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JEL Classification: G12, N2, N23, N43

Keywords: Government bonds, British Empire, liquidity, credit risk, Colonial finance

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Matthieu Chavaz and Marc Flandreau[(*)]

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Abstract

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1 Introduction

In September 1888, William Westgarth, the owner and manager of the London Stock Exchange brokerage firm W. Westgarth and Co. that specialized in colonial bonds set foot in Auckland, New Zealand. This stopover was the first in a "road show" that was to take him through British Australasian possessions, where he met with local government treasurers, and ended in London with a crowded meeting at the Royal Colonial Institute. The motive for these meetings was a wide-sweeping reorganization of colonial borrowing in the London Stock Exchange. Westgarth's main insight was that the regard London investors had for colonies credit was already "high", but that colonial bonds liquidity was desperately "dry." As a result, colonies paid too much to borrow. This situation contrasted with that of sovereign borrowers such as Turkey, which had poor credit but highly liquid bonds.

At first sight, the problem identified by Westgarth was merely technicality. However, his solution involved nothing short of a reshuffle of the imperial architecture.[1] Westgarth's plan was "to consolidate all [Australian] debts into one uniform stock" issued by a politically unified Australian Federation that included New Zealand.[2] The reward from such an institutional transformation would have been large. According to his own counterfactual estimate (Figure 1), the price of the new perpetual three percent Australasian bond his reform would have created would have been between 11% (New South Wales) and 25% (New Zealand) higher than that similar 3% loans issued independently by the individual colonies. Expressed otherwise, this

[1] Westgarth, (1889b 23-24). From the language Westgarth used, there is no doubt that contemporaries were fully aware of the distinction between credit and liquidity. As he put it, Turkish bonds are "alike one of the most marketable and one of the least esteemed stocks in the London market. *Thus such marketability comes, from its great convenience, to have a distinct value of its own, additional to that arising from quality*" In contrast, colonial bonds lacked "marketability" or "salability". Contemporaries used the term "stocks" to refer to bonds. We use the modern term "bonds" in the text to avoid confusion, but keep the contemporary terminology in citations.

[2] Westgarth (1889a, p. 24). Westgarth's colonial brokerage firm was an important stock market operator in Australasian bonds, in effect participating in underwriting syndicates. Thus, Westgarth had perhaps an immediate interest in bond market liquidity. His insights on the perils of illiquidity were also premonitory: W. Westgarth and Co. collapsed in 1890, having failed to place a large number of bonds of the Australian province of Victoria it had underwritten.

would amount to a reduction of borrowing costs from 33 to 75 basis points.[3]

Westgarth was not the only one to see a direct link between the seemingly dry subject of colonial illiquidity and the grand question of the design of empire. In 1895, a few years after he made his proposals, a newly appointed and famously enterprising Colonial Secretary called Joseph Chamberlain took up Westgarth's idea and suggested the launch of a "Colonial Consol", in essence a fund which would borrow then re-lend to colonies.[4] Chamberlain speculated that the Colonial Consol would secure terms as good as those enjoyed by the British Consol since the two bonds would be as liquid.

The proposal was opposed by the Treasury Secretary Edward Hamilton and eventually shelved (although a variant of it re-emerged in 1899 to assist Crown colonies borrowing, known as the Colonial Loan Act). Hamilton had been wary that the arrangement would encourage colonies to take up too much debt. This again suggests that that the apparently obscure topic of colonial illiquidity was political at heart.[5]

The illiquidity of colonial debt was not only the pet topic of some financiers and politicians, but also a recurrent concern for Victorian and Edwardian bankers. In his classic study of the London joint-stock banks (1880-1914), Charles Goodhart shows that banks invested heavily in colonial bonds. However, he also shows that bankers debated the legitimacy of long-term colonial bonds as bank reserves because, while being safe, they crucially lacked "marketability" (Goodhart, 1972, p. 132).

Despite these significant hints, the question of liquidity has not been taken into account in existing research on foreign and colonial debt. Grand narratives of empire are silent on the

[3] Westgarth (1889b, p. 248).
[4] Westgarth's efforts to promote Australia and New Zealand through an influential *Circular* that was also an instrument of lobbying have caught the attention of historians of British colonial finance (Attard 2015).
[5] Jessop (1976, p. 156). In Chamberlain's scheme, the spread between the Colonial Consol rate and the rate at which the fund would relend to individual colonies would generate revenues that would subsidize navy, postal, and commercial communications within the empire.

subject of colonial liquidity. Cain and Hopkins (2001) account of “gentlemanly capitalism” emphasizes the City’s concern with credit but ignores liquidity. Davis and Huttenback (1986) pioneering quantitative study glosses over the subject. When they analyze the impact of colonial subjection on colonial securities, Davis and Huttenback simply read it as a change from ”risky” to ”safe” asset status – a change in credit risk.

The same dearth of attention to liquidity characterizes more recent cliometric investigations of colonial government yields (they are surveyed in section 2.2). More troubling still are the results from what is to our knowledge the only study to have focused on the question of liquidity in the late 19th century and early 20th century (Alquist 2010). Indeed, this author claims that liquidity did not matter at all for colonial bonds because, he suggests, political subjection made those bonds “immune” to liquidity shocks (Alquist 2010, p. 220). Could it be that brokers such as Westgarth, politicians such as Chamberlain and modern students of banking such as Goodhart all over-estimated the extent of the problem?

In this paper, we take up the matter again and suggest that in fact it is Alquist’s conclusion that is misguided. We show that in order to understand the liquidity outlook of colonial markets we need to take into account the operation, micro-structures and clienteles of those markets. In particular, we provide evidence that Alquist’s results are undermined by his incorrect assumption that foreign and colonial debt markets were “fully integrated.” Far from being fully integrated, foreign and colonial debt markets displayed segmentation as defined by modern literature - a situation where certain classes of investors consider investing in a subset of all existing assets only (Merton, 1987; Kadlec and McConnell, 1994).

In the instance, clienteles for sovereign and colonial bonds differed partly from one another and this imparted specific dynamics to each market. Therefore, the upshot of our paper is that properly accounting for the sovereign/colonial segmentation – properly understanding the nature of the various markets at hand – enables to explain the concerns of contemporaries. Our

study indeed reveals strikingly different roles for liquidity and credit depending on whether one looks at foreign or colonial debts. As Westgarth correctly suggested, illiquidity was a rampant feature of colonial markets. Moreover, if the problem of colonial illiquidity was substantial, then it ought indeed to have generated political concern explaining the involvement of politicians such as Chamberlain. In other words, we suggest that there exists a so-far neglected "political economy of liquidity." Liquidity was anything but a technical matter: it was a significant cost and a hot political issue.

Although neglected in previous research on empire, liquidity has received substantial attention after the subprime and Eurozone crises that developed after 2007. Modern policy makers are well aware of the economic importance of liquidity, while economists have become sensitive to the methodological challenges involved in identifying these premia. An example that is relevant to our work is Schwarz (2014) who uses the spread between the yield of German federal government debt and the guaranteed debt of a German development agency (KfW, Kreditanstalt fur Wiederaufbau) to measure liquidity premia. The intuition is that both bonds carry the same (low) credit risk, but the agency one is less liquid, so that the spread between both bonds captures illiquidity. Something similar applies to British colonies: Not unlike the KfW, they were (implicitly) backed by their "parent" government and thus faced negligible credit risk. This means that colonial spreads should have largely reflected a liquidity risk.[6]

To test this hypothesis, we develop a framework that permits to separate liquidity from credit. This is done through three methodological imports: First we show how the framework of the existing macro-financial history literature for studying the determinants of government borrowing spreads can be adapted to deal with liquidity. Second, we show how an indicator of liquidity (or rather illiquidity) can be inferred from information in the London market's official stock and bond price list (the *London Daily Stock & Share List*). Third, we construct a database

[6] See Accominotti et al. (2011, p. 399) for a statement of the intuition.

for the secondary market prices and the indicator of illiquidity for all bonds issued by sovereign and colonial borrowers reported in the *List* at monthly frequency for the period 1872-1909, the most comprehensive coverage of the period to date. Doing this enables us to demonstrate quantitatively the importance of liquidity in the market for colonial debts, which helps explaining why it became a source of political concern.

The remainder of the paper is organized as follows. We first review existing work on the impact of liquidity on bond spreads and motivate our benchmark equation (section 2). We then move to discuss our measure of liquidity and show that although it is not a pure bid-ask spread, it can be used as a good proxy for measuring idiosyncratic liquidity (Section 3). In Section 4 we exploit this measure's cross-sectional and time-series dimensions; we then provide empirical evidence supportive of the view that there were large illiquidity premia for colonial securities as suggested by Westgarth, with liquidity explaining between 10 and 39% of colonial yield spreads. We then explain the differences between our results and those in Alquist (2010). Last, we further explore the institutional and political mechanisms that underpin the significance of liquidity in colonial bond markets. We argue in particular that imperial control, because of its effect on information asymmetries, influenced simultaneously the micro-structures of the colonial market (section 5) and the composition of its clientele (section 6). This is done by providing new theoretical and empirical insights on the effects of the Colonial Stock Acts of 1877 and 1900. We end with conclusions and directions for future research.

2 Liquidity and the Workhorse

2.1 Liquidity From Now to Then

The modern asset pricing literature has accumulated comprehensive evidence on the role of liquidity in asset prices, especially government bonds such as US Treasuries. Amihud and Mendelson (1986) first defined asset liquidity as "the costs of immediate execution"

incurred by an investor. In practice, executing transactions requires resorting to a broker. Thus, a bond's liquidity is best captured by its bid-ask spread, i.e. the difference between the price at which a broker accepts to buy the bond from the seller and the one at which it passes the bond over to a buyer. Transaction costs mechanically diminish the investor's expected return. Thus, investors should be compensated by earning higher yields from less liquid assets. Amihud and Mendelson (1991) confirm that US Treasury bills with higher bid-ask spreads have higher expected returns.[7] Identifying liquidity effects in bond markets where both credit risk and illiquidity are present has proved more challenging, as exemplified by the inconclusive literature on Eurozone government spreads (Codogno, Favero, and Missale, 2003; Bernoth and Erdogan, 2011; Beber, Brandt, and Kavajecz, 2009; Favero, Pagano, and Von Thadden, 2010; Schwarz, 2014).

One reason is that the standard measure of bond illiquidity – the bid-ask spread – may be observationally correlated with credit risk in some circumstances. This is because the bid-ask spread not only compensates the broker for the cost of processing orders, but also for "inventory" costs (holding a sub-optimal portfolio of bonds while waiting for a buyer) and "adverse selection" costs (transacting with a party better informed about the true value of the asset) (Stoll, 1989).

To see this, consider a sovereign debt crisis. In such a situation, a broker should find fewer buyers, leading the bid-ask spread to increase as liquidity deteriorates. In parallel however, both the broker's cost of holding to a portfolio of sovereign bonds (or the average duration thereof) and the risk of dealing with a better-informed counterparty increase as well. Brokers may thus widen bid-ask spreads to deter trading in questionable sovereigns, generating a spurious correlation between liquidity and credit risk. This does not mean that the

[7] See Krishnamurthy (2002), Fontaine and Garcia (2007) and Li, Wang, Wu, and He (2009) for subsequent explorations. Recently, literature has focused on premia paid by investors to compensate the risk that asset prices may fluctuate along with market liquidity (Pastor and Stambaugh, 2003; Acharya and Pedersen, 2005).

bid-ask spread is not the best available proxy for bond liquidity, but simply that one needs to control for both credit risk and liquidity risk when regressing bond yields on bid-ask spreads. This is what this paper does. Alquist (2010) also follows a similar strategy. However, he separates liquidity from credit using a variant of the time-series asset pricing framework. By contrast, we use a panel approach. As we now explain, our own approach builds on an existing body of well-established research on the determinants of government yield spreads in the late 19th century. We also show in section 4.3 that, with our data, we can obtain results similar to Alquist's when using his time-series asset pricing approach.

2.2 Macro-econometric Literature on Government Bond Spreads in the Late 19th Century

The modern literature on pre-1914 government bond spreads has focused on two aspects of the determination of government borrowing spreads. Research has sought to determine which "fundamentals" mattered for the credit of borrowing governments. This literature, pioneered by Bordo and Rockoff (1996) uses panel or cross-section analyses to identify the effects of alternative candidates such as debt, fiscal policy or monetary policy (see e.g. Flandreau, Le Cacheux, and Zumer (1998), Mauro, Sussman, and Yafeh (2002), Obstfeld and Taylor (2003), Flandreau and Zumer (2004), Mitchener and Weidenmier (2008)).

A sub-literature or rather, a subset of questions within this literature, has examined the specific relation between credit risk and empire, with the assumption that imperial subjection had a "favorable" effect on colonial borrowing costs. This line of investigation was pioneered by Davis and Huttenback (1986). They sought to construct a measure of "favorable treatment in the capital market" by matching similarly developed sovereign and empire countries and comparing borrowing costs across those groups. Later regression analysis has included empire as treatment (Obstfeld and Taylor (2003), Ferguson and Schularick (2006)). Accominotti et al. (2011) show that these approaches are biased by model mis-specification.

Since investors looked at empire as a credit risk-reducing technology, similar changes in "credit fundamentals" did not have the same effect for colonies and sovereigns (Flandreau, 2006). For instance, an informed British investor believing that the mother country stands by its colony will not be as wary of a drift in the government debt of New Zealand as he would be of the same drift in Argentina. The upshot is that one should not pool together colonies and sovereigns in the same model. Doing so produces incorrect, severely biased estimates of bond spread sensitivity to credit risk. To remedy this problem Accominotti et al. (2011) suggest replacing the dummy treatment by interactive terms in the bond spread equation. This allows different pricing formulas for colonies and sovereigns.

Virtually all previously used empirical models of bond spreads can be mapped into a benchmark model where the borrowing cost (yield spread) of country *c* in year *t* is explained as a function of a set of fundamentals $X_{c,t}$. The model allows for different sensitivities depending on whether the country is a colonial subject or not. We call the specification shown in equation (1) the "workhorse" model (where $Yield_{c,t}$ is the yield on one representative bond issued by country c and $Yield_{UK,t}$ is the yield on the British Consol, the British benchmark long-term bond):

$$Yield_{c,t} - Yield_{UK,t} = \beta_1 \cdot Colony_c + \beta_2 \cdot X_{c,t} + \beta_3 \cdot Colony_c \times X_{c,t} + FE_c + \varepsilon_{c,t} \quad (1)$$

2.3 Liquidity in Panel Regressions

The workhorse can be expanded to deal with liquidity effects. Provided a reasonable indicator of liquidity exists, one simply needs to inject it in equation (1). Formally the equation we consider is the following:

$$Yield_{i,c,t} - Yield_{UK,t} = \beta_1 \cdot CreditRisk_c + \beta_2 \cdot Colony_c \times CreditRisk_{c,t}$$
$$+ \beta_3 \cdot Illiquidity_{i,c,t} + \beta_4 \cdot Colony_c \times Illiquidity_{i,c,t} + FE_c + \varepsilon_{i,c,t} \quad (2)$$

This new model contains two main innovations. First, it considers the entire set of

securities (indexed by I) issued by each country, rather than one unique bond per country. The reason for our choice is that liquidity is predominantly an asset-specific factor, so that averaging out bonds or picking a benchmark security entails erasing relevant information since by definition benchmark bonds tend to be the most liquid ones, and are thus not representative of the average liquidity outlook of a given borrower.

