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Abstract

We gather the most comprehensive database of government bonds for the first globalisation era to date to conduct the first historically informed study of the importance of liquidity for colonial and sovereign yield spreads. Considering both liquidity and credit shows that the two markets were segmented: credit was the most important factor in the pricing of sovereign debt, but liquidity predominated in the colonial market, explaining 10% to 39% of colonial yield spreads. This reflected both different market microstructures and bond clienteles, themselves influenced by heterogeneous political, institutional and financial arrangements. The flows from the colonies to British 'ordinary' investors in the form of illiquidity premia should be taken into account in future studies of the political economy of empire.

Key words: Government bonds, British Empire, liquidity, credit risk, colonial finance.

JEL classification: G12, N2, N23, N43.

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1 Introduction

In September 1888, William Westgarth, Scottish descent merchant extraordinaire, Australasian colonist, student of aborigines, statistician, and the owner and manager of W. Westgarth and Co., a London Stock Exchange brokerage firm, set foot in Auckland, New Zealand, the first stop in a "road show" that was to take him through British Australasian possessions, ending after he returned to Britain with a much attended meeting of the Royal Colonial Institute in London.[1] While at the Antipodes, he met local government treasurers to promote a reorganisation of external borrowing. Westgarth's idea was not to improve the credit outlook of colonies in the eyes of London investors, which he thought was already "high", but rather to improve their securities' liquidity, which he thought to be desperately "dry". Westgarth claimed that Australasian governments overpaid because their debts were too heterogeneous and fragmented. To use Westgarth's language, they thus lacked "marketability" or "saleability".[2] Standardisation, he suggested, would promote marketability and it could be ultimately achieved through political federation, leading to the issue of a uniform, liquid, Australasian debt instrument.

Westgarth's expert opinion was not without its conflicts of interests. His colonial brokerage firm was an important stock market operator in Australasian bonds, in effect participating in underwriting syndicates. But at least, that made him an authority. For one thing, he clearly understood the difference between credit and liquidity, noting that Turkish bonds "were 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"* (Westgarth, 1889b). Westgarth claimed he hoped to address the misconception of those who were "incurably apt to fancy marketability to be due to quality". This liquidity benefit was quite unlike what happened for some colonial bonds, according to Westgarth. These were heavily penalised by illiquidity, despite credit quality. As to where did liquidity came from, Westgarth suggested that it had to do in part with market depth. For instance, he ascribed the liquidity of Turkish bonds to the large quantities traded on the market - "fifty to sixty millions" (Westgarth, 1889b, p. 23-24).

This must have informed his counterfactual assessment of the effects of the reforms he

[1] Westgarth (1889a).

[2] Westgarth used the language of the time. Economist Menger's classic work on money as a medium of exchange (Menger, 1892) provides a contemporary example of the use of "marketability" and "saleability."

recommended. Among the documents he put forward during his Australasian road show, was a table (reproduced in figure 1) where he assessed the liquidity benefits accruing under alternative reorganizations of Australasian finance. The current situation was compared with a set of scenarios corresponding to increasing levels of uniformity in colonial issues, the most favourable being the case of bonds issued by a politically unified Australian Federation that included New Zealand. The table showed enormous financial benefits. Computed as a price increase for a three-percent loan, they ranged between 11% (New South Wales) and 25% (New Zealand). In terms of yield this translated into an interest rate reduction ranging between 33 basis points and 75 basis points (assuming a perpetual or long-term bond, as recommended by Westgarth).[3] He concluded that the goal of colonial policy should be "to consolidate all debts into one uniform stock, so as to confer the highest marketability possible to each case".[4]

Westgarth was not the only contemporary to be of the opinion that a margin existed between the liquidity of colonial debts and the liquidity of British Consols. In 1895, the newly appointed, enterprising Colonial Secretary Joseph Chamberlain suggested a "Colonial Consol", in essence a fund which would then be used to re-lend to colonies. It was speculated that Colonial Consols would enjoy extremely good terms, comparable to those faced by the British government when it went to the financial market. The spread between the new Colonial Consol rate and the rate at which the fund would re-lend to individual colonies would generate revenues that would subsidise navy, postal, and commercial communications within the empire. 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 was sceptical on the grounds that as soon as the market would learn about the measure being adopted by Parliament, it would assume that colonies were guaranteed by the British government. The spread between colonies' borrowing terms and the Colonial Consols would disappear but with it the means to control them. One interpretation of the debate is that colonial spreads were interpreted as signs of illiquidity by Chamberlain but as signs of inferior credit by Hamilton, motivating his apparent concern with moral hazard.[5]

[3] Westgarth (1889b, p. 248).
[4] Westgarth (1889a, p. 24).
[5] Jessop (1976, p. 156).

It is intriguing that neither the points raised by Westgarth nor those raised as part of the Chamberlain-Hamilton dispute are taken into account in modern research. In existing grand narratives of empire the question of colonial credit has taken the lion's share while research is agnostic or silent on the subject of colonial liquidity. Cain and Hopkins (2001) account of "gentlemanly capitalism" emphasises the City's concern with colonial and foreign credit but ignores liquidity. The same dearth of attention to liquidity does characterise cliometric investigations of colonial government yields. Davis and Huttenback (1986) pioneering cliometric study of the political economy of British imperialism glosses over liquidity. They analyse the impact of colonial subjection on the securities of colonies as a change from "risky" to "safe" asset status. They describe the interest rate reduction effect of colonial subjection as a pure credit element, which they call the "interest subsidy", an important factor in their estimation of the benefits from empire.[6]

Alquist (2010) is the only study to have discussed liquidity in government debt markets during "the first era of globalization." However Alquist does only engage with the issue of colonial liquidity in an oblique way (as a brief robustness test). While this important work was a source of inspiration for our study, we wish to underscore our strong disagreement with the historical hypotheses that underpin Alquist's econometric research. We are sceptical in particular of his claim (Alquist, 2010, p. 220) that "the fact that the bonds were traded in a single, centralized market permits the identification of the relationship between market liquidity and sovereign risk premia without conducting the test across markets that may not be fully integrated".[7] This claim of a uniform market conflicts with existing historical accounts of the London Stock Exchange (Kynaston, 1994, 1995; Michie, 1999). These have emphasised that the different segments of the exchange were physically separated and identified as such, bearing different nicknames. There was a foreign bonds corner, a colonial corner, and so on. The South African corner of the market was infamously known as "Kaffirs". These sub-markets also had different operators. For instance, Westgarth and his peers called themselves "colonial brokers" and specialised in this specific commodity.

Not only were the debts of different countries traded by different intermediaries, but

[6]For a recent discussion and criticism of the interest subsidy computation, see Accominotti, Flandreau, and Rezzik (2011).

[7]Technically, Alquist finds that colonial bond returns are relatively insensitive to his measure of liquidity. However as we shall see, the measure of liquidity he uses fails to account for the fundamentally different nature of colonial and sovereign markets. See section 4.3 for a discussion.

they were not all countries alike in the eyes of investors in the London stock market. As a first approximation, there were on the one hand sovereign countries, which could default, and on the other hand colonies, for which default was less straightforward since they were controlled by one of the agencies of the British government (Treasury, Colonial office, India office). One further distinction to be considered is between nominally sovereign self-governing colonies in Australasia and Canada and dependent colonies directly ruled by British governors or agents. However, regression analysis in Accominotti et al. (2011) shows that differences within colonies were less significant as far as bond spreads are concerned. This suggests that colonial subjection (whatever the precise status) had a relatively homogeneous effect on investors' perceptions. They appear to have expected that British authorities would somehow stop a self-governing colony from defaulting just as they would for dependent.

This set created important agency problems and explains why the British Treasury sought to promote forms of control of the financial outlook of colonies. Accominotti, Flandreau, Rezzik, and Zumer (2010); Accominotti et al. (2011) have documented the paraphernalia of formal declarations that had to be made by a self-governing colony or dominion whenever a new stock was issued. These were intended to create legal mechanisms to assist colonial bondholders: essentially, in case of default, the bankruptcy procedure would be run from London. As far as default was concerned, self-governing colonies were not sovereign at all and at the end of the day, the distinction between self-governing and dependent colonies, while very relevant in several respects (such as ability to borrow), does not seem so important for pricing, and will therefore not receive prominent attention from now on.

As research has shown, the segmented markets traded all kinds of foreign securities originated and distributed by different intermediaries. Banks and bank hierarchies differed depending on whether one looked at sovereign debt on the one hand (Suzuki, 1994; Flandreau and Flores, 2009; Flandreau, Flores, Gaillard, and Nieto-Parra, 2010), or on the other hand at self-governing colonies' government debts (Hall, 1963; Attard, 2013), Crown colonies' debt (Sunderland, 2004) or Indian debt (Sunderland, 2013). One of the major themes in our paper is that the sovereign/colonial segmentation was particularly significant, and that accounting for this segmentation reveals strikingly differential roles for liquidity and credit in the two broader markets. Illiquidity, in particular, was a rampant problem in colonial markets, as

Westgarth suggested. Moreover, attempts at addressing the problem of colonial illiquidity generated significant institutional and market dynamics that are impacted the empirical evidence in this study.

Observers of the aftermath of the subprime crisis are well aware of the importance of liquidity premia. An example is Schwarz (2014) who uses the spread between the German federal government's risk-free rate and the rate on the guaranteed debt of a German development agency (KfW, *Kreditanstalt für Wiederaufbau*) to generate a measure of liquidity risk since 2008. This insight suggests that the study of colonial or guaranteed debt provides important inroads to the study of liquidity. Our intuition is as follows: if empire reduced or removed the credit risk of colonies, then the spread between colonial borrowing rates and British risk free rates should mainly reflect liquidity. Conversely, had there not been any liquidity premia, then colonial yield spreads vis--vis the British Consols ought to have been zero. They were *not* zero however, and thus liquidity must have made up a significant share of the positive yield premia colonies paid. A related conjecture is found in Accominotti et al. (2011, p. 399). After controlling for credit risk, they report finding significant fixed effects for colonial spreads "that can very well hover around 50-80 basis points", a feature which they conjecture might be ascribed to colonial "illiquidity".

Using Westgarth's and contemporary insight as a guiding thread, the present article seeks to improve existing bond spread analysis with a rigorous separation of credit and liquidity. This is the first paper to do that. Essentially, we want to show that liquidity can be distinguished from credit, that liquidity mattered, and that it was a relevant (large and significant) factor in the determination of colonial spreads - more significant in fact than for sovereign spreads. This is made possible through three contributions: First we show how the existing framework 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 collect a database for the secondary market prices and the indicator of illiquidity for all issues by sovereign and colonial issuers in the *List* at monthly frequency for the period 1872-1909. This results in the most comprehensive coverage of the period to date.

