon rates are available through the Official Quotation List for the whole sample period, that allows for an updated series of contractual payments.

Finally, after combining the data from the Official Quotation List with company data from secondary sources, we apply the following filter criteria as per general practice in the corporate bond literature: (i) remove bonds with floating rates (that is, variable rather than fixed interest payments) and (ii) only retain bonds with at least 12 consecutive monthly observations. The result is a monthly index of prices, coupons, and returns based on consistent definitions over a period of 102 years that we use as an ideal historical setting to study the long-run performance of corporate bonds.

B. Descriptive Statistics

PLACE TABLE I ABOUT HERE.

Table I shows the number of bond-month price observations — and the number of distinct firms and bonds that these observations relate to — by decade in Panel IA. In total, we hand-collected 201,844 end-of-month bond prices and 29,899 coupon payment observations for 1,033 bonds issued by 645 unique firms during the sample period of May 1838 to December 1939. Observations increase over time as the corporate bond market

gains in size. There were on average 165 bonds listed per month throughout the sample period and a maximum of 458 in November 1923. The number of firms averaged 131 per month and peaked in December 1922 at 329 firms that accessed the public bond market. The fact that the number of firms listed concurrently peaked at 329 while the total number of firms in the dataset was 645 indicates that firms did not only appear during the sample period, but that they also disappeared. During the 1930s, the sample shrinks for three different reasons. The first reason is that the existing bonds reached maturity. Second, firms delisted following the increase in defaults during the 1920s. The third reason concerns the slowdown in new public bond offerings. Instead, we observe a transition towards broader common stock ownership as equity financing fully flourished during the 1920s when the BSE reached the zenith of its importance (Van der Valk, 1932, p. 107; Baudhuin, 1944, p. 196). This evolution is not uniquely Belgian, as it was also observed in other countries (Baskin and Miranti, 1997). As a result, the number of traded bonds with monthly pricing information drops to 409.

Panel IB contains the summary statistics for the selected characteristics of bonds in our sample. The table shows that typical firm only has a single bond issue outstanding at any point in time. However, there is a wide range in the distribution of listed bonds as the 99th percentile firm has three different bond issues trading concurrently in the market. As expected, the distribution of the market values of these issues has a significant positive skew. When the median bond issue has a market valuation of BEF 0.9 million in 1905 constant BEF, the average bond issue holds a market valuation of BEF 2.65 million in 1905 constant BEF. The coupon rate on our sample of bonds averaged 4.46 per cent during the sample period. The initial maturity of the securities is close to 34 years. This result speaks to a recent strand in finance literature wherein sovereigns, municipalities, and companies have shortened their maturity structure in recent decades (Barbosa, Cortes and Cunha, 2022; Custódio, Ferreira and Laureano, 2013; Meyer, Reinhart and Trebesch, 2022). The median maturity at issuance of 30 years is consistent with Badoer and James (2016) for long-term bond issuances in the modern US market. The average listing period of an individual bond within our dataset is about 17 years.[5]

[5]Another characteristic worth noting is bond liquidity. Trading activity was relatively high with bonds trading on average 70 per cent of the time during the period following the Liberalization Act of 30 December 1867, whereby we define liquidity as the proportion of months with non-zero returns over a year following Campbell, Turner and Ye (2018). This strongly contrasts with the liquidity of the earliest decades, where bonds traded only 35 per cent of the time on average.

III. Aggregate Trends

A. *Trends in Corporate Bond Market Size*

PLACE FIGURE 1 ABOUT HERE.

We analyze how the corporate bond market has developed over time by charting the aggregate market size and its industrial composition. Figure 1 plots the development of the Belgian corporate bond market in terms of market capitalization. Details regarding data collection of stock market data can be found in Internet Appendix A.1.

Looking at the time-series variation, Figure 1 shows three distinct phases that form an inverted U-shaped pattern over the course of our sample period. First, during the initial 20 years, the nascent corporate bond market was fairly stable as the BSE was dominated by equities and sovereign bonds which had a sizeable market share in the early 1830s as the modern market system emerged (Annaert, Buelens and De Ceuster, 2012). The size of the corporate bond market rose substantially from the mid-1850s onwards. This manifestation of corporate bond use on the BSE is explained by private railroad firms listing bonds around the middle of the nineteenth century as the state abstained from railroad investment in favor of the private sector (Avakian, 1936). Such delay in initial development of an active corporate bond segment also existed in the US (McQuarrie, 2021), the UK (Coyle and Turner, 2013), and France (Rezaee, 2012).

Second, from the early 1860s to the early 1920s, the corporate bond market grew from a total size of 150 million BEF to 2.2 billion BEF. Compared to GDP, the market increased almost tenfold from a level of 3 per cent to a level of 21 per cent. Notwithstanding the extensive nationalization of railroads since the 1870s (Chlepner, 1930, p. 57; Bogart, 2009), we find that the corporate bond market upheld its importance. It is in this period that we quickly move from rather exceptional issues to large-scale bond issues becoming listed that marked the emergence of a genuine corporate bond market. This large increase in market value was due to non-railway companies entering the bond market. It was common for firms to issue bonds as between a quarter and a third of firms with listed stocks also had at least one bond listed in any given year (see Internet Appendix Figure A.4).

This second phase in the development of the Belgian corporate bond market coincides with the increasingly open and liberal nature of the Belgian economy as it fostered the development of the corporate credit market with the specific purpose of increasing domestic and international trade (Chlepner, 1930, p. 51; Van der Valk, 1932, p. 52; Chlepner, 1943, p. 32). The corporate bond market enjoyed a significant amount of new listings as a direct

result of regulatory change following the progressive legislative ideas instilled by the liberal party as it came to dominate the Belgian government from 1857 on. Interest rates were liberalized in 1865 and the liberalization of the stock exchange was realized in 1867. The Company Reform Act of 1873 abolished the need of royal approval for the establishment of a joint-stock company. This abolition meant that the government could no longer ban firms from listing their securities.

The emergence of the wide-spread use of corporate bonds since 1860 was further stimulated by leading universal banks (Van Schoubroeck, 1951). Belgium had one of the most highly developed banking sectors in the world and was internationally singled out as the prime example of the beneficial effects of bank-firm relationships (Cameron, 1967; Da Rin and Hellmann, 2002). Banks such as *Société Générale*, *Banque de Belgique*, *Banque d'Anvers*, *Crédit Général Liégeois*, and *Banque de Bruxelles* extended long-term credit through bilateral contracts. These contracts typically stipulated that corporations would soon issue stocks or bonds to reimburse bank loans (Vaes, 1929; Van der Valk, 1932, p. 92; Chlepner, 1943, p. 44). Banks typically formed a syndicate with stockbrokers and other financiers, either acting as intermediaries and selling the securities directly to the public on what we would now call a best-efforts basis, or by buying the securities themselves and then selling them to the public through a firm commitment agreement (Vaes, 1929). The combination of liberal legislation combined with bank's active role in underwriting, issuance, and brokerage of industrial securities played an principal role in increasing the importance of the corporate bond market in Belgium.

During the third phase, the 1920s, the size of the corporate bond market as a proportion of GDP fell to just below 8 per cent, a level it had experienced almost 80 years earlier. While the total market capitalization of the corporate bond market did not contract from its 1913 level, Belgian GDP rose in rapid fashion in the aftermath of WWI, increasing by 17.83 per cent in constant 1905 BEF from BEF 6.9 billion in 1913 to BEF 8.1 billion in 1930. While the US corporate bond market was able to exceed its pre-WWI level of development during the 1930s (Giesecke *et al.*, 2014), the Belgian corporate bond market was not able to do so. It rather experienced the same downward trajectory as did the corporate bond market of the UK (Coyle and Turner, 2013) and in other non-Anglophone advanced economies after WWI (Hannah, 2015, p. 13; Baron, Verner and Xiong, 2021, p. 58).

In terms of other corporate bond markets, the Belgian domestic corporate bond market was large in 1913. Only the US (Giesecke *et al.*, 2011, 2014), France, and Spain (Musacchio, 2010, p. 58) had larger bond markets relative to GDP, but the difference was small. We therefore conclude that the Brussels market was one of the pree-

minent corporate bond markets in the world together with the US and UK, especially before WWI.[6] The same conclusion holds when we make the comparison between the two categories of corporate securities — stocks and corporate bonds. Compared to the UK corporate bond market, which reached its zenith in 1913 (Coyle and Turner, 2013, p. 818–819), we find a relative importance of corporate bonds compared to equities of 25.17 per cent for Belgium in 1913, which greatly exceeds the 15 per cent found by Coyle and Turner (2013, p. 819). While it could be the case that Belgium had smaller equity markets compared to the UK, thereby artificially increasing the relative importance of its corporate bond market due to a smaller equity market capitalization in the denominator, Rajan and Zingales (2003) and Kuvshinov and Zimmermann (2021) show that Belgium together with UK housed the two largest stock markets relative to GDP in 1913.

B. Industrial Composition of the Corporate Bond Market

PLACE FIGURE 2 ABOUT HERE.

Next, we turn our attention to the industrial composition of the corporate bond market. We sort bonds in five major industries following the mapping of Goetzmann, Ibbotson and Peng (2001): Transportation, Financials, Mining and Extraction, Utilities, and Industrials.[7] Figure 2 shows the evolution of the five industrial categories. As can be clearly seen from the figure, great changes occurred in the industrial composition of the corporate bond market in our sample period based on the number of issues outstanding (Panel 2A) and market capitalization (Panel 2B).

Two patterns are noteworthy. First, Figure 2 shows that the industrial diversification of the corporate bond market was increasingly pronounced after 1880. The emergence of multiple industries in Belle Époque Belgium is consistent with the boom in Belgian exports (Huberman, Meissner and Oosterlinck, 2017). For a long time, financial markets were dominated by railroad securities. In this way, railway bonds played an important role in familiarizing investors with corporate bonds (Baskin and Miranti, 1997; Coyle and Turner, 2013). Other industries would soon follow the same line of conduct. Subsequently, there was a significant shift in the composition of the corporate bond market away from railroads following their nationalization (see Chlepner

[6] The potential influence of sovereign guarantees in point estimates of the size of the historic corporate bond market (Hannah, 2015) and the fact that we find comparable estimates for Belgium despite correcting for such occurences further strengthens our claim that Belgium housed one of the leading corporate bond markets.

[7] *Transportation* comprise passenger, freight, and service transport by road or water. *Financials* comprise banks, insurance companies, trusts, investment funds, and holding companies. *Mining and Extraction* comprise coal, non-ferro, miners, and blast furnaces. *Utilities* comprise electric, gas, communication, street railways, and miscellaneous utilities. *Industrials* comprise agriculture, construction, trade, services, manufacturing companies, and miscellaneous industrials.

(1930, p. 57) and Bogart (2009)) and towards utilities, mining and extraction, and industrials. While firms active in the mining and extraction industry and industrial firms were present since the mid-1850s, utilities saw their importance increase in rapid fashion after the passing of the law of 9 July 1875 as tramways and shortline rail operations were introduced into Belgium. In later decades, utilities and mining and extraction become the most dominating industries within the corporate bond market.

Second, we find a long-run average of 17.47 per cent in terms of issues and 19.48 per cent in terms of market capitalization for financials against the total corporate bond market. When we consider the post-reform period, 1874–1939, we find a long-run average of 6.24 per cent in terms of issues and 10.62 per cent in terms of market capitalization.[8] Related, we find that financials became an active issuer on the Belgian corporate bond market much earlier than in New York. The financial sector was not active on the Belgian corporate bond market between 1856 and 1878 as shown in Panel 2A, similar to the absence of issues by the financial institutions reported by Giesecke *et al.* (2011, p. 235). However, later there is a much greater importance of financial companies: Compared to the 1.2 per cent in 1900 and the 6.9 per cent in 1930 for the US, we find a level of 6.97 per cent in 1900 and 7.91 per cent in 1930 for Brussels. The Belgian context puts the finding of the importance of financials within the modern European corporate bond market in a historical context (Gilchrist and Mojon, 2018, p. 121). Our results also extend recent evidence of the importance of financials within the historic equity market (Campbell, Grossman and Turner, 2021; Cortes, Taylor and Weidenmier, 2022) to the corporate bond market. Combined, the evolving composition of the bond market highlights the importance to include industries other than railroads to accurately estimate its long-run performance.

IV. Long-Run Investment Performance

In this section, we evaluate the investment performance of corporate bonds over the 102 years spanned by our sample. We also discuss our findings on historical bond returns in the light of existing research on this topic. Additionally, we compare corporate bonds with other financial assets, show the effect of portfolio diversification, and examine the influence of faulty coupon data. We also conduct a battery of additional analyses and robustness checks.

[8] Limiting our financial index to be composed of only banks, we find a long-run average of 14.72 per cent in terms of issues and 16.16 per cent in terms of market capitalization, respectively. This drops to 1.98 per cent in terms of issues and 5.43 per cent in terms of market capitalization when we consider the post-liberalization period from 1873 onwards.

A. Measuring Bond Returns

In accordance with standard practice in the literature, we compute the *gross* total bond return at time t as:

$$\begin{aligned} R_{i,t}^{gross} &= \frac{P_{i,t} + AI_{i,t} + C_{i,t}}{P_{i,t-1} + AI_{i,t-1}} - 1 \\ &= \frac{DP_{i,t} + C_{i,t}}{DP_{i,t-1}} - 1 \\ &= \underbrace{\frac{DP_{i,t} - DP_{i,t-1}}{DP_{i,t-1}}}_{\text{capital gain}} + \underbrace{\frac{C_{i,t}}{DP_{i,t-1}}}_{\text{coupon return}}, \end{aligned} \tag{1}$$

where $P_{i,t}$ is the clean price reported at the end of month t, $AI_{i,t}$ is the accrued interest, and $C_{i,t}$ is the coupon payment obtained by the holders of bond i as the ratio of its annual coupon rate to its coupon frequency. The prices of corporate bonds are shown as 'clean' prices (*intérêts non compris* or *intérêts au dehors*) within the Official Quotation Lists of the BSE before May 1923.[9] We thus have to adjust for accrued interest (*intérêts à bonifier*) accumulated in month t from the last coupon payment onwards to reflect the full or 'dirty' price, $DP_{i,t}$, paid at settlement. We use the standard convention for coupon accrual that means we calculate the accrued interest as the coupon rate multiplied by the number of days between the end of current month t and the previous coupon payment date. Unlike the clean prices of bonds that trade with accrued interest due, bonds in a state of coupon default trade at dirty prices (Bastiné, 1876) — that motivate the adjustment of the accrued interest component in Equation (1) as coupons promised by defaulted bonds are never paid in month $t + 1$. In analysis that follows, we assume that the coupons were paid at month-end.