The second innovation is that model (2) allows colonial spreads to not only react differently to credit risk (as in Accominotti et al. (2011)), but also to liquidity. There are theoretical and historical motivations for this choice. As further discussed in sections 5 and 6, the implicit metropolitan guarantee should have almost eliminated information asymmetry in the colonial market, but not in the sovereign debt market, resulting in segmentation reflected in different types of intermediaries (underwriters) and bond clienteles being involved.[8] In turn, different underwriting techniques may have led to different levels of bond liquidity, while different clienteles may also have had different preferences for bond liquidity. Thus, this second innovation allows doing justice to the likely effect of institutional heterogeneity on information asymmetries and investors characteristics.

3 Taking "Turns": Measuring Government Bond Liquidity in the First Age of Globalization

3.1 Measuring Liquidity in Historical Bond Price Analysis

We must now define a suitable indicator of liquidity. Modern research emphasizes the so-called relative bid-ask spread as preferred proxy for the liquidity of a bond *i* at time *t* (Fleming, 2003). It is the ratio between the bid-ask spread and the bond price:

[8] Empirically, there is indeed evidence of different set of bonds being distributed by different intermediaries and types of investors (Attard, 2013, Flandreau and Flores, 2009; Flandreau, Flores, Gaillard, and Nieto-Parra, 2010; Hall, 1963; Sunderland, 2004; Sunderland, 2013; Suzuki, 1994).

$$Liquidity_{i,t} = \frac{Ask\ Price_{i,t} - Bid\ Price_{i,t}}{Price_{i,t}} \quad (3)$$

Although this point is often missed in cliometric investigations, using a modern concept in historical research is not straightforward, when it has to do with a mental or cultural representation. We can reconstruct a GDP number regardless of what contemporaries thought but on approximating a factor such as liquidity, which contemporaries may have considered in a very specific way, we need to guard ourselves against anachronistic application of "modern" notions (that is, except if we consider economics – and economic history – as a social physics). Therefore, it is necessary to examine the notions entertained by contemporaries. This is not at all an exercise in the "history of thought" but a basic requirement for a methodologically sound approach.

Luckily for us, Westgarth's informed discussion of liquidity reveals deep parallels with the way modern financial economists understand the subject. For instance, he emphasized that one tangible sign of liquidity was what he described as a bid-ask spread, set by the market makers ("jobbers") and known in the language of the London Stock Exchange as the "dealer's (or jobber's) turn." Moreover, Westgarth claimed that, other things being equal, larger (more liquid) issues had lower jobbers' turns than smaller (less liquid) ones, the same relationship modern researchers would hypothesize between volumes and bid-ask spreads.[9] It would seem therefore natural to rely on the dealer's turn in order to document the bid-ask spread. The question however is: Where can we find the information on the dealer's turn?

The fact is that to date, the dealer's turn is nowhere to be found. Looking into the *London Official Daily Stock & Share List* (the official price list for the London Stock Exchange

[9] In Westgarth's wording: "There is another mark of negotiability, namely, the narrowness of what is technically termed 'the dealer's turn'. Every investor knows, to his cost, that he can never buy or sell any stock in the market, even at the same moment at the same price [...]. But the large stocks have the advantage to the investor of a small turn while small stocks are relatively costlier by their wide turn" (Westgarth, 1889a, p. 250). In the London Stock Exchange, jobbers were 'market makers' while brokers who received orders from their clients can be seen as the jobbers' counterparties.

and the main authority on the subject) all we find is two sets of indications: one column with "closing quotations" giving an upper and a lower price and one column indicating "business done" (see figure 2). The closing quotations entry has the shape of an interval (e.g. "90-91" or "66-68"). Perhaps because of the apparent similarity between a bid-ask spread and this presentation, Alquist (2010) constructs what he describes as a percentage "bid-ask spread" measured as follows (the denominator is a proxy for the bond price):[10]

$$Bid - Ask_{i,t} = \frac{Upper\ Price_{i,t} - Lower\ Price_{i,t}}{\frac{1}{2}(Upper\ Price_{i,t} + Lower\ Price_{i,t})} \tag{4}$$

One should not go so fast, however. Indeed, the closing quotations bracket was not the dealer's turn. Rather they reflected a kind of loosely defined trading range as certified by brokers. In fact, contemporary experts explicitly stated that the closing quotations were not to be mixed up with true dealers' turns. Duguid (1905) emphasizes that buying and selling could occur at prices substantially within those posted in the (sometimes extremely large) "closing" bracket.[11] Likewise, according to another leading authority the closing quotation "is frequently quite nominal and only to be looked upon as an expert's opinion of the price at which business perhaps be done" (Clare, 1898). Anyone concerned with getting a given valuation right (such as trustees involved in assessing the value of an estate for probing inventories) should "not […] trust the [closing prices bracket in the] List quotation, but seek the advice of a broker or other expert."

On the other hand, contemporary testimony suggests that, while the closing quotations were not a bid-ask spread, they did contain valuable information nonetheless. For instance,

[10] Note that Alquist (2010) does not collect this data from the *Official List* but from the *Money Market Review*, a contemporary periodical that reprinted the information from the *Official List* (most probably from the weekly variant of the *Official List*).

[11] This can be illustrated from evidence in Westgarth (1889a) who states that liquid colonial bonds would have had jobber's turns of about ¼% to ½%, while the figure for illiquid ones would have been 1%. For January 1889, our data for the closing quotations interval reported in the *Official List* indeed point to higher numbers, with the mean and median interval amounting to 2.55 and 2%, respectively.

> after vilipending those who would mistakenly identify closing quotations with the dealers' turn, Duguid (1905) claims that "the width of the [closing quotations] margin" enabled investors "to form an idea of the condition of the market" for a given security. He notices that "[brackets for the] quotations of securities which are *very actively dealt in are narrow*, whilst those of the *out-of-the-way securities are wide*. It is naturally the case that the [price brackets] of stocks which, because of the limited market, cannot easily be bought or sold, are less favorable, or wider, than the prices of those in which the market is free." Further, he suggests that the time series behavior of the closing quotations could be informative too, because in periods of "nervousness or panic" intermediaries were reluctant to commit to "deal except at a wide margin" and this was reflected in wider closing quotations. In other words, the closing quotations may not be the true dealer's turn, but they may correlate with liquidity. If so, we should not dispose of them so lightly.

It is in fact possible to test this conjecture. The intuition is as follows. We cannot observe the "true" bid-ask spread, but we do observe closing quotations and we do also observe variables that are known to correlate with liquidity in modern datasets. The test we provide thus examines whether the closing quotation bracket does correlate with the modern correlates of liquidity. For this, we have sorted colonial and sovereign bonds at each point in time into five portfolios according to the size of the closing quotations bracket and report the group average for four known measures of liquidity used in recent studies: 1) *Volume*[12] 2) *% Non-Zero* (a variable that reflects whether reported closing prices did exhibit changes compared to previous month)[13] 3) *% Business Done* (which takes value one if there is evidence of transactions in the "business done" column, and thus captures more active trading/reporting) and finally 4) *Age*, the age of the security issue in years.[14] Under the assumption that the closing quotations bracket is

[12] Crabbe and Turner (1995) find that the size of a corporate bond issue is negatively correlated with its liquidity.
[13] Bekaert, Harvey, and Lundblad (2007) among others show that the percentage of non-zero returns are a good proxy for trading activity.
[14] This reflects the notion that bonds closer from issuance have fewer buy-and-hold investors and thus are traded

informative of the "true" bid-ask spread, we should observe that bonds with smaller brackets (more liquid bonds) tend to be associated with 1) larger issues, 2) more frequent changes of closing prices, 3) more frequent evidence of activity ("business done") and 4) younger issues.

Results (Table 1) strongly support the hypothesis that closing quotations brackets have informational value for liquidity (this is especially clear in the case of colonials). Bonds with higher liquidity (lower closing price bracket) tend to exhibit a larger volume, more frequent closing price updates, greater evidence of business done and are also younger. Consider the relation between liquidity and the frequency of "business done" reports. For the group of colonial securities with the largest brackets (by assumption the most "illiquid" ones), the incidence of business done reports is 20% only, but it rises gradually to 46% for the securities with the lowest closing quotation brackets. There is therefore a tight correspondence between the information in the closing quotation bracket and extraneous measures of market liquidity.[15] In other words, closing quotations are no bid-ask spreads but they are an indicator of liquidity.[16] Therefore, we will from now on rely on closing quotations as our individual asset-specific liquidity indicator. Note that by construction, a larger indicator means a less liquid security, because it is associated with a wider bracket of the closing quotation.[17]

3.2 The Liquidity of Government Debt: Statistical Features

more actively; see e.g. Amihud and Mendelson (1991) for a discussion of the case of US Treasury bonds.

[15] Table 2 provides a matrix of covariance between the liquidity indicator and alternative measures of liquidity further supporting the conclusions in this section.

[16] Clare (1898) provides a plausible mechanism whereby the relation between closing quotations and "turns" might have obtained. In practice the closing brackets were reported by a dealer (jobber) responsible for that specific security. If a broker could not find a jobber willing to trade within the reported margin, he could not commit the jobber-in-charge to buy or sell at the posted price but he could have the bracket changed (so as to be able to show to his client the reason why the order could not be effected at the assigned price). On the other hand, the credibility of the dealer and his ability to remain in charge of the posting of given closing prices encouraged him to avoid reporting overly wide brackets. These set of incentives might have protected the information content of the closing quotations, not as a literal measure of the bid-ask spread, but enough so as to ensure that it contains enough information to correlate with the "true" (unobserved) bid-ask spread.

[17] One referee suggested as an alternative to rely on a method by Corwin and Schultz (2012) that uses daily high/low prices to construct an approximation of the bid-ask spread. As the referee noted, it would be interesting to see whether this estimator is correlated with the closing bracket reported in the *Official List*. While a good suggestion for continental markets, which display relatively abundant daily prices, the method cannot not be applied to the data in the *List*. Indeed, the norm for business done seems to be to report zero, one or two prices and very exceptionally more than that.

Figure 3 shows the distribution of our liquidity indicator for alternative groups of securities during the period 1872 to 1909 (see Appendix A for the behavior of the indicator for individual countries). The Figure is organized following the presentation of bond prices in the *Official List*: The left panel shows the distribution for securities listed under the "British Stocks" entry (typically Consols and British-guaranteed bonds such as the securities of India). The center panel shows the distribution for securities given under "Colonial Stocks". The right panel finally shows the distribution of the bracket for "Foreign Stocks" (non-colonial foreign government debt). The general message is that British bonds tended to be more liquid (they concentrated in the high liquidity bracket) than both colonial and sovereign bonds. Within British bonds (where the Consol reigned supreme as the most liquid investment), indicators clustered around 0.125, 0.25 and 0.5%. In contrast, liquidity indicators for colonials and sovereigns hovered around 2%.

Figure 4 plots indices of average liquidity of colonial and sovereign securities over time.[18] This is only a heuristic exercise because the composition of the indicator changes as new bonds are issued and older ones retired and no effort is made to control for those changes. Accordingly one should not try to read anything in the long run trends they exhibit, since they reflect changing characteristics of the population of bonds. However, over the short run, the composition of the indicators changes little and they provide valuable information.

As seen in Figure 4, correlation between the colonial and sovereign indicators is positive, but far from perfect and the two indices exhibit occasional "de-coupling" – that is, they suddenly diverge from their previous apparent pattern of correlation. Characteristically, this happened in episodes of market turbulences, such as during the Egyptian debt crisis of 1876 or the "Baring crisis" in 1890 (Argentina's default in 1889 and the failure of the House of Barings).

[18] Alquist (2010) constructs a similar index of overall market liquidity that pools sovereigns and colonials (see below Section 4.3 for a discussion).

We see that in both cases the liquidity indicator for sovereigns shot up, not so for colonials. This is consistent with the fact that during episodes of sovereign default, brokers in foreign debt markets reacted strongly to the risk of adverse selection. But brokers in colonial debt knew that the instruments they dealt in were immune. This does not mean that colonies were simply insulated from the shocks affecting the liquidity of bond markets "in general." Rather, they could be subjected to their own turbulences, pointing to the segmentation of colonial and foreign debt markets. This is quite visible during the banking crisis of 1878, when a scramble for liquid assets by British banks took place (Collins, 1989). Demand for safe but illiquid instruments (such as colonial debts) plummeted, and dealers in colonial debt markets now needed to protect themselves from the consequences for this scramble for liquidity. As Figure 4 shows, this episode adversely affected colonial debt, but not foreign sovereigns. We interpret this as suggestive evidence that colonial liquidity was tied to factors related to the behavior of major financial operators (British banks, investment trusts in which rentiers or "widows" were invested). The evidence from Figure 4 thus reinforces the notion that colonial and sovereign markets must have been segmented.

4 Credit, Liquidity and the Yield on Government Bonds: Empirical Evidence

4.1 Baseline Estimates

We now use the workhorse model laid out above to study the effect of our illiquidity indicator on individual yields. Our prior is that illiquidity was priced, with less liquid bonds commanding a higher yield. Yield spreads, closing quotation brackets, loan volumes, and bond age (the number of years a bond has been in existence) have been hand-collected. *Illiquidity* is the closing quotation bracket divided by the price, as proxied by the average between the upper and lower bracket. *Credit Risk* is the classic debt service ratio extensively used in the literature,

taken from Flandreau and Zumer (2004). (Appendix B contains further details on sample, data and sources). To prevent abnormal observations from driving results, observations when a country is in default were in this first stage excluded from the benchmark regression.[19]

Table 3 displays the results from estimation of different variants of our baseline equation (2).[20] To better identify the contribution of the different variables, we first estimate minimalistic variants of equation (2). In columns 1 and 2, we start with a model that only includes liquidity, credit as well as an issuer-fixed effect, which we run separately for colonial and sovereign issuers. Liquidity and credit are both correctly signed for both groups, with higher illiquidity and credit risk being associated with higher yield spreads. However, liquidity is only significant for colonials, whereas credit is only significant for sovereigns. In the case of colonies, this result is consistent with modern results in Amihud and Mendelson (1986). Investors demand a positive premium for holding illiquid bonds because of their higher transaction costs. Point estimates suggest that a one basis point deterioration of liquidity results in a 0.127 basis point increase in spreads. Alternatively, a one-standard deviation change in bid-ask spread (2.74 basis points) would result in a 0.35 basis point increase in yield spread.[21] This is a substantial change, amounting to 26% of the average colonial yield spread (1.35%).

Columns 3 and 4 show the results from a regression of spreads on liquidity alone. This enables us to assess the overall explanatory power of liquidity. Results point to a powerful contribution of our liquidity indicator to the variance of colonial yield spreads, as shown from the R^2 (22%). In contrast, the contributing power of liquidity to the pricing of sovereigns is almost inexistent ($R^2 \approx 0$). The explanatory power of liquidity for colonial spreads is also larger than that

[19] The source for the default years is Flandreau and Zumer (2004).
[20] Note that all regressions allow for serial correlation and heteroskedasticity. To allow for an arbitrary form of serial dependence, we cluster standard errors by bond.
[21] This is about four times lower than the effect found by Chen, Lesmond, and Wei (2007) for modern US corporate bonds. However no meaningful comparison can be made between our indicator of colonial liquidity and genuine bid-ask spreads as they have different scales. Modern measures being substantially narrower (24.5 to 77 basis points for short-term bonds, and 52 to 87 basis points for long-term ones) than in our sample (245 basis points for colonials, and 176 basis points for sovereigns). A proper comparison of elasticities would have to control for this and it is unclear how this could be done.

found in modern studies (for instance bid-ask spreads only explain 0.86 to 7.29% of the variance of modern US corporate bonds in Chen et al. (2007)). Another suggestive result can be seen by comparing columns 1 and 3: the point estimate of liquidity remains remarkably stable for colonials regardless of whether credit risk is controlled for, indicating negligible contamination through multi-colinearity. The opposite holds for sovereigns, as can be seen by comparing columns 2 and 4. This is consistent with the fact that dealers will react to an increase in sovereign credit risk by posting larger bid-ask spreads reflected in wider closing quotations.