The paper is organised as follows. We first review existing work on bond spreads and

motivate our benchmark equation ("the workhorse"). We then move to discuss our measure of liquidity and show that although it is not a bid-ask spread, it can be used as a good proxy for idiosyncratic liquidity. Through systematic exploitation of 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 suggest that a bridge could be built between economic history research on government debt market microstructures and the empirical results from macro-historical research. We end with conclusions and directions for future research.

2 Liquidity and the Workhorse

2.1 Liquidity From Now to Then

Starting with Amihud and Mendelson (1986), modern asset pricing literature has accumulated comprehensive evidence as to the role of liquidity in asset prices, especially government bonds such as US Treasuries. The pioneering contribution by Amihud and Mendelson (1991) shows that credit risk-free Treasury bills with higher bid-ask spreads have higher expected returns.[8] Recently, literature has focused on premia paid by investors to compensate the risk that asset prices may fluctuate along with market liquidity (Pástor and Stambaugh, 2003; Acharya and Pedersen, 2005). Evidence on liquidity effects in cross-sections of issuers with heterogeneous levels of credit risk is more scarce and less unequivocal, 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).

Alquist (2010) is the first empirical study of government bond liquidity that explores the subject with historical data. Using a variant of the asset pricing approach, he finds that the sensitivity to an aggregate liquidity risk index ("factor") was a significant factor explaining government bond returns. His research is primarily concerned with liquidity effects in government debt in general, not with the liquidity of colonies nor with differences in the effect

[8] See Krishnamurthy (2002), Fontaine and Garcia (2007) and Li, Wang, Wu, and He (2009) for subsequent explorations.

of liquidity for colonies and sovereigns, the subject of this paper. Alquist thus does not exploit the rich heterogeneities in bond pricing that have been found to differ across sovereign and non-sovereign governments (Accominotti et al., 2011).

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

In what follows, we approach liquidity by relying on what we call the workhorse of macro-econometric research on government bond spreads. This pricing model, which seeks to identify the determinants of government yield spreads will enable us to discuss whether the effects stressed by Westgarth were indeed important. Moreover, it will provide a convenient way to discuss and test for the potentially contrasted effects of liquidity in colonial vs. non-colonial settings.

The modern literature on pre-1914 government bond spreads has two separate origins. On the one hand are panel regressions exploring the determinant of sovereign spreads beginning with Bordo and Rockoff (1996). Subsequent works include Flandreau, Le Cacheux, and Zumer (1998), Mauro, Sussman, and Yafeh (2002), Obstfeld and Taylor (2003), Flandreau and Zumer (2004), Ferguson and Schularick (2006) and Mitchener and Weidenmier (2008).[9] This research has generally emphasised that credit risk mattered for bond spreads. These works however either focus strictly on sovereign countries (Flandreau et al., 1998; Flandreau and Zumer, 2004), or do not distinguish between colonies and sovereigns.

On the other hand, there has been empirical work devoted to comparing borrowing costs between sovereign and sub-sovereign (empire) countries. This line of investigation was pioneered by Davis and Huttenback (1986) who 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. Subsequent work includes Obstfeld and Taylor (2003) who introduced an empire dummy in the traditional panel model and Ferguson and Schularick (2006) who suggest a two-stage approach, where a fixed effects regression is first run without the empire dummy, and then the resulting estimated fixed effects are regressed on the empire dummy. Intuitively, this consists in examining whether

[9] A more recent contribution is Alquist and Chabot (2011) who depart from the panel regression approach using time-series models of portfolios of bonds. Their qualitative conclusions are not dissimilar from those using panel approaches.

"other things being equal," empire countries have lower interest rates. However, if the unobservable variables captured by the fixed effects are correlated with some empire-dependent characteristic, this approach will yield a biased empire effect. For instance if, say, colonies have a younger population but we have no data to control for this, we shall call "empire effect" something which is only a characteristic of empire countries but has little to do with the institutions of empire. A more serious problem with both the dummy and two-stage dummy approaches is model mis-specification (Accominotti et al., 2011). Since investors looked at empire as a default risk reducing technology, similar changes in "credit fundamentals" did not have the same effect for colonies as it had for sovereigns (Flandreau, 2006). For instance, an informed British widow understanding that the mother country stands by its colony will not be as wary of a drift in public debt as she would be if the same thing was happening to a sovereign. Thus, pooling together colonies and sovereigns produces incorrect, severely biased estimates of bond spread sensitivity. To remedy this problem Accominotti et al. (2011) suggest that a more rigorous modeling of colonial bonds pricing is to introduce interactive terms in the bond spread equation allowing investors to price colonies and sovereigns in different ways. In other words, an increase in indebtedness will mean one thing if the country is sovereign, but another if it is a colony. This seems to be a more meaningful approach, and it allows for the previous dummy approach as a particular case, which can be tested against alternatives.

These various works 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:

$$\begin{aligned} Yield_{c,t} - Yield_{UK,t} &= \beta_1 \cdot Colony_c + \beta_2 \cdot X_{c,t} \\ &+ \beta_3 \cdot Colony_c \times X_{c,t} + FE_c + \epsilon_{c,t} \end{aligned} \tag{1}$$

In equation (1), $Yield_{c,t}$ is the yield on one representative bond issued by c and $Yield_{UK,t}$ is the yield on the British Consol, the UK benchmark long-term bond. Virtually all previous empirical models can be mapped into this general formula. For instance, Bordo and Rockoff

(1996) and Mauro et al. (2002) assume that $\beta_1 = \beta_3 = 0$.[10] Obstfeld and Taylor (2003) and Ferguson and Schularick (2006) assume that $\beta_3 = 0$. Accominotti et al. (2011) use this model to test restrictions. They find that one cannot reject $\beta_3 = -\beta_2$, (colonial spreads are essentially insensitive to credit variables relevant to sovereign spreads). In summary, credit-wise, colonies and sovereigns were very different animals (Accominotti et al., 2011). What about liquidity?

2.3 Liquidity in Panel Regressions

The previous model can be expanded to deal with liquidity effects. Provided that one gets a reasonable indicator of liquidity then one simply needs to add liquidity in equation (1) in the same manner as credit and test its importance. Formally the equation we consider is the following:

$$\begin{aligned} Yield_{i,c,t} - Yield_{UK,t} &= \beta_1 \cdot CreditRisk_{c,t} + \beta_2 \cdot Colony_c \times CreditRisk_{c,t} \\ &+ \beta_4 \cdot Illiquidity_{i,c,t} + \beta_5 \cdot Colony_c \times Illiquidity_{i,c,t} + FE_c + \epsilon_{i,c,t}. \quad (2) \end{aligned}$$

As can be seen from the subscripts in (2) we now consider for each country c a set of securities indexed by i (since each country has several bonds). This is in contrast to existing literature, which has more generally relied on a single benchmark bond (a significant exception is Alquist and Chabot (2011)). The reason for our choice is that liquidity is predominantly an asset-specific factor, so that averaging out bonds or picking a benchmark entails erasing relevant information. Since by definition benchmark bonds tend to be the most liquid ones for every issuer the information loss would be serious, amounting to the exclusion of a lot of interesting cross-sectional variance.

As seen previously, colonial rule and institutions affected investors' perception of credit risk. Hence, our model (2) allows for differentiated sensitivity of colonial yields to indicators of credit worthiness, as advocated by Accominotti et al. (2011). The innovation is that the model additionally allows for differentiated effects of liquidity depending on status (colony or sovereign). This is because institutional heterogeneity should have been associated with very different degrees of information asymmetries in the two markets. Specifically, the im-

[10] Mauro et al. (2002) have two colonies only in their sample.

plicit metropolitan guarantee should have substantially reduced information asymmetry in the colonial market. This may have resulted in segmented markets, characterised by different types of underwriters and bond clienteles. In turn, different underwriting techniques may have led to different degrees of bond liquidity. And different clienteles may have had different preferences for bond liquidity. Both call to allow for a differential effect of liquidity on colonial versus sovereign yields. We are not aware of any work that has recognised this.

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

Having detailed our econometric approach, we now show how we operationalise it by defining a suitable indicator of liquidity.

3.1 Measuring Liquidity in Historical Bond Price Analysis

Modern research emphasises 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:

$$Liquidity_{i,t} = \frac{AskPrice_{i,t} - BidPrice_{i,t}}{Price_{i,t}}. \tag{3}$$

Using this concept in historical research is straightforward. Westgarth's informed discussion of liquidity reveals deep parallels with the way modern financial economists understand the subject. For instance, he did emphasise that one tangible sign of liquidity was the dealer bid-ask spread, set by the market makers ("jobbers") and known in his language 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, just as modern researchers would claim.[11] 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 to find this information.

[11] 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.

In the recent past, financial historians have become aware of the existence of a price bracket reported in the *London Official Daily Stock & Share List* (the official price list for the London Stock Exchange and the main authority on the subject) under an entry called "closing quotations". This entry has the shape of an interval (e.g. "90-91" or "66-68") but it is our understanding that there is no certainty as to the significance of the entry. Investigation reveals that the "closing quotations" column began to appear when the *Official List* changed its reporting style in the early 1870s. Under this new layout, the *Official List* stopped reporting a daily price (or set of prices) for individual securities, and gave instead two sets of indications. On the one hand a column entitled "business done" reported prices for transactions effected. On the other hand, was the column "closing quotations" (figure 2 shows an entry in the *Official List* showing the two set of prices for a number of colonial bonds).

It is tempting to identify the true bid-ask spread contemporaries described as the dealers' turn with the closing quotations reported by market authorities. This was done by Alquist (2010) who did construct a "bid-ask" spread as:

$$Bid - Ask_{i,t} = \frac{UpperPrice_{i,t} - LowerPrice_{i,t}}{\frac{1}{2}(UpperPrice_{i,t} + LowerPrice_{i,t})}, \tag{4}$$

where the denominator is a proxy for the bond price in (3).[12] Alquist then averaged this measure out across securities to generate an index of market liquidity. However, the closing quotations bracket was not the bid-ask spread (the "dealer's turn" mentioned by Westgarth). Contemporary discussion of the information available under closing quotations explicitly warned against using the closing quotations as a measure for the true bid-ask spreads. Duguid (1905) mentions that a reader of the *Official List* would always find that buying and selling typically occurred at prices substantially different from those posted in the "closing" bracket. According to Clare (1898) 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*". He exhorts anyone seriously concerned with getting valuation right (such as required for probate or other purposes for instance) "not to trust the [closing prices bracket in the] List quotation, but to call in the advice of a broker or other expert." Appendix A shows further evidence on

[12]Note that he does not collect it from the *Official List* but from a publication that reprinted the information from the *Official List* (most probably from the weekly variant of the *Official List*), the *Money Market Review*, a contemporary periodical.

how contemporaneous experts viewed the relationship between closing quotations and the true dealers' turn.

