

The alchemy of gold: interest rates, money stock, and credit in eighteenth-century Lisbon[†]

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This article addresses the partial equilibrium functioning of the short-term credit market in eighteenth-century Lisbon and its response to massive gold inflows from Brazil. Gold inflows were a colonial rent, and thus a source of income and a financial asset that increased the liquidity supply in a credit market populated by both (direct) participants and non-participants in the colonial trade or in mining. As a source of income it would induce a positive upward pressure on interest rates, while as a financial asset it would lead to the opposite. A method is developed to extract interest rates from notarized personal credit, unbundling the aggregate and the idiosyncratic components of risk pricing. The results show that interest rates in Lisbon did not differ critically from those observed in other cities at the core of the premodern European economy, which were spared from devastation by the earthquake that struck Lisbon in 1755. A simple model relating the market interest rate series to gold stock variations finds that the liquidity channel dominated over the endowment channel, which explains the downward trend in interest rates up until 1757 when the interest rates were freely settled. Mild credit rationing may have been introduced by a 5 per cent ceiling on interest rates that was imposed after 1757.

‘Antónia Margarida Leonor said she needed one million *réis*, and for that reason, she asked Luis António da Rocha whether he was willing to lend such an amount under her obligation . . . ; [because] he agreed, he delivered the said million *réis* in gold coins in front of me [the notary]’.¹ This was a common wording in notarized credit contracts in eighteenth-century Lisbon. It reports one particular use of the

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¹ Arquivo Nacional da Torre do Tombo (National Lisbon Archive), hereafter ANTT, Lisbon notarial ledgers, office 2, box 128, book 607, fl.75–6, 1 March 1780 (emphasis added).

monetized gold accumulated in Portugal after the discovery of the first alluvial samples in Brazil in the 1690s.

Three fleets brought approximately three billion *réis* (83,300 pounds sterling) to Portugal annually from Brazilian ports. This money, mostly coined in the colony's mint houses, was to be delivered to an average of 2,300 recipients.² Renowned historians have examined the implications of such a magnitude of remittances for the Portuguese economy. Some have referred to the effect of gold transfers on the domestic market as causing a 'Dutch disease';³ others—equally renowned—have delved into the consequences of gold re-exports flooding France and Great Britain, the largest European economies at the time.⁴ However, thus far no one has addressed the issue of how these gold inflows affected the Portuguese domestic private credit market, and in particular the fluctuation of interest rates. This article aims to fill this gap.

We provide a time series of the market interest rate which we extracted from notarized private credit contracts in Lisbon, and we test statistically the impact of gold stocks on interest rates charged. To compose the time series, we sampled 2,854 obligations dating from 1715 to 1800. Interest-rate information sampled from notarized contracts cannot be simply weighted to provide market-based interest rates, for they contain both an aggregate (market) and an idiosyncratic component. While the former responded to general macroeconomic pressures (including gold inflows), the latter was related to information asymmetries and the contracting parties' characteristics. We propose a new method for separating these two components. This method is distinct from other attempts to extract market-based interest rates from documentary sources, such as bills of exchange. It also goes beyond exploration of the variables that affected idiosyncratic risk.⁵ Our method highlights the relevance of notarized credit. While notarized credit contracts have been used to support important analyses in financial history, they have produced less impressive results when used to build up long-term series of market-based interest rates.⁶

We take the view that gold inflows are exogenous to the economy and affected interest rates in Portugal. On the one hand, monetized gold represented an endowment, since it was a rent generated in the colony, not only because its supply depended on the Brazilian mining regions, but also because its sterilization by a monetary authority cannot be traced. On the other hand, its accumulation in Portugal represented a source of liquidity supply in a credit market populated by both (direct) participants and non-participants in the colonial trade or in mining. Gold inflows were thus simultaneously outside and inside money.

Consequently, the effect of gold inflows on interest rates could be, a priori, ambiguous: the endowment channel would induce a positive upward pressure on interest rates, whereas the liquidity channel would have the opposite effect. Since the average growth rate of gold stock (*c.* 2.5 per cent) was undoubtedly higher than

² Costa, Rocha, and Sousa, *O ouro do Brasil*, pp. 88–91.

³ Azevedo, *Épocas de Portugal*; Godinho, *Prix et monnaies*; Macedo, *A situação económica*; Sideri, *Trade and power*.

⁴ Fisher, *Portugal trade*; Morienau, *Incroyable gazettes*.