Importantly, prior to 1920, Belgium was characterized as a European tax haven (Annaert, Buelens and De Ceuster, 2012). There were no specific taxes on coupons in Belgium during this time. Taxation changed profoundly after the passing of the law of 29 October 1919 (Janssens, Verboven and Tiberghien, 1990). In January 1920, the government introduced coupon taxes, while capital gains remained tax-exempt. These taxes, which were only affected by the interest income received by bondholders, ranged from 2 per cent for bonds issued by Belgian firms whose main activity was abroad to 16.5 per cent by Belgian firms whose main activity was in Belgium (see Internet Appendix A.3.4). Bond issuers had the possibility to take on income taxation by issuing tax-exempt bonds. This was the case for approximately 45 per cent of coupons paid in the post-1919 sample. To account for the tax treatment of corporate bonds, we modify our *gross* return computation of Equation (1) by

[9] Prices are quoted including accrued interest (*intérêts compris dans le cours*) from 1 May 1923 onwards due to a change in the way bond prices were reported in the Official Quotation List. We therefore do not adjust these prices for accrued interest.

defining the *net* return, or after-tax return, on corporate bond i using $\widehat{C}_{i,t} = C_{i,t} \cdot (1 - \tau_{i,t})$ for which $\tau_{i,t}$ represents the marginal tax rate that is defined as the tax disadvantage of coupons relative to capital gains (subscripts allow for time variation as well as heterogeneous marginal investors across bonds), and is imposed on pre-tax interest income.

To compute portfolio returns we aggregate corporate bonds at each point in time. Specifically, we calculate monthly realized portfolio returns for all bonds, R_t^P, as:

$$R_t^P = \sum_{i=1}^{N} R_{i,t} \cdot \frac{w_{i,t-1}}{\sum_{i=1}^{N} w_{i,t-1}}, \tag{2}$$

where R_t^P is the realized return of the portfolio including corporate bond 1 to N and $w_{i,t-1}$ denotes the weight of bond i in month $t-1$. As is customary in fixed-income research, we use value-weighted returns.

Volatility typically is measured by the standard deviation in returns which is calculated based on monthly returns to capture intra-year volatility. However, given that the hypothesis that there is no autocorrelation in the monthly return series is rejected by the data (see Internet Appendix Table A.VI), the variance is annualized taking into account potential serial correlation up to 11 lags as follows:

$$\sigma^2_{Yearly} = \left(12 + 2 \cdot \sum_{l=1}^{11} (12 - l)\rho_l\right) \sigma^2_{Monthly}, \tag{3}$$

where ρ_l is the return autocorrelation at lag l.

B. An Index for Corporate Bonds

Place Table II about here.

Table II provides the summary statistics on our value-weighted return series. As investors are interested in real performance — considering the loss of purchasing power due to inflation — we not only consider *nominal* returns but also *real* returns. To calculate real returns, we use the annual consumer price index (CPI) of Van de Velde (1944, p. 21–25) for the period before WWI. For the WWI period, we source updated inflation data from Scholliers (1978). For the period after WWI, we use data from the Ministry of Economics (*L'Indice des Prix à la Consommation - Historique de 1920 à nos jours*). Because the CPI data (see Internet Appendix Figure A.5) are only available on an annual basis, we calculate inflation-adjusted, *real*, returns on an annual basis as follows:

$$R_t^{P,Real} = \frac{1 + R_t^{P,Nominal}}{1 + \pi_t} - 1, \tag{4}$$

where π is the inflation rate measured as $\frac{CPI_t}{CPI_{t-1}} - 1$ per year t and $R_t^{P,Nominal}$ is calculated by compounding monthly market returns.

We present our new data on capital appreciation, coupon income, and total returns during the period from 1838 to 1939 in Panel A. We further divide our sample into three subperiods in Panel B based on the major institutional and geopolitical changes that took place. Panel B starts with the period before the Company Reform Act of 18 May 1873 went into effect. From this point on there was no requirement for government authorization to set up a limited liability company. This absence led to an unprecedented liberalization of the market whereby free incorporation intensified competition and encouraged corporate capitalism. We further consider the period during which the BSE had adopted its laissez-faire legislation up until WWI. Lastly, we also display the interwar period from 1920 until the end of the sample period in 1939. The capital appreciation indices track the price evolution of an investment in all listed bonds issued by Belgian-based companies and thus comprise only capital gains. The total return indices take both coupon income and capital gains into account.

For the full sample period from May 1838 to December 1939 corporate bonds show an annual nominal total return of 4.35 per cent for the value-weighted market portfolio. The geometric average total return, which represents the average annual compounded return of an investor who has remained invested for one century, is 4.20 per cent in nominal terms. These results are consistent when we divide our sample period into sub periods. The arithmetic (geometric) average rate of return varies between 4.11 per cent (4.07 per cent) for the pre-WWI period to 4.71 per cent (4.60 per cent) for the early nineteenth century. The interwar performance lies in between these two averages, with an arithmetic average return of 4.58 per cent and a geometric average return of 4.10 per cent. Our historic long-run average returns are dramatically lower than the average annual growth rate of 7.79 per cent in nominal terms experienced by the modern global corporate bond index of Doeswijk, Lam and Swinkels (2020) for 1960–2017.

The real returns in Table II are much lower and equate to 2.81 per cent for value-weighted returns on corporate bonds. The average real return of our corporate bond sample is 115 basis points below the 3.96 per cent found by Doeswijk, Lam and Swinkels (2020) for 1950–2017.[10] When we incorporate inflation, the risk of corporate bonds more than doubles from 5.15 per cent to 12.04 per cent. Real returns show a great variability across eras, with rates of return exceeding 4 per cent leading up to WWI where this changed going into WWI, show-

[10] While inflation was much more stable before WWI due to the gold standard, it became a much more prevalent phenomenon afterwards. The average annual inflation rates are 2.92 per cent in our sample period compared to 3.74 per cent for Doeswijk, Lam and Swinkels (2020) for 1960–2017.

ing a return of just 1.44 per cent for the interwar period. Our results are consistent with the interpretation that investors were disinclined to invest in fixed income securities — corporate and sovereign — during the post-WWI period due to high levels of inflation and uncertainty regarding the value of the Belgian franc (Van de Velde, 1944, p. 206, 212; Van Meerten, 1992, p. 238). Consequently, fixed income generated its lowest average rate of real return during the interwar period. It was only after the devaluation of the Belgian franc in 1926 that corporate bonds gained from the general *hausse* at the stock exchange (Van Meerten, 1992, p. 245), especially so for lower-priced issues. The Belgian franc was devalued to one-seventh of its pre-war value, resulting in a considerable undervaluation compared to the British pound and American dollar thereby strongly stimulating Belgian exports and the Belgian economy (Van Meerten, 1992).

Table II clearly demonstrates the importance of accurate information on coupon data to obtain an adequate view of the performance and univariate properties of historical corporate bond indices. The observed total returns are mainly attributed to coupon payments (that is, interest income) rather than to price changes (that is, capital gains). Capital returns are very close to zero over the very long run for corporate bonds, with an arithmetic (geometric) average of 0.05 per cent (-0.09 per cent) over the full period between 1838 and 1939. This holds not only for the full sample period but also across all subperiods. Yet, capital gains varied substantially depending on the considered time frame. We find that the arithmetic (geometric) average capital gains vary between -0.32 per cent (-0.78 per cent) for the interwar period and 0.54 per cent (0.45 per cent) for the early nineteenth century. Consequently, looking at the risk of the portfolios, Table II shows see that the standard deviation of the nominal total return series is 5.15 per cent for the market portfolio. This is almost identical to the standard deviation of the capital return. The disproportionate influence of capital gains on total return volatility is therefore evident. Unsurprisingly, coupon returns are much more stable.[11] We conclude that coupon income represents a high proportion of total returns but contributes only marginally to total return variances. Coupons are the main driver of returns in each sample configuration, roughly contributing between four and five percentage points to ex-post nominal returns. In this way our findings tie into the research on the long-run performance of other asset classes: equity (e.g., Dimson, Marsh and Staunton (2002), Annaert, Buelens and Deloof (2015), and Le Bris, Goetzmann and Pouget (2019)), real-estate (e.g., Eichholtz *et al.* (2021)) and sovereign bonds (e.g., Dimson, Marsh and Staunton (2002) and Meyer, Reinhart and Trebesch (2022)). Given declining

[11] Coupons do show a clear seasonal pattern as per Internet Appendix Figure A.6. Two months stand out, January and July, in which 21 per cent of all bonds pay a coupon, respectively. The coupon return amounts to approximately 0.99 per cent for these months, while the average monthly coupon return is 0.23 per cent across other months. Not correctly accounting for coupon timing may induce spurious seasonality in returns when dirty prices are quoted.

interest rates worldwide from mid nineteenth century (Van de Velde, 1944, p. 115–117; Homer and Sylla, 2005), investors were looking for other avenues to invest their capital than in sovereign bonds. Corporate bonds were an ideal investment vehicle for this reason.

C. Corporate Bonds Versus Other Assets

In this subsection, we compare the returns of Belgian corporate bonds with the after-tax returns of other financial assets: equities, sovereign bonds, and commercial paper. Data sources on Belgian equities, government bonds, and commercial paper are described in Internet Appendix A.1.

Place Table III about here.

A full overview of the distribution of the nominal and real returns of corporate bonds and other financial assets can be found in Table III. Panel A shows that annualized nominal value-weighted returns over the sample period 1838–1939 are 5.72 per cent, 4.35 per cent, and 4.02 per cent for equities, corporate bonds, and sovereign bonds, respectively. Thus, corporate bonds have underperformed equities during our sample period when considering average returns, but they outperformed sovereign bonds. However, corporate bonds did realize a much lower standard deviation (5.15 per cent) compared to equities (16.52 per cent) and sovereign bonds (7.23 per cent). The higher volatility of sovereign bonds is due to their longer duration, given that they were typically perpetuities (*rentes*). The comparable average annualized performance combined with its relative stability results in corporate bonds having the highest Sharpe ratio. The Sharpe ratio is the mean excess return (in excess of the risk-free asset) per unit of total risk, as measured by the standard deviation of excess returns.

Panels B to D of Table III show that corporate bonds performed better than equities over the course of the entire nineteenth century and early twentieth century on a risk-adjusted basis as we consider subperiods as previously done in Table II next to the nineteenth century in its entirety. Interestingly, in Panel C, we are able to extend upon the result of McQuarrie (2021) that stocks failed to outperform fixed income securities during the nineteenth century on a value-weighted basis, specifically for corporate bonds. Corporate bonds generated a geometric average rate of return that was 68 basis points above stocks. The Sharpe ratio of corporate bonds during this time vastly exceeded that of stocks, with 0.45 compared to 0.14, respectively.

Place Figure 3 about here.

Time-series evidence for the main financial assets in Figure 3 echoes this conclusion. Panel 3A and Panel 3B plot the evolution of the relative performance of corporate bonds vis-à-vis equities and sovereign bonds, respectively, by using monthly value-weighted returns over the sample period from May 1838 to December 1939. The relative performance is measured by the cumulative return index of corporate bonds over the cumulative return index of equities or sovereign bonds. Whenever corporate bonds outperform, the relative performance line will increase. Moreover, one can easily gauge the relative performance over any desired period: Whenever the line is higher at the end point than at the starting point of the period, then the corporate bonds outperformed. The figure confirms that corporate bonds were the best performing asset class during the nineteenth century when compared to equities. Looking at the cumulative performance of corporate bonds against sovereign bonds, the figure show that corporate bonds underperformed sovereign bonds during the first 40 years of the sample period, except surrounding the February Revolution as it spread from Paris to Brussels in March 1848. Belgian sovereign bonds lost close to a third of their value in a single month during this important geopolitical event despite the common belief that Belgium remained unaffected by the wave of revolutions that swept over Europe in 1848 (Dhondt, 1948; Hobsbawm, 1962).[12] Shifting our attention to the last segment of the sample period, we observe that the return index showcases large volatility during the interwar period, effectively resulting in a final value in 1939 that is very much comparable to the situation at the end of WWI. Hence, the financial attractiveness of corporate bonds was lost going into the 1920s, a period characterized by equity becoming more widespread and economic development growing exponentially due to the rebuild of Belgium following the damages introduced by warfare. Panel E of Table III confirms this result.

Place Table IV about here.

The novelty of our paper is that long-run return series of corporate bonds and equities enable us to control for idiosyncratic risk. This allows us to test how important the distribution of issuers' idiosyncratic risk is in driving the interesting results of the bond advantage shown in Table III and Figure 3. Specifically, we ask the following question: Keeping the cross-section of issuers fixed, which asset class outperformed? Each month we select those firms which had at least one corporate bond and one common stock concurrently listed on the BSE. This results in a sample of 585 firms which had 937 corporate bonds and 651 common stock concurrently outstanding between April 1838 and December 1939. We then construct within-firm return series that invests in

[12] Historiography has always pretended that little happened in Belgium in 1848, but the republicans had almost staged another revolution by then (Witte, 2020, p. 283).

these securities using the same weights for both stock and bond portfolios to control for the effect of multiple securities issued by the same firm. This means we hold constant firm-specific risk. To be consistent with a measure of firm-level integration, we value-weight the portfolio of stocks using the relative market capitalization of the firm based on their outstanding bonds, and subsequently employ the same weights for the bond portfolio. In case of multiple issues of the same security type, we equally-weight individual stocks and bonds for a particular firm.

The results in Panel A of Table IV reveal that portfolios of corporate bonds do produce higher Sharpe ratios than do portfolios of equities when correcting for idiosyncratic risk. We further analyze if idiosyncratic risk varied across industries (that is, financial companies *vs.* non-financial companies) and periods (that is, recessions *vs.* expansions and financial or banking crises *vs.* non-crises) in Panel B to Panel D. Irrespective of the method of constructing subsamples, we unmistakenly observe outperformance in terms of Sharpe ratio of corporate bonds vis-à-vis equities. The results based on the matched sets of bonds and equities therefore suggest that the corporate bond asset class had better ex-post risk-return characteristics than other financial assets listed on the BSE. In addition, we utilize the same methodology to show robustness of the finding that corporate bonds generated higher average returns during the nineteenth century in Internet Appendix Table A.VII.