On the other hand, as if to confound us further, contemporaries emphasised that the *Official List* price bracket did contain valuable information. The language used by Duguid (1905) suggests this powerfully. After energetically criticising those who would identify closing quotations with actual dealers' turns, he claimed that "the width of the [closing quotations] margin" nonetheless enabled investors "to form an idea of the condition of the market" for a given security. Observers invariably noticed, he remarked 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 favourable, or wider, than the prices of those in which the market is free." Further, he suggested that this cross-sectional variation would also have obtained in time series 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.

We conclude from this brief review of evidence from contemporaries that closing quotations were not proper *measures* of absolute bid-ask spreads (dealers' turns) but that they might have been relevant indicators of relative liquidity across securities and time. We suggest now how to test for this conjecture. The intuition for our test is as follows. We cannot observe the "true" (unobservable) bid-ask spread, but we do observe a set of variables that are known to correlate with bid-ask spreads in modern datasets. Furthermore we observe closing quotations. The test we provide thus examines whether the closing quotation bracket does correlate with the correlates of liquidity.

Table 1 provides the results. 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: "Volume"[13], "% Non Zero" (a variable that reflects whether reported closing prices did exhibit changes compared to previous period)[14], "% Business Done" (which takes value one if there is evidence of transactions in the "business done" column, and thus captures more active

[13] Crabbe and Turner (1995) find that the size of a corporate bond issue is negatively correlated with its liquidity.

[14] Bekaert, Harvey, and Lundblad (2007) among others show that the percentage of non-zero returns are a good proxy for trading activity.

trading/reporting) and finally "Age", the age of the security issue in years.[15] Under the assumption that the closing quotations bracket is informative of the "true" bid-ask spread, we should observe that bonds with smaller brackets (more liquid bonds) tend to be associated with larger issues, more frequent changes of closing prices, more frequent evidence of activity ("business done") and younger issues.

The cross-portfolio behaviour of our alternative indicators of liquidity supports the hypothesis that closing quotations brackets have informational value as an indicator of (il)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 for instance 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.[16] This is a strong encouragement to rely on closing quotations, for this measure is not only reasonable, but unlike competing others, it is encompassing, and available at high frequency. From now on we will rely on closing quotations (either absolute or relative) as being our security-specific *liquidity indicator*. The reader should keep in mind that given the way this indicator is constructed a larger indicator means a less liquid security, because it is associated with a wider bracket of the closing quotation.

3.2 The Liquidity of Government Debt: Statistical Features

Figure 3 plots the average of our liquidity indicator over time for colonial (panels a-b) and sovereign (panels c-d) issuers. It makes clear that sovereign bonds exhibited higher and less dispersed liquidity than colonials. This result could be anticipated from table 1, where closing quotations brackets show greater variability among colonial bonds: the difference between illiquid and liquid portfolios amounts to 4.26% for colonials, compared with 1.73%

[15] This reflects the notion that bonds closer from issuance have fewer buy-and-hold investors and thus are traded more actively; see e.g. Amihud and Mendelson (1991) for a discussion of the case of US Treasury bonds.

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

for sovereigns. This is fully consistent with Westgarth's claim that Turkish bonds were much more liquid than those of British colonies.

Figure 4 shows the distribution of the liquidity indicator for alternative groups of securities during the period 1872 to 1909, as they were distinguished by the *Official List*. The left panel shows the distribution for securities given in the *Official List* under "British Stocks" (typically Consols and UK-guaranteed bonds such as the securities of India). The centre panel shows the distribution for securities given under "Colonial Stocks". The right panel finally shows the distribution of the bracket for sovereign bonds. The general message is that British stocks tended to be more liquid (they concentrated in the high liquidity bracket) than both colonial and sovereign debt. Within British stocks (where the almighty hyper-liquid Consol reigned supreme), indicators concentrated around the .125, .25 and .5% marks. In contrast, liquidity indicators for colonials and sovereigns hovered around the 1 and 2% marks.

A useful way to distill the insights from the previous discussion is to construct two time-series indices of market liquidity by taking cross-sectional averages of the closing quotations spreads over alternative populations of government securities.[17] Figure 5 shows the behaviour of two such indicators computed by averaging individual closing brackets over sovereigns and colonies respectively.

The two indicators convey strikingly different messages. Correlation is positive, but far from perfect. The two indices undergo prolonged phases of "decoupling". Characteristically, this happened in episodes of sovereign credit turbulences, such as during the Egyptian debt crisis of 1876 or following Argentina's default in 1889 and failure of the House of Barings in 1890 (known as the "Baring crisis"). During these periods the colonial liquidity factor was much less volatile than the sovereign liquidity factor. But this does not mean that colonies were simply "insulated" from the shocks affecting the liquidity of bond markets. Indeed, they could be subjected to their own fluctuations as illustrated by a number of significant contemporary disturbances. This is most notably the case during the banking crisis of 1878, when a scramble for liquid assets by British banks took place (Collins, 1989). Our chart shows that this penalised illiquid colonial debt. We interpret this as suggestive evidence that colonial liquidity was tied to factors related to the behaviour of major financial oper-

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

ators (British banks, investment trusts in which rentiers or "widows" were invested). The evidence that liquidity was partly sub-market specific also reinforces the notion that markets were segmented.

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

4.1 Baseline Estimates

We now use the workhorse to study the effect of our illiquidity indicator on individual yields. Our prior is that illiquidity was priced, leading to higher yields. The data used for this exercise are described in appendix B. The yield spreads, closing quotation brackets, size of the loans, and bond age (the number of years a bond has been in existence) have been specially hand-collected for this paper, as explained. *CreditRisk* is the classic debt service ratio extensively used in the literature, the data for which was taken from Flandreau and Zumer (2004). Appendix C gives further details as to the measurement of variables. To prevent abnormal observations from driving results, observations when a country is in default were in this first stage excluded from the benchmark regression, but reintroduced along with control variables in subsequent robustness tests.[18]

Table 3 displays the result from estimation of different variants of our baseline model (2).[19] To better identify the contribution of the different variables, we first estimate minimalistic versions of the model nested in equation (2). In columns 1 and 2, we start with a model that only includes liquidity, credit as well as an issuer-fixed effect, running the same model separately for the respective populations of 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. Crucially 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 .127 basis point

[18]The source for the default years is Flandreau and Zumer (2004).

[19]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.

increase in spreads. Alternatively, a one-standard deviation change in bid-ask spread (2.74 basis points) would result in a .35 basis point increase in yield spread.[20] 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 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% of colonial spreads are explained by the liquidity model). 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 numbers 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). This underscores the relevance of Wesgarth's remarks and confirms the relevance of empire as a "natural" laboratory for the study of liquidity effects. Another suggestive result is that, as 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 or is not controlled for, indicating negligible contamination. Expectedly, 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 and this should be reflected in closing quotations too.

Columns 5 and 6 show estimates of the workhorse model (2), with colonials and sovereigns now pooled, allowing for different sensitivity of yield spreads to credit and liquidity respectively as recommended by Accominotti et al. (2011). Column 5 uses the baseline model while column 6 includes additional potentially relevant variables as done in of modern studies using characteristics-based panel models (Chen et al., 2007; Dick-Nielsen, Feldhütter, and Lando, 2011; Friewald, Jankowitsch, Subrahmanyam, et al., 2012). Specifically, column 6 does include the bond's present volume and age, the latter acting as proxy for time-to-maturity. To facilitate comparison between sovereign and colonial elasticities, we additionally report at the bottom of the regression tables the sensitivity of spreads to credit and

[20]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 from 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.

liquidity for a colony.[21]

As in Accominotti et al. (2011), being a colony results in a considerably lower sensitivity of interest spreads to credit. Specifically, the corresponding parameter is only .29 (column 5) or .49 (column 6) compared to 4.04 and 3.43 for sovereigns, a 20 and 10-fold difference, respectively. Second, 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 5-6). As can be seen in columns 5 and 6, it is not possible to reject the null that the sensitivity of sovereign yield spreads to liquidity is insignificantly different from that of colonies (the interaction of *Colony* and *Illiquidity* is not statistically significant). But again, the statistical significance of illiquidity can be ascertained for colonials only.

This confirms that while liquidity premia may not have been significantly different in the two markets, they were unambiguously significant pricing arguments for colonials only. Column 6 sheds additional light. We note first that albeit the two additional explanatory variables that it considers (volume and age) may be correlated with both liquidity and credit (as noted above), results remain qualitatively similar. This suggests that the liquidity effect captured by our indicator is not only to be ascribed to bond characteristics (size or maturity). Interestingly, 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. A possible interpretation as to bond age is that colonial bonds are more likely to be held by longer-term investors, who will require a premium for a bond with short time-to-redemption. For sovereigns in contrast, bond age and volume may simply reflect the ability of countries to issue bonds on a longer-term basis, or in larger volumes.

Finally, table 4 illustrates the economic significance of the results in this section by offering a decomposition of colonial spreads into liquidity and credit components. Results are given in basis points (columns 2 and 3) and percentages (columns 4 and 5) of the mean yield premium shown in column 1.[22] As can be seen, the contributions of liquidity premia are always very large - peaking at 39% for South Australia - and typically larger than the credit premia. Excluding Egypt, liquidity explains 19.6% of yield spreads for the average colony, against 16% for credit. The latter number must however is not economically meaningful

[21] This is the sum of the elasticity to credit - respectively illiquidity - and of the elasticity to the interactive term: $CreditRisk + CreditRisk \times Colony$ (t-statistics correspond to a one-sided test of the null that this sum is zero).

[22] Figures are computed by multiplying the parameter estimates from the regression of colonial yield spreads on liquidity and credit in column 1 of table 3 with each colony's mean liquidity and credit.

since credit, unlike liquidity, is really *statistically insignificant* in colonial regressions.