In columns 5 and 6, we report estimates of the model with colonials and sovereigns pooled, but allowing for different sensitivity of yield spreads to credit and liquidity respectively. Column 5 reports result for the striped down model while column 6 includes the bond's present volume and age, the latter acting as proxy for time-to-maturity.[22] To facilitate comparison between sovereign and colonial elasticities, we report the sensitivity of spreads to credit and liquidity for a colony at the bottom of the regression tables.[23]

Being a colony results in considerably lower sensitivity of interest spreads to credit. Specifically, the corresponding parameter is only 0.29 (column 5) or 0.49 (column 6) compared to 4.04 and 3.43 for sovereigns, a 20 and 10-fold difference, respectively. The significance of liquidity for sovereigns is nil in most specifications (columns 2, 4 and 5), while it is substantial for colonies (columns 1, 3 and 5). In general, the statistical significance of illiquidity is particularly apparent for colonies. Results therefore support the view that while liquidity premia may not have been significantly different in the two markets (*Colony x Illiquidity* is not statistically significant), illiquidity was unambiguously a powerful pricing argument for colonials bonds.

The results in Column 6 show that this conclusion survives the introduction of additional explanatory variables, which may be correlated with both liquidity and credit (as noted in section

[22] These variables have been identified by modern studies using characteristics-based panel models similar to ours (Chen et al., 2007; Dick-Nielsen, Feldhutter, and Lando, 2011; Friewald, Jankowitsch, Subrahmanyam, et al., 2012).
[23] This is the sum of the elasticity to credit – respectively illiquidity – and of the elasticity to the interactive term: *CreditRisk* + *CreditRisk* × *Colony* (t-statistics correspond to a one-sided test of the null that this sum is zero).

3.1). Bond age and volume are significant for colonies only. Older and smaller bonds bear higher yield spreads, credit and liquidity being equal, but these effects are muted for sovereign bonds.[24] However, other results remain qualitatively similar. In other words, the effect of the liquidity component measured by our indicator on the pricing of bond yields cannot be ascribed only to bond characteristics such as size or maturity.

Finally, using results from the benchmark regressions in Table 3, Table 4 documents the economic significance of colonial liquidity premia. Column (1) gives the average yield spread (over the British Consol) of the individual colonies. Columns (2) and (3) report each colony's average liquidity premium in basis points and percentage of mean yield spreads, respectively.[25] As can be seen, the contributions of liquidity premia are always very large – peaking at 39% for South Australia. Excluding Egypt (a part of the Ottoman Empire that became a British colony), liquidity explains 19.6% of yield spreads for the average colony. Column (4) gauges the economic importance of liquidity premia from the vantage point of colonial treasurers. To do so, we use the share of annual interest service to colonial government expenditures from Flandreau and Zumer (2004) and multiply it with the ratio of liquidity premia to total yield, so as to measure the reduction in the fiscal burden resulting from enhanced liquidity. Results show that liquidity premia translate into 5% of yearly fiscal expenses for the average colony (ex-Egpyt). The number is always larger or equal to 2%, and peaks above 10% (13.1% for South Australia). This exercise is illustrative only, since the secondary market yield and liquidity premia measured here may not correspond one-to-one to the primary market costs faced by colonial treasurers. This said, estimates do suggest that the problem of colonial liquidity was material. They also rationalize why liquidity became an important political issue, as documented in the introduction, inspiring the schemes of Westgarth and Chamberlain.

[24] A possible interpretation for the positive effect of bond age on yields is that colonial bonds are more likely to be held by longer-term investors, who require a premium for a bond with short time-to-redemption. Older bonds being in general closer to their redemption points, they will thus be penalized by investors (explaining the higher yields).
[25] Figures are computed by multiplying the parameter estimates from the regression of colonial yield spreads on liquidity in column 1 of table 3 with each colony's mean liquidity indicator.

To sum up, results confirm earlier findings that colonial subjection essentially eliminated credit risk. Credit had a marginal and often insignificant effect for colonies. The entirely new finding reported here is that, while credit risk was for colonies a matter of second order, liquidity was a significant concern. In a nutshell, credit mattered for sovereigns and less so for colonies, whereas liquidity mattered a lot for colonies and less so for sovereigns.

4.2 Robustness

A key challenge is to ensure that our measure of liquidity is not contaminated by credit risk effects. We now perform a number of robustness checks to make sure that this is not the case. We start with our most radical test, which consists in purging out all variations in credit risk. The intuition is as follows: the liquidity risk for two different New Zealand bonds in the same year, e.g. 1892, can differ, but their credit risk must be the same. Introducing country-time fixed effects thus allows abstracting completely from credit risk and to focus on liquidity. The procedure is applied to both colonials and sovereigns, and results are presented in columns 1 and 2 of Table 5.

We find that illiquidity is strongly significant for colonials – similarly to findings from the baseline regression – when credit risk is controlled for in the strictest way. This bolsters our conclusion that illiquidity determines colonial yields. By contrast, the same procedure yields insignificant effects of liquidity for sovereigns. This suggests that, for sovereigns, it is more difficult to separate liquidity from credit.

Another potential source of contamination of our liquidity indicator by credit risk is that its numerator – the bond's closing quotations bracket – should reflect only liquidity, but its denominator – the bond's price – may reflect both liquidity and credit. A natural test of whether this is an issue consists in replacing our indicator of liquidity with the absolute value of the closing quotations bracket (i.e. using the numerator only). Columns 3 and 4 show that this

substitution leaves earlier results unaffected.

One further potential problem is that some countries (those issuing a large number of bonds) are over-represented in our sample. This could bias results if those large issuers also display idiosyncratic risk behaviors, being for instance high credit risks (like Argentina) or low ones (like Canada). To see if this matters, we assemble a new sample which includes only one bond per country. (To make sure that this bond is representative, we construct synthetic representative bond by taking the average yield and closing quotation for each country at each point in time.) As seen in column 5 and 6, qualitative conclusions do not change, albeit with a somewhat lower statistical significance level (but still exceeding the 10% threshold).

A final potential problem with our liquidity indicator is that closing brackets tend to be highly auto-correlated, which may generate spurious estimates. Clustering standard errors by bond as we do throughout the paper should address that concern. Here we mitigate further concerns by re-estimating the benchmark model (2) for colonies separately for each year. Figure 5 plots the resulting liquidity (left panel) and credit (right panel) parameter estimates and confidence bands. Liquidity is significant for all years, which excludes the possibility that our results are spurious. Moreover, point estimates are remarkably stable over time. They are larger from 1880 to 1884 only. In contrast, the right panel confirms that credit is insignificant for the vast majority of years.

4.3 Panels, Portfolios and Investors

Our results thus far invariably point to the importance of liquidity in the pricing of colonial bonds. Yet, as stated in the introduction, the exact opposite has been argued by Alquist (2010, p. 227) who declares instead that “the implicit guarantee [enjoyed by colonial bonds] immunized colonial bond returns against fluctuations in market liquidity.” In this sub-section, we deconstruct the reasons for our divergence from Alquist, arguing that it all boils down to the question of the

segmentation of colonial and sovereign markets, which Alquist explicitly assumed away. To show this, we had to overcome a number of dataset, modeling and measurement differences. As the discussion raises a number of somewhat tedious and secondary points, we refer the reader to Appendix C. But the matter at hand is crucial and we therefore provide here a discussion of the intuitions involved.

In his approach, Alquist does not regress bond spreads on individual bonds characteristics (liquidity and credit) as we do here. Rather, he regresses bond returns against a set of so-called market factors reflecting aggregate (non-diversifiable) time-varying risks, among which market liquidity. Since his results show that colonial returns are not sensitive to changes in an indicator of market liquidity, Alquist concludes that liquidity was not a significant pricing factor for colonial bonds.

While Alquist's approach is methodologically valid, his definition and measurement of market liquidity is incorrect in our opinion. Alquist's indicator of market liquidity averages the individual indicator of liquidity which we have used above (the closing price for a given bond and country at date *t*) over all foreign and colonial bonds.[26] By aggregating both colonies and sovereigns, Alquist assumes that they belong to the same "market." The justification he gives is that all foreign bonds "were traded in a single, centralized market [the London Stock Exchange]". But we have seen that there are strong reasons to doubt such an assumption, because of historical evidence that these markets were operated by different intermediaries and involved different types of information asymmetries. We also documented in Figure 4 marked differences between the behavior of foreign debt and the colonial debt markets indicators. For instance, the sovereign indicator shoots up during periods of foreign debt crises while the colonial indicator stays put, whereas the opposite holds during the 1878 UK banking crisis. This suggests that the two market suffered different liquidity shocks, and that agents in each market

[26] In substance therefore, it is a mix of the two mean liquidity indicators shown in Figure 4.

should have rather responded to market-specific shocks rather than to average shocks across the two markets. In Appendix C therefore, we replicate Alquist's colonial regression with our data, using instead of his pooled sovereign-colonial indicator of liquidity an indicator of liquidity for the colonial market alone. The result is that colonial returns now do react to shocks in colonial market liquidity.

Revisiting Alquist's results provides important insights on the role of heterogeneous clienteles in the pricing of liquidity across the two markets. Specifically, we find that the less liquid colonial bonds are less sensitive to colonial market liquidity than the most liquid ones. In contrast, less liquid sovereigns react more strongly to sovereign market liquidity. How can we make sense of these contrasted results? The results for the sovereign bonds appear easy to explain away. For instance, Acharya and Pedersen (2005) argue that investors get rid of illiquid bonds when aggregate liquidity worsens. Hence, less liquid bonds react more strongly to the liquidity factor: This is the classic scramble for liquidity effect.

We argue that the outcome for colonial bonds may be rationalized in reference to clientele effects. As discussed in section 6, we suspect that colonial bonds are favored by a clientele of buy-and-hold investors, such as banks and ordinary retail investors (the "Widow"). The latter class should in particular favor the least liquid bonds because they offer a higher coupon. Obviously, the higher yield is a compensation for higher future transaction costs. But ordinary investors transact little, including during liquidity crises. Cashing in the illiquidity premium is thus particularly valuable to them. The opposite holds for bankers. Banks must liquidate their securities during liquidity crises, so they are happy to hold colonial bonds with a smaller yield but a greater liquidity. This logic explains why the logic Acharya and Pedersen is put on its head in the colonial market: in contrast to bankers, ordinary investors stay put during episodes of liquidity stress. Thus, the bonds they concentrate in (the least liquid colonial bonds) react less to liquidity shocks than the more liquid colonial bonds favored by bankers.

Overall, the heterogeneous sensitivity of colonial and sovereign bonds to liquidity shocks clearly points to the significance of the micro-structure of the markets in which the bonds were originated and distributed, and to self-selection effects within the set of British investors. We now address those two aspects in turn.

5 Market Micro-Structures, Institutional Arrangements, and the Credit Curse

We now investigate the channels behind the contrasted importance of liquidity and credit in colonial bond markets. Our hypothesis is that imperial subjection was both a blessing and a curse for colonial finance. The main effect of empire was to remove information asymmetries on colonial debt. If default was not an option, information on the fundamentals of colonies was not as relevant as it was for sovereigns. This reduced the pricing of colonies' credit risk (the "blessing"). Paradoxically however, this very absence of credit risk also affected colonial liquidity (the "curse"). This materialized via two main channels. First, the absence of asymmetric information deterred the aggressive traders (in particular, merchant banks) which dominated the sovereign bond market from engaging in active trading in colonial bonds. This impaired colonial liquidity. Second, the absence of asymmetries invited a clientele of investors looking for risk-free assets such as commercial banks, insurances or "ordinary" investors, discussed in section 6.

5. 1 Market Micro-structures: Risk, Empire and Liquidity

We claim that the ways in which market intermediaries handled information asymmetries cast a long shadow on the liquidity of foreign government debt. Different regimes of information asymmetries gave rise to different market micro-structures and these contributed to the results reported in previous sections. In particular empire affected the nature of colonial debts in subtler ways than implied by conventional views that empire simply "reduced risk."

Consider first foreign sovereign debts that were introduced primarily in London. This was typically done through underwriting banks and underwriting syndicates (Suzuki, 1994). Underwriting acted as a signal of credit worthiness. The reputation of the bankers substituted for the reputation of the borrowing government, and because they wanted to maintain the reputation of their securities, prestigious underwriters also stood ready to both sell and re-purchase these bonds from their clientele (Flandreau and Flores 2009). This per se promoted liquidity. At the other end of the spectrum, less credit-worthy borrowers were underwritten by less prestigious banks who did not offer liquidity services. But because such governments were serious credit risks, they invited a whole set of active traders, who specialized in volatile instruments. Mauro et al. (2002) have documented the existence of large potential trading gains from substantial volatility due to political and other news. This encouraged traders to invest in information acquisition (Flandreau, 2003). As a result, a considerable amount of information was collected and divulged, promoting liquidity (see Veldkamp (2006) for discussion of this mechanism in the modern context).

Just like the existence of substantial credit risks and asymmetries of information in the sovereign debt market prompted the emergence of an under-writing ecology with consequential effects on liquidity, the safer character of colonies, and the political and legal remedies that existed against colonial delinquents, invited a different set of intermediaries with consequences, there too on liquidity. Reflecting the more limited reputational risks involved with colonies, the Bank of England, while virtually absent from the sovereign debt market (except when it was issuing a foreign loan fully guaranteed by the British state) often acted as the banker for colonies (Sayers, 1976). Another striking difference between intermediaries involved in originating foreign sovereigns and those involved in colonial debt originations was the presence in the latter group of London Stock Exchange brokers. Evidence in Hall (1963, p. 75 ff.) and Attard (2013, pp. 105-7) attests of the early involvement of brokers (no later than the 1870s

according to Attard) in conjunction with the colonial agent for the loan issue (such as colonial banks). Unlike what happened with foreign government debt, brokers did not initially underwrite the issue, but instead pledged to do their best to find buyers. As described by Hall (1963, p. 101) lack of "formal" underwriting meant that shocks affecting the money market could temporary impair the distribution of colonial debt and lead to the failure of some issues, although in general the "unallotted balance was successfully reissued shortly afterwards." We conjecture that the critical element in the operation of primary markets for colonial debt was knowledge of the amount of "buy-and-hold" investment money available at any point in time, explaining the increasing participation of large commercial banks, with their clientele of middle class savers, which previous authors have emphasized.

Although a complete story of the underwriting of foreign government debt remains to be written, there is anecdotal evidence that the key problem in colonial issues was to handle liquidity risks, rather than credit risks. It is reported that brokers speculated in new issues, leveraging themselves and taking advantage of liquidity risks. This was not without dangers. Indeed, a few months after the Baring crisis, Westgarth & Co. failed and had to compromise with creditors, having found itself saddled with Victorian securities it apparently could not sell in the new market conditions. The *Sydney Morning Herald* (13 October 1890) stated that beyond Westgarth & Co. a total of nine brokers failed at that point. The paper speculated that the event would "undoubtedly have the effect of making syndicates more cautious in future. We do not apprehend, however, that syndicates will not be formed to take up our loans." This makes sense, since the basic principle on which colonial debt rested made sense provided there would be someone willing to shoulder the liquidity risks.