Place Figure 4 about here.

Table IV shows that corporate bonds outperform equities in terms of average rate of return — both in nominal and real terms — during periods where risk aversion is highest and did so with much lower volatility. We now examine the performance of each asset class around selected major crises in the financial center(s) that have different features, as to their global effects. In particular, we compare the cumulative total return of Belgian stocks, sovereign bonds, and corporate bonds five years before and after (i) the 1875 financial crisis (crash month: January), (ii) the Panic of 1900 (crash month: March), and (iii) the Great Depression (crash month: October 1929). The selection of these crises follows their large-scale impact on the Belgian economy and capital market. Van de Velde (1944, p. 117) lists these crises, together with 1848, as the most extreme events to be observed on the BSE before WWII.

Figure 4 shows the resulting monthly return series — indexed to 100 in the starting month of the crisis. The results from these case studies are broadly in line with the aggregate statistics summarized earlier. Corporate bonds show higher cumulative returns than stocks in all three crises. By definition, the returns on our bond

portfolio also tend to be less volatile than those of stocks. Compared to Belgian sovereign bonds, corporate bonds fare better in 1875, but significantly worse during the Great Depression. The remarkable outperformance of corporate bonds during the 1875–78 international crisis is consistent with the increasing interest of Belgian investors in fixed income securities in their quest to find security (Chlepner, 1930, p. 77). Summing up, these findings suggest that corporate bonds can provide insurance against major shocks to stock markets, a conclusion which is consistent with Page and Panariello (2018). The high average coupon payments on corporate bonds help to stabilize total returns when prices are volatile. Although the number of years producing negative capital gains is 53 (out of 102), high coupon returns meant that the total corporate bond market return was negative for only 14 years. The historical setting of major crises provides empirical evidence of the safety of corporate bonds as argued by previous anecdotal evidence (Van de Velde, 1944, p. 100; Coyle and Turner, 2013, p. 823). We provide robustness of this result in Internet Appendix Figure A.7.

D. Comparing Our Index to Previous Work

Having established our main estimates for corporate bond returns and their historical financial attractiveness, in this section we discuss these estimates in more detail. More specifically, we discuss the possible role of measurement error as our unique dataset allows us to draw to the potential flaws that historical corporate bond datasets might embed. The discussion highlights the main differences between our index and the indices of other scholars.

Place Table V about here.

Table V compares the returns on the Belgian corporate bond market in the pre-WWII period with those of the UK, the US, and France in the same period. Although such comparison helps to place the performance of the Belgian corporate bond market into context, such comparison should be made circumspectly given the possible differences in construction, constituents, and survivorship bias.

Overall, we find substantially lower returns than the other studies in Table V, except for the US sample by Cowles (1939) and UK samples by Chabot and Kurz (2010) and Coyle and Turner (2013). A likely explanation is the low rate of default observed within their respective samples. While Cowles (1939) deliberately focusses on highest quality firms (or, conversely, the lowest yielding securities), Coyle and Turner (2013) and Hannah (2015) denote a very low rate of default within the historical UK corporate bond market. This is in stark contrast with

the evidence of Giesecke *et al.* (2011) on the prevalence of corporate default for the US between 1866 and 2008 — the world's largest and most successful corporate bond market — and the prevalence of coupon payment defaults for Belgium. This reasoning can be further extended to the difference between our index and the results of Ibbotson and Sinquefield (1976) given the focus on very high quality firms (that is, the lowest yielding bonds) in their respective sample as shown by Hallerbach and Houweling (2013) and McQuarrie (2020). When we look at the volatilities, we find that apart from two exceptions, volatilities are of the same order of magnitude. While Cowles (1939) finds a volatility of only 0.77 per cent for the US corporate bond market between 1872 and 1938, we find a volatility of 5.63 per cent for our Belgian sample. The other large difference in volatility is between our index and Ibbotson and Sinquefield (1976); we find a volatility of 11.96 per cent for 1926–39 compared to 4.09 per cent for their US sample.

Two major differences are apparent in the methodology of corporate bond indices. Most of the international empirical work on the historical investment performance of corporate bonds relates to the history of the railroad industry — the largest and most successful firms — and returns incorporating *contractual* rather than *realized* coupon payments. Where the former are the most easily identifiable corporate securities within a historical context, the latter is due to the elusive past of corporate bond default data within a historical setting (see Giesecke *et al.* (2011) and Muir (2017)).[13] Our Belgian corporate bond indices enable us to reconsider what potential bias such aforementioned index construction procedures would bring forth upon our main estimates of historical corporate bond performance.

Place Table VI about here.

To test the proposition of industry selection (or the lack thereof), we analyze the extent to which returns differ across industries, and how industry performance compares to the general market. To assess the performance of industrial portfolios, we compress our sample period into a time frame when all industries were simultaneously listed on the BSE. This condition results in a subperiod that starts in February 1878 rather than April 1838. Table VI presents the summary statistics for all industry portfolios and the overall market portfolio. Panel A shows that there is clearly some variation in the average return across industries in which financials show the highest average return of 4.49 per cent. The transportation portfolio generated lower coupon returns than other

[13] It is important to note that coupon payment defaults are distinct from the topic of delisting returns mentioned by Coyle and Turner (2013, p. 823). Coupon payment defaults deal with the lack of payment during the lifetime of a bond issue, while delisting returns deal with the very last return observation of a financial security due to final payments received by the bond holder.

industries. Risk as measured by the standard deviation of returns shows considerable variation among industries. The volatilities vary between 5.97 per cent for utilities and 12.90 per cent for transportation. Meanwhile, the bond market index has a standard deviation of only 5.84 per cent that indicates that industry diversity also implies return diversification potential. Further, Panel B shows that the industries other than transportation are economically very important in the corporate bond market portfolio. The transportation portfolio shows the largest average size (BEF 215.9 mil. in 1905 constant BEF), while industrials show the smallest average portfolio size (BEF 69.67 mil. in constant 1905 BEF). The ex-post performance of the corporate bond market portfolio indicates that it represents a more attractive investment opportunity than the transportation portfolio — that is the standard proxy for the historical corporate bond market portfolio in extant literature.[14] Combined, our findings underscore the need to include industries other than railroads within historical settings to accurately estimate the long-run performance of corporate bonds as an asset class.

Place Figure 5 about here.

The importance of data on realized coupon payments has previously been shown in the study of sovereign bond returns (Meyer, Reinhart and Trebesch, 2022). However, such analysis is still lacking for historical corporate bonds given the difficulty in acquiring the necessary data on missed payments (Giesecke *et al.*, 2011; Muir, 2017). The BSE data have the unique advantage of allowing us to identify the bonds with a missed or delayed coupon on a daily basis. The number of bonds experiencing missed coupon payments over the course of their listing is displayed in Figure 5. A total of 301 bonds from 234 firms experienced missed coupon payments over the course of their listing. This means that 29.14 per cent of the bonds in our sample (301 out of 1,033) experienced a coupon payment default episode from 1873 on according to the reporting of the Exchange Commission.

Place Table VII about here.

Given the sheer volume of bonds with missed coupon payments, the omission of such pieces of key information may influence both the short and long-run statistical properties of returns.[15] To estimate the magnitude of coupon defaults for corporate bonds, we compute a counterfactual bond index to address the following

[14] The bond market underperforms the transportation industry on average by 40 basis points on an annual basis. However, this spread is highly volatile, with a standard deviation of 11.17 per cent.

[15] We consider the impact of taxation in Internet Appendix Table A.VIII.

question: What would the returns and volatilities of a bond portfolio have been, if instead of weathering the storm of missed coupon payments, the companies had paid out the contractual coupon cash flows as stated within the original bond contract? Therefore, we test the difference in ex-post performance between our index and an index constructed following the methodology used in other datasets (see e.g., Cowles (1939), Ibbotson and Sinquefield (1976), Snowden (1990), Chabot and Kurz (2010), Rezaee (2012), Coyle and Turner (2013), and McQuarrie (2020)). We do this for the 1873–1939 period given the reporting of missed coupon payments in the Official Quotation Lists from 1873 on. While our focus is on value-weighted returns, we also include the analysis of the equally-weighted returns as researchers do not always have access to market capitalization data (see, e.g., Cowles (1939), Snowden (1990), and Coyle and Turner (2013)). Table VII shows that, to construct a credible return index, it is crucial to fully take into account *realized* rather than *contractual* coupons. Ignoring missed coupon payments results in an upward bias of 37 basis points for the value-weighted bond portfolio and no less than 181 basis points for the equally-weighted bond portfolio. The large upward bias found for the equally-weighted index is due to low-priced bonds which have lower credit quality and are more likely to default. These differences are highly statistically significant as seen in the robust Newey and West (1987) t-statistics adjusted for autocorrelation and heteroskedasticity (3.84 for the value-weighted index and 2.69 for the equally-weighted index, respectively). Ignoring missed coupon payments leads to a substantial upward bias in the estimation of average corporate bond returns. Consequently, our results imply that estimates from historical corporate bond markets should not be extrapolated as such when contractual coupon payment schedules were not always followed.

V. Conclusion

In this paper, we examine the Belgian corporate bond market between 1838 and 1939 by using a unique dataset that was hand-collected and digitized from the archives of the Brussels Stock Exchange. These data provide invaluable information to facilitate an understanding of the history of the corporate bond market.

Our analysis shows that the Belgian bond market of the pre-WWII era was well-developed and similar to the US and UK markets in terms of relative size. Looking at industry composition, our indices provide evidence consistent with an historical narrative that is commonly told of how railroads facilitated the emergence of the corporate bond market. Yet, we also find that the Belgian corporate bond market was relatively well diversified across industries, especially from the 1880s on. Firms in the financial industry were an important issuer during

the corporate bond market's first centennial as they have been in the equity market and the modern European bond market.

The corporate bond total return index appreciated at a value-weighted yearly average rate of 4.35 per cent in nominal terms, which is equivalent to a real return of 2.81 per cent. This return estimate is lower than that reported in other studies that have typically used US data only — both for historical and modern sample periods. Coupons are the main driver of corporate bond returns, with capital gains close to zero over the long run. However, the volatility of total returns is almost entirely due to variability in capital gains, while coupon returns are remarkably stable over time.

Comparing corporate bonds against other financial assets, our findings show that corporate bonds were good investments in the long run on a risk-adjusted basis when considering nominal returns. Related, corporate bonds provided security during recessions and major crises. While equities clearly provided a better average rate of return than other financial assets in the very long run in Belgium as elsewhere, interestingly, corporate bonds outperformed equities in terms of average rate of return and Sharpe ratio over the course of the nineteenth century. This result is observed at both the aggregate market level as well as the firm-level.

We find that it was a very common practice for companies to stop paying their coupons for extended periods of time. Inability to account for such coupon payment defaults results in an upward bias of 37 basis points on a value-weighted basis and 181 basis points on an equally-weighted basis. It is not implausible, therefore, that the resulting average rates of return within other studies provide potentially exaggerated estimates of the long-run performance of corporate bond investments given the lack of such vital financial data.

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Tables

Table I: Composition of Corporate Bond Dataset

Panel A – Distribution over Decades

	N	# Firms	# Bonds
1838–1849	149	2	2
1850–1859	685	18	19
1860–1869	4,507	50	64
1870–1879	6,590	66	87
1880–1889	10,927	112	144
1890–1899	20,551	267	357
1900–1909	34,376	388	479
1910–1919	45,235	378	493
1920–1929	49,214	386	551
1930–1939	29,610	271	409
Total	201,844	645	1,033

Panel B – Bond Characteristics

	N	Mean	Median	SD	Percentiles			
					1st	25th	75th	99th
# Bonds per Firm/Month	159,763	1.26	1.00	0.59	1.00	1.00	1.00	3.00
Mkt. Value of Issue (BEFmil.)	16,909	2.65	0.90	5.03	0.01	0.29	2.60	25.90
Amount Outstanding (BEFmil.)	16,909	3.01	3.01	5.59	0.02	0.37	3.00	31.16
Maturity at Issuance (years)	928	33.96	30.00	21.36	5.00	20.00	40.00	93.73
Coupon (%)	201,844	4.46	4.50	0.87	3.00	4.00	5.00	7.00

Notes: This table shows the number of bond-month price observations (N), the number of distinct firms, and bonds that these observations relate to per decade in Panel IA. Bond characteristics comprise the number of bonds per firms-month, year-end market value (millions of constant 1905 BEF), year-end amount outstanding (millions of constant 1905 BEF), maturity in years at issuance, and coupon rate (%) as in Panel IB. We observe maturity information for 928 bonds rather than the full cross-section of 1,033 bonds due to lack of reporting in the *Moniteur des Intérîs Matériels* and the *Recueil Financier*. Our sample runs from May 1838 to December 1939 and comprises all corporate bonds issued by Belgian firms on the Brussels Stock Exchange. *Source:* Study Center for Companies and Exchanges (SCOB).

Table II: Summary Statistics for Corporate Bond Returns

	Total Returns – Real			Total Returns – Nominal			Capital Returns – Nominal		
	Mean returns		SD (%)	Mean returns		SD (%)	Mean returns		SD (%)
	Geom. (%)	Arithm. (%)		Geom. (%)	Arithm. (%)		Geom. (%)	Arithm. (%)	
Panel A – Full Sample (1838–1939)									
Incl. WWI	2.05	2.81	12.04	4.20	4.35	5.15	−0.09	0.05	5.04
Excl. WWI	3.44	3.77	8.23	4.28	4.43	5.29	−0.02	0.12	5.18
Panel B – By Era									
Early 19th c. (1838–1873)	3.87	4.08	6.81	4.60	4.71	3.80	0.45	0.54	3.36
Pre-WWI (1874–1913)	4.44	4.65	6.68	4.07	4.11	2.57	−0.07	−0.03	2.58
Interwar (1920–1939)	0.70	1.44	12.43	4.10	4.58	9.67	−0.78	−0.32	9.68

Notes: This table shows summary the statistics for yearly value-weighted nominal corporate bond returns by accumulating monthly returns. We also calculate inflation-adjusted, *real*, total returns on an annual basis as $R_t^{P,Real} = (1 + R_t^{P,Nominal})/(1 + \pi_t) - 1$, where π is the inflation rate measured as $CPI_t/CPI_{t-1} - 1$ per year t and $R_t^{P,Nominal}$ is calculated by compounding monthly market returns. We compute indices for capital gains (that is, excluding coupon payments) and total returns (that is, including both capital gains and coupon payments) across 102 years. The geometric mean, arithmetic mean, and standard deviation (SD) are in percentages and annualized. The full sample period is May 1838 to December 1939, including WWI. *Source:* SCOB.