To sum up, results confirm Accominotti et al. (2011) finding that colonial subjection substantially modified the pricing of credit risk compared with sovereigns. As in Accominotti et al. (2011) we also find that subjection all but eliminated credit risk. The more refined model used here, which takes into account liquidity, shows credit variables to have an always marginal and often insignificant effect for colonies. Moreover, if credit risk was for colonies a matter of second order, the situation was reversed for liquidity. Liquidity mattered a lot for colonies, not so much for sovereigns.

4.2 Robustness

We now submit our main result of interest - the contrasting importance of liquidity for colonial versus sovereign bonds - to a battery of robustness checks. Results are shown in table 5.

First, we reintegrate countries in default in columns 1 and 2, while adding a default dummy. Results show that liquidity is significant now for sovereigns as well. This may be seen as a sign that our indicator of liquidity is contaminated by credit risk for sovereign bonds, as the time-series behaviour of average sovereign bid-ask spreads in figure 5 had suggested. This is consistent with modern literature on financial market micro-structure, which argues that adverse selection costs are one of the three fundamental determinants of bid-ask spreads as set by a competitive market maker (Ho and Stoll, 1981). The message may be that during periods of default, brokers react strongly to the risk of adverse selection, and the bid-ask spread thus becomes more informative of credit risk.

Another source of contamination of our liquidity indicator by credit risk is that the closing quotations bracket (the numerator) does display high inertia, which means that time-series and cross-sectional variation is largely driven by price movements (the denominator). A natural test of whether this could be an issue consists of replacing our indicator of (il)liquidity with the absolute value of the closing quotations bracket. Columns 3 and 4 show that earlier conclusions are unaffected.

Columns 5 and 6 further control for the possibility that our credit variable does not adequately capture relevant fundamentals, biasing credit and liquidity estimates. Since credit is an issuer-level, time-varying variable, it is possible to completely mute the effect of credit risk by adding country-year fixed effects. This still leaves enough observations to capture

the effect of liquidity (by comparing, say, a liquid New Zealand bond to an illiquid one during the same year, say in 1882). Our indicator of liquidity remains significant for colonials and insignificant for sovereigns.

Next, columns 7 and 8 examine whether our results are driven by those countries issuing a large number of bonds, such as Canada and Argentina. While this is not necessarily a problem (we do need evidence from those countries with enough bonds so that liquidity effects can be ascertained), the test is nonetheless useful. As seen, qualitative conclusions do not change, albeit with statistical significance levels somewhat lower (but it still exceeding the 10% threshold).

A final potential problem with using our liquidity indicator as the main explanatory variable is that its inertia may cause results to be spurious due to autocorrelation. Using bond-clustered standard errors as we do throughout the paper should suffice to address that concern. Here we further remove any lingering doubt by re-estimating the benchmark model (2) for colonies in a pure cross-sectional setting for each year. Figure 6 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 only larger from 1880 to 1884, a period known for lacklustre liquidity due to concerns about the conversion of Consols. In contrast, the right panel confirms that credit is insignificant for the vast majority of years.

4.3 Panels and Portfolios: Reconciling with Alquist

Our results invariably point to the importance of liquidity in the pricing of colonial bonds. Yet, as stated in the introduction, this is in contrast with Alquist (2010, p. 227) who argues instead that "the implicit guarantee [enjoyed by colonial bonds], if any, immunized colonial bond returns against fluctuations in market liquidity".

In this section, we explain that our divergence with Alquist vanishes once the segmentation of colonial and sovereign markets is accounted for. To show this, we had to overcome a number of modeling and measurement differences. As the discussion of this is somewhat tedious we discuss the matter in detail in appendix D and provide here a simple intuition for the argument we make. The moot point is the measurement of liquidity. Alquist does not

regress bond prices on bonds' *individual characteristics* (liquidity and credit) as we do here. Rather, he regresses bond prices against a set of so-called *market factors* reflecting aggregate (un-diversifiable), time-varying risks, among which market liquidity. Specifically, Alquist's model states:

$$Return_{p,t} = \alpha + \beta \cdot Liq_t + \beta \cdot Credit_t + \gamma \cdot Risk_t + \epsilon_{p,t}, \tag{5}$$

where $Return_{p,t}$ is the average return on a given portfolio p and Liq_t is the time series for the liquidity factor (see appendix D for further details about the model).[23] To measure Liq_t, Alquist starts with the very 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 for each time t to form a time-series indicator of market-wide liquidity. Alquist's measure is thus similar to the indices of (il)liquidity shown in figure 5. In fact it is a kind of average of the two measures we showed. Alquist's central result is that colonial and sovereign bond prices (pooled together) react positively to changes in his index market liquidity. Notwithstanding the different approach, the intuition is fully consistent with ours: 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).

Crucially however, Alquist's result breaks down when his regression (5) is applied to colonial bonds only. Since colonial bonds do not seem to react to aggregate liquidity, Alquist hypothesizes that the colonials were "immune" to illiquidity problems. We argue that this inference is unwarranted, as it relies on a mis-measurement of "market liquidity." At stake is not so much the definition of "liquidity", but rather the delineation of "markets". Alquist's Liq_t amalgamates colonies and sovereign. This amounts to assuming that there was one unique "market", and thus one unique market liquidity. This is not innocuous: as we saw in figure 5, 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. In other words, Alquist implicitly assumes that investors in the bonds of the colony of Victoria - as we saw, a very safe, but illiquid investment - should react

[23] Note that the fact that the unit of observation is a *portfolio* rather than individual bonds - as in our paper - does not matter for economic interpretation.

to woes in Turkish bonds - a highly risky, yet very liquid investment. This does not make sense of course. If anything colonial returns ought to have mostly 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 7 and 8 do replicate Alquist's approach (5), with one exception: we measure market liquidity (Liq_t) *separately* for colonial and sovereigns, by taking the average bid-ask of the respective groups at each t. Results are now consistent with our own results. In particular, the return on colonial bonds is now sensitive to the colonial market liquidity factor (increases in illiquidity depressing returns) for all five portfolios. 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 once again that colonial and sovereign markets were very different. Colonial bonds were not "immune" to market liquidity, but they logically reacted to liquidity in the colonial market and not the sovereign one.

Revisiting Alquist's results gives further evidence of the differential importance of liquidity in the two markets and provides hints on the role of heterogeneous clienteles in that respect, the subject of the two following sections. Specifically, table 7 shows that the portfolio made of less liquid colonial bonds (*Illiquid*, see column 1) is *less sensitive* to colonial market liquidity than the most liquid one (*Liquid*, see column 5).[24] In contrast, the opposite holds for sovereigns, as can be seen by comparing columns 1 and 5 in table 8: more liquid sovereigns react more strongly to the liquidity of the sovereign market. Alquist reports the same result in his approach that mixes sovereigns and colonials and takes comfort from that result because it coincides with important modern theories of liquidity risk. 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.

But what if some bonds, as we suspect was the case for colonials, are primarily sought after by a clientele of buy-and-hold investors, investors who would hold securities in thick and thin rather than shedding them in periods of liquidity stress? The logic in Acharya and Pedersen would then be reversed: less liquid bonds should react less to the liquidity factor, exactly as we observe for colonies. Colonies being roughly credit risk-free, their higher

[24] 0.000731 vs 0.00179. Likewise, the factor loading on the illiquid-minus liquid (IML) portfolio is negative and is the most significant loading, as column 6 in the same table shows.

return must compensate for higher transaction costs (lower liquidity). But buy-and-hold investors are by definition uninterested in transacting and will be happy to forego low transaction costs in exchange for high returns. In turn, concentration of buy-and-hold investors into the most illiquid colonial bonds should make those bonds significantly less sensitive to changes in colonial market liquidity, exactly as observed.

Overall, the results thus confirm our intuition that buy-and-hold ("ordinary") investors dominated in the colonial market, while more active investors dominated in the sovereign market. This 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

In this section, we argue that the results above bore the footprints of the set of micro-structural arrangements that emerged to deal with government debt uncertainty. The nature of uncertainties depended on whether one looked at sovereigns or colonies. The same applies to the institutional solutions to those uncertainties that evolved. In what follows, we discuss how institutional arrangements might have affected market micro-structures and contributed to the results reported in previous sections.

Consider foreign sovereign debt. If we leave aside cases of cross-listing discussed later, foreign debt traded in London was principally introduced to the London market through underwriting banks and underwriting syndicates (Suzuki, 1994). Underwriting acted as a signal of credit worthiness and syndicates served to divide the risk among underwriters. Although underwriters might have diversified away the credit risk, one risk that could not be diversified away was reputational risk borne by the underwriting leader(s) whose name was shown on the prospectus and press announcements. But it was the fact reputational risk could not be diversified that made the signal credible and so helped to solve the pre-commitment problem faced by foreign governments. The reputation of the bankers substituted for the reputation of the borrowing foreign government - with their reputation on the line, bankers had both an incentive to do do due diligence and apply discipline on borrow-

ing governments (Flandreau and Flores, 2009).

An important feature of the role of the more prestigious intermediaries is that they stood ready to sell to or re-purchase from their clientele the securities they had issued, thus promoting liquidity. Also, treasury officials in credit-worthy countries had a sophisticated understanding of markets and developed a number of innovations intended to promote the liquidity of their debts. For instance, relying on large, standardised, Consol-like long-term debts (such as the Italian *Rendita*) with which new issues could be merged promoted market depth. At the other end of the spectrum, less credit-worthy borrowers were underwritten by less prestigious bankers who did not offer liquidity services. But because such governments were serious credit risks, they invited a whole set of active traders, who specialised 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 and medias 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 a related mechanism).

The ideas discussed above may go some way towards explaining the greater liquidity of foreign sovereign debt (as seen for instance in table 1). However another explanation seems to be needed to explain the observed *insensitivity* of foreign government debt to measures of liquidity (as seen for instance in table 3). 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 London 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 illiquidity is insignificant. In column 2, we do the same 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 (10%). 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 a London-based measure of liquidity is not informative of true "global" liquidity. As to how to properly address this, further research is needed.

The difference in the nature of the asymmetries of information in the colonial and sovereign debt markets was reflected in differences in the micro-structures of these markets (although the precise techniques and methods used for the distribution of colonial debt still require a comprehensive study).[25] Just like the existence of substantial credit risks and asymmetries of information in the sovereign debt market prompted the emergence of an underwriting 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. The Bank of England for instance, 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 banker for colonies, paying colonial coupons and managing the debt subscription records. This did not involve exceedingly high reputational risks for the Bank, given existing recourses.