In this situation of chronic colonial illiquidity, lies the origin of what we suggest to call the "credit curse" of colonies, referring to the phenomenon whereby credit worthy colonies faced higher yield premia, other things being equal, on account of their illiquidity. Indeed, while "good"

sovereign issues were sponsored by prestigious underwriters who stood willing to trade in “their” securities, and “poor” sovereign issues benefited from substantial volatility that invited speculators and led to disclosure of information, the more serious, but dull colonies were paradoxically penalized by their good but unexciting position. They were sponsored by agents with less financial means who were eager to sell them as soon as they could to the buy-and-hold clientele. Colonial debts went from the books of the sponsoring commercial bank and/or broker-underwriter to the pocket of the English “widow.” Once there, they were unlikely to be quickly resold and this did nothing to promote liquidity. In other words, we suggest that the features observed in previous sections can be accounted for by emphasizing the microeconomic consequences of the difficult enforcement of sovereign debts and the safer character of colonial securities. This was most paradoxical, because everything happened as if the smaller colonial credit risks “caused” their more substantial liquidity risks.

5.2 Evidence from Cross-listing

The different nature of credit risk in colonial and sovereign debt markets and its effect on these markets’ respective micro-structures may go some way towards explaining why only liquidity mattered for colonial bonds, and why it mattered more for colonies than for sovereigns. However it must also explain the observed insensitivity of foreign government debt to measures of liquidity (Table 3). After all, a holder of sovereign bonds should have faced both credit and liquidity risk, and thus have required compensation for both.

One hypothesis is that foreign debt traded in London really comprised two sub-sets. For some borrowers, the market was predominantly located in London but for others, the bulk of holdings and trading was located on the Continent or in the issuing country. In such cases, it might have been that liquidity in London was a less significant factor in explaining (internationally priced) yields. In other words, owing to relatively cheap arbitrage between

London and the home market, London prices were set by arbitrage with foreign prices, regardless of London illiquidity. If they could not buy or sell a given security in London, sophisticated London traders could buy or sell it abroad. Table 6 lends some support to this view. In column 1, we run the same sovereigns-only regression shown in column 1 of table 3, showing that liquidity is insignificant. In column 2, we do the same, but this time excluding the countries for which the "home" market was known to be located abroad: the Netherlands (Amsterdam), Portugal (Paris and Lisbon), Spain (Paris and Madrid), and Russia (Paris and Saint-Petersburg). As can be seen, illiquidity now shows some significance (at the 10% threshold). This may imply a different interpretation of the apparent insensitivity of sovereign yield spreads to measures of liquidity: it is not that the London market for foreign sovereigns did not care about illiquidity, but rather that, for some sovereigns, a London-based measure of liquidity is not informative of true "global" liquidity. This is an important caveat for future research.[27]

6 Of Bankers and Widows: Colonial Bonds and their Clienteles

Here, we argue that the uniqueness of colonial debt was not only reflected in its market micro-structure as seen in the previous section, but also in the type of clientele it attracted. Given that colonial bonds were devoid of asymmetric information, they were sought after by investors in need of risk-free stores of value, be it because of the nature of their business (such as banks) or because of limited information and/or legal constraints and norms of prudent investment (as was the case for "ordinary" investors). The consequence was a tendency for

[27] One referee encouraged us to reflect on how cross-listing might also affect the informational content of our liquidity measures for colonies too. First, it is well-known that foreign stock exchanges never played a significant role for British colonial debt. Second, Thomas (1973) does not emphasize the role of provincial exchanges either. Our own investigation of price lists suggests that some colonial bonds were traded in regional exchanges such as Manchester and Glasgow. These markets would typically quote the most liquid colonial bonds only, by one count a quarter only of the population of colonial bonds in London (the share of colonial bonds in London that are found in the *Official list* in Glasgow was 22.7% in 1875 and 26.5% in 1905). It is our impression that London had a virtual monopoly over colonial debt, making the closing quotations in this market a good measure of their liquidity.

colonial bondholders to be long-term investors rather than active speculators, thus impairing colonial liquidity. This is another manifestation of our hypothesis that the "blessing" of empire for colonial credit risk was offset by the "curse" for colonial liquidity.

6.1 The Bankers

Several scholars have emphasized that, in the late 19th century, colonial bonds featured prominently in British banks' rapidly growing investment portfolios (Goodhart, 1972; Cassis, 2002; Collins and Baker, 2003). For instance, about 35% of the Metropolitan Bank of England and Wales' investment portfolio consisted of colonial bonds in 1889 (Goodhart, 1972, p. 469-78). Likewise, 21% of London and Midland Bank's head office investment portfolio consisted in colonial bonds in 1890 (Goodhart, 1972, p. 483-90). Importantly, Goodhart (1972, p. 132) adds that there was "little switching between [these] stocks. [...] The large London banks at this time were long-term holders of the very best grade securities." Banks would thus hardly trade their bonds, which is consistent with our hypothesis that colonial bonds suffered from a lack of liquidity. In cases of turbulences however – such as a run on their deposits – banks would need to liquidate their holdings. As noted earlier, Goodhart explains that, despite being growing consumers of colonial bonds for reserve purposes, banks had few illusions about the "marketability" of these investments in turbulent times.

This tension between the safety of colonial bonds and their lack of "marketability" is consistent with our finding that liquidity was a key pricing argument in colonial bonds. If banks liked colonials for their safety, they worried about their liquidity. This must have generated a strong discrimination within the class of colonials in terms of liquidity. The consequence as we found, was that liquidity was priced.

6.2 The Widows

The late Victorian era not only saw a formidable surge in bank balance sheets, but also in private wealth (Feinstein and Pollard, 1988). The ability to identify suitable stores of value thus became increasingly important and the concern was reflected by a growing number of manuals and publications addressing the concerns of the layman investor. A common conclusion across manuals was that colonial bonds were fit for the prudent investor. Cotton (1898, p. 56-7) claimed that British colonial loans "have always been a favorite mode of investing money," and that "experience has shown that, so far, the investment has been a safe one" despite occasional and temporary price fluctuations. Duguid (1905, p. 52) notes that "colonial [bonds] are almost without exception solid investment."

The potential for colonial bonds to cater to the needs of an expanding population of "ordinary" Victorian investors did not go unnoticed to experts, financiers and colonial leaders. As they reasoned, increased demand for colonial bonds would raise their price, reducing colonies' interest expenses. In addition, unlike banks, "widows" would worry less about liquidating bonds in times of liquidity crises. Ensuring a steady increase of the share of "pensioners" within colonial bond purchasers would thus lower the premium paid by colonies to compensate investors for liquidity risk. For this to happen however, legal hurdles had to be overcome. One key signal to convince prudent investors to purchase colonial bonds was whether the said investments were eligible as so-called Trustees or trust fund investment. Intermediaries thus set their mind to devising ingenious institutional or legal solutions that would encourage savers to hold colonial securities. The result was two celebrated pieces of legislation, known as the Colonial Stock Acts of 1877 and 1900.[28]

6.2.1 Bonds for Widows: The Colonial Stock Acts of 1877 and 1900

[28] Unsurprisingly our friend Westgarth turned out to be associated with the lobbying in favor of the first Act, and he later supported energetically "the concession of the high privilege of being included in the list for legal trust investment" which was to be the substance of the second one. According to Westgarth, the objective was for colonial debts to be able to tap the resources of "the poorer clergy and curates, the widows and orphans." Westgarth (1889a, p. 248 and 251-2). On the role of Westgarth in the promotion of the Act of 1877 see Dalziel (1975, p. 57).

The Colonial Stock Act of 1877 was promoted by New Zealand's former Premier Julius Vogel, then agent-general for New Zealand in London. This Act sought to give a boost to the popularity of colonial bonds by allowing colonies to issue so-called "inscribed stocks." Inscribed stocks had their ownership registered at the Bank of England or at a major bank (known as the "registrar"), thus protecting the owner of the bond against loss or fraud. In contrast, bonds to bearer – the most common type of bonds until then – were more easily bought and sold, making them a favorite of speculators or bankers (Duguid, 1905). This very convenience represented a significant risk for the prudent buy-and-hold investor and for reasons of liability, trustees typically preferred inscribed stocks. The permission given to colonies to issue inscribed bonds had therefore the potential to enable colonial borrowers to fully avail themselves of the clientele of ordinary investors.

But for the many imperial hopefuls such as Baden-Powell (1889), inscription was not enough. They felt that the ultimate prize consisted in securing the much-coveted status of Trustee investment – the inclusion in the Trustee list. The effect of including colonial bonds in the Trustee list would have been for trustees (but also for institutional investors constrained by norms of prudence such as insurance companies) to invest in colonial bonds without incurring personal liability and without the trust deed having foreseen formal authorization. Thus, inclusion in the Trustee list would increase the demand for colonial bonds, reducing colonies' borrowing costs and the plan was supported in the colonies and in the London Stock Exchange.

In fact, the conferring of Trustee status to colonial bonds had been considered during the debates that led to the first Colonial Stock Act of 1877 but eventually cast aside (Baster, 1933, p. 602). It was submitted again to Parliamentary approval as part of a wide-reaching reform of trustee norms in 1888. The proposal was again rejected on the grounds that it constituted a subsidy in favor of the colonies. There had been governmental concerns that this would create

moral hazard.[29] It took an additional decade and, according to Jessop (1976), the activism of Chamberlain and the special circumstances of the late 1890s for the government to change its attitude. The Colonial Stock Act of 1900 was adopted in a context of imperial enthusiasm conjured up by the Jubilee celebrations in 1897 as the Boer War in South Africa saw the colonies "standing by" the mother country. It had become increasingly difficult politically to ignore the renewed requests by self-governing colonies (in particular, Canada) to see their bonds included in the Trustee list.

The Act of 1900 thus satisfied the demands of colonial governments but, in return, required reductions in colonial legislative sovereignty in financial matters. These were intended to address the problem of moral hazard. One condition for Trustee status was that the colony would show that funds for payment of the coupon and amortization had been provided for. Another was that the colony should place on record "a formal expression of their opinion, that any Colonial legislation which appears to the Imperial Government to alter any of the provisions affecting the stock to the injury of the stockholder, or to involve a departure from the original contract in regard to the stock, would properly be disallowed".[30] Colonial financial legislation thus received a junior status vis-a-vis courts in Britain where bondholders could secure remedies.

Although generally amicable to the notion that the Act of 1900 was a milestone, previous appraisal has struggled with finding hard evidence of a substantial effect of the Act. An early assessment was provided by William Stevens Fielding, Canadian finance minister of the time. He claimed the Act might increase the price of colonial securities by 2 or 3 percent (a reduction of yields between 7 and 10 basis points).[31] Using bond price data and a primitive form of

[29] See Westgarth (1889a). Another less discussed Colonial Stock Act was also adopted in 1892, aimed at facilitating the transfer by deed of securities registered under the previous Act (Baster, 1933, p. 602). We abstract from it here as it seems to have merely made legal a common practice.
[30] Quoted from Baster (1933, p. 603). See also Accominotti et al. (2010) for a discussion emphasizing the role of "legal juniority" in the Colonial Stock Acts.
[31] We take here the same assumptions as in Westgarth's counterfactual discussed in the introduction, namely the

structural break analysis, Baster (1933) argued that the yield reduction had been of 12 to 37 basis points at most and closer to the lower bracket. He concluded that he was skeptical that the Act of 1900 had brought a "real saving." Davis and Huttenback (1986) compared average spreads before and after the Act and concluded that they were actually larger after 1900, suggesting that the effect of the Act was nil at best (but they do not control for other factors).

6.3 Empirical Results

6.3.1 Method

Our workhorse model provides again a most convenient instrument to revisit the impact of the Colonial Stock Acts of 1877 and 1900. Previous studies have simply compared bond prices before and after the adoption of the Acts. This obscures the fact that the Acts did not apply uniformly to all colonial securities. We construct instead a set of dummy variables that take value 1 when a given bond *i* is covered by one of the Acts. Specifically, $Inscribed_{i,c,t}$ is 1 if *i* is an inscribed bond as per the Act of 1877, and $Trustee_{i,c,t}$ is 1 if *i* belongs in the Trustee list by virtue of the Act of 1900.[32] Moreover, while previous writers assumed that the Acts were meant to bring about a transformation in colonial credit prospects, we consider instead the possibility that they brought about a transformation in clientele. Specifically, our analysis does recognize that, consistently with the discussion above, the effect of the Acts for bond pricing could have been twofold. First, it could have increased demand for those bonds falling within the remit of the Acts, while leaving the effects of credit and liquidity on the pricing of bonds unchanged. Second, it could have attracted a clientele with different preferences, resulting in a different

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case of a perpetual 3 percent bond. The bond was assumed to be trading at 90 before the reform, and 92 or 93 after. See House of Commons Debates, 8th Parliament, 5th Session: Vol. 1, pp. 2602-4. Fielding's speech took place on 23 March 1900. The estimate was constructed in order to show that the saving from the Act would offset the expenditure "for the sending of the Canadian soldiers to South Africa".

[32] We collected information as to the Inscribed status from the bond denominations in the *Official List*. Trustee status was granted in a piece-meal fashion following an examination of the colonies' finances by Treasury officials, starting with Canada in 1900 and ending with West African colonies in 1902. We collect dates of Treasury approvals from Ellissen (1904).

sensitivity of the concerned bonds to both liquidity and credit. We thus add $\text{Inscribed}_{i,c,t}$ and $\text{Trustee}_{i,c,t}$ to the previous model as dummy variables (to test the first hypothesis) and as interaction terms with $\text{Illiquidity}_{i,c,t}$ and $\text{Credit}_{c,t}$ (to test the second hypothesis).[33]

6.3.2 The Act of 1877

In Table 7 we provide the result of a set of regressions, starting with the Act of 1877 (columns 1 and 2). Column 1 probes whether inscription increased demand while leaving investors' tolerance to illiquidity and credit risk unchanged. Thus, we allow for inscribed stocks to have a different risk-adjusted yield spread (intercept), but not a different sensitivity to liquidity and credit. Results suggest that issuing inscribed stocks secured a significant interest reduction (a "bonus") of 46.5 basis points on average. This is substantial, given that average colonial spread was 1.5 per cent (150 basis points) in 1885, the year inscribed stocks started to become popular for new issues (Figure 6).

In column 2, we additionally allow inscribed stocks to have different sensitivity to credit and liquidity by introducing interaction terms. If, as envisioned by supporters of the Act, inscribed stocks attracted a new buy-and-hold clientele, then the Act should make yields less sensitive to illiquidity. Results support this. They show that stock inscription almost halved the pricing of liquidity (the sensitivity of inscribed colonial stocks to illiquidity is 7.4 (=13.6-6.2), against 13.6 for non-inscribed colonial stocks). This is consistent with the hypothesis that inscription worked by attracting long-term, patient investors. The table further shows that inscribing a bond also results in reduced sensitivity to credit risk, but the effect is not statistically significant. Overall, this suggests that, while the Act of 1877 has been previously discussed as a signal on the existence of an implicit metropolitan credit guarantee, the main effect of inscription

[33] To better isolate the reforms' impact from confounding changes impacting all bonds, these regressions additionally include time fixed effects. Since the passing of the 1877 Act predates the start of the sample, identification of the corresponding regression parameter mainly exploits the cross-sectional dimension of the panel in theory. In practice however, colonies did not regularly issue inscribed stock until the mid-1880s (see figure 8), which means that the time dimension is effectively exploited as well.

operated through enhanced insensitivity to illiquidity.[34] This is consistent with our view that the Act brought about a transformation in clientele rather than a transformation in colonial credit prospects. This suggests that the technical innovation of inscription was important, aside and beyond yet-to-come institutional innovations pertaining to colonial control.