Table III: Comparing Corporate Bonds With Other Assets

	Mean Returns		Dispersion			Sharpe
	Geom. (%)	Arithm. (%)	SD (%)	Min (%)	Max (%)	
Panel A – Full Sample (1838–1939)						
Corporate Bonds	4.20	4.35	5.15	−16.26	32.47	0.22
Equities	4.40	5.72	16.52	−42.26	63.95	0.15
Sovereign Bonds	3.82	4.02	7.23	−12.93	38.15	0.11
Commercial Paper	3.22	3.22	0.97	0.96	7.42	
Panel B – Early 19th c. (1838–1873)						
Corporate Bonds	4.60	4.71	3.80	−4.72	18.35	0.33
Equities	4.20	5.10	12.94	−42.26	37.49	0.13
Sovereign Bonds	4.73	4.83	7.08	−9.36	20.49	0.21
Commercial Paper	3.32	3.32	0.87	2.03	5.55	
Panel C – Entire 19th c. (1838–1900)						
Corporate Bonds	4.68	4.76	3.28	−4.72	18.35	0.45
Equities	4.00	4.72	11.49	−42.26	37.49	0.14
Sovereign Bonds	4.36	4.43	5.51	−9.36	20.49	0.23
Commercial Paper	3.13	3.14	0.85	1.64	5.55	
Panel D – Pre-WWI (1874–1913)						
Corporate Bonds	4.07	4.11	2.57	−1.69	13.53	0.40
Equities	4.18	4.61	9.15	−10.33	31.33	0.18
Sovereign Bonds	3.05	3.08	2.65	−7.53	6.88	0.05
Commercial Paper	2.95	2.95	0.72	1.64	4.65	
Panel E – Interwar (1920–1939)						
Corporate Bonds	4.10	4.58	9.67	−16.26	32.47	0.11
Equities	3.78	7.82	29.44	−31.51	63.95	0.15
Sovereign Bonds	4.34	4.98	12.18	−12.93	38.15	0.12
Commercial Paper	3.51	3.52	1.41	0.96	7.42	

Notes: This table reports the distribution of value-weighted nominal total returns for corporate bonds and different Belgian asset classes. For each asset category, the table shows the geometric and arithmetic average annualized return, the annualized standard deviation (SD), and the lowest and highest recorded annual return. It also shows the nominal ex-post Sharpe ratios for corporate bonds, equities, and sovereign bonds. The full sample period is May 1838 to December 1939, including WWI. *Source:* SCOB.

Table IV: Within-Firm Comparison of Corporate Bonds and Equities

	Corporate Bonds			Equities		
	Return (%)	SD (%)	Sharpe	Return (%)	SD (%)	Sharpe
Panel A – Full Sample (1838–1939)						
Within-Firm	5.72	6.39	0.39	6.89	18.85	0.19
Panel B – Financials vs. Non-Financials						
Financials	4.95	7.42	0.24	0.31	2.17	−1.37
Non-Financials	6.22	6.74	0.46	8.82	19.83	0.29
Panel C – Recessions vs. Expansions						
Recession	4.69	5.17	0.28	3.30	16.10	0.00
Expansion	6.60	7.16	0.49	9.96	18.79	0.36
Panel D – Financial or Banking Crisis vs. Non-Crisis						
Financial Crisis	2.90	5.23	−0.13	−8.08	13.70	−0.87
Non-Financial Crisis	6.37	6.50	0.51	10.32	18.21	0.39

Notes: This table reports the distribution of value-weighted nominal total returns for corporate bonds and equities. We use the same weights for both stock and bond portfolios to control for the effect of multiple securities issued by the same firm, thus accounting for issuer-level differences in idiosyncratic risk. To be consistent with a measure of firm-level integration, we value-weight the portfolio of stocks using the market capitalization of the firm based on their bond market size, and subsequently employ the same weights for the bond portfolios. We then equally-weight issues within each firm in case of multiple issues outstanding. For each asset category, the table shows the arithmetic average annualized return and annualized standard deviation (SD). It also shows the nominal ex-post Sharpe ratios. The full sample period is May 1838 to December 1939, including WWI. Financial and non-financial firms are defined following the definitions portrayed in Figure 2. Recessions are identified using the Bry and Boschan (1971) algorithm to locate local turning points in real GDP per capita. We let recessions start in the year following a peak and end in the year of a trough. Historical financial or banking crises are coded based on chronologies provided by Buyst and Maes (2008) and Baron, Verner and Xiong (2021). *Source:* SCOB.

Table V: Comparison With Existing Research

Authors	Period	Country	Weighting	Reference Index		Our Index	
				Mean (%)	SD (%)	Mean (%)	SD (%)
Cowles (1939)	1872–1938	US	Equal	4.82	0.77	5.42	5.76
Ibbotson and Sinquefield (1976)	1926–1939	US	Value	6.52	4.09	5.95	11.96
Snowden (1990)	1872–1925	US	Equal	5.52	4.06	4.21	3.72
Chabot and Kurz (2010)	1866–1907	UK	Value	3.60	3.67	4.75	3.20
Chabot and Kurz (2010)	1866–1907	US	Value	6.12	4.99	4.75	3.20
Rezaee (2012)	1838–1914	FRA	Value	4.75	5.84	4.37	3.89
Coyle and Turner (2013)	1861–1939	UK	Equal	4.77	4.04	5.26	5.52
McQuarrie (2020)	1910–1939	US	Value	4.72	7.27	3.87	8.66

Notes: This table repeats our corporate bond total return index for Belgian corporate bonds. We report the performance of earlier work on the historical corporate bond market and adjust our return series to provide a direct comparison. Given that other studies use annual returns, we accumulate monthly market returns, R_t^P, of month t and year y in order to facilitate comparison: $R_y^P = \prod_{t=1}^{12} \left(1 + R_t^P\right) - 1$. *Source:* SCOB.

Table VI: Comparing Industry Returns

	Transportation	Financials	Mining and Extraction	Utilities	Industrials	All Bonds
Panel A – Portfolio Returns						
Geometric Mean (%)	3.76	4.19	3.53	3.59	3.47	3.81
Of which: Coupon Return (%)	3.88	4.15	4.88	4.43	4.76	4.35
Arithmetic Mean (%)	4.39	4.49	3.70	3.82	3.78	3.98
SD (%)	12.90	6.52	6.00	5.97	6.81	5.84
Min (%)	−18.68	−14.17	−17.63	−13.46	−19.29	−16.26
Max (%)	96.76	58.00	20.99	37.77	52.49	32.47
Panel B – Portfolio Size						
Average N. of Bonds	33	18	81	83	42	257
Average Market Cap. (BEFmil.)	215.91	75.88	115.59	168.63	69.67	645.67

Notes: This table shows the summary statistics for the value-weighted industry indices and the corporate bond market index. The annualized mean returns, standard deviations (SD), and lowest and highest recorded annual return are expressed as percentages. Panel B presents additional statistics on the relative size of different portfolios: the average number of bonds included in the portfolio and the average year-end market capitalization in millions of constant 1905 BEF. The period covered, February 1878 to December 1939, is the period over which all industries have data available at the same time. *Source:* SCOB.

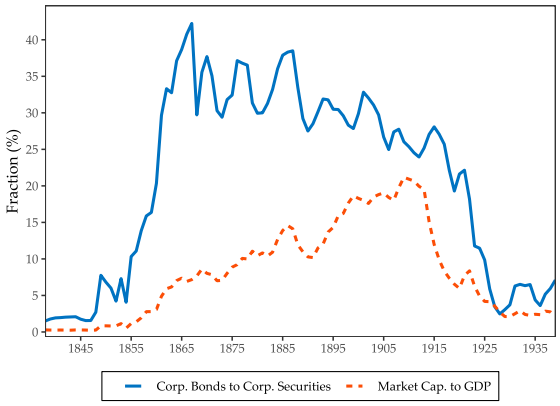
Table VII: Counterfactual Coupon Analysis

	Naïve Coupon Index	Actual Index
Panel A – Value-Weighted		
Mean (%)	4.72	4.35
SD (%)	5.10	5.15
Difference in Means (t-static)	3.84***	
Panel B – Equally-Weighted		
Mean (%)	6.69	4.88
SD (%)	5.87	4.97
Difference in Means (t-static)	2.69***	

Notes: This table reports the average annual returns on the counterfactual naïve coupon index and the actual coupon index as shown in Table II. The naïve coupon index is constructed by relying on contractual rather than realized coupon cashflows, thereby ignoring coupon payment defaults. Panel A constructs the value-weighted portfolios. Panel B presents the equally-weighted portfolios. The third row of each panel gives the t-statistic of the difference in average returns. Significances are based on heteroskedasticity- and autocorrelation-consistent (HAC) standard errors using Newey and West (1987). The sample runs from January 1873 to December 1939 as that is when the Official Quotation Lists started to provide data on missed coupon payments. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source:* SCOB.

Figures

Figure 1: Corporate Bond Market Size

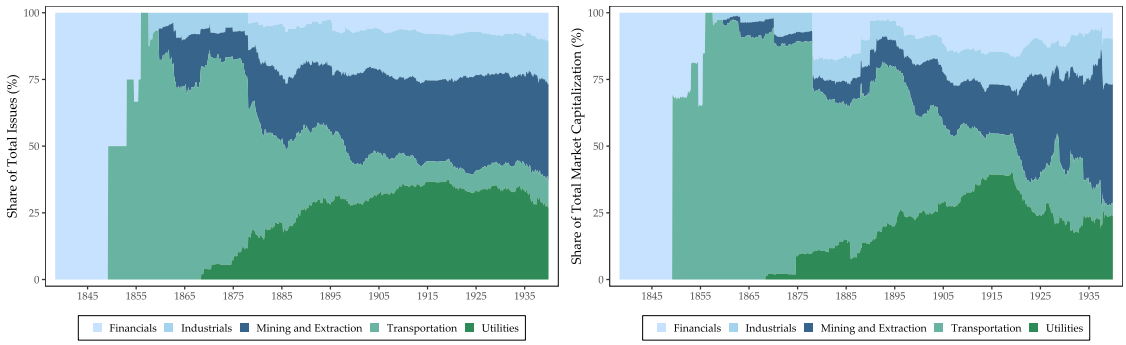


Notes: The figure plots the market size of corporate bonds traded on the BSE. The dotted orange line shows the ratio of market capitalization of outstanding corporate bonds to GDP. Data on Belgian GDP for the pre-1940 period is based upon Smits, Woltjer and Ma (2009) for 1838–1913, Bordo *et al.* (2001) for 1914–1919, and Buyst (1997) for 1920–1939, respectively. The blue line shows the market capitalization of corporate bonds compared to the total market capitalization of corporate securities (that is, corporate bonds and common stocks) traded on the BSE. The sample period runs from May 1838 to December 1939. *Source:* SCOB.

Figure 2: Composition of Corporate Bond Market in Industries

Panel A – Bond Market Issues: Industry Breakdown

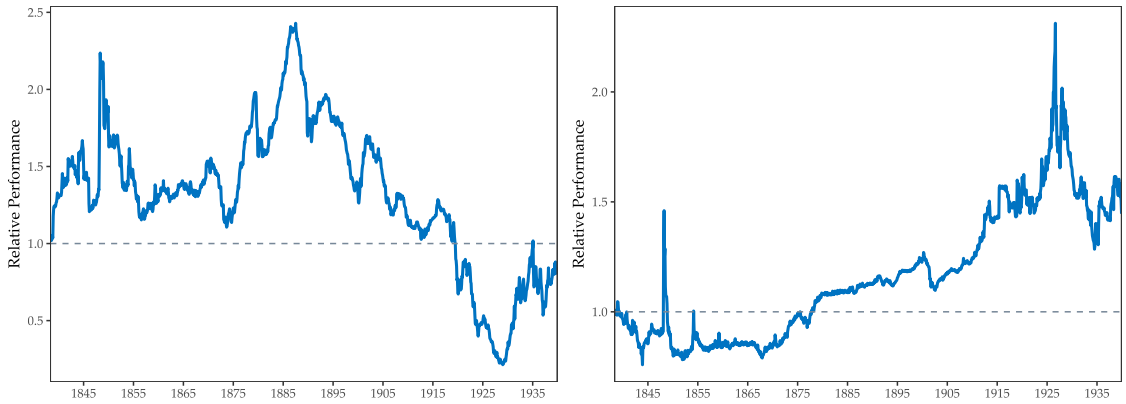
Panel B – Bond Market Size: Industry Breakdown



Notes: The figure plots the industry classification of firms within our sample from May 1838 to December 1939. *Financials* comprise banks, insurance companies, trusts, investment funds, and holding companies. *Industrials* comprise agriculture, construction, trade, services, manufacturing companies, and miscellaneous industrials. *Mining and Extraction* comprise coal, non-ferro, miners, and blast furnaces. *Transportation* comprise passenger, freight, and service transport by road or water. *Utilities* comprise electric, gas, communication, street railways, and miscellaneous utilities. Panel 2A shows the relative importance per number of listed bonds. Panel 2B shows the relative importance per market capitalization. *Source:* SCOB.