Likewise, one striking feature from existing accounts of colonial debt origination is the participation of London Stock Exchange brokers as underwriters of colonial loans. This contrasts with foreign government debt, which was apart from a few exceptions predominantly the territory of merchant banks.[26] Evidence in Hall (1963, p. 75 ff) and Attard (2013, pp. 105-7) attests of their early involvement (no later than the 1870s according to Attard) in conjunction with the colonial agent for the loan issue (such as colonial banks). As described by Hall (1963, p. 101), lack of formal underwriting meant that shocks affecting the money market could temporary affect colonial debt and lead to the failure of some issues, although in general the "unallotted balance was successfully reissued shortly afterwards." We con-

[25] Attard (2013) argues that the signaling logic described in Flandreau and Flores (2009) was relevant to colonies. On the other hand, colonies also received a form of certification from authorities in London, so that the nature of the information asymmetries, not to mention enforcement problems were quite different for colonies and sovereigns, suggesting that the parallel should not be overstretched.

[26] According to Flandreau (2013) London Stock Exchange brokers could be involved in foreign debt origination in the special case of conversion and issues arising from sovereign debt restructurings, owing to their intimate knowledge of the working of the Exchange's General Purpose Committee which was responsible for authorizing defaulters to issue new loans.

jecture 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.

There is anecdotal evidence 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 and Co. failed and had to compromise with creditors, having found itself with Victorian securities it had taken but could not sell in the new market conditions. This case was not an isolated incident. The *Sydney Morning Herald* stated that beyond Westgarth & Co. a total of nine brokers had failed at the same 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."[27] This makes sense, since the basic principle on which colonial debt rested did not involve serious credit risk and always provided rewards for those willing to shoulder liquidity problems.

In this situation of chronic colonial illiquidity, we may find the origin of what we suggest to call the "credit curse" of colonies. With this expression, we refer to the phenomenon whereby credit worthy colonies faced higher yield premia on account of their illiquidity. Indeed, while "good" sovereign issues were sponsored by prestigious underwriters who stood willing to trade in "their" securities, while "poor" sovereign issues benefited from substantial volatility that attracted speculators and led to widespread information disclosure, the more serious, but dull colonies did exhibit neither big pre-commitment problems nor wide price gyrations. A lot of the relevant information remained locked behind political bargaining between colonial offices and the colonies. Colonial debts were unexciting. They were sponsored by agents with less financial means who were eager to shove them as soon as they could towards the buy-and-hold clientele. They went from the books of the sponsoring commercial bank and/or broker-underwriter to the pocket of the buy-and-hold investor (the English "Widow"). Once in such portfolios the securities were unlikely to hit the market again any time soon and this was unlikely to promote liquidity. In other words, we suggest that the features observed in previous sections can be accounted for by the more difficult

[27] *The Sydney Morning Herald*, 13 October 1890.

enforceability of sovereign debt. Paradoxically, the smaller colonial credit risks entailed substantial liquidity risks.

6 Drying up Illiquidity Premia: Westgarth and the "Widow"

In this section, we further confirm that the unique nature of colonial debt can be observed in both its particular market micro-structures and bond clienteles. We concentrate specifically on the role of legal reforms in entrenching the dominance of ordinary (buy-and-hold) investors in the colonial market.

6.1 Liquidity and Investors

Previous sections have provided empirical underpinnings to Westgarth's claim in 1889 that the trouble with colonial stocks lay not so much with credit risk, but rather with illiquidity. This is what motivated his advocacy of reforming the supply of colonial debt - especially of Australasian debt, of which his brokerage was a specialised dealer. In particular, during the road show described in the Introduction, he was encouraging the standardisation of Australasian securities and their consolidation into a kind of "Eurobond" ultimately issued by a politically federated Australia.

This was not the first time Westgarth, the "chief adviser of the colonies in finance" intervened in the colonial financial policy debate, urging reform.[28] Westgarth's travels to the antipodes went back to the 1840s. He was a colonist in the Port Philip District and Victoria from 1840 to 1857, and made various business trips back to England. His renowned monthly financial newsletter (*Westgarth's Monthly Circular*) started covering Australian and New Zealand debts and financial prospects in the 1860s.[29] He had been an inspirer of the first Colonial Stock Act of 1877 promoted by New Zealand's former Premier Julius Vogel, at the time of the Act the agent-general for New Zealand in London (Dalziel, 1975, p. 57). This first Colonial Stock Act had sought to boost the popularity of colonial stocks by giving them features that might attract long-term investors. In 1889, as part of the multi-pronged strategy already discussed, Westgarth further endorsed an extension of the scope of the first Colonial

[28] *Edinburgh Evening News*, Nov 1, 1889.

[29] See Serle (1976). Despite being so widely quoted, Westgarth's *Circular* is not kept in libraries and appears to have been weeded out from archives. A few odd copies survive in addition to issues that were reprinted in the contemporary press. We are grateful to Bernard Attard for having shared with us some early documents.

Stock Act giving British colonies' bonds the coveted "Trustee investment status". This enabled Trustees (but also 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 authorisation. The inclusion of colonies in the Trustee list was finally achieved through the widely acclaimed Colonial Stock Act of 1900. The two Acts (1877 and 1900) thus were both intended to cater to the needs of a wide investing public or in the language of Westgarth, to "the poorer clergy and curates, the widows and orphans."[30]

In this section, we suggest an empirical exploration of the respective effects of the Colonial Stock Acts of 1877 and 1900. A natural economic interpretation of the Acts is that their authors had anticipated, almost one century before, the seminal finding of Amihud and Mendelson (1986) that the sensitivity of bondholders to illiquidity decreases with their investment horizon.[31] By catering to a clientele of long-term investors, colonies could contemplate the possibility of substantially reducing not the illiquidity of their debt but the *effect* that the illiquidity component had on borrowing costs. In other words, it is not that colonial bonds could suddenly be traded more easily, but that its clientele would not care too much about transacting at all, even in the face of market liquidity shocks. As a result, the costs of illiquidity (the illiquidity premia paid by colonies to investors) would be reduced. Our workhorse model provides the perfect instrument to discuss this issue. To see whether individual reforms modified the demand for colonial debt in a way that made bond prices less sensitive to illiquidity, we simply introduce dummy variables capturing whether bonds fell under the scope of the two Colonial Stock Acts in interactive terms. We then test whether these bonds did exhibit reduced liquidity sensitivity as predicted by modern analysis (as

[30] Westgarth (1889a, p. 248). See also p. 251-2 for a summary of the complete strategy: "[Concluding Remarks on the Favourable Prospects now opening for Australasian Securities]. Great and rapid has has been the advance in the value of these Colonies' stocks in the home market of late years, a very considerable further rise no doubt awaits them. Towards this end there are three great steps still before them: First, the complete consolidation of the still lingering varieties of the securities of each Colony, so that each shall present all its obligations in one perfectly uniform stock. Second, the inter-colonial federation, by which the stocks of the different Colonies shall be consolidated into one uniform security for the whole group, as has been accomplished with so much advantage by the Canadian Dominion. Third, the concession of the high privilege of being included in the list for legal trust investment. These steps secured, I do not doubt that an Australasian 3 per cent, will stand ere long at the price of 100; and thus show, by so practical a proof, that the Daughter States are worthy to take the place in the great Home market which has been so recently vacated by the Mother Country."

[31] Amihud and Mendelson (1986) show that heterogeneous investment horizons result in long-term investors specialising in holding illiquid assets, whereas short-term investors specialise in liquid securities. Therefore, while large bid-ask spreads are associated with larger yields, there is a second-round, opposing effect accruing from the endogenous sorting of clienteles.

discussed above).

6.2 The Colonial Stock Acts of 1877 and 1900

The main consequence of the Colonial Stock Act of 1877 was to allow colonies to issue so-called "inscribed" stocks. Inscribed stocks rested on the principle that their ownership was registered at the Bank of England or at a major bank (known as the "registrar"), thus protecting the owner of the bond. Bonds to bearer by contrast were more easily bought and sold, making them favourite of speculators or bankers (Duguid, 1905). But this very convenience represented a significant risk for non-speculative investors, as bonds could be lost, or stolen by unscrupulous intermediaries. Perhaps also a bond to bearer would signal a security with a greater danger of trading against superior information. For such reasons, Trustees typically preferred inscribed stocks and the permission given to colonies to issue such bonds had the potential to enable colonial borrowers to access a whole new set of investors.

But for the many imperial hopefuls such as Baden-Powell (1889), inscription was not enough. They felt that the ultimate coronation for colonial bonds consisted in securing the much coveted status of Trustee investment, and inclusion in the Trustee list. Adoption of the Trustee status for colonial bonds had been considered in 1877 (Baster, 1933, p. 602) and had been submitted to Parliamentary approval as part of a wide-reaching reform of trustee norms in 1888. In both instances, however, the proposal, had been rejected.[32] It took an additional decade and, according to Jessop (1976), the special circumstances of the late 1890s for the metropolitan government to change its attitude towards granting Trustee status to colonies. The Colonial Stock Act of 1900 was adopted in a context of imperial enthusiasm conjured up by the Jubilee celebrations in 1897 and of the Boer War in South Africa, which saw the colonies "standing by" the mother country. It became 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 addressed this, but in return required reductions in colonial legislative sovereignty in financial matters intended to address the problem of moral hazard. For instance, one condition for Trustee status was that

[32]The reform was mentioned by Westgarth as part of his liquidity promoting reform package in 1889, although he did not emphasise this so much, a suggestion he had few illusions as to political feasibility (Westgarth, 1889a). Another Colonial Stock Act was also adopted in 1892 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 engraved the legality of a commonplace practice (see below).

the colony had to show that the funds for payment of the coupon and amortisation 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".[33] Colonial financial legislation thus received a junior status vis-à-vis courts in Britain where bondholders could secure remedies.

Contemporaries who supported these reforms appear to have reasoned that the signal sent by Trustee status would create more demand for the bonds and increase prices. This is suggested in particular by previous appraisal of the Act of 1900. However, although generally amicable to the notion that the Act of 1900 was a milestone, earlier commentary has struggled with finding evidence of a substantial effect of the Act. An early assessment was by the Canadian finance minister of the time, Fielding, who 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 if we use the same framework as for the example given by Westgarth).[34] Using bond price data and a primitive form of structural break analysis, Baster (1933) claimed 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 sceptical that the Act of 1900 had brought a "real saving". Still more recently, Davis and Huttenback (1986) noted that regression analysis on a dummy variable pointed to *larger* colonial spreads for the post-1900 period *ceteris paribus* suggesting that the effect of the Act was nil.