6.3.3 The Act of 1900

We perform a similar analysis for the Act of 1900. Column 3 in table 7 suggests that inclusion in the Trustee list following the Act of 1900 resulted in a risk-adjusted (intercept) yield spread lower by 22.3 basis points. In column 4, as we allow Trustee investment status to have an effect on liquidity and risk sensitivity (via interaction terms), the significance of the intercept vanishes. Again, as we found for inscription, the results suggest that the main effect of Trustee investment status was a lower sensitivity of spreads to liquidity. But this result is obtained only if we omit to control for inscription. If this is done (column 5), the effect of inclusion in the Trustee list becomes statistically insignificant.

In summary, we report significant effects for the Act of 1877 but not for the Act of 1900. While our results for 1900 are not inconsistent with the conventional view that the Act had a limited impact, we argue that they also explain why contemporaries placed so much faith in such legal innovations: In fact, the "disappointing" outcome of the Act of 1900 stems from the fact that its effects had been already secured by the process of inscription. Indeed, before we control for inscription, we find a significant effect of the Act. In other words, the conclusion is that the behavior of investors anticipated on the Act of 1900.[35] A possible

[34] The possibility for colonies to issue inscribe bonds ("stocks") under the Act of 1877 brought a notable, albeit ambiguous, amelioration to the ambivalent riskiness of colonial bonds. This is because inscription with a British registrar – the London-based intermediary responsible to inscribe bond property on its books and process coupon payments – rendered the colony's agent "liable" and suable before English courts. This is at least the interpretation favoured by colonial enthusiasts like (Baden-Powell, 1889, p. 329). British officials did not seem to fully share this view, as shown e.g. by Chancellor Goschen's arguments against the inclusion of colonial bonds as trustee investments as part of the 1888 reform debates in Parliament.

[35] See also Attard (2015) for a relevant discussion. Ten years before the adoption of the Act of 1900 Westgarth, conjectured that Trust funds had already come to represent a "large and increasing" share of colonial bondholders

interpretation is provided by legal historian Chantal Stebbings (2002, p. 145-6). Trustee status operated principally as a default clause in case the deed had imposed no instruction. In such cases, Trustees had to abide by rules of prudence, which required them to follow the Trustee list. But it was possible for deeds to allow for investment in colonial bonds despite the absence of a formal Trustee investment status. As Stebbings explains, such provisions became increasingly popular in the context of the late 19th century capital export boom.[36] Our evidence suggests that inscription was the signal that set the process in motion. According to this interpretation, colonial markets had largely anticipated the Act of 1900. This final conclusion underscores the importance in interpreting bond price and bond yields, of looking carefully at market structures and clienteles, as we have done in this paper.

7 Conclusion

This paper has explored the role of liquidity in late 19th century government bond markets. We have found that illiquidity premia represented a substantial share of colonial spreads (between a quarter and a half). According to our computations, the economic costs of colonial illiquidity represented an average 4.5% of colonial government revenues. We argued that the magnitude of these costs explains the recurring concerns raised by contemporaries and why colonial illiquidity attracted the attention of leading policy makers such as Joseph Chamberlain. We have put the concern to promote colonial liquidity at the heart of several famous reform proposals of the late 19th century, such as the Colonial Stock Acts of 1877 and 1900 and measured the effects of these Acts. This conclusion that liquidity

(Westgarth, 1889a, p. 248).

[36] See also Burn (1899, p. 497) for a similar view from the vantage point of a contemporaneous actuary. Quoting an investment manual for trustees (Denny Urlin's *Handy Book on the Investment of Trust Funds*), he details that Canadian and Australian bonds were among the deeds' favorite choices. Moreover, we note that Scottish trustees had already been granted the permission to invest in colonial inscribed stock with the passage of the 1884 Scots Trusts Act and this was followed by an expansion of colonial investment trusts often sponsored by Scottish investors. Many of the investment trusts that were started in the mid-1880s were incorporated in Scotland but listed in the London Stock Exchange.

was important both in policy and in practice is opposite to Alquist (2010) who has argued that colonial subjection rendered colonial bonds immune to liquidity problems. We found they were not. We have shown that the difference between the two sets of results arises from taking in account the segmentation that existed between colonial and sovereign debt markets.

A striking contrast between colonial and sovereign debt markets which our study brought to the fore is that liquidity mattered less for sovereigns than it did for colonial bonds. This provides a kind of mirror image for the (already established) finding that credit risk mattered much more for sovereign than colonial borrowers. We argue that these results had to do with the different nature of sovereign and colonial debts. Empire cast a long shadow on the severity of information asymmetries in the two markets, which can be read in their respective micro-structure and clienteles. Imperial control - or anticipations thereof - limited colonial bond price gyrations. The resulting stability deterred more prestigious underwriters and active investors from participating in the colonial market. The result was to make the colonial market a very dull one. This dullness - along with legal reforms - allowed colonial bonds to attract a clientele of ”buy-and-hold” investors such as joint-stock banks or ”ordinary” investors. The consequence was illiquidity. In return, colonies incurred substantial payments to London investors in the form of liquidity premia. The growing importance of the ”ordinary” clientele had a second-round effect that somewhat reduced the cost for colonies by raising demand for colonial bonds. However, this second-round effect was never strong enough to eliminate liquidity premia altogether.

From the vantage point of the historical literature on bond spreads, a major contribution of this paper is to demonstrate the advantage of integrating a better understanding of the operation of the foreign debt markets into the study of the pricing of government bonds. In other words, we need to combine micro- and macro-economic insight.

This is an obvious point for followers of the sub-prime crisis, but a more novel one in historical bond spread analysis. In particular, a contribution of our analysis is to encourage future researchers to integrate carefully the operation of markets into more traditional bond spread regressions. In the instance, we argued that imperial control, far from simply removing the default risk of colonies, actually encouraged the emergence a specific market set- up. We showed that this set up had consequences on market liquidity.

At the end of the day, what our study calls for is a revisiting - or at least an update - of some older ideas on the effects of empire for colonies and British investors. Following Davis and Huttenback (1986), it has become common to interpret empire as a system of subjection whose main effect was to reduce the cost of colonial borrowing at the expense of the British taxpayer. In effect, the argument goes, colonies enjoyed a credit guarantee for which they paid no premium. This paper nuances this view: our findings confirm that empire lowered colonial credit risk, but it also suggests that this very safety proved to be a mixed blessing for colonial liquidity. While more research is needed to evaluate which of these effects weighed more in each colonial budget, our findings suggest that the impact of empire for British investors also was definitely subtler than commonly thought. While the absence of colonial credit risk prevented speculators and merchant banks alike from doing profitable business from colonial debt, it allowed banks and ”widows” in search of safe assets to expand their investment frontier while securing a return they would never have received from British Consols.

This explains why seemingly dry pieces of legislation like the two Colonial Stock Acts summoned passions, why many contemporaries became obsessive about colonial illiquidity and why their reform plans met resistance. Indeed, while the likes of Westgarth and Chamberlain thought that colonial illiquidity could be addressed through institutional reform, they encountered the hostility of the British Treasury who felt that with no credit or liquidity

risk left, there would be very little mechanism to stand in the way of a colonial borrowing binge. Could it be that the threat of an overseas, high-liquidity- low-return competitor to the hitherto almighty British Consol was in the mind of the British Treasury when it objected to Chamberlain's proposals? The conclusion to all this may be that liquidity is always and everywhere a political phenomenon. This will come as no surprise to economists familiar with the recent European debt crisis.

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FIGURES AND TABLES

In this table the five columns A to E represent as follows:—

A. The price a 3-per-cent. would bring to each colony if issued quite separately and unconnectedly, as the colonies hitherto have issued their loans.

B. The price if they agreed in issuing a stock uniform in all respects, except that each colony was responsible only for its own issue.

C. The price if a financial federation could be achieved, so as to make but one and the same stock.

D. The price if the federation were politically complete.

E. The price to which the D stock might be expected to rise after some interval—say two to three years from the first issue—to accustom investors to the stock, and secure their adequate confidence.

Faithfully yours,

Hon. Sir H. A. Atkinson. W. WESTGARTH.

—	A.	B.	C.	D.	E.
New South Wales	90	92	94	96	100
Victoria	90	92			
South Australia	87	90			
Queensland	87	90			
Tasmania	85	88½			
New Zealand	80	85			

Figure 1: **Westgarth's table of Colonial 3% bond prices under alternative counterfactuals** (price in pound sterling for a £100 nominal bond). Source: Westgarth (1889c); A: Price if individual 3 per cent are issued. B: Price if 3 per cent issued are standardized (maturity etc.); C: Price if financial federation achieved (issue of a "Euro-bond"); D: Price if financial federation bolstered by political federation; E: Price after markets have understood the significance of the changeover.

Authorized Issue.	DIVIDENDS DUE.	₩ Ct.	NAME.	CLOSING QUOTATIONS.	BUSINESS DONE.
1135800*l.*	1 Jan. & 1 July	5	New South Wales, 1876	101 —102	
5031500*l.*	" "	5	Do. do. 1888 to 1902	105 —106	
550,000*l.*	" "	5	Do. red. by ann. draws. from 1867 to 1875	100½—101½	
1000000*l.*	" "	5	Do. 2 pr. ct. ann. draws. from 1872 to 1898	102½—103½	
93,100*l.*	" "	6	New Zealand, 1891	109 —111	
493,500*l.*	15 Jan. & 15 July	5	Do.	102 —103	
5609000*l.*	15 Jan. April July Oct.	5	Do. Consolidated	103 —104	103½
204,000*l.*	15 Mar. & 15 Sept.	6	Do. 1891	112 —114	
332,000*l.*	15 June & 15 Dec.	6	Do. 1891	110 —112	
31,600*l.*	15 April & 15 Oct.	6	Do. Province of Auckland, 1st and 2nd series, 1896	.. — ..	
250,000*l.*	1 Jan. & 1 July	6	Nova Scotia, 1875	101½—102½	
225,000*l.*	" "	6	Do. 1886	108 —110	
1850200*l.*	" "	6	Queensland, 1882–5	110 —111	
1608050*l.*	" "	6	Do. 1891–6	113 —114	
309,800*l.*	" "	6	South Australian, 1872–1880	.. — ..	
299,500*l.*	" "	6	Do. 1881–1890	107 —110	
410,200*l.*	" "	6	Do. 1891–1900	113 —116	
778,500*l.*	" "	6	Do. 1901–1918	116 —118	
140,000*l.*	" "	5	Do. 1915–1920	105 —106	105½
102,500*l.*	" "	6	Tasmanian, 1895	111 —112	
552,800*l.*	" "	6	Do. redeemable 1893 to 1901	111 —112	
333,000*l.*	" "	6	Victoria	.. — ..	
850,000*l.*	" "	6	Do. 1891	116 —118	
7000000*l.*	1 April & 1 Oct.	6	Do. 1883–5	115 —116	115
2107000*l.*	1 Jan. & 1 July	5	Do. 1894	107 —108	107½

Figure 2: **Example of Bond Quotation in the Official List** (31 January 1873)

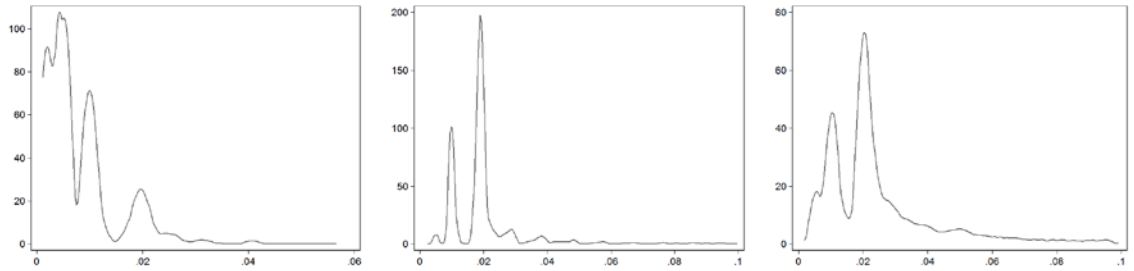

Figure 3: **Distribution of liquidity indicator**s (ratio of closing quotation spread to bond price): British (left), colonial (center) and sovereign (right) bonds. Density is cut at .1 in the center and right panels for better visualization. Source: authors' database based on the *Official List*.

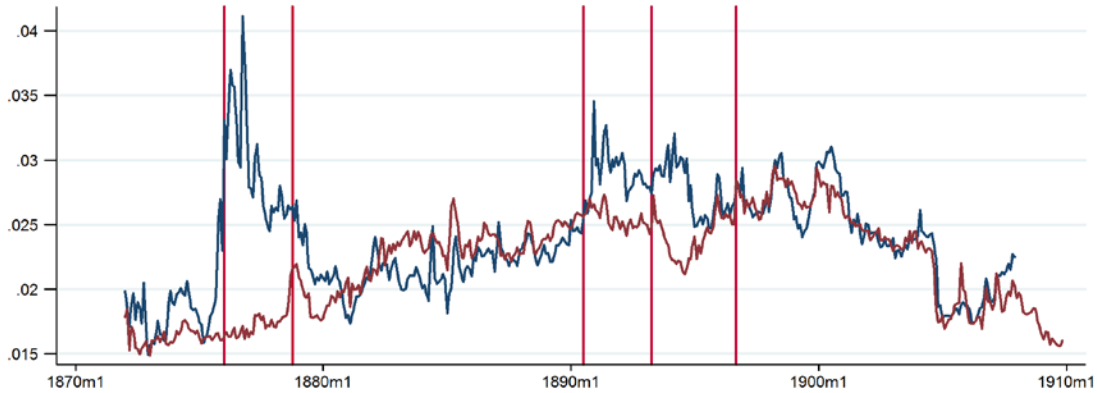

Figure 4: **Mean liquidity indicator** (ratio of closing quotation spread to bond price): all bonds (blue line) and colonial bonds (red line). Vertical lines indicate the Egyptian default (1876m1), the 1878 banking crisis (1878:10), the Baring crisis (1890:7), the Australian banking crisis (1893:3) and the 1896 panic (1896m7). Source: authors' database based on the *Official List*.