Figure 3: Relative Performance of Corporate Bonds Versus Other Financial Assets

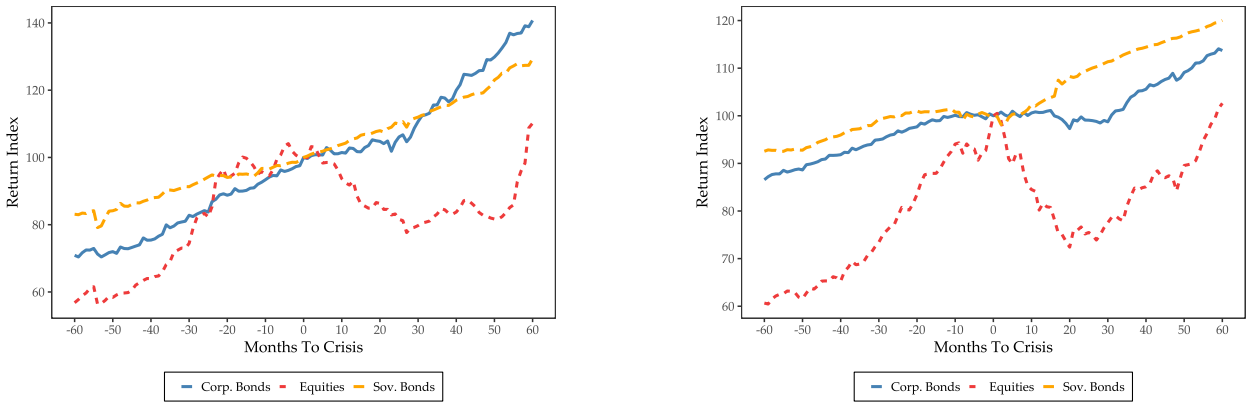
Panel A – Corporate Bonds Against Stocks *Panel B – Corporate Bonds Against Sovereign Bonds*



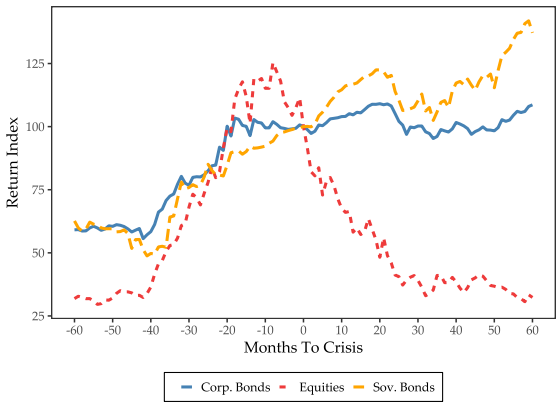
Notes: The figure shows the cumulative performance of corporate bonds vis-à-vis equities in Panel 3A and sovereign bonds in Panel 3B. Relative performance is measured by the cumulative return index of corporate bonds over the cumulative return index over equities and sovereign bonds based upon value-weighted total returns. The sample period runs between May 1838 and December 1939. *Source:* SCOB.

Figure 4: Asset Returns Around Major Financial Crises

Panel A – Banking Crisis of 1875 *Panel B – Panic of 1900*

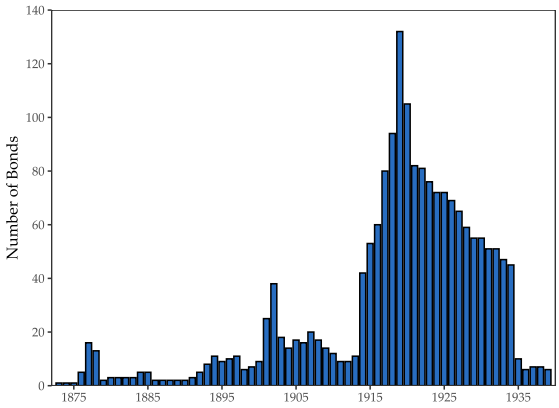


Panel C – Great Depression



Notes: This figure shows a cumulative return index around three financial crisis events: the 1875 international crisis (dated on January 1875), the panic of 1900 (starting in March 1900), and the Great Depression (dated on Black Tuesday in October 1929). The series are indexed at 100 in the starting month of the crisis. *Source:* SCOB.

Figure 5: Occurrence of Coupon Payment Defaults



Notes: This figure shows the occurrence of coupon payment defaults at the bond level. The data on missed coupon payments from the Official Quotation Lists are available from 1873 onwards. This information is shown in a separate table (*obligations des compagnies qui ont des coupons en souffrance ou des coupons suspendus provisoirement*) at the end of each daily price record. *Source:* SCOB.

Bonds for the Long Run?

The Rate of Return on Corporate Bonds in Belgium, 1838–1939

Internet Appendix

Kevin Van Mencxel Jan Annaert Marc Deloof

Appendix A. Data Appendix

In this appendix, we describe all the steps that are necessary to create the dataset used in our analysis and provide extra background and empirical detail for the article 'Bonds for the Long Run? The Rate of Return on Corporate Bonds in Belgium, 1838–1939'.

A.1. Description and Sources

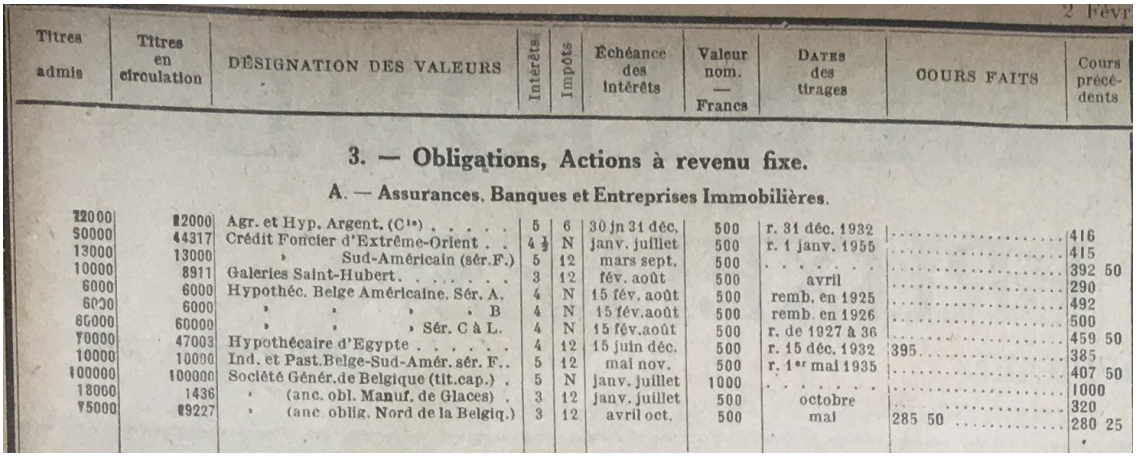
This section summarizes the sources and coding for our database of corporate bond prices and returns across a sample period of 102 years. As explained in the main text, we focus on bonds issued by (i) Belgian firms irrespective of whether they have their main activities in Belgium or abroad, (ii) with a fixed coupon rate (i.e., no bonds with floating rates), and (iii) with at least 12 consecutive monthly observations.

A.1.1. Primary Sources

To identify bonds and their prices, we start from one main source. The Official Quotation Lists of the Brussels Stock Exchange (*Cours Authentique de la Bourse de Bruxelles*) are at our disposal on a continuous basis from 1853 onwards. The complete Official Quotation Lists for the years 1832, 1834, 1839, 1846 and 1847 are also available. These lists report the following items for all bonds: face value, bid and ask prices, transaction prices, payment dates, coupon types, and coupon rates. Price quotations are based on the paid-up capital, ignoring uncalled sums. Financial securities are classified across industries from the beginning on. Bonds of firms owned by the state, or whose interest payments and amortization were guaranteed by the state, were per conventional put under the governmental securities section, *Fonds d'État* in the earlier versions and *Rentes Belges Directe et Indirecte* later, allowing for clear identification thereof. Internet Appendix Figure A.1 provides a typical example of how bond prices and quotations were published in the Official Quotation Lists.

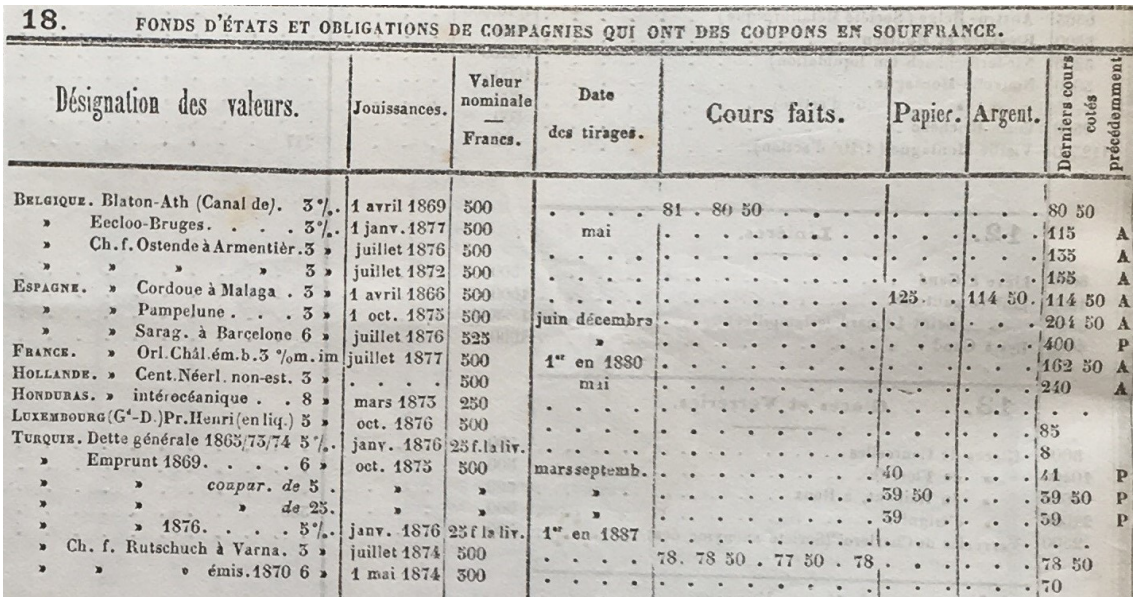
Figure A.1: Data Sources

Panel A – Excerpt of the Official Quotation Lists: Example of Historical Price Quotes



Titres admis	Titres en circulation	DÉSIGNATION DES VALEURS	Intérêts	Impôts	Échéance des intérêts	Valeur nom. — Francs	Dates des tirages	COURS FAITS	Cours précédents
		3. — Obligations, Actions à revenu fixe.							
		A. — Assurances, Banques et Entreprises Immobilières.							
12000	12000	Agr. et Hyp. Argent. (C^ie)	5	6	30 jn 31 déc.	500	r. 31 déc. 1932		416
80000	44317	Crédit Foncier d'Extrême-Orient	4 ½	N	janv. juillet	500	r. 1 janv. 1955		415
13000	13000	» Sud-Américain (sér.F.)	5	12	mars sept.	500			392 50
10000	8911	Galeries Saint-Hubert	3	12	fév. août	500	avril		290
6000	6000	Hypothéc. Belge Américaine. Sér. A.	4	N	15 fév. août	500	remb. en 1925		492
6000	6000	» » » B	4	N	15 fév.août	500	remb. en 1926		500
60000	60000	» » » Sér. C à L.	4	N	15 fév.août	500	r. de 1927 à 36		459 50
70000	47003	Hypothécaire d'Egypte	4	12	15 juin déc.	500	r. 15 déc. 1932	395	385
10000	10000	Ind. et Past.Belge-Sud-Amér. sér. F.	5	12	mai nov.	500	r. 1^er mai 1935		407 50
100000	100000	Société Génér.de Belgique (tit.cap.)	5	N	janv. juillet	1000			1000
18000	1436	» (anc. obl. Manuf. de Glaces)	3	12	janv. juillet	500	octobre		320
75000	69227	» (anc. oblig. Nord de la Belgiq.)	3	12	avril oct.	500	mai	285 50	280 25

Panel B – Excerpt of the Official Quotation Lists: Example of Missed or Delayed Coupon Payments



18. FONDS D'ÉTATS ET OBLIGATIONS DE COMPAGNIES QUI ONT DES COUPONS EN SOUFFRANCE.							
Désignation des valeurs.	Jouissances.	Valeur nominale — Francs.	Date des tirages.	Cours faits.	Papier.	Argent.	Derniers cours cotés précédemment
Belgique. Blaton-Ath (Canal de). 3 %.	1 avril 1869	500		81 . 80 50			80 50
» Eecloo-Bruges. 3 %.	1 janv. 1877	500	mai				115 A
» Ch. f. Ostende à Armentièr. 3 »	juillet 1876	500					135 A
» » » 3 »	juillet 1872	500					155 A
Espagne. » Cordoue à Malaga . 3 »	1 avril 1866	500			125 .	114 50.	114 50 A
» » Pampelune . 3 »	1 oct. 1875	500	juin décembre				204 50 A
» » Sarag. à Barcelone 6 »	juillet 1876	525	»				400 P
France. » Orl. Châl. ém. b. 3 %, m. im	juillet 1877	500	1^er en 1880				162 50 A
Hollande. » Cent. Néerl. non-est. 3 »		500	mai				240 A
Honduras. » intérocéanique . 8 »	mars 1873	250					
Luxembourg (G^d-D.) Pr. Henri (en liq.) 3 »	oct. 1876	500					85
Turquie. Dette générale 1865/73/74 5 %.	janv. 1876	25 f. la liv.					8
» Emprunt 1869. 6 »	oct. 1875	500	mars septemb.		40		41 P
» » *coupur. de* 5 .	»	»	»		59 50		59 50 P
» » » *de* 25.	»	»	»		59		59 P
» » 1876. 5 %.	janv. 1876	25 f. la liv.	1^er en 1887				
» Ch. f. Rutschuch à Varna. 5 »	juillet 1874	500		78. 78 50 . 77 50 . 78			78 50
» » » émis. 1870 6 »	1 mai 1874	500					70

Notes: This is an example of the original records used to construct the historical corporate bond data. Panel A.1A from the Official Quotation Lists of February 2, 1925 shows the organization of the records and the typical information available. Panel A.1B from the Official Quotation Lists of May 1, 1878 shows the recording of missed or delayed coupon payments. *Source:* Study Center for Companies and Exchanges (SCOB).

Some information is missing in the earlier versions of the Official Quotation Lists. In the earlier years, the numbers of bonds listed are not reported. The number of bonds admitted to the Stock Exchange (*titres admis*) and the number of bonds listed (*titres en circulation*) are reported from 1878 onwards. Any difference between *titres admis* and *titres en circulation* shows amounts redeemed or repurchased. Other information, especially on missed or delayed coupon payments was never published in the Official Quotation Lists before 1873. Taxation rates (*taux de taxation*) are available from 1920 onwards.

A.1.2. Secondary Sources

To fill in the gaps from the Official Quotation Lists multiple secondary sources were used. Information on prices for the missing years was easily found elsewhere. We used the following sources to retrieve data for the years missing in the Official Quotation Lists:

- The *Moniteur Belge* and the *Official Journal*, both published by the Belgian government, published bond prices based on all bond price quotations from the four biggest stock exchanges in Belgium, including Brussels.
- For the period 1835–1855, the Committee of Official Stock Brokers (*Commission des Agents de Change*) published a quarterly detailed price quotations as well as annual maxima and minima for all bonds listed on both the BSE and provincial stock exchanges.
- Several newspapers also published bond prices during this period, such as *Journal du Commerce d'Anvers*, *Journal de Bruxelles*, and *Le Précurseur*.
- Additional information was found in the Rothschild Archives in London as Rothschild's agents correspondence gives detailed information on bond prices in Belgium (Willems, 2005).