6.3 Empirical Results

We now probe the impact of the two Acts (Colonial Stock Act of 1877 and 1900). Rather than simply comparing bond prices before and after the adoption of the legislation as previously done, we capture the effect of the Acts by noting the Acts did not apply uniformly to all colonial securities, effectively covering a subset only of colonies *and* securities. Thus, using

[33] 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.

[34] That is, a perpetual 3 percent bond 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".

contemporary sources, we construct a set dummy variables that take value 1 when a given bond i issued by country c was placed under the benefit of either or both Acts at time t. 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.[35] The exposition above suggests that the effect of the Acts could have been twofold. First, it could have increased demand for bonds covered, while leaving the pricing of credit and liquidity unchanged. Second, it could have attracted a clientele with different preferences, resulting in a different sensitivity of bonds covered to both liquidity and credit. To test both hypotheses, we resort again to our "workhorse" model (2). We however add $Inscribed_{i,c,t}$ and $Trustee_{i,c,t}$ both as a dummy variable (to test the first hypothesis) and as an interaction term with $Illiquidity_{i,c,t}$ and $Credit_{c,t}$ (to test the second hypothesis).[36]

Table 9 provides the result of a set of regressions, starting with investigating the Act of 1877 in columns 1 and 2. In column 1, we first probe 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 we do not allow for inscribed stocks to have a different sensitivity to liquidity and credit. Results suggest that issuing inscribed stocks secured an 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 7). In column 2, we additionally allow inscribed stocks to have different sensitivity to credit and liquidity by introducing interaction terms. If, as envisioned by Westgarth, inscribed stocks attracted a new buy-and-hold clientele, then the effects of the Act would be to 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

[35] 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).

[36] 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 7), which means that the time dimension is effectively exploited as well.

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 operated through liquidity insensitivity.[37] This is consistent with our view that the Act brought about a *transformation in clientele rather than a transformation in colonial credit prospects* (as previous writers appear to have assumed). This suggests that the technical innovation of the inscription were important, aside and beyond yet-to-come institutional innovations pertaining to colonial control.

We now do a similar analysis for the Act of 1900. Column 3 in table 9 suggests that inclusion in the Trustee list following the Act of 1900 resulted in a risk-adjusted (intercept) lower by 22.3 basis points. In column 4 however, the significance of the intercept vanishes as we allow trustee status to have an effect on liquidity and risk sensitivity (interaction terms). Again, as we found for stock inscription, the regression suggests that the main effect of Trustee status was a lower sensitivity of spreads to liquidity. This result, though, is obtained only if we omit to control for inscription. When this is done (column 5), the effect of inclusion in the Trustee list becomes statistically insignificant. This is consistent with earlier findings that the overall impact of the Trustee status on borrowing costs proved rather disappointing from the colonial standpoint (Baster, 1933; Davis and Huttenback, 1986). But our overall interpretation differs from what these authors have claimed: results suggest that the disappointing outcome of the Act of 1900 stemmed from the fact that its effects had been already secured by the process of inscription (see Attard (2015) for a consistent insight that the Act of 1900 did not revolutionise colonial markets).

We conjecture that our companion and guide in this empirical exploration, William Westgarth, would not have been surprised by our evidence. Writing ten years before the adoption of the Colonial Stock Act of 1900, this knowledgeable colonial broker claimed that Trust funds had come to represent a "large and increasing" share of colonial bondholders (Westgarth, 1889a, p. 248). In other words, ordinary investors started to dominate the colonial

[37]The inscription of 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 (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 stocks as trustee investments as part of the 1888 reform debates in Parliament.

market *before* the Act of 1900. The reason for this is suggested by legal historian Chantal Stebbings (2002, p. 145-6). Trustee status operated more 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 stocks despite the absence of a formal Trustee investment status. As Stebbings explains, this became increasingly popular in the context of the Victorian capital export boom.[38] Our evidence suggests that inscription is what set the process in motion. Moreover, 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. The conclusion may be that financial innovation permitted by the process of inscription and changes in the "micro-structures" of colonial markets largely anticipated the Act of 1900. This final piece of legislation was thus less economically meaningful than its fanfare might have led one to presume.

7 Conclusion

This paper has provided what is to our knowledge the first historically informed empirical exploration of the role of liquidity in late 19th century government bond markets. While we share with the only other economic investigation that addresses the issue the idea that liquidity did matter, our findings, guided by historical insight, differ from Alquist (2010) in important respects. We found that illiquidity premia represented a substantial fraction (between a quarter and a half) of colonial spreads. We found that illiquidity mattered much less for sovereigns than it did for colonial bonds, and we suggested that this had to do with radically different market structures. Imperial control, whether formal or informal, did cast a long shadow on the organisation of colonial debt, and its impact on either credit or liquidity can be read in simple yield spread models such as the one used here. A consequence of our findings is that the concerns of contemporaries such as Westgarth or Chamberlain were

[38] 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 stocks were among the deeds' favourite choices.

warranted. This rationalises the reasons for the recurring debate on how to best design colonial borrowing. This may also refine or recast the political economy of the British empire. Following the steps of 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 capital. The previous critical work by Accominotti et al. (2011) has emphasised that reduced borrowing costs are a very imperfect way to measure the impact of colonial subjection. This research goes one stage further: our present findings suggest that British political control did not only produce a transfer from the metropolis to the colonies in the form of lower credit premia, but also from the colonies to the metropolitan bondholder class in the form of illiquidity premia. Through illiquidity premia, a substantial benefit accrued to the British middle class, a result which may qualify Davis and Huttenback's conclusion that the British middle class generally lost from empire. Curious as it may sound, much of the welfare of the English widow was tied to the degrees of liquidity, which the debts of Jamaica or Tasmania enjoyed in the London Stock Exchange, a topic that has never been explored empirically thus far.

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A Closing quotations and bid-ask spreads

According to contemporary descriptions such as Duguid (1905), a reader of the *Official List* would always find that buying and selling typically occurred at prices substantially different from those posted in the "closing" bracket. True jobbers' buying and selling prices were significantly narrower than those reported in the *List*. Jobbers, he explained, "fearing competition", would have posted narrower bid-ask spreads.[39]

Clare's *Lectures on the London Daily Stock and Share List* (Clare, 1898) go further, emphasising that especially in the case of "securities that are rarely dealt in", 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*". He exhorts anyone seriously concerned with getting valuation right (such as required for probate or other purposes for instance) "not to trust the [closing prices bracket in the] List quotation, but to call in the advice of a broker or other expert."

Clare (1898) provides a plausible mechanism whereby the relation between closing quotations and "turns" might have ensured. 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 bracket, not as a literal measure of the bid-ask spread, but as a decent indicator that should correlate with the "true" (unobserved) bid-ask spread.

B Sample

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

[39] Consistently, Westgarth (1889a) states that liquid colonial bonds would have had jobber's turns of about $\frac{1}{4}$ to $\frac{1}{2}$% while the corresponding figure for illiquid ones would have been 1%. For January 1889, our data of 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.

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 Flandreau and Zumer (2004). Their datasets covers the 1880-1909 period at yearly frequency for a subset of countries present in our database. The colonies included in Flandreau and Zumer (2004) 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 included 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.

C Measurement & Sources

Following relevant literature (Davis and Huttenback, 1986; Flandreau and Zumer, 2004; Ferguson and Schularick, 2006; Accominotti et al., 2011), we measure the yield on a bond i issued by country c using a standard coupon-yield formula such as:

$$Yield_{i,c,t} = \frac{Coupon_{i,c}}{Price_{i,c,t}}. \tag{6}$$

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

$$Price_{i,c,t} = \frac{1}{2}(UpperPrice_{i,c,t} + LowerPrice_{i,c,t}). \tag{7}$$

Data for coupon and upper and lower 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 6 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, we make use of the Global Finance database collected by Flandreau and Zumer (2004), as stated below. Flandreau and Zumer (2004) show that the debt service-to-revenue ratio is the most powerful predictor of country default. We thus proxy for credit risk by:

$$Credit_{c,t} = \frac{InterestService_{c,t}}{GovernmentRevenue_{c,t}}. \tag{8}$$

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.

D Reconciling with Alquist

This section gives further details on how to reconcile Alquist's approach with ours.[40] Let us start by explaining differences in modeling. Alquist's model is an application of the Arbitrage Pricing Theory (APT), a powerful and 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,

[40] We thank Ron Alquist for having provided with us his market factor series, as well as for insightful guidance about how he calculated the other series in his study, enabling us to mimic as closely as possible his approach.

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. Concretely, Alquist's full model is:

$$Return_{p,t} = \alpha + \beta \cdot Liq_t + \beta \cdot Credit_t + \beta \cdot Credit_t + \beta \cdot Term_t + \beta \cdot Market_t + \epsilon_{p,t}. \quad (9)$$

As explained in the main text, Liq_t, is the average of individual closing quotations (called by Alquist bid-ask spreads) for each time t, over the universe of all bonds. Technically, Alquist's regressions use the "shock" component of Liq_t, as measured by the residuals of a second-order autoregressive (AR(2)) model of Liq_t. The reader must also keep in mind that Alquist's regressions effectively use the opposite ($x \times -1$) of the average liquidity index, so that an *increase* in the index suggests an improvement in market liquidity. 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).

Credit 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. This is done by Alquist using data from Flandreau and Zumer (2004). *Term* measures the aggregate risk of changes in interest rates, as measured by the return on UK Consols net of the return on 30-days bankers' bills. *Market* 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 five portfolios according to their liquidity, as proxied by their individual bonds' closing quotations.

As explained in the text, 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 table 1 and 2. Just keep in mind that since his model is specified in terms of liquidity rather than illiquidity shocks (as said illiquidity multiplied by -1), his results are simply the opposite, a positive and significant β (an amelioration of liquidity boosting bond prices).