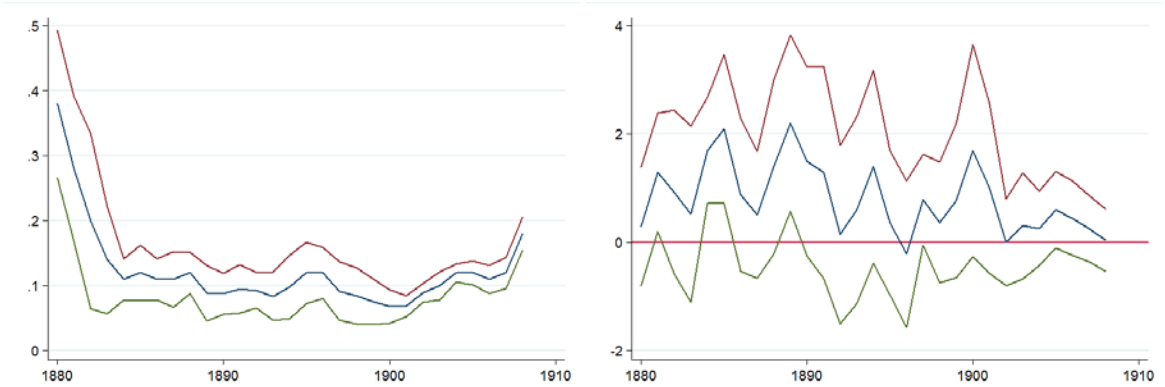

Figure 5: **Effect of illiquidity (left) and credit risk (right) on colonial bond yield**. These figures show the parameter estimates obtained from a cross-sectional OLS regression of colonial bond yield spreads against the benchmark illiquidity and credit indicators, ran separately for each year. Left and right panels show the parameter estimates (blue line) and confidence bands (red and green lines) for the illiquidity and credit indicator, respectively. Source: Authors' calculations.

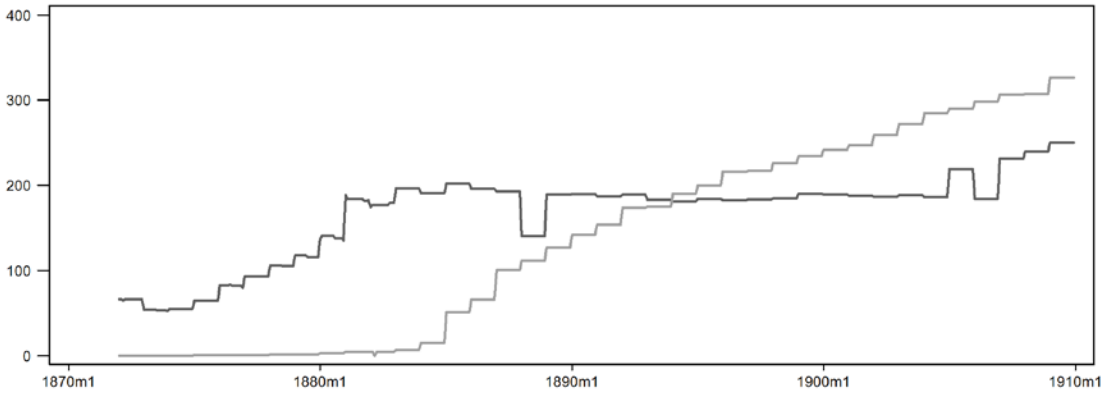

Figure 6: **Volume of issued colonial bonds**, by year (£Mio.): Bonds to bearer (black line) vs. inscribed stocks (gray line). Source: authors' database as collected from the *Official List*.

Table 1: BOND CHARACTERISTICS, BY BID-ASK SORTED PORTFOLIOS

	Yield	Bid-Ask	Volume	% Non-Zero	% Business Done	Age
Colonial Bonds						
Illiquid	1.71	5.63	3.02	0.38	0.20	20.52
2	1.29	2.00	2.70	0.47	0.25	14.00
3	1.28	1.91	3.35	0.46	0.26	15.23
4	1.13	1.65	4.10	0.54	0.37	12.76
Liquid	1.02	1.37	5.52	0.61	0.46	11.79
Illiq-Liq	0.69	4.26	-2.50	-0.23	-0.26	8.73
Sovereign Bonds						
Illiquid	2.67	2.65	6.30	0.65	0.19	17.92
7	2.90	2.03	5.40	0.71	0.27	17.61
8	1.99	1.80	9.62	0.63	0.26	16.35
9	2.40	1.37	10.94	0.75	0.44	12.81
Liquid	2.31	0.92	47.54	0.87	0.65	11.91
Illiq-Liq	0.36	1.73	-41.25	-0.22	-0.46	6.01

Notes: This table shows mean characteristics of colonial (above panel) and sovereign bonds (below panel). Characteristics are averaged in five portfolios assembled at the beginning of each year depending on a bond's bid-ask spread. *Liquid* and *Illiquid* are the portfolios with lowest and highest bid-ask spread, respectively. *Illiq−Liq* corresponds to the difference between these two portfolios. Yield is the coupon-price ratio, in percentage. *Bid-Ask* is the difference between high and low closing prices. *Volume* is the bond's initial issue size, in pounds. *Non-Zero* is one if the bond price changed between t and t + 1, and zero otherwise. *Done* is one if the "business done" column shows trading activity, and zero otherwise. *Age* is the time elapsed since bond issue, in years. Source: Authors' calculations based on the *Official List* and Burdett's (various issues).

Table 2: CORRELATIONS BETWEEN EXPLANATORY VARIABLES

	Bid-Ask	Volume	% Non-Zero	% Done	Age
Colonial Bonds					
Bid-Ask	1				
Volume	-0.1528	1			
% Non-Zero	0.1639	-0.2094	1		
% Done	-0.1627	0.5186	-0.1878	1	
Age	0.4301	-0.2021	0.1897	-0.2085	1
Sovereign Bonds					
Bid-Ask	1				
Volume	-0.3136	1			
% Non-Zero	0.0982	-0.1651	1		
% Done	-0.2432	0.2855	-0.1712	1	
Age	0.1126	-0.0038	0.096	-0.1664	1

Notes: This table shows pairwise correlations between characteristics of colonial (top panel) and sovereign bonds (bottom panel). *Bid−Ask* is the difference between high and low closing prices. *Volume* is the bond's initial issue size, in pounds. *Non-Zero* is one if the bond price changed between t and t-1, and zero otherwise. *Done* is one if the "business done" column indicates some trading activity, and zero otherwise. *Age* is the time elapsed since bond issue, in years. Sources: Authors' calculations based on the *Official List* and Burdett's (various issues).

Table 3: YIELD SPREADS, LIQUIDITY & CREDIT: PANEL EVIDENCE

	(1)	(2)	(3)	(4)	(5)	(6)
Sample:	Colonies	Sovereigns	Colonies	Sovereigns	Pooled	Pooled
Dep. Variable:	Yield	Yield	Yield	Yield	Yield	Yield
Illiquidity	12.71***	11.70	12.04***	5.776	11.70	17.91**
	(1.659)	(7.357)	(1.756)	(11.681)	(7.330)	(8.687)
Credit Risk	0.288	4.037***			4.037***	3.427**
	(0.332)	(1.058)			(1.054)	(1.327)
Volume						-0.000789
						(0.090)
Age						0.000485
						(0.005)
Colony					-1.017***	1.205
					(0.319)	(1.425)
Colony × Illiquidity					1.012	-9.156
					(7.516)	(8.811)
Colony × Credit Risk					-3.749***	-2.933**
					(1.105)	(1.365)
Colony × Volume						-0.177*
						(0.094)
Colony × Age						0.0143**
						(0.006)
Issuer FE	Yes	Yes	No	No	Yes	Yes
N	2504	1388	2504	1388	3892	3426
R^2	0.356	0.516	0.216	0.00191	0.573	0.613
Illiquidity if Colony					12.71***	8.750***
					(1.658)	(1.470)
Credit Risk if Colony					0.288	0.494
					(0.332)	(0.317)
Volume if Colony						-0.178***
						(0.027)
Age if Colony						0.0148***
						(0.003)

Notes: This table shows results of an OLS regression of bond yield spreads against different sets of explanatory variables and using different samples for the 1880-1909 period (yearly frequency). Columns 1 and 3 use colonial bonds only. Columns 2 and 4 use sovereign bonds only. Columns 5 and 6 use the entire sample. Yields are measured as coupon-price ratio in excess of the yield on the benchmark British Consol. *Illiquidity* is measured by the relative bid-ask spread. *Credit Risk* is measured by the debt service-to-revenues ratio. *Volume* is the bond's initial issue size, in pounds. *Age* is the time elapsed since bond issue, in log years. All regressions feature bond-level clustered standard errors. ***, ** and * indicate significance to the 1, 5 and 10 % level, respectively. *Illiquidity if Colony* and the respective standard errors add the *Liquidity* and *Illiquidity x Colony* parameter estimates and test the hypothesis that the sum is zero. *Credit Risk if Colony*, *Volume if Colony* and *Age if Colony* are defined analogously.

Table 4: ECONOMIC IMPORTANCE OF COLONIAL LIQUIDITY PREMIA

		Liquidity premium expressed as:		
	Yield Spread (perc. points)	Basis points	% of yield spread	% of yearly government revenue
	(1)	(2)	(3)	(4)
Canada	1	.22	22	5.6
Cape	1.3	.19	15	3.7
Ceylon	1.1	.21	18	2.3
Egypt	1.4	-.055	-3.9	-1.5
Jamaica	1.1	.2	19	2.7
Mauritius	1.3	.25	19	2.0
Natal	1.3	.19	15	2.9
New South Wales	1.2	.28	23	5.3
New Zealand	1.7	.18	1	3.6
Natal	1.3	.19	15	2.9
Queensland	1.2	.24	2	6.5
South Australia	1.4	.55	39	13.1
Tasmania	1.5	.37	25	8.7
Victoria	1.2	.19	15	3.6
Western Australia	.94	.18	19	3.4
Average (w/o Egypt)	1.25	.25	196	4.9
Average	1.26	.23	18	4.4

Notes: This table shows the mean colonial bond yield (coupon-price ratio, column 1) and estimates of liquidity premia for colonies (columns 3 to 5). Premia are calculated by multiplying the parameter estimates from an OLS regression of colonial yield spreads on an indicator of illiquidity (ratio of closing quotation spread to bond price) for the 1880-1909 period (yearly frequency) with each colony's mean liquidity indicator during the same period. In column 3, the premium is expressed in basis points. In column 4, the premium is expressed as percentage of the mean yield (column 1). In column 4, the premium is expressed as percentage of government revenue (as collected from Flandreau and Zumer (2004). Specifically, we multiply the ratio of interest service expenses to total government expenses with the ratio of liquidity premium to total yield (column 4).

Table 5: YIELD SPREADS, LIQUIDITY & CREDIT: ROBUSTNESS CHECKS

	Issuer-Year Fixed Effect		**Absolute Bid-Ask Spread**		**Issuer-level Regression**	
Sample:	Colonies	Sovereigns	Colonies	Sovereigns	Colonies	All
Dependent variable:	Yield (1)	Yield (2)	Yield (3)	Yield (4)	Yield (5)	Yield (6)
Illiquidity	4.104*** (0.938)	10.70 (12.287)	0.0773*** (0.014)	-0.0695 (0.111)	13.84* (6.977)	14.02 (13.096)
Credit Risk			0.532* (0.312)	2.354** (1.174)	1.425 (0.999)	3.565* (1.768)
Volume	-0.0929*** (0.019)	0.0016 (0.099)	-0.177*** (0.027)	-0.157 (0.103)		
Age	0.0413*** (0.003)	0.00677 (0.007)	0.0149*** (0.003)	0.00234 (0.006)		
Colony × Illiquidity						-0.328 (14.030)
Colony × Credit Risk						-3.908* (1.957)
Colony × Volume						
Colony × Age						
Issuer FE Issuer- Year FE	Yes Yes	Yes Yes	Yes No	Yes No	Yes No	Yes No
N	3241	1160	2266	1228	717	717
R^2	0.841	0.688	0.522	0.602	0.760	0.774

Notes: This table shows results of an OLS regression of bond yield spreads against different sets of explanatory variables and using different samples for the 1880-1909 period (yearly frequency). Columns 1 and 2 feature an issuer× year fixed effect. In columns 3 and 4, *Illiquidity* is measured by the absolute bid-ask spread. Columns 5 and 6 use dependent and independent variables averaged by issuer. All regressions feature bond-level clustered standard errors. ***, ** and * indicate significance to the 1, 5 and 10 % level, respectively.

Table 6: SOVEREIGN YIELD SPREADS, LIQUIDITY & CREDIT: WITH & WITHOUT NON-LONDON BASED ISSUERS

	(1)	(2)
With Non-London based issuers:	**Yes**	**No**
Dependent variable:	Yield	Yield
Iliquidity	11.70	25.95***
	(7.357)	(9.733)
Credit Risk	4.037***	3.085**
	(1.058)	(1.335)
Country FE	Yes	Yes
N	1388	1020
R^2	0.516	0.538

Notes: This table shows results of an OLS regression of sovereign bond yield spreads against a liquidity and credit proxy for the 1880-1909 period (yearly frequency). Column 1 uses all sovereign issuers. Column 2 only includes issuers using London as prime issuing market, thus excluding the Netherlands, Portugal, Spain and Russia. Yields are measured as coupon-price ratio in excess of the yield on the benchmark British Consol. *Illiquidity* is measured by the relative bid-ask spread. *Credit Risk* is measured by the debt service-to-revenues ratio. All regressions feature bond-level clustered standard errors. ***, ** and * indicate significance to the 1, 5 and 10 % level, respectively.

Table 7: YIELD SPREAD, LIQUIDITY, CREDIT & INSTITUTIONAL ARRANGEMENTS

	(1) Yield	(2) Yield	(3) Yield	(4) Yield	(5) Yield
Illiquidity	13.59*	13.81*	13.53*	13.51*	13.78*
	(7.011)	(7.018)	(7.128)	(7.128)	(7.027)
Credit Risk	2.140**	2.151**	1.668	1.662	2.159**
	(1.016)	(1.015)	(1.034)	(1.035)	(1.017)
Colony	-1.098***	-1.136***	-1.599***	-1.602***	-1.138***
	(0.294)	(0.301)	(0.310)	(0.311)	(0.301)
Colony × Illiquidity	-3.779	-3.850	-1.466	-1.418	-3.815
	(7.138)	(7.144)	(7.272)	(7.278)	(7.153)
Colony × Credit Risk	-1.646	-1.520	-1.276	-1.268	-1.522
	(1.044)	(1.076)	(1.079)	(1.082)	(1.077)
Inscribed	-0.465***	-0.264*			-0.267*
	(0.058)	(0.138)			(0.138)
Inscribed× Illiquidity		-6.201**			-5.901*
		(3.128)			(3.170)
Inscribed× Credit Risk		-0.367			-0.363
		(0.493)			(0.489)
Trustee			-0.223***	-0.0966	0.0333
			(0.076)	(0.224)	(0.219)
Trustee× Illiquidity				-6.607*	-4.683
				(3.949)	(5.090)
Trustee× Credit Risk				-0.0355	0.0661
				(0.679)	(0.692)
Issuer FE	Yes	Yes	Yes	Yes	Yes
Year FE	Yes	Yes	Yes	Yes	Yes
N	3892	3892	3892	3892	3892
R^2	0.638	0.639	0.618	0.618	0.639

Notes: This table shows results of an OLS regression of bond yield spreads against different sets of explanatory variables and using a pooled sample of colonial and sovereign bonds for the 1880-1909 period (yearly frequency). Yields are measured as coupon-price ratio in excess of the yield on the benchmark British Consol. Illiquidity is measured by the relative bid-ask spread. Credit Risk is measured by the debt service-to-revenues ratio. *Colony* is 1 if issuer is a colony, and 0 otherwise. *Inscribed* is 1 if bond is an inscribed stock, and 0 otherwise. *Trustee* is 1 if bond is eligible as trustee investment, and 0 otherwise. *Volume* is the bond's initial issue size, in pounds. *Age* is the time elapsed since bond issue, in log years. All regressions feature bond-level clustered standard errors. ***, ** and * indicate significance to the 1, 5 and 10 % level, respectively.