Beyond prices, we draw on additional sources to collect financial and legal characteristics of each bond as well as company specific information. Fortunately, abundant and extraordinarily detailed information on all bond quoted companies was found. This data covers industry affiliation, mergers and demergers, capital operations, coupon payment schedules, numbers of bonds listed, and a detailed overview of company history. Multiple other publications discuss history per company and give information about the individual companies within our sample as well as the corporate bonds issued by them. Multiple detailed auxiliary archival sources allow us to cross-check our data to enhance the internal consistency of our dataset:

- Starting from 1822, the *Société Générale* published annual reports in which she provides detailed financial information (company by company) on all the companies in her portfolio. As leading mixed bank, she had stakes in the several publicly listed companies during the first decades of our sample, resulting in a highly valuable source for detecting bond information.
- Trioen (1839) published the bylaws of all listed companies founded until 1839. Trioen gives information on capital issued, coupons, number of bonds, and information on capital operations.

- In 1851, the *Moniteur des Intérêts Matériels* was published for the first time. Within a few years it grew out into an international reference source of financial news. Not only did it publish detailed price data on Belgian financial markets, it also provided data from a manifold of other countries too. Before 1868 several other newspapers, such as *L'Indépendance Belge*, offered extensive information. After 1868, *L'Écho de la Bourse*, *Le Courrier de la Bourse*, and numerous other financial press periodicals joined this list. Not only are all these newspapers, and others such as the *Beurzencourant* and the *Journal de Commerce d'Anvers*, extremely useful to complement the information for the years before 1878, but they also allow us again to cross-check the data enhancing the internal consistency of our database.[1]

- In 1855, Courtois (1855) compiled his *Manuel des Fonds publics et des Sociétés par actions* with (retrospective) information on corporate financing. Between 1855 and 1883 eight successive volumes with updated information were published (Courtois, 1855, 1856, 1859, 1861, 1863, 1874, 1879, 1883). Courtois did not restrict himself to his home country of France but gives information on companies from other countries, especially Belgium, too.

- Demeur (1858, 1870, 1874, 1876, 1879, 1885) provided complete (including retrospective) company information and going back to the first incorporated companies.

- Van Damme (1859) discussed all quoted companies. Information on all quoted companies, their capital issued, the numbers of bonds, their face value and coupons paid (in a retrospective manner) is provided.

- In 1864, the publications of Vitu (1864) and Limauge (1864) considered bond and coupon information. Unfortunately, these publications were never updated for the years after.

- The company law of 1873 obliged all companies to publish their balance sheet in the *Official Gazette*. For more recent decades, a wealth of information becomes available with the publication of the *Recueil Financier* from 1893 onwards. The *Recueil Financier* was an annual monograph providing extremely detailed information about all publicly quoted companies, including administrators, production, capital changes, dividends, balance sheets, and income statements. It was published on an annual basis until 1975. Coppin (1893) started the same type of publication in 1893. Unfortunately, he never succeeded in making it an

[1]Note that all these newspaper existed until the end of our sample period with *L'Indépendant* changing its name to *L'Indépendance Belge*.

annual publication. Four (extensive) volumes were published that dealt with all publicly quoted companies (Coppin, 1893, 1896, 1899, 1901).

- Les Dossiers Financiers (1928) started a retrospective publication, *Sociétés Disparues*, with company information between 1873 and 1927. The publication reports all Belgian limited liability firms dissolved and closed at any time before 1940 throughout its eight volumes. It enables us to separate firm closures from mergers, demergers, acquisitions, liquidations, defaults, or simple changes of company name.

- Later on, scholars in financial history of Belgium since the Industrial Revolution published detailed information on companies. In many historical publications additional information is provided on specific companies. Several important studies are sourced following their extensive coverage of Belgian corporate capitalism. Frère (1938, 1951) studied all companies founded in Belgium between 1830 and 1914. Smets (1972) summarizes essential company information on all companies (capital issued, number of bonds, merger information). The historical records of Laureyssens (1975) are the result of a detailed study of the archives of all companies from 1819 until 1857. Additional information for multiple firms is provided until 1873. She classified all companies within industries and gave detailed accounts of the numbers of bonds within their capital structure.

A.1.3. Equity Data

Table A.I: Stock Sample Construction Overview

Sample	N
Initial Sample	707,235
Excluding Foreign Firm Stocks	104,741
Excluding Stocks Traded on The Forward Market	5,764
Excluding Short-Lived Stocks	2,156
Excluding Non-Common Stocks	197,385
Excluding Low Priced Stocks	4,633
Final Sample	392,556

Notes: This table presents the intermediate steps taken from the initial full set of stocks within the Official Quotation Lists towards the final sample. The second column shows the number of observations dropped per successive exclusion criteria. The final row gives the final sample as utilized throughout the paper. *Source:* SCOB.

We construct our stock return database following Annaert, Buelens and De Ceuster (2012) and Annaert, Buelens and Deloof (2015). The stock data includes end-of-month stock prices, dividends, ex-dividend day, and the number of stocks admitted to the Brussels Stock Exchange. While stock data is available from 1832 onwards we start our series in May 1838 as this is the point in time when the corporate bond market sprung up. We adjust the stock returns for important capital operations (e.g., mergers and demergers, splits and reverse splits, bonus stocks, inscription rights and attribution rights, exchanges, liquidations, and delistings). To attain a comparable sample with our corporate bond data we apply the following filters. First, since we focus on Belgian firms irrespective of whether they have their main activities in Belgium or abroad, we exclude foreign firm stocks. Next, we only select stocks that were traded on the spot market. There were several reasons for this: (i) corporate bonds were traded exclusively on the spot market, (ii) stocks listed on the forward market also had to be listed on the spot market, but not vice versa, implying that the spot market had a wider coverage, (iii) forward contracts were not allowed before 1871 due to their resemblance with gambling (*exception de jeu*), and (iv) the majority of issues listed on the forward market were foreign securities. Next, stocks with a listing period less than 12 months were excluded since it is doubtful whether these companies really got off the ground. We focus on common

stocks, excluding all other stock types as described by Annaert, Buelens and De Ceuster (2012, p. 191). Finally, to emphasize economic importance and statistical reliability (see, e.g., Fama (1998) and Fama and French (2008)), we control for microcap stocks by deleting stocks with prices below 5 BEF. The effect of each successive sample exclusion criteria is shown in Internet Appendix Table A.I. The number of observations of our final common stock sample across different decades is shown in Internet Appendix Table A.II.

Table A.II: Composition of Equity Dataset

	N	# Firms	# Stocks
1838–1849	5,176	48	50
1850–1859	6,043	80	85
1860–1869	10,813	118	129
1870–1879	14,590	171	191
1880–1889	22,062	252	261
1890–1899	30,543	461	477
1900–1909	55,793	674	707
1910–1919	70,554	651	692
1920–1929	87,685	1,010	1,079
1930–1939	89,297	915	974
Total	392,556	1,510	1,678

Notes: This table shows the number of stock-month price observations and the number of distinct firms and stocks that these observations relate to per decade. Our sample runs from May 1838 to December 1939 and includes all common stocks issued by Belgian firms on the Brussels Stock Exchange. *Source:* SCOB.

In accordance with standard practice in literature, the total stock return at time t is computed as

$$\begin{aligned} R_{i,t} &= \frac{P_{i,t} + D_{i,t}}{P_{i,t-1}} - 1 \\ &= \underbrace{\frac{P_{i,t} - P_{i,t-1}}{P_{i,t-1}}}_{\text{capital gain}} + \underbrace{\frac{D_{i,t}}{P_{i,t-1}}}_{\text{dividend return}} , \end{aligned} \tag{A.1}$$

where $P_{i,t}$ is the transaction price reported at month-end t for stock i and $D_{i,t}$ is the dividend payment. The dividends are adjusted for tax effects from January 1920 onwards.

A.1.4. Sovereign Bond Data

Table A.III: Composition of Sovereign Bond Dataset

	N	# Bonds
1838–1849	744	8
1850–1859	779	8
1860–1869	751	8
1870–1879	451	5
1880–1889	543	6
1890–1899	549	5
1900–1909	480	4
1910–1919	480	4
1920–1929	723	7
1930–1939	858	11
Total	6,358	23

Notes: This table shows the number of sovereign bond-month price observations (N) and the number of distinct sovereign bonds that these observations relate to per decade. Our sample runs from May 1838 to December 1939 and includes all sovereign bonds issued by Belgian Treasury on the Brussels Stock Exchange. *Source:* Study Center for Companies and Exchanges (SCOB).

As mentioned previously, multiple securities of companies with state ties are listed within the the governmental securities section of the Official Quotation Lists. Governmental securities are shown in the first panel, under the title of *Fonds d'État* in the earlier versions and *Rentes Belges Directe et Indirecte* later, within the daily records of the Official Quotation Lists. We obscure from such types of securities — indirect and guaranteed debt by the state — and select the direct debt issued by the state itself in the form of uniform *rentes*. The number of observations of our collected sovereign bond data is shown in Internet Appendix Table A.III.

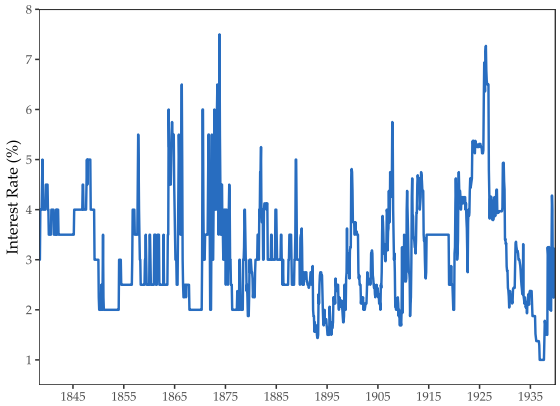
Returns for sovereign bonds are calculated in the same way as for corporate bonds following Equation (1). However, while corporate bonds' way of quoting prices changes from May 1923 onwards, no such adjustment is found for sovereign bonds. Thus, the return calculation remains constant over time based upon clean prices throughout our entire sample period. The coupons are adjusted for tax effects from January 1920 onwards as is

the case for corporate bonds.

A.1.5. Commercial Paper Data

While the Belgian government issued Treasury bills as of 1833, this rate did not move much in the pre-World WarI period, indicating that it did not fully reflect money market evolution (Nicolai, 1922). We therefore obtain data on the rate on Belgian commercial paper (*taux de l'escompte hors banque du papier commercial*) seeing it was recognized as the best money market rate for this period (Dupriez, 1930, p. 124). These short-term securities usually had a maturity of one to three months with a maximum maturity of 100 days. Commercial paper rates for 1832–1918 come from the Official Quotation Lists of the Antwerp Stock Exchange (*Cours Authentique de la Bourse d'Anvers*) and were cross-checked with data from *Journal du Commerce d'Anvers*, *L'Avenir*, *Moniteur des Intérêts Matériels*, and *Het Handelsblad*. For the period 1919–1939, we take data on the commercial paper rate from the National Bank of Belgium. The short-term interest rate is shown in Internet Appendix Figure A.2 for the period between 1838 and 1939.

Figure A.2: Short-End Interest Rate



Notes: The figure plots the monthly open market discount rate for commercial paper in percentage per annum from May 1838 to December 1939. *Source:* SCOB.

To construct a series of contemporaneous monthly risk-free returns, rf_t, we need to compute prices from the quoted discount rates and assume that the investor buys at the end of month t and sells in the following month $t + 1$. The monthly price, P_t^{rf}, is calculated using the bank discount rate formula:

$$P_t^{rf} = 100 \cdot \left(1 - y_t \cdot \left(\frac{d}{360}\right)\right), \tag{A.2}$$

where y_t denotes the discount rate (in decimals) at time t and d equals the days to maturity. We assume that

an investor buys a bill at 100 days maturity and sells in the following month at 70 days of maturity. For each month an acquisition price, $P_t^{rf,A}$, was calculated along with a sale price, $P_t^{rf,S}$. The monthly return is calculated as $P_t^{rf,S}/P_{t-1}^{rf,A} - 1$.

A.2. Sample Construction

Table A.IV: Corporate Bond Sample Construction Overview

Sample	N
Initial Sample	339,523
Excluding Foreign Firm Bonds	97,739
Excluding Sovereign-Linked Bonds	23,782
Excluding Crédit Communal Bonds	1,848
Excluding Foreign Currency Denoted Bonds	2,230
Excluding Missing Face Value Bonds	492
Excluding Floating Rate Bonds	7,168
Excluding Profit Clause Bonds	2,111
Excluding Bonds with Detached Coupons	40
Excluding Double Pricing Bonds	160
Excluding Short-Lived Bonds	162
Excluding Low Priced Bonds	1,947
Final Sample	201,844

Notes: This table presents the intermediate steps taken from the initial full set of corporate bonds within the Official Quotation Lists towards the final sample. The second column shows the number of observations dropped per successive exclusion criteria. The final row gives the final sample as utilized throughout the paper. *Source:* SCOB.

Our original historical database contains 339,523 monthly corporate bond price quotes of 1,594 bonds traded in Brussels and listed in the original sources per Internet Appendix A.1. Upon closer inspection, we drop a considerable amount of these observations, so to get a homogeneous sample of corporate bonds issued by Belgian firms. The effect of each successive exclusion criteria is shown in Internet Appendix Table A.IV. Specifically, we drop:

- 97,739 observations of bonds issued by companies domiciled abroad.
- 23,782 observations for bonds that were issued or explicitly guaranteed by the Belgian or Congo State. Notable examples include railroads owned by the Belgian State or Intercommunal companies created for the purpose of performing a public service such as water, gas and electricity distribution, and public transport. A clear advantage of our empirical setting is that the BSE's Official Quotation Lists contain a separate section for governmental firms (*Fonds d'État* and *Rentes Belges Directe et Indirecte*). Hence, we are able to easily exclude governmental firms from all of our analysis.
- 1,848 observations related to bonds issued by the *Crédit Communal de Belgique*, a cooperative bank in which municipalities were shareholders. It granted investment credits to the municipalities. The bank still exists today and is known as the *Belfius Bank and Insurance*.
- 2,230 observations for bonds denominated in foreign currencies (that is, not in Belgian francs or Belga).[2]
- 492 observations by bonds for which we did not find basic information on the face value.
- 7,168 observations of bonds that had a floating rate coupon (*obligations à revenu variable*).
- 2,111 observations of bonds that had a profit-sharing clause or were equity-linked (*obligations avec participation dans le bénéfice* and *obligations avec un droit d'option de convertibilité*).
- 40 observations related to detached coupon bonds (*obligations avec des coupons détaché*).
- 160 observations for bonds that multiple pricing lines within the Official Quotation List per month-end.
- 162 observations of bonds that were listed for a period less than 12 months.
- Finally, we exclude 1,947 observations by bonds that showcased a price in month t below 1% of its face value.