The second main difference with Alquist's study is our sample. His sample covers both a smaller period (1872-1907, against 1872-1909 for our full sample) and a smaller cross-section of bonds. As explained in the text, Alquist collects bond prices from a secondary source, which provides only a limited subset of all quotations displayed in our primary source (the *Official List*). Our coverage is thus substantially more comprehensive, especially that of colonial bonds in earlier parts of the sample. Information on the precise scope of Alquist's smaller dataset was not communicated to us. To find out whether this could explain different results, we first replicated Alquist's monthly frequency sovereign-colonial pooled estimation for the 1872-1909 period (9) using *our* sample and *his* five risk factors (which he communicated).[41]

In accordance with his approach, we created ten portfolios comprised of both sovereign and colonial bonds sorted at the beginning of each year according to their average bid-ask spread the year before. We then calculated the average returns on those portfolios and regressed each of the resulting time-series against the five market factors. We were able to retrieve the essence of Alquist's result (results available upon request). In particular, Alquist's 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. Finally and most importantly, just as in Alquist (2010), Alquist's liquidity factor is mostly insignificant when the above approach is implemented on colonial bonds alone.[42]

Having evacuated our concern about differences in samples, we then replicated Alquist's

[41] Alquist collected data at a 28-day frequency. We therefore converted his market factor to a 30-days equivalent using a simple linear approximation.

[42] The liquidity factor is significant at 5% level for the most liquid portfolio (it is significant at 1% level in Alquist (2010)), at 10% for the second most liquid portfolio and insignificant for all the other portfolios.

regressions (9) using our sample. However, we distinguished between a sovereign sample (to which a sovereign liquidity factor was applied) and a colonial sample (to which a colonial liquidity factor was applied). Results are displayed in tables 7 and 8. As described in the main text, in contrast to Alquist's findings, our results show that returns for both groups are sensitive to their respective factor. In particular, colonial bond returns are now sensitive to the colonial bond market liquidity factor and the factor loading has the right sign (increases in market illiquidity depress returns).

E Figures & 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.

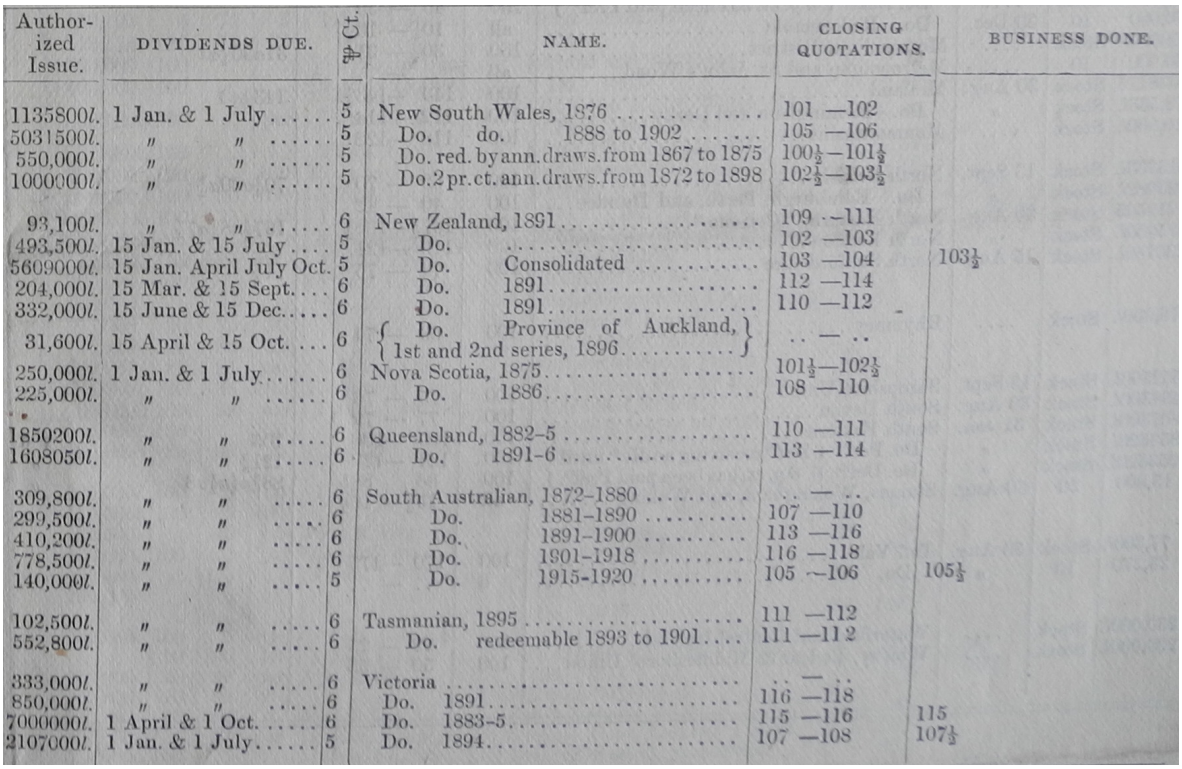
E. The price to which the D stock might be expected to rise after some interval—say two to three years from the first issue—to accustom investors to the stock, and secure their adequate confidence.

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.



Author-ized 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)

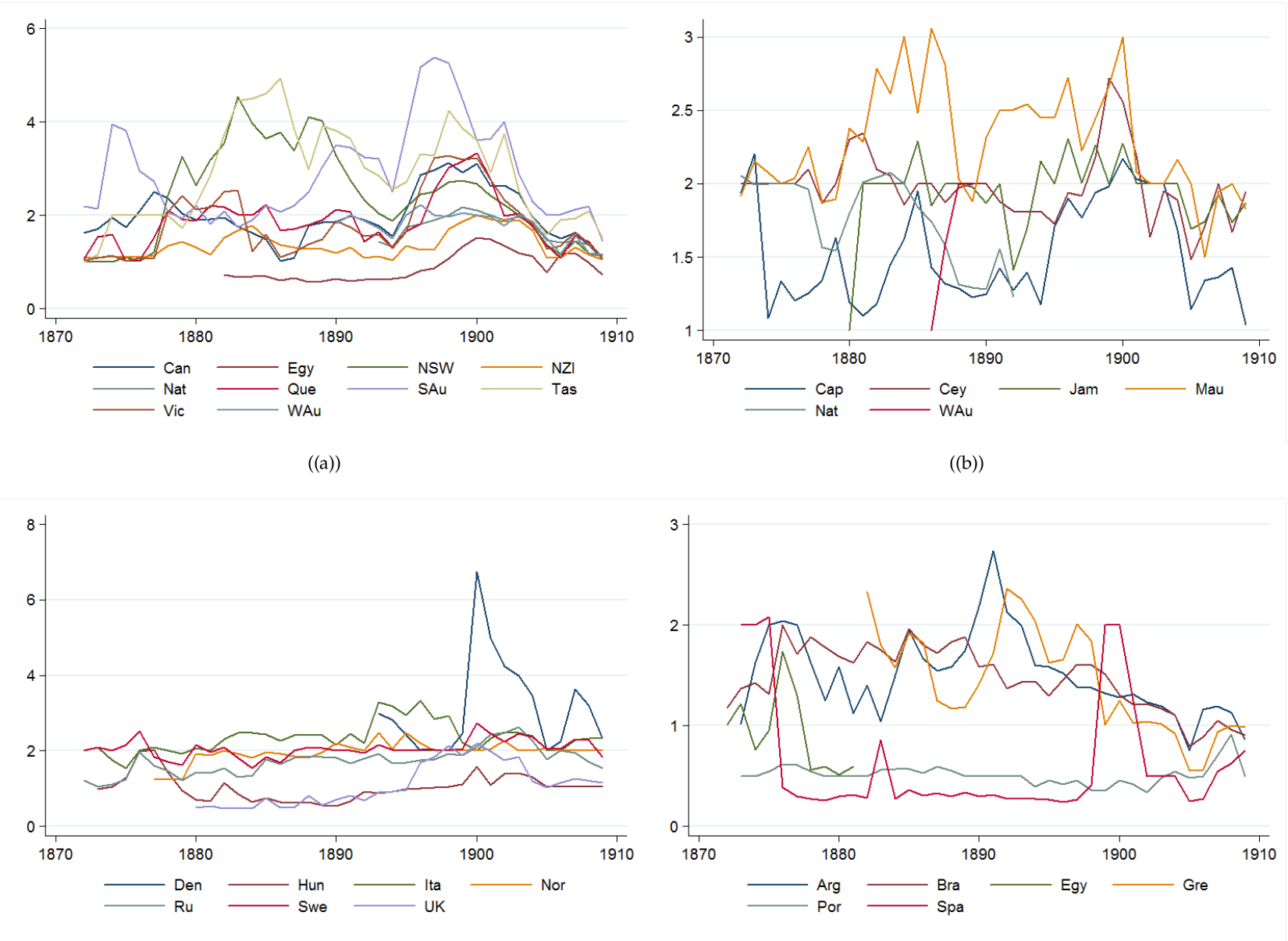


Figure 3: Colonial (panels a-b) & sovereign (panels c-d) mean yearly relative bid-ask spread. *Source*: author's database as collected from the *Official List*.

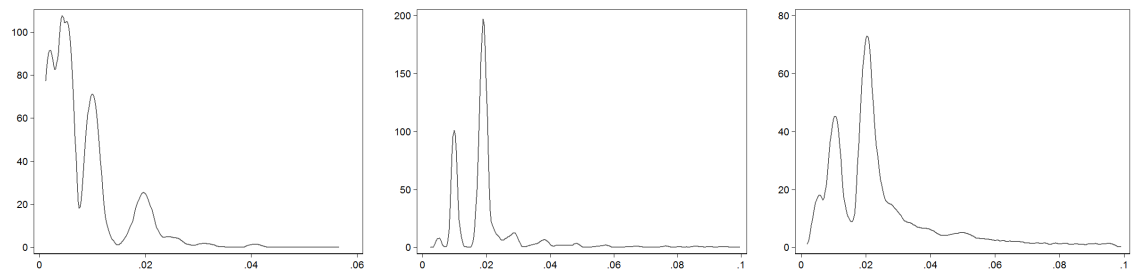


Figure 4: Distribution of bid-ask spreads: British (left), colonial (center) and sovereign (right) bonds. Density is cut at .1 in the center and right panels for visualization. *Source*: authors' database based on the *Official List*.