Appendix:

A British, Foreign and Colonial Liquidity Indicators

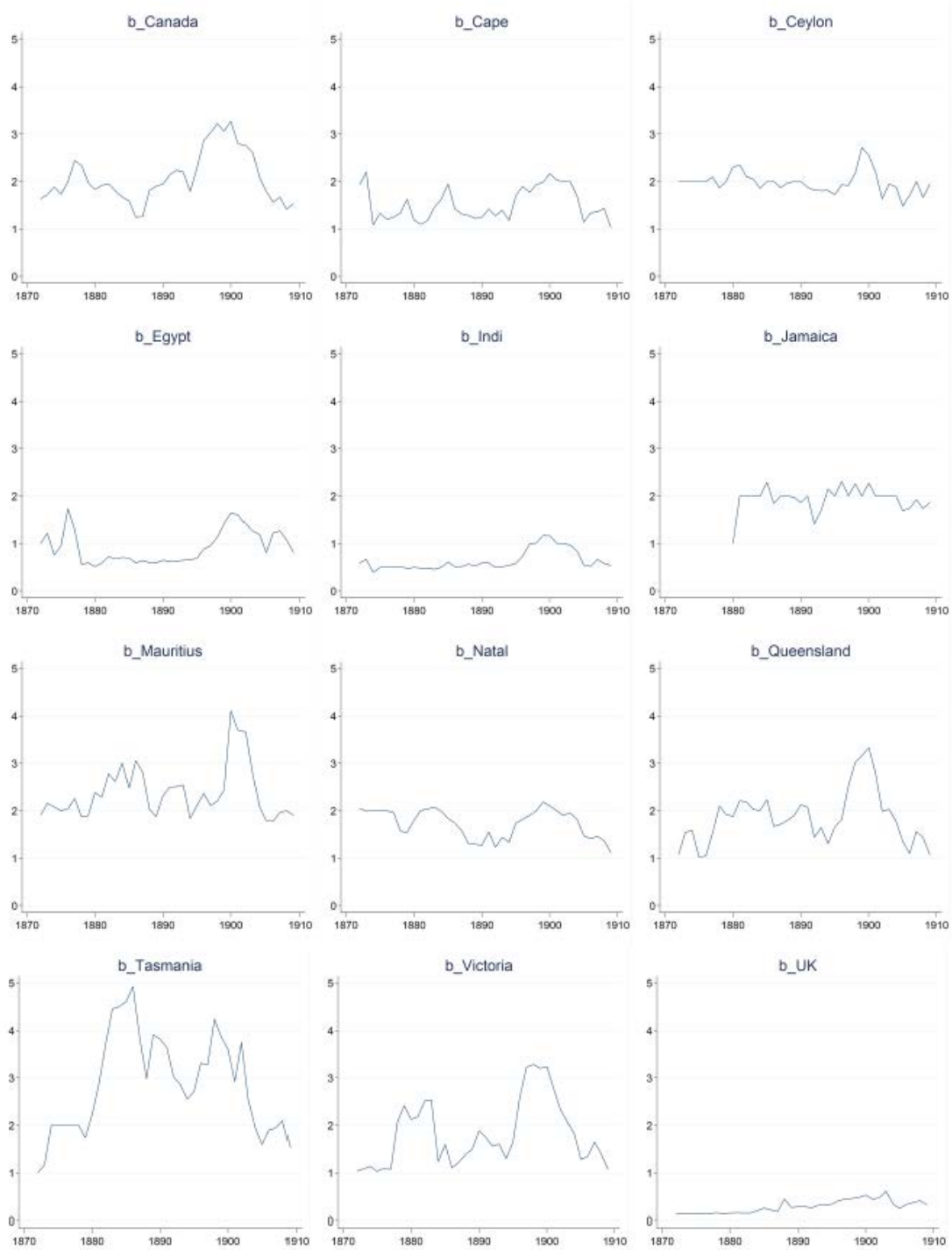

Figure A1. **Colonial liquidity indicators** (ratio of closing quotation spread to bond price; mean by country and year). Source: author's database as collected from the *Official List*.

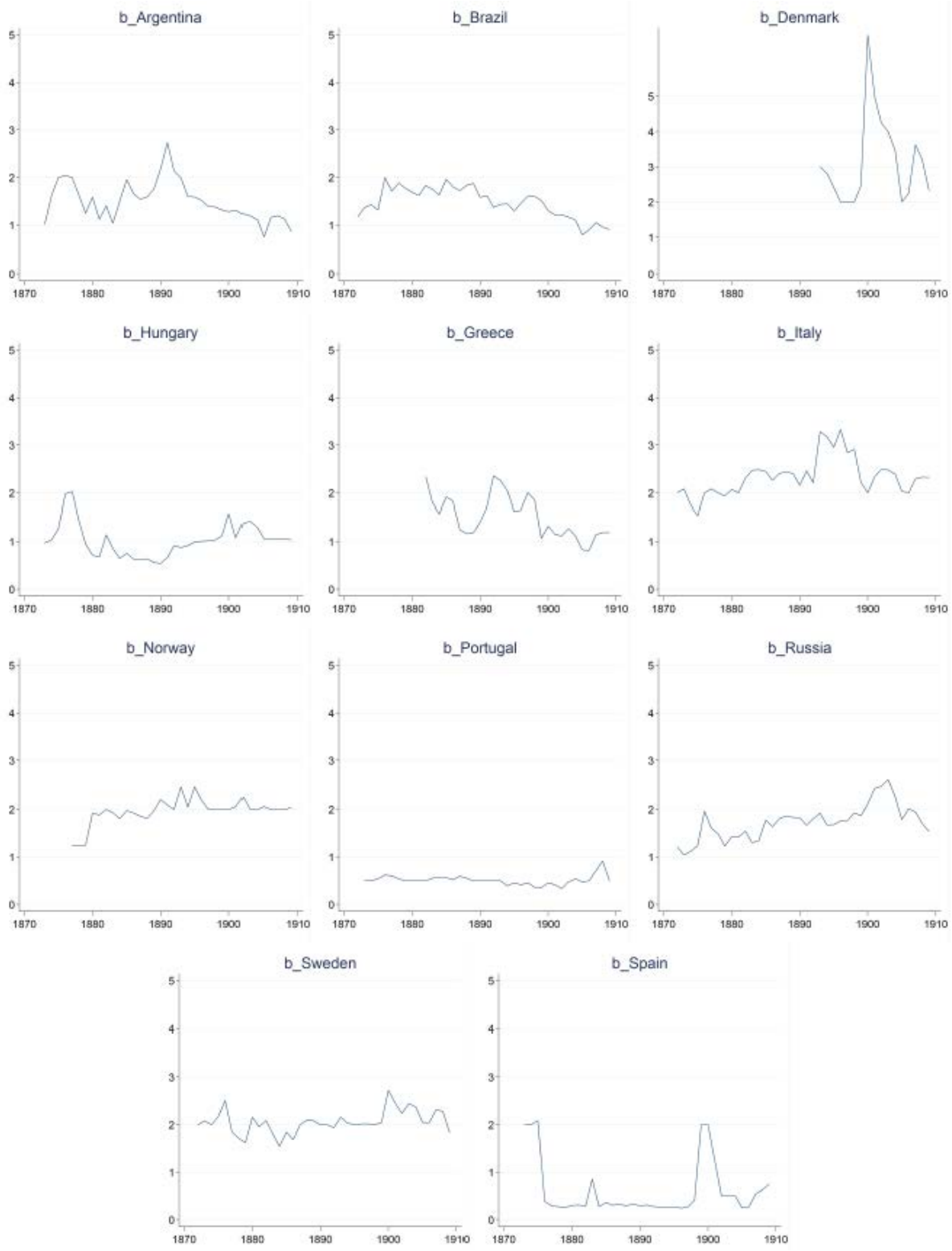

Figure A2. **Sovereign liquidity indicators** (ratio of closing quotation spread to bond price; mean by country and year). Source: author's database as collected from the *Official List*.

B Sample, Data and Sources

Our sample draws from a novel hand-picked database of government bond quotations from the London Stock Exchange covering the 1872-1909 period. We originally collected the entire universe of quoted sovereign and colonial bonds at monthly frequency (the last trading day of the month) in the *London Daily Stock & Shares List*, a leading financial publication (Michie, 1999). However, the main tests of this paper exploit only yearly prices (using the month of December data) for a subset of countries and abstracts from the 1872-1880 years. This is because we additionally use credit risk proxies drawn from the Global Finance Database (http://eh.net/database/global-finance/) which draws on Flandreau and Zumer (2004) and Accominotti, Flandreau and Rezzik (2011). This dataset covers the 1880-1909 period at yearly frequency for a number of countries in our database. The colonies included in the Global Finance Database are Canada, Cape of Good Hope, Ceylon, Egypt, India, Jamaica, Mauritius, New South Wales, New Zealand, Natal, Queensland, South Australia, Tasmania, Victoria and Western Australia. The sovereigns are Argentina, Brazil, Denmark, Greece, Hungary, Italy, Norway, Portugal, Russia, Spain and Sweden.

In contrast, results in Tables 7 and 8 exploit the whole sample of countries and years at monthly frequencies. In both cases, we excluded the bonds of countries in default by using the corresponding proxy in Flandreau and Zumer (2004). We also excluded sovereign bonds denominated in currencies other than Sterling. Finally, we removed those bonds for which we observed less than 12 data points.

We measure the yield on a bond *i* issued by country *c* using a standard coupon-yield formula such as:

$$Yield_{i,c,t} = \frac{Coupon_{i,c}}{Price_{i,c,t}}. \tag{A.1}$$

Since the *List* only provides upper and lower price brackets (see discussion in Section 3), we approximate $Price_{i,c,t}$ by:

$$Price_{i,t,} = \frac{1}{2}\left(Upper\ Price_{i,c,t} + Lower\ Price_{i,c,t}\right). \tag{A.2}$$

Data for coupon and lower and upper prices come from our database, as collected from the *London Daily Stock & Shares List*. To control for changes in long-term risk-free interest rates, we measure $Yield_{i,c,t}$ in excess of the yield on British Consols. An incidental difficulty in that respect is that the British issues considered as benchmark long-term risk-free bond by investors has changed over time due to conversion threats. To identify the correct benchmark Consol at each *t*, we follow Klovland (1994). This implies successively using the 3% Consol (1872m1-1880m12), the New 2.5% (1881m1-1884m12), the Childers 2.5% (1885m1-1888m12) and the Goschen 2.75/2.5% Consol (1889m1-1909m12).

To proxy for issuers' credit risk, Flandreau and Zumer (2004) recommend using the debt service-to-revenue ratio. They show that it is a strong predictor of default risk and that it was also a variable of choice to inform contemporary opinion. We thus measure credit risk as follows (the data to construct this ratio is taken from the Global Finance Database):

$$Credit_{c,t} = \frac{Interest\ Service_{c,t}}{Government\ Revenue_{c,t}} \tag{A.3}$$

A bond's *Age* is measured by the (log) number of years since the bond was issued. We prefer this measure to the more usual time-to-redemption since the latter can be observed only imperfectly owing to missing information or redemption clauses. We draw information on issuance year and month from the *List* (where available) or *Burdett's* (otherwise). This leaves us with a few missing observations, which explains why the number of observations is slightly smaller when the regressions include *Age*. Bonds' *Volume* is measured by the (log) outstanding

amount, as collected from the *List* at the beginning of each year (for the month of January). We prefer the outstanding amount to the initial amount (also displayed in the *List*) because a large number of bonds were redeemed gradually during their lifetime, for instance via the operations of a sinking fund.

C Explaining Alquist

In this section, we discuss in detail the differences between Alquist's approach and ours so as to demonstrate that the point of departure is the extent to which colonial and foreign debt markets were "integrated." We argue they were not and that this explains the differences between the two results. In what follows we first discuss differences in methodologies, then differences in datasets and finally discuss the insights one can glean from applying an arbitrage pricing approach to our dataset.

A) Foreign and colonial debt markets were not integrated

Let us start by explaining differences in modeling. Alquist's model is an application of the Arbitrage Pricing Theory (APT), a widespread approach in finance. According to APT, investors do not price individual bond characteristics (as we assume in this paper) because the latter can always be diversified away within an investment portfolio. In contrast, they do price the sensitivity of individual bonds to market-wide risks (or "factors"), which by definition cannot be diversified away. To test the model empirically, Alquist regresses time-series of bond prices on a set of five such time varying factors:

$$Return_{p,t} = \alpha + \beta_1 \cdot Liq_t + \beta_2 \cdot Credit_t + \beta_3 \cdot Term_t + \beta_4 \cdot Market_t + \varepsilon_{p,t}. \qquad \text{(A.4)}$$

Liq_t is the average of individual closing quotations (called by Alquist bid-ask spread) for each time t, over the universe of all bonds. Technically, Alquist's regression uses the "shock"

component of Liq_t, measured by the residuals of a second-order autoregressive (AR(2)) model of Liq_t. $Credit_t$ comprises two different measures of aggregate credit risk. They correspond to the return differentials between portfolios made of bonds of both colonial and sovereign issuers sorted at the beginning of each year according to each countries' debt level and export-to- GDP ratio, respectively, which Alquist takes from Flandreau and Zumer (2004) and Accominotti et al. (2011). $Term_t$ measures the aggregate risk of changes in interest rates, as measured by the return on British Consols net of the return on 30-days bankers' bills. $Market_t$ measures changes in aggregate stock returns, as measured by an average of stock prices collected by Alquist.

On the left-hand side, returns are measured net of the return on a one-month bill, which Alquist considers to be the benchmark risk-free rate. As the subscript indicates, returns are not measured at the level of an individual bond, but rather at the level of a portfolio of bonds. Specifically, $Return_{p,t}$ is the average return (the average change in bond prices) on a given portfolio p. Individual bonds are sorted at the beginning of each year into ten portfolios according to their liquidity, proxied by their individual bonds' closing quotations.

While our econometric strategy differs from Alquist's, both are really based on the very same intuition. To see this, let's make the following thought experiment. Consider a market-wide evaporation of liquidity, reflected in a sudden increase in the set of all individual securities' liquidity indicators. In our own workhorse framework, this adverse shock will cause individual bond prices to go down (equivalently, will cause yields to rise) because our model predicts that lower liquidity depresses bond prices. In terms of portfolio returns now, the inference is that illiquidity shocks have a negative impact on bond prices (they go down), and thus on returns. Formally, the loading β for an illiquidity factor should be negative and significant. This is exactly what Alquist finds in results obtained with the entire population of bonds, as can be seen from his Tables 1 and 2. Just keep in mind that since his model is specified in terms of liquidity rather than illiquidity shocks (illiquidity multiplied by -1), his results are simply the opposite, a positive

and significant β (an amelioration of liquidity boosting bond prices). [37]

Now, here comes the crucial difference between the two approaches. To measure Liq_t, Alquist starts with the same individual colonial and sovereign closing quotations brackets from the *Official List* we use in our workhorse regression framework. But he then averages all of these individual measures at each time t to form one time-series indicator of market-wide liquidity. (Alquist's measure is thus a kind of average of the two measures we show in Figure 4). Alquist's central result is that colonial and sovereign bond prices (pooled together) react positively to changes in this index of market liquidity. Notwithstanding the different approach, the logic of the test is consistent with ours: it asks whether an improvement in market-wide liquidity (a narrowing of closing quotations in our framework, and a decrease in his index) lifts up bond prices (decreases bond yields in our framework, and increases returns in his model).