Our cleaned, final historical dataset after adjustments covers 201,844 monthly prices and 29,936 coupon payments of 1,033 bonds issued by 645 Belgian firms on the Brussels Stock Exchange.

[2] Belgium left the Latin Monetary Union at the end of 1925 following the constant devaluation of its members' currencies. Minister Émile Francqui put in place a program to stabilize the Belgian franc, which was in dire straits. Its value stabilized at only one-seventh of former parity. One of the measures taken in the decree of October 25 1926 was the establishment of a new currency, the Belga, worth 5 francs. This new unit was to replace the Belgian franc on the international exchange market. In this way, Belgium distanced itself from the French franc which was in turmoil at the time. The Belgian population, like exchange markets, never adopted the new monetary unit and it was repealed in the decree law of January 8, 1946.

A.3. Calculating Bond Returns

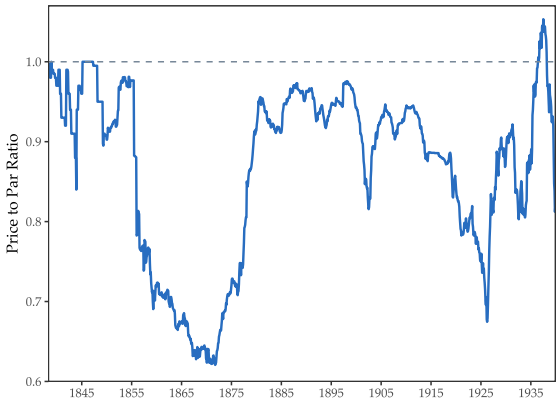
A.3.1. Treatment of Bond Quantities

The number of bonds admitted to the stock exchange (*titres admis*) and the number of bonds listed (*titres en circulation*), the total issue size and amount of the issue remaining outstanding, respectively, are reported from 1878 onwards. Before 1878 we have data on the number of bonds admitted to the stock exchange. Information on bond quantities was extracted by the Exchange Commission from the transcripts of general meetings, lists of bonds to be drawn or redeemed, and balance sheets which companies were obligated to disclose as part of its listing requirements (Thiebauld, 1905). Our bond quantity series take into account the role of debt buybacks and exchange offers as any difference between *titres admis* and *titres en circulation*. Firms often decide to amortize their debt service by buying back debt, converting to lower coupon bonds, or by exchanging debt for equity — these 'negative issuance activities' are captured by the *titres en circulation*. Moreover, the quantities reported also correct for amount by which the issue's amount outstanding was adjusted through multiple successive series (*à la souche*).

Most bonds in history are not due and payable at maturity (so-called bullet bonds), but have stretched out amortization across its lifespan, often in the form of so-called sinking fund arrangements. During the ninteenth and early twentieth century there are two main types of sinking funds in our sample of bonds. The first, simpler type is a fixed sinking fund scheme that is comparable to a linear amortization plan — with equal payments stretching from the end of the grace period until maturity. Second, there are cumulative sinking fund schemes. These follow a non-linear, typically increasing annuity amortization plan written in the bond contract. The type of redemption was specifically mentioned in the initial bond issuance notice. The sinking fund payments were usually forwarded to a payment agent who carried out the delivery of coupon and principal payments to investors. The payment agent was determined in the bond contract and generally a partner in the initial issuance of the bond. This agent uses the debt service to amortize the bonds either by a redemption at par to bondholders or via repurchases on the secondary market. Redemption at par is attractive to investors because bonds typically trade at prices below par as shown in Internet Appendix Figure A.3. For this reason, the allocation of repayments from the sinking funds were often assigned via lottery (*amortissable par tirage au sort*). This technique of drawing bonds was explicitly characterized as not being subject to the Lottery Act of December 1851. In the lottery, the payment agent randomly selects a subset of bonds for full repayment, chosen among all outstanding bonds.

This exercise is repeated until the sinking fund payments due in that period are depleted. The majority of bond contracts had a specific clause giving the debtor the right to reimburse the creditor at a time of his choice (Van de Velde, 1944, p. 78). In practice, redemption at par was the rule, while buy-backs on the open market (*amortissable par rachat*) were the exception. Following Meyer, Reinhart and Trebesch (2022) we disregard the possibility that some of the redemptions are made at par, because the beneficiaries of the redemption lottery are random and market prices should reflect any expected redemption gains. We also prefer to be conservative and not add up potential capital gains due to redemption at par. As a result, the calculated returns on sinking fund bonds in history can be regarded as a lower bound.

Figure A.3: Average Price to Par Ratio



Notes: The figure plots the monthly average of the price to par ratio on the bond level between May 1838 and December 1939. *Source:* SCOB.

A.3.2. Treatment of Delayed or Missed Coupon Payments

A common error by scholars seeking to calculate bond returns is to rely on the announced contractual coupon, usually referred to in the bond's name, rather than the realized coupon. When coupons are partially, or potentially not at all, paid out for a while during default spells, realized returns calculated assuming regular contractual coupon payments are often largely overstated. Therefore, a main challenge to compute total returns on historical corporate bonds is to collect bond-level data on delayed or missed coupon payments (also known as 'arrears'). Interest service during the default period is known and taken into consideration. Several bonds relied upon interest arrears, especially if their default was long delayed. This information was published in the Official Quotation Lists from 1873 onwards in a separate table, *obligations des compagnies qui ont des coupons en souffrance ou des coupons suspendus provisoirement*, placed at the end of the official price list of each trading day. To fill gaps, we retrieve retrospective information on interest servicing from Demeur (1858, 1870, 1874, 1876,

1879) until the last updated version in 1885 (Demeur, 1885) and the *Moniteur des Intérêts Matériels*. For the years after 1893, we augment the coupon data from the Official Quotation Lists with the relevant coupon information extracted from the *Recueil Financier* and *Moniteur Belge*. Especially for the period surrounding WWI we collect numerous observations on delayed, partial, or missed coupon payments. Particularly helpful were reprints of (temporary) debt agreements, official announcements, or press releases of the firm. We typically extracted the relevant information on interest servicing from text statements such as 'L'assemblée des obligataires a décidé: […].' and 'Arrangement avec les obligataires, approuvé par l'assemblée extraordinaire des actionnaires, […].' In case the date of delayed or missed coupon payments is missing we assume that the debtor paid in full on the due date of the coupon payment thereby respecting the original deadline.

After gathering all coupon details we calculate bond-level accrued interest, $AI_{i,t}$, by distributing the coupon payments over the original coupon payment period. Specifically, we calculate $AI_{i,t}$ as:

$$AI_{i,t} = C_{i,t} \cdot \left(\frac{d_{i,t}}{D_{i,t}} \right),$$

where $d_{i,t}$ is the number of days between time t and the last coupon payment date, and $D_{i,t}$ is the number of days between the two consecutive coupon payment dates starting from the day after ex-coupon date for bond i. We assume coupons are paid out at the month end.

A.3.3. Accounting for Change in Debtor

To deal with mergers, demergers, acquisitions, and simple name changes, we follow conventional practice and track the corporation which had ultimate responsibility for making bond payments. For the period before 1873, we rely on Demeur (1858, 1870, 1874, 1876, 1879, 1885). From 1873 until the end of our sample period we rely on the eight volumes of Les Dossiers Financiers (1928) that stretch to 1939. For the post-1893 period we also use the *Recueil Financier* for cross-checking purposes. In this way we account for the significant consolidation of economic activity into large firms following the great merger wave of the 1920s (Kurgan-Van Hentenryk, 1997; Lemoine, 1929).

A.3.4. Accounting for Tax Effects

We use Internet Appendix Table A.V as a lower bound on the time-series variation in tax rates during our sample period for cross-checking purposes. For all indicated years but 1920, two potential taxation rates are possible:

either the creditor pays the taxation (*taxe mobilière*) or the debtor takes on the responsibility of paying the taxation (*taxe professionnelle*) in which case coupons are tax-exempt for bondholders. The latter case is shown as the second row per year in Internet Appendix Table A.V. Capital gains were tax-exempt throughout the whole period of study.

Table A.V: Evolution of Taxation on Corporate Bond Interest Income

Year	Payer	Belgium			Colony			Abroad		
		Base	Supplement	Total	Base	Supplement	Total	Base	Supplement	Total
1920	Everyone	10.00	0.00	10.00	10.00	0.00	10.00	2.00	0.00	2.00
1923	Investor	10.00	5.00	15.00	12.00	0.00	12.00	4.00	0.00	4.00
	Issuer	10.00	2.00	12.00	12.00	0.00	12.00	4.00	0.00	4.00
1926	Investor	15.00	1.50	16.50	12.00	0.00	12.00	5.00	1.00	6.00
	Issuer	12.00	1.20	13.20	12.00	0.00	12.00	5.00	1.00	6.00
1928	Investor	15.00	1.50	16.50	12.00	1.00	13.00	5.00	1.00	6.00
	Issuer	12.00	1.20	13.20	5.00	1.00	6.00	5.00	1.00	6.00
1930	Investor	15.00	1.50	16.50	12.00	1.00	13.00	5.00	1.00	6.00
	Issuer	12.00	1.20	13.20	5.00	1.00	6.00	5.00	1.00	6.00
1932	Investor	15.00	1.50	16.50	12.00	1.00	13.00	5.00	0.50	5.50
	Issuer	12.00	1.20	13.20	5.00	1.00	6.00	5.00	0.50	5.50
1934	Investor	15.00	1.50	16.50	12.00	1.00	13.00	5.00	0.50	5.50
	Issuer	10.00	0.00	10.00	5.00	1.00	6.00	5.00	0.50	5.50

Notes: This table presents the evolution of the marginal yearly interest on income tax rates in percentages starting from 1920 following the implementation of the Law of 29 October 1919. Firms of Belgian origin are divided into three distinct categories characterizing their main geography of economic activity: Belgium, colony, and abroad. For each of the respective origins, taxation is separated into main governmental tax (*Base*) and supplementary tax (*Supplement*). The column of interest is the total taxation (*Total*), computed as the sum of the main governmental tax and supplementary tax. All years but 1920 make a separate case for who pays the taxation. The first row shows the tax rates levied in case the investor pays the taxation rather than the debtor. The second row showcases the tax rates levied in case the debtor itself pays the taxation rather than the investor, resulting in tax-exempt coupon payments for the bondholder. Capital gains were exempt throughout the whole sample period from 1838 to 1939. *Sources:* Beatse (1920), Wauwermans (1920), Gilson (1921), Lapotre (1924), Beatse (1925), Coart-Frésart (1928), Requette (1928), De Mey (1930), Dielen (1933), De Visschere (1935), Claes and Gillet (1936), Loeckx (1937), Ministerie van Financiën (1937), Bruisseret (1941), Centre d'Étude des Sociétés (1941), Delacroix (1941), De Mey (1941), and Amerijckx (1944).

Appendix B. Additional Information on the Historical Context

Previous studies have attributed the rapid success of the BSE to the laissez-faire legislation induced by the Stock Exchange Liberalization Act of 30 December 1867 and the corporate law reform of 18 May 1873 (see e.g., Van Nieuwerburgh, Buelens and Cuyvers (2006, p. 25–26)). Their establishment coincided with the abolition of

the dirigiste framework based upon the Paris Stock Exchange model as introduced during the early years of the Stock Exchange since 1801 (Witte, Luyten and Meynen, 2016).

The development of parallel illegal exchanges as the *Lloyd Bruxellois* and its success made quite clear that the centralized government-controlled system had to be adapted.[3] The monopolistic regime was seen as clear opposition to the right of assembly enshrined in the constitution. The law of 30 December 1867 meant an institutional turnaround that started the extreme liberalization of the BSE (*liberté du courtage*) that *de facto* abolished the statutory provisions introduced in the *Code de Commerce* during the Napoleonic reign of 1795–1814 (Vanthemsche, 1992). The law abolished the inheritance of Napoleon's strictly regulated Bourse, thereby removing all restrictions that prohibited speculation outside of governmental oversight. Nearly complete freedom of stock exchange life would be realized. The job of stockbroker became completely free and so, at once, the monopoly of the brokers faded away.

The Company Reform Act of 18 May 1873 abolished the requirement of government authorization to set up a limited liability company leading to an unprecedented liberalization of the market whereby free incorporation intensified market competition and encouraged corporate capitalism. The possibility of general incorporation was already introduced in Belgium in 1807 during the Napoleonic era. Before 1873, corporations underwent a cumbersome procedure involving a careful examination of their commercial strategy, the reputation of its founders, and the public benefit of their existence. The government could grant authorizations at its own discretion and sought to prevent concentration and competition among established industries (Frère, 1938, 1951; Neuville, 1976). Additionally, the government could ban firms from trading on the BSE, restricting their access to capital markets and the composition of their equity and bond financing.

Yet, the introduction of the Law of 5 May 1865 also constituted a vital element in the legislative reforms introduced by Minister of Finance Walthére Frére-Orban of the Belgian Liberal Party. The Law of 5 May 1865 on the free-floating of interest rates overturned the usury law of 1807 which had set a maximum interest rate of 5% on civil affairs and 6% on commercial affairs. The law allowed the *Banque Nationale*, known as *Banque Nationale de Belgique* or *National Bank of Belgium* since 1900, to manage its discounting window in all liberty (Chlepner, 1930, p. 44–45; Calomiris, Flandreau and Laeven, 2016, p. 52). All three of these regulatory changes paved the way for the rapid development of the BSE and Belgium attained unprecedented levels of economic and financial

[3]Based upon the London Lloyd's, the *Petite Bourse* or *Lloyd Bruxellois* was a parallel circuit where brokers, bankers, and other interested parties, came together to conduct clandestine trade since 1 July 1833. A ruling by the Brussels' Chamber of Commerce on 23 February 1863 stated that all the transactions concluded there, even if by sworn brokers, were not recognized by the court. Transactions concluded on this 'exchange' were punishable and could be prosecuted (Willems, 2006, p. 269–270).

prosperity.