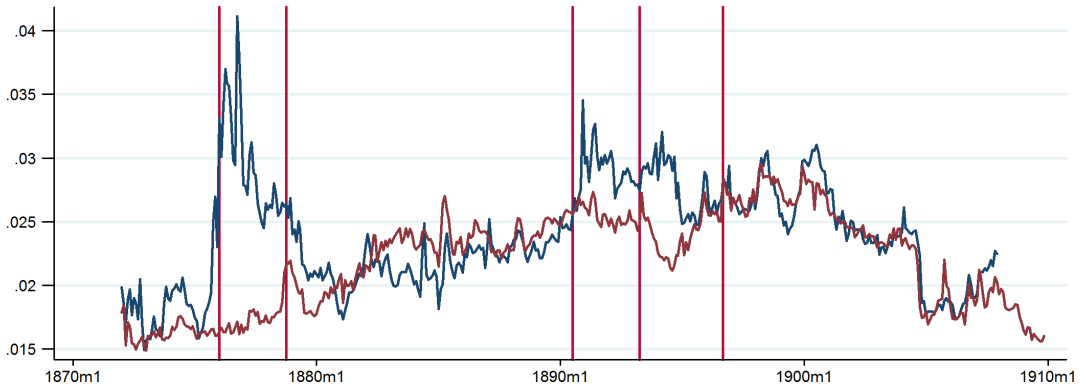


Figure 5: Market liquidity proxies: mean bid-ask spread across all bonds (blue line) and colonial bonds (red line). Vertical lines indicate the Egyptian default (1876m1), the 1878 banking crisis (1878:10), the Baring crisis (1890:7), the Australian banking crisis (1893:3) and the 1896 panic (1896m7). *Source*: authors' database based on the *Official List*.

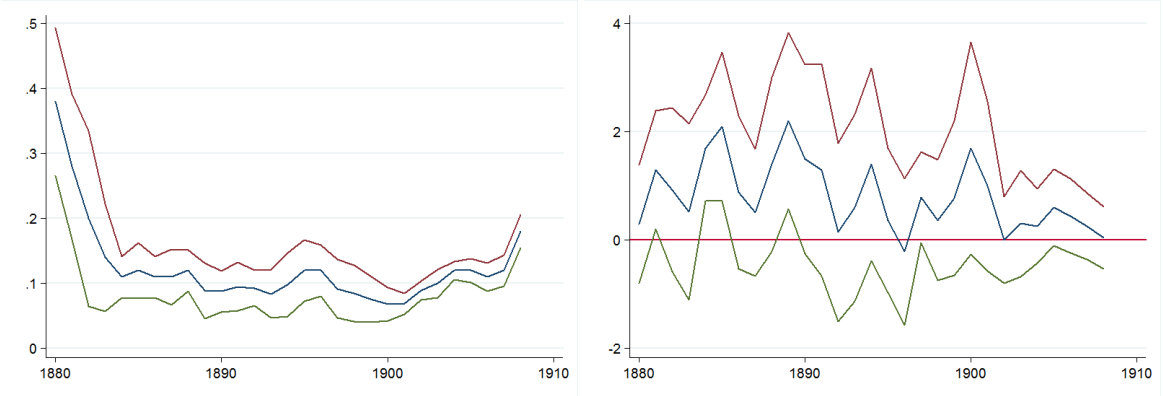


Figure 6: These figures show the parameter estimates obtained from a cross-sectional OLS regression of colonial bond yield spreads against the benchmark illiquidity and credit indicators, ran separately for each year. Left and right panels show the parameter estimates (blue line) and confidence bands (red and green lines) for the illiquidity and credit indicator, respectively.*Source*: Authors' calculations.

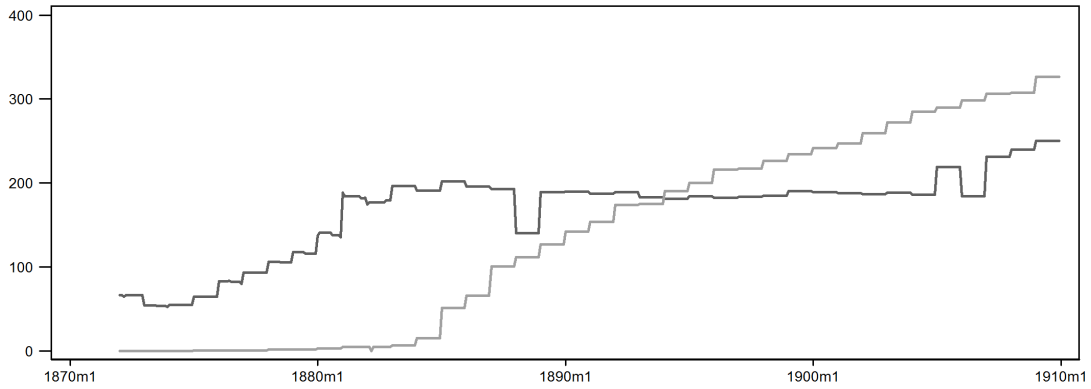


Figure 7: Volume of issued colonial bonds, by year (£Mio.): Bonds to bearer (black line) vs. inscribed stocks (gray line). *Source*: authors' database as collected from the *Official List*.

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* $*$ *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: COLONIES' LIQUIDITY & CREDIT PREMIA

	Yield	Liq (bp)	Credit (bp)	Liq (%)	Credit (%)
Canada	1	.22	.23	.22	.23
Cape	1.3	.19	.21	.15	.16
Ceylon	1.1	.21	.11	.18	.099
Egypt	1.4	-.055	1.9	-.039	1.3
Jamaica	1.1	.2	.12	.19	.11
Mauritius	1.3	.25	.086	.19	.065
Natal	1.3	.19	.16	.15	.13
New South Wales	1.2	.28	.19	.23	.16
New Zealand	1.7	.18	.31	.1	.18
Natal	1.3	.19	.16	.15	.13
Queensland	1.2	.24	.28	.2	.23
South Australia	1.4	.55	.29	.39	.21
Tasmania	1.5	.37	.29	.25	.19
Victoria	1.2	.19	.2	.15	.16
Western Australia	.94	.18	.14	.19	.15
Average (w/o Egypt)	1.25	.25	.193	.196	.16
Average	1.26	.23	.31	.18	.23

Notes: This table shows estimates of mean liquidity and credit premia for colonies in basis points (columns 2 and 3) and in percentage of the mean yield in column 1 (columns 4 and 5). Premia are calculated by multiplying the parameter estimates from an OLS regression of colonial yield spreads on liquidity (measured by the relative bid-ask spread) and credit (measured by the debt service-to-revenues ratio) for the 1880-1909 period (yearly frequency) with each colony's mean liquidity and credit during the same period.

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

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	With Default		**Abs. Bid-Ask**		**Issuer-Year FE**		**Issuer-level**	
Sample:	Sovereigns	All	Colonies	Sovereigns	Colonies	Sovereigns	Colonies	All
Dependent variable:	Yield	Yield	Yield	Yield	Yield	Yield	Yield	Yield
Illiquidity	26.48***	26.48***	0.0773***	-0.0695	4.104***	10.70	13.84*	14.02
	(6.058)	(6.027)	(0.014)	(0.111)	(0.938)	(12.287)	(6.977)	(13.096)
Credit Risk	2.098*	2.098*	0.532*	2.354**			1.425	3.565*
	(1.180)	(1.174)	(0.312)	(1.174)			(0.999)	(1.768)
Volume	-0.0045	-0.0045	-0.177***	-0.157	-0.0929***	0.0016		
	(0.092)	(0.092)	(0.027)	(0.103)	(0.019)	(0.099)		
Age	-0.00194	-0.00194	0.0149***	0.00234	0.0413***	0.00677		
	(0.006)	(0.006)	(0.003)	(0.006)	(0.003)	(0.007)		
Default	2.362***	2.362***		3.144***				
	(0.328)	(0.327)		(0.387)				
Colony × Illiquidity		-17.73***						-0.328
		(6.204)						(14.030)
Colony × Credit Risk		-1.605						-3.908*
		(1.216)						(1.957)
Colony × Volume		-0.173*						
		(0.095)						
Colony × Age		0.0167***						
		(0.006)						
Issuer FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Issuer-Year FE	No	No	No	No	Yes	Yes	No	No
N	1228	3494	2266	1228	3241	1160	717	717
R^2	0.628	0.686	0.522	0.602	0.841	0.688	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 also include sovereign countries in default. *Default* is equal to 1 if issuer is considered in default in Flandreau and Zumer (2004). In columns 3 and 4, *Illiquidity* is measured by the absolute bid-ask spread. Columns 5 and 6 feature an issuer× year fixed effect. Columns 6 and 7 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. *Yield* 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: COLONIAL RETURNS 1872-1909; BID-ASK-SORTED PORTFOLIOS

	(1)	(2)	(3)	(4)	(5)	(6)
Portfolio:	Illiquid	2	3	4	Liquid	ILM
Liquidity (Colonial)	0.000731***	0.000754***	0.000655***	0.000929**	0.00179***	-0.001***
	(3.08)	(2.77)	(2.69)	(2.28)	(4.95)	(-3.93)
Credit (Export)	-0.00682	0.00132	-0.0178	-0.0278	-0.0450**	0.0362**
	(-0.49)	(0.08)	(-1.35)	(-1.51)	(-2.11)	(2.11)
Credit (Deficit)	-0.0381**	-0.0291	-0.0419**	-0.0276	-0.0290	-0.00513
	(-2.53)	(-1.52)	(-2.58)	(-1.21)	(-1.38)	(-0.27)
Term	0.200***	0.211***	0.152***	0.233***	0.205***	-0.00509
	(7.27)	(6.19)	(5.43)	(6.76)	(5.63)	(-0.16)
Market	0.0706***	0.0978***	0.0810***	0.0737***	0.0820***	-0.0114
	(4.39)	(4.58)	(4.60)	(3.44)	(3.63)	(-0.58)
Constant	0.00197***	0.00144***	0.00140***	0.00147***	0.000559*	0.00140***
	(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 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. ***, ** and * indicate significance to the 1, 5 and 10 % level, respectively.

Table 8: SOVEREIGN RETURNS 1872-1909; BID-ASK-SORTED PORTFOLIOS

	(1)	(2)	(3)	(4)	(5)	(6)
Portfolio:	Illiquid	2	3	4	Liquid	IML
Liquidity (Sovereign)	0.0134***	0.00585***	0.00710***	0.00807***	0.00592***	0.00766*
	(3.35)	(2.71)	(5.05)	(3.84)	(5.42)	(1.91)
Credit (Export)	-0.250	-0.0626	-0.0107	-0.0428	-0.0355	-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	0.0101**	0.00181*	0.000646	0.00369***	0.00196**	0.00805*
	(2.31)	(1.74)	(1.10)	(5.52)	(2.53)	(1.83)
N	430	429	430	429	430	429
R^2	0.0430	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 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. ***, ** and * indicate significance to the 1, 5 and 10 % level, respectively.

Table 9: 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.