With this approach, Alquist's finds that the significance of liquidity vanishes when his regression (A.4) is applied to colonial bonds only. Since colonial bonds do not react to this "aggregate liquidity", Alquist concludes that the colonials were "immune" to illiquidity problems. This is where our conclusions strongly differ. We argue that this inference is incorrect, because it relies on a mis-measurement of "market liquidity." At stake is not the definition of "liquidity" but the delineation of "markets". As said, Alquist's Liq_t amalgamates colonies and sovereign. This amounts to assuming that there was one unique "market" and thus one unique measure of "market liquidity." This is not an innocuous assumption: as we saw in Figure 4, average liquidity indicators for sovereigns and colonies exhibited long phases of decoupling, most strikingly during episodes of sovereign debt turmoil. Since Alquist's liquidity factor is an average, it will effectively be driven by sovereign turbulences during times of sovereign distress. To be very concrete, Alquist assumes that investors in the bonds of the colony of Victoria – a very safe, but illiquid investment – should react to woes in Turkish bonds – a highly risky, yet very liquid

[37] For the sake of simplicity and to facilitate comparison with our results, we have adjusted the discussion in the main text to take this into account (this of course is without loss of generality).

investment. We think this is unwarranted. If anything, colonial returns ought to have reacted to changes in colonial market liquidity, and sovereign returns to changes in sovereign liquidity. Assuming otherwise is unjustified, and can lead to erroneous conclusions.

To show this, Tables A.1 and A.2 replicate Alquist's approach, but for one dimension: we measure market liquidity (Liq_t) separately for colonial and sovereigns, by taking the average bid-ask of the respective groups at each *t*. [38] As can be seen from the tables, results are now consistent with our own results. In particular, Table A.1 shows that the return on colonial bonds is now sensitive to the colonial market liquidity factor for all five portfolios (increases in illiquidity depressing returns). Furthermore, our model's R^2 is between two and ten times higher than reported in Alquist's "colonial" regression (depending on the portfolio). Taken together, results underscore that, as argued in the text, colonial and sovereign markets were very different. Colonial bonds were not at all "immune" to market liquidity shocks. Instead, they logically reacted to liquidity in the colonial market but not in the sovereign one.

B) Differences in data

We have argued on the basis of results in Tables A.1 and A.2 that the difference between our results and Alquist's is due to a divergence in the definition of markets, rather than in econometric models. We now investigate whether differences in datasets also play a role.

Alquist's sample covers both a smaller period (1872-1907, against 1872-1909 for our full sample) and a smaller cross-section of bonds. As he explains in his article Alquist collected bond prices from a secondary source (a periodic called *The Money Market Review*), which reported a subset only of the quotations in the *Official List* (our source). Since we do not have his dataset, we cannot elaborate further on differences in coverage. But since Alquist kindly

[38] Alquist kindly shared his market factors. We thus use his market and term factors (which we had not collected ourselves). Alquist collected data at a 28-day frequency. We therefore converted his market factor to a 30-days equivalent using a simple linear approximation.

shared his colonial portfolios, we could observe that his colonial data has a lot of missing values in the earlier years of the sample. upon inspection, our coverage seems more comprehensive, especially for colonial bonds and in earlier parts of the period of study.

Given the limited information on his data, we can only make indirect inferences about the role of dataset differences. Bearing this caveat in mind, one first informative exercise is to apply Alquist's (i) econometric model *and* (ii) definition of markets to *our* data, and see whether we can replicate his key result – the importance of pooled "market liquidity" for the pooled colonial-sovereign sample. Specifically, we sort sovereign and colonial bonds for the 1872-1907 period into 10 portfolios according to their bid-ask spread (from most illiquid to most liquid). To measure the "market liquidity" factor, we take the shock component of the average bid-ask spread across *all* bonds (both colonial and sovereign) at each t (we have done this separately for colonials and sovereigns in Tables A.1 and A.2). The results in Table A.3 show that we can retrieve the essence of Alquist's result: the "market liquidity" factor shows a positive and significant correlation with portfolio returns for each portfolio. Moreover, as in Alquist, we find that the less liquid the portfolio, the stronger the effect (e.g. 0.01 for the most illiquid portfolio and 0.002 for the most liquid one).

The other important result in Alquist is that the "market liquidity" factor is not significant in his panel of colonials. As stated, our own results show the opposite, but perhaps it is just that his colonial data is different from ours (think for instance of the scarcity of observations in his database for the early years)? To find out, we run a "horse race" between our and Alquist's definitions of market liquidity. We sort our colonial data for the 1872-1907 period into 5 portfolios (as in Table A.1). We next introduce two liquidity factors. The first is Alquist's market liquidity factor, measured with our own data, i.e. the shock component of the average bid-ask spread for the pooled colonial-sovereign sample (as in Table A.3). The second is our colonial-only liquidity factor, i.e. the shock component of the average bid-ask spread for colonial sample (as in Table

A.1). The results are shown in Table A.4. Only the latter factor (our colonial-only liquidity factor) is significantly correlated with colonial returns. By contrast, like in Alquist, the pooled liquidity factor is irrelevant for colonial returns. In other words, the liquidity of the combined sovereign and colonial market does not matter for colonial returns, but the colonial market liquidity does. Taken together, the results in this section show that our divergence with Alquist stems from different assumptions regarding market structures, not from different econometric methodology or data. We argue that the colonial and sovereign debt markets were different. This makes sense from historical evidence (different intermediaries and operation) and economic logic (different asymmetries of information). The previous statistical evidence also supports this view.

Table A.1: COLONIAL RETURNS 1872-1909; BID-ASK-SORTED PORTFOLIOS

	(1)	(2)	(3)	(4)	(5)	(6)
Portfolio:	**Illiquid**	**2**	**3**	**4**	**Liquid**	**ILM**
Liquidity (Colonial)	0.001***	0.001***	0.001***	0.001**	0.002***	-0.001***
	(3.08)	(2.77)	(2.69)	(2.28)	(4.95)	(-3.93)
Credit (Export)	-0.007	0.001	-0.018	-0.028	-0.045**	0.036**
	(-0.49)	(0.08)	(-1.35)	(-1.51)	(-2.11)	(2.11)
Credit (Deficit)	-0.038**	-0.029	-0.042**	-0.028	-0.029	-0.0051
	(-2.53)	(1.52)	(-2.58)	(-1.21)	(-1.38)	(-0.27)
Term	0.200***	0.211***	0.152***	0.233***	0.205***	-0.005
	(7.27)	(6.19)	(5.43)	(6.76)	(5.63)	(-0.16)
Market	0.071***	0.098***	0.081***	0.074***	0.082***	-0.011
	(4.39)	(4.58)	(4.60)	(3.44)	(3.63)	(0.58)
Constant	0.002***	0.001***	0.001***	0.001***	0.0006*	0.001***
	(9.65)	(5.57)	(6.30)	(5.29)	(1.87)	(5.63)
N	431	429	430	430	429	428
R2	0.295	0.252	0.227	0.229	0.260	0.0655

Notes: This table shows results of a time-series OLS regression of average returns on five portfolios of colonial bonds against five aggregate risk factors. Returns are measured in excess of the return on the one-month Bill rate. Portfolios are assembled at the beginning of each year by sorting bonds into five groups depending on their bid-ask spread. *IML* is the return on an investment long in the *Illiquid* portfolio and short in the *Liquid* portfolio. *Liquidity (Colonial)* is the residual from an AR(2) model of the average bid-ask spread in colonial bonds. *Credit (Export)* and *Credit (Deficit)* correspond to the return differential between portfolios of most and least credit worthy issuers ranked in three groups using the export-to-GDP and deficit-to-GDP ratio, respectively. *Term* corresponds to the return differential between British Consols and the bills rate. *Market* corresponds to average stock market return (from Alquist (2010)). ***, ** and * indicate significance to the 1, 5 and 10 % level, respectively.

Table A.2: SOVEREIGN RETURNS 1872-1909; BID-ASK-SORTED PORTFOLIOS

	(1)	(2)	(3)	(4)	(5)	(6)
Portfolio:	**Illiquid**	**2**	**3**	**4**	**Liquid**	**ILM**
Liquidity (Sovereign)	0.013***	0.006***	0.007***	0.008***	0.006***	0.008*
	(3.35)	(2.71)	(5.05)	(3.84)	(5.42)	(1.91)
Credit (Export)	-0.250	-0.063	-0.011	-0.043	-0.036**	-0.215
	(-1.40)	(-1.08)	(-0.24)	(-1.16)	(-0.70)	(-1.28)
Credit (Deficit)	-0.277*	-0.179***	-0.175***	0.0109	0.0212	-0.296**
	(-1.91)	(-3.08)	(-4.26)	(0.23)	(0.40)	(-2.14)
Term	0.301	0.164*	0.266***	0.226***	0.181*	0.0913*
	(1.19)	(1.73)	(3.77)	(2.73)	(1.81)	(0.36)
Market	-0.140	0.442***	0.183***	0.282***	0.254***	-0.383
	(-0.22)	(3.61)	(3.74)	(5.01)	(3.74)	(-0.60)
Constant	0.010**	0.0018*	0.001	0.004***	0.002**	0.008*
	(2.31)	(1.74)	(1.10)	(5.52)	(2.53)	(1.83)
N	430	429	430	429	430	429
R2	0.043	0.218	0.380	0.374	0.226	0.0175

Notes: This table shows results of a time-series OLS regression of average returns on five portfolios of sovereign bonds against five aggregate risk factors. Returns are measured in excess of the return on the one-month Bill rate. Portfolios are assembled at the beginning of each year by sorting bonds into five groups depending on their bid-ask spread. *IML* is the return on an investment long in the *Illiquid* portfolio and short in the *Liquid* portfolio. *Liquidity (Sovereign)* is the residual from an AR(2) model of the average bid-ask spread in sovereign bonds. *Default (Export)* and *Default (Deficit)* correspond to the return differential between portfolios of most and least credit worthy issuers ranked in three groups using the export-to-GDP and deficit-to-GDP ratio, respectively. *Term* corresponds to the return differential between British Consols and the bills rate. *Market* corresponds to average stock market return (from Alquist (2010)). ***, ** and * indicate significance to the 1, 5 and 10 % level, respectively

Table A.3: POOLED SOVEREIGN AND COLONIAL RETURNS 1872-1907; BID-ASK-SORTED PORTFOLIO

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)
Portfolio:	**Illiquid**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**Liquid**	**ILM**
Liquidity (pooled)	0.01**	0.008***	0.003***	0.006***	0.003**	0.004***	0.002***	0.002***	0.002***	0.002***	0.006
	(0.0038)	(0.0011)	(0.0012)	(0.0011)	(0.0018)	(0.0006)	(0.0005)	(0.0005)	(0.0008)	(0.0008)	(0.0037)
Credit (Export)	-0.13	-0.05	-0.02	0.03	0.01	0.01	-0.00	-0.03	-0.05	-0.00	-0.13
	(0.12)	(0.041)	(0.042)	(0.027)	(0.022)	(0.020)	(0.017)	(0.025)	(0.031)	(0.033)	(0.12)
Credit (Deficit)	-0.23**	-0.14***	-0.15***	-0.12***	-0.02	-0.03	-0.02	-0.10***	-0.02	0.02	-0.24**
	(0.11)	(0.047)	(0.044)	(0.032)	(0.023)	(0.020)	(0.024)	(0.028)	(0.032)	(0.043)	(0.11)
Term	0.35*	0.33***	0.25***	0.28***	0.23***	0.18***	0.22***	0.26***	0.26***	0.16**	0.19
	(0.20)	(0.079)	(0.074)	(0.067)	(0.044)	(0.031)	(0.040)	(0.064)	(0.060)	(0.072)	(0.21)
Market	-0.08	0.22***	0.31***	0.19***	0.12***	0.11***	0.11***	0.18***	0.21***	0.25***	-0.33
	(0.47)	(0.047)	(0.063)	(0.050)	(0.036)	(0.023)	(0.029)	(0.036)	(0.041)	(0.045)	(0.48)
Constant	0.01**	0.00***	0.00*	0.00**	0.00**	0.00***	0.00***	0.00***	0.00***	0.00***	0.01
	(0.0032)	(0.0006)	(0.0007)	(0.0005)	(0.0004)	(0.0003)	(0.0004)	(0.0004)	(0.0005)	(0.0006)	(0.003)
N	431	430	430	431	431	431	431	429	430	430	429
R^2	0.02	0.20	0.26	0.22	0.28	0.19	0.18	0.22	0.20	0.16	0.01

Notes: This table shows results of a time-series OLS regression of average returns on ten portfolios of sovereign and colonial bonds against five aggregate risk factors. Returns are measured in excess of the return on the one-month Bill rate. Portfolios are assembled at the beginning of each year by sorting bonds into ten groups depending on their bid-ask spread. *IML* is the return on an investment long in the *Illiquid* portfolio and short in the *Liquid* portfolio. *Liquidity (pooled)* is the residual from an AR(2) model of the average bid-ask spread in sovereign and colonial bonds. *Default (Export)* and *Default (Deficit)* correspond to the return differential between portfolios of most and least credit worthy issuers ranked in three groups using the export-to-GDP and deficit-to-GDP ratio, respectively. *Term* corresponds to the return differential between British Consols and the bills rate. *Market* corresponds to average stock market return (from Alquist (2010)). ***, ** and * indicate significance to the 1, 5 and 10 % level, respectively

Table A.4: COLONIAL RETURNS 1872-1907; BID-ASK-SORTED PORTFOLIOS

	(1)	(2)	(3)	(4)	(5)	(6)
	Illiquid	**2**	**3**	**4**	**Liquid**	**ILM**
Liquidity (colonial)	0.0006**	0.0006**	0.0005**	0.0008**	0.001***	-0.0009***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Liquidity (pooled)	0.0003	0.0004	0.0003	0.0003	0.0008**	-0.0005**
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
Credit (Export)	-0.01	0.00	-0.02	-0.02	-0.05**	0.04**
	(0.01)	(0.02)	(0.01)	(0.02)	(0.02)	(0.02)
Credit (Deficit)	-0.03**	-0.03	-0.04**	-0.04*	-0.03	-0.01
	(0.01)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Term	0.20***	0.21***	0.15***	0.23***	0.20***	-0.00
	(0.03)	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)
Market	0.07***	0.09***	0.08***	0.08***	0.07***	-0.01
	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)	(0.02)
Constant	0.00***	0.00***	0.00***	0.00***	0.00**	0.00***
	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)	(0.00)
N	430	429	430	429	429	428
r2	0.30	0.26	0.23	0.24	0.27	0.07

Notes: This table shows results of a time-series OLS regression of average returns on five portfolios of colonial bonds against six aggregate risk factors. Returns are measured in excess of the return on the one-month Bill rate. Portfolios are assembled at the beginning of each year by sorting bonds into five groups depending on their bid-ask spread. *IML* is the return on an investment long in the *Illiquid* portfolio and short in the *Liquid* portfolio. *Liquidity* (colonial) is the residual from an AR(2) model of the average bid-ask spread in colonial bonds. *Liquidity* (pooled) is residual from an AR(2) model of the the average bid-ask spread in colonial and sovereign bonds. *Credit (Export)* and *Credit (Deficit)* correspond to the return differential between portfolios of most and least credit worthy issuers ranked in three groups using the export-to-GDP and deficit-to-GDP ratio, respectively. *Term* corresponds to the return differential between British Consols and the bills rate. *Market* corresponds to average stock market return (from Alquist (2010)). ***, ** and * indicate significance to the 1, 5 and 10 % level, respectively.