⁵ Flandreau, Galimard, Jobst, and Noguès-Marco, 'Bell-jar'; Gelderblom, Hup, and Jonker, 'Notaries'; van Zanden, Zuijderduijn, and de Moor, 'Small is beautiful'; Reis, 'Portuguese judicial system'; Kuran and Rubin, 'Financial power of the powerless'.

⁶ Rosenthal, 'Credit markets and economic change'; Hoffman, Postel-Vinay, and Rosenthal, *Priceless markets*.

the growth rate of the Portuguese economy, our hypothesis is that the second effect was dominant throughout the century.

In order to test our hypothesis, we constructed a simple model relating our market interest rate series to gold stock variations. Two features of the tests performed should be highlighted. First, we used our yearly interest-rate series, covering the period from 1715 to 1800, as a measure for market interest-rates. Our series displays two phases. The first phase is characterized by a descending trend, starting around 6.25 per cent. This downward surge stops at 5 per cent in 1757. Interest rates stabilized thereafter, although in the 1780s they fell below 5 per cent in some years. This flat trend was influenced by a change in the institutional framework brought about by the imposition of a 5 per cent ceiling in April 1757. Second, we also considered the institutional framework constraining the contracts: between 1715 and 1756 loans were negotiated without any legal caps, but a 5 per cent legal cap was imposed in 1757. Assuming that no change of market structure occurred, we performed an out-of-sample forecast for the period 1757 to 1800.

Two conclusions emerged. First, the conjecture that the liquidity channel dominated over the endowment channel seems to hold. Second, the 5 per cent cap was established at a rate that was not very far from a notional (free) interest rate, although some credit rationing may have occurred.

Our research establishes a link with existing literature that regards the injection of precious metals into the economy as one of the significant consequences of the European colonial experience.⁷ The conclusions we draw have implications for the debate on the interplay between financial depth, trends in interest rates, and the institutional background of economies.⁸ The topic of our study encourages new readings of North and Weingast's foundational article in which they claimed the primacy of the political constitution in lowering the aggregate risk that ultimately allowed Britain to take a first step towards modern economic growth.⁹ The case studied here concerns an absolutist monarchy. It thus broadens the discussion on conditions that influence the state's credible commitment, independently of the political constitution, owing to a century-long stream of revenues that materialized in the form of the gold that engulfed the Portuguese economy at the time.¹⁰ Our results favour earlier interpretations about liquidity as the dominant factor for the working of credit, capital markets, and financial depth.¹¹

The remainder of this article is structured as follows. In section I we review the literature and provide our reasons for conducting research that is centred on precious metals. Section II describes the gold stock variation in Portugal throughout the eighteenth century, while section III addresses the intervention of the state in the market—either as a borrower or as a sovereign. In section IV we gauge the representativeness of notarized credit, which is the institution that provides the main data for an estimation of a market-based interest rate. Section V presents

⁷ Following Hamilton's work, *American treasure*, a massive body of studies on precious metals in the early modern period could be cited. Recent attempts to formalize the approach include Costa, Palma, and Reis, 'Great escape?'; Palma, 'Harbingers of modernity'.

⁸ Clark, 'Political foundations'; Epstein, *Freedom and growth*; Quinn, 'Glorious Revolution's effect'; Stasavage, *States of credit*; Sussman and Yafeh, 'Institutional reforms'.

⁹ North and Weingast, 'Constitutions and commitment'.

¹⁰ Acemoglu, Johnson, and Robinson, 'Rise of Europe'.

¹¹ Capie, 'Money and economic development'; Neal, 'How it all began'; Mayhew, 'Prices in England'.

our model for estimating interest rates from a partial equilibrium perspective. In section VI, we estimate a model for the credit market's interest rates as a function of the gold stock. Section VII concludes.

I

It is an undisputed fact among economic historians that throughout the early modern period interest rates displayed a downward trend.¹² However, it has been claimed that the 'magnitude of this decline is little appreciated, its cause is a mystery'.¹³ Some authors even question the pertinence of an enquiry into interest rates, because of the fact that usury laws hindered the unconstrained working of market forces.¹⁴

A large body of research on the factors that contributed to the fluctuation of interest rates and financial development stems from North and Weingast's view on the consequences of the English political constitution after the Glorious Revolution of 1688.¹⁵ According to this view, the English Parliament's control over public finances assured the state's credible commitment when issuing debt securities. Some studies emphasized this stance, assuming political order to be the mechanism through which external shocks, such as openness to Atlantic trade, influenced the divergent growth paths of European colonial powers.¹⁶