Appendix C. Additional Results

C.1. Corporate Bond Return Autocorrelation

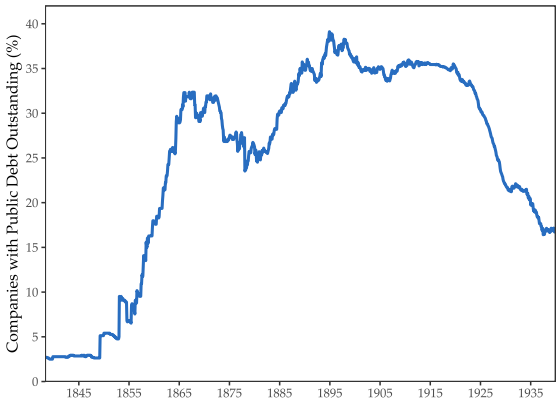
Table A.VI: Autocorrelations

	Autocorrelation Lag											
	1	2	3	4	5	6	7	8	9	10	11	12
Panel A – Full Sample (1838–1939, Number of Obs. = 1220)												
Coefficient	−0.10	0.08	0.04	0.02	−0.07	0.22	−0.04	−0.03	0.06	−0.01	−0.09	0.29
LB (*p*-val.)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel B – Early 19th c. (1838–1873, Number of Obs. = 428)												
Coefficient	−0.28	−0.01	0.10	0.00	−0.26	0.44	−0.23	−0.02	0.08	0.04	−0.23	0.42
LB (*p*-val.)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel C – Pre-WWI (1874–1913, Number of Obs. = 480)												
Coefficient	−0.16	0.03	0.06	0.09	−0.16	0.57	−0.19	0.03	0.05	0.04	−0.17	0.55
LB (*p*-val.)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Panel D – Interwar (1920–1939, Number of Obs. = 240)												
Coefficient	0.05	0.15	0.00	0.03	0.09	−0.01	0.14	−0.04	0.03	−0.06	0.03	0.14
LB (*p*-val.)	(0.44)	(0.05)	(0.12)	(0.20)	(0.14)	(0.22)	(0.07)	(0.09)	(0.13)	(0.14)	(0.19)	(0.07)

Notes: This table shows autocorrelation coefficients for the monthly value-weighted corporate bond return index. We present results for the full sample period and subsamples corresponding with those presented in Table II. Corresponding p-values are reported below between parentheses based on the Ljung-Box (LB) test with corresponding lags. *Source:* SCOB.

C.2. Corporate Bond Market Access

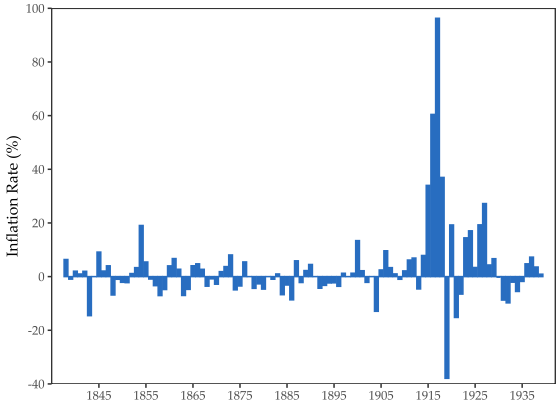
Figure A.4: Share of Companies Using the Public Debt Market



Notes: The figure shows the share of companies listed on the BSE that had a public corporate bond issue outstanding over the sample period from May 1838 to December 1939. *Source:* SCOB.

C.3. Inflation Rate

Figure A.5: Annual Inflation Rates

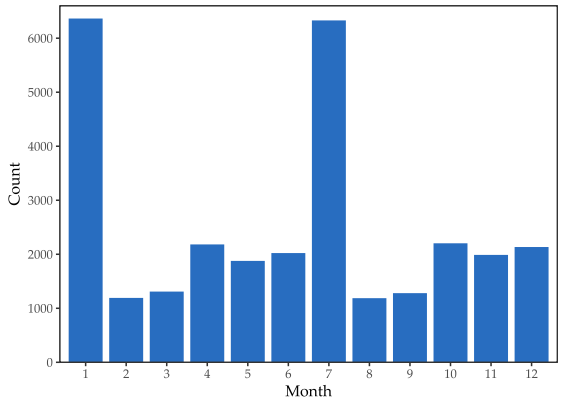


Notes: This figure shows the annual inflation rate the total sample period from 1838 to 1939. *Sources:* We use the annual consumer price index (CPI) of Van de Velde (1944, p. 21–25) for the period before WWI. For the WWI period, we source updated inflation data from Scholliers (1978). For the period after WWI, we use data from the Ministry of Economics (*L'Indice des Prix à la Consommation - Historique de 1920 à nos jours*).

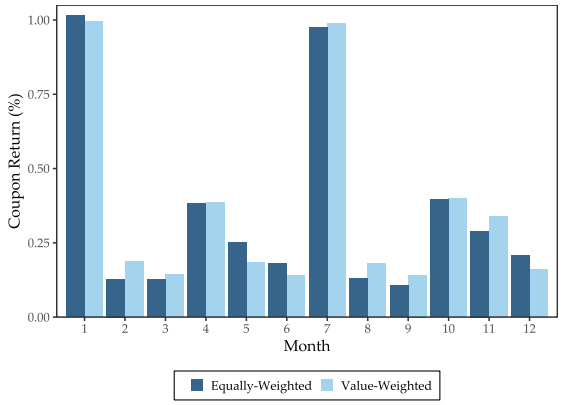
C.4. Coupon Payment Seasonality

Figure A.6: Coupon Seasonality

Panel A – Monthly Coupon Payment Observations



Panel B – Monthly Coupon Return



Notes: The figure shows the number of coupon observations per month in Panel A.6A and the monthly average coupon return per weighting scheme in Panel A.6B. The sample period runs from May 1838 to December 1939. *Source:* SCOB.

C.5. Within-Firm Performance of Corporate Debt versus Equity in 19th c.

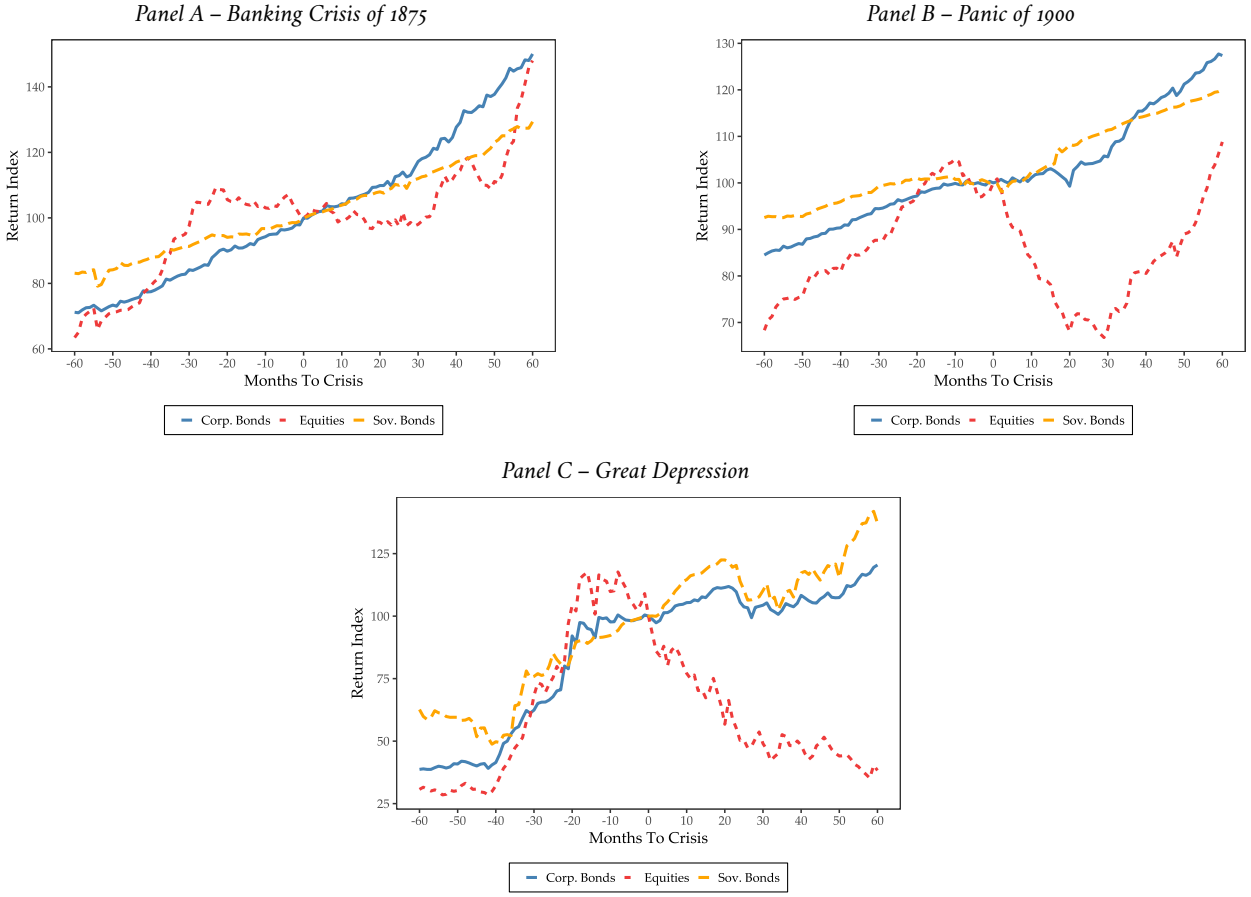
Table A.VII: Comparing Corporate Bonds With Other Assets During 19th Century

	Mean Returns		Dispersion			Sharpe
	Geom. (%)	Arithm. (%)	SD (%)	Min (%)	Max (%)	
Panel A – Early 19th c. (1838–1873)						
Corporate Bonds	4.82	4.93	3.83	−4.72	18.35	0.38
Equities	1.09	2.73	15.51	−33.69	92.00	−0.04
Sovereign Bonds	4.73	4.83	7.08	−9.36	20.49	0.21
Commercial Paper	3.32	3.32	0.87	2.03	5.55	
Panel B – Entire 19th c. (1838–1900)						
Corporate Bonds	5.04	5.12	3.24	−4.72	18.35	0.55
Equities	3.28	4.53	13.94	−33.69	92.00	0.10
Sovereign Bonds	4.36	4.43	5.51	−9.36	20.49	0.23
Commercial Paper	3.13	3.14	0.85	1.64	5.55	

Notes: This table reports the distribution of real total returns and nominal total returns for corporate bonds and different Belgian asset classes for value-weighted indices. For each asset category, it shows the geometric and arithmetic average annualized return, the annualized standard deviation (SD), and the lowest and highest recorded annual return. It also shows the nominal ex-post Sharpe ratios for corporate bonds, equities, and sovereign bonds. The results obtained for sovereign bonds and commercial paper are an exact copy of those portrayed in Table IV. We employ the within-firm weighting scheme of Table IV to construct alternative corporate bond and equity return series that account for issuer-level differences in idiosyncratic risk. Specifically, we weight portfolios of stocks using the market capitalization of the firm based on their total bond market size, and subsequently employs the same weights for the bond portfolios. We then equally-weight issues within each firm in case of multiple outstanding issues. *Source:* SCOB.

C.6. Corporate Bond Performance Around Major Financial Crises

Figure A.7: Asset Returns Around Major Financial Crises Using Within-Firm Return Series



Notes: This figure shows a cumulative return index around three financial crisis events: the 1875 international crisis (dated on January 1875), the panic of 1900 (starting in March 1900), and the Great Depression (dated on Black Tuesday in October 1929). The series are indexed at 100 in the starting month of the crisis. The corporate bond and equity return index is constructed following Table IV and Internet Appendix Table A.VII. We employ the within-firm weighting scheme of Table IV to construct alternative corporate bond and equity return series that account for issuer-level differences in idiosyncratic risk. Specifically, we weight portfolios of stocks using the market capitalization of the firm based on their total bond market size, and subsequently employs the same weights for the bond portfolios. We then equally-weight issues within each firm in case of multiple outstanding issues. *Source:* SCOB.

C.7. Effect of Taxation on Corporate Bond Returns

Table A.VIII: Counterfactual Taxation Analysis

	Gross Coupon Index	Actual Index
Panel A – Value-Weighted		
Mean (%)	4.79	4.58
SD (%)	9.68	9.67
Difference in Means (t-static)	7.43***	
Panel B – Equally-Weighted		
Mean (%)	7.65	7.32
SD (%)	8.58	8.56
Difference in Means (t-static)	12.45***	

Notes: This table reports the average annual returns on the counterfactual gross coupon index and the actual coupon index. The gross coupon index is constructed by relying on gross pre-tax rather than net post-tax coupon cashflows. Panel A shows the value-weighted portfolios. Panel B shows the equally-weighted portfolios. The third row of each panel provides the t-statistic of the difference in average returns. Significances are based on heteroskedasticity- and autocorrelation-consistent (HAC) standard errors using Newey and West (1987). The sample runs from January 1920 to December 1939 given the emergence of coupon taxation in Belgium after the passing of the law of 29 October 1919. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. *Source:* SCOB.

A further complication in all studies of returns on corporate bonds is the differential taxation vis-à-vis Treasury bonds while no proper tax treatment was attempted in the overall majority of previous research efforts. Yet, as pointed out by Elton *et al.* (2001), coupon payments on corporate bonds are subject to a differential taxation treatment. To investigate the impact of interest income taxes, we estimate gross coupons, $C_{i,t}$, for all bonds as $C_{i,t} = \widehat{C}_{i,t}/(1 - \tau_{i,t})$, where $\widehat{C}_{i,t}$ represents the net coupon and $\tau_{i,t}$ the empirical taxation rate for bond i in month t. Internet Appendix Table A.VIII shows that, to construct a credible return index, it is crucial to fully take into account tax-adjusted coupon payments. We find a difference of 21 basis points between our actual corporate bond market index based on post-taxation coupons and the counterfactual index based on pre-taxation coupons between 1920 and 1939. Again, we add the results for equally-weighted returns, for which we find a difference of 33 basis points. Both these results are highly statistically significant, with an autocorrelation- and heteroskedasticity- adjusted t-statistic of 7.43 for value-weighted returns and 12.45 for equally-weighted returns.

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