Datasets on land rents and new approaches concerning intertemporal preferences opened up a dispute about the role of political risk.¹⁷ Different explanations of the driving force behind the trends in interest rates have been put forward—namely, the comparative advantages of diverse financial systems and the impact of the liquidity of state bonds on private credit.¹⁸ Additional evidence on war-driven public expenditures, as well as on international integration of credit markets without the assistance of national rules, cast further doubts on North and Weingast's hypothesis.¹⁹

While the English case prompted a dispute regarding the effects of political institutions on interest rates and financial depth, the critical views become less assertive when examining the case of absolutist monarchies. Notwithstanding the lack of quantitative evidence, interest rates are expected to reflect the higher risks of regimes that lacked regular checks on the king's decisions. The Spanish Habsburgs' easy access to silver, together with their massive expenditure in military endeavours, is an illustrative example of political risks leading to the expropriation of creditors,

¹² Homer and Sylla, *History of interest rates*, pp. 168, 176.

¹³ Clark, 'Interest rates in the very long run', p. 1.

¹⁴ Temin and Voth, 'Credit rationing'; eisdem, 'Private borrowing'; eisdem, *Prometheus shackled*; Hoffman et al., *Priceless markets*.

¹⁵ North and Weingast, 'Constitutions and commitment'. For a survey of the debate, see Coffman, Leonard, and Neal, eds., *Questioning credible commitment*, especially the editors' introduction.

¹⁶ Acemoglu et al., 'Rise of Europe'; van Zanden, Buringh, and Bosker, 'Rise and decline', p. 851.

¹⁷ Allen, 'Price of freehold land'; Clark, *Farewell to alms*; idem, 'Political foundations'; Edvinsson, 'Shadow interest rates'; Epstein, *Freedom and growth*.

¹⁸ Neal, 'Financial markets and cliometrics'; idem, 'How it all began'; Reis, 'Portuguese judicial system'; Gelderblom and Jonker, 'Finance'; Carlos and Neal, 'Amsterdam and London'.

¹⁹ Barro, 'Government spending'; Sussman and Yafeh, 'Institutional reforms'; Neal, *Rise of financial capitalism*; idem, 'How it all began'; Flandreau et al., 'Bell-jar'; Nogues-Marco, *Tipos de cambio*.

thwarting the path to financial development and economic growth.²⁰ Evidence collected for the eighteenth century, however, points to a trend in interest rates of sovereign financial instruments which was not quite distinct from that observed in parliamentary regimes, even though the core of the Spanish absolutist regime had not changed much since the sixteenth century.²¹

This vivid debate about the institutional constraints on credit markets was broadened by theoretical insights into informational issues.²² Several studies addressing the microeconomics of transactions have scrutinized the institutional arrangements that coped with adverse selection, moral hazard, agency problems, and idiosyncratic risk.²³ Research conducted on credit in Paris by Hoffman et al., focusing on the agent's behaviour, is an instructive example of this. It modelled notarial mediation in the allocation of funds, and showed that this contributed to financial deepening.²⁴ The Paris study acknowledges, however, that usury laws hindered the market clearing through variations in interest rates. Additionally, contracts often did not explicitly state an interest rate. Altogether, by addressing informational problems, this type of research has enhanced the potential of notarized credit to help us understand financial systems in Europe. However, any series on interest rates is yet to be extracted from notarial evidence.

Another relevant strand of the literature has been concerned with the role of the flow of precious metals in public or private credit markets.²⁵ The existing debate concerns whether or not credit was constrained by the availability of liquidity. Scholars have mainly evaluated contexts characterized by a perennial scarcity of specie, and thus references to the credit market facing an abundance of gold, as occurred in the eighteenth century, are rather uncommon.²⁶ Recent studies, however, have carried out formalized analyses of the impact of American precious metals on the performance of European economies and on the trade Europe carried out on a global scale. This has again emphasized the importance of full-bodied metallic money for the development of financial systems.²⁷

Our enquiry follows this strand of the literature. It re-evaluates the role of colonial rents materialized in precious metals as having an endowment effect (that is, non-produced income). It has been fully recognized that Portugal took part in the mechanisms through which Europe had access to gold money in the eighteenth century. Exports of this precious metal were substantial and our current knowledge of its inflows and outflows allows for an estimation of the Portuguese money stock

²⁰ On all these subjects, see Acemoglu et al., 'Rise of Europe'. Studies of state making and fiscal development have revised this view; Comín Comín and Yun-Casalilla, 'Spain'.

²¹ Grafe, *Distant tyranny*; Álvarez-Nogal, *Oferta y demanda*.

²² Akerlof, 'Market for lemons'.

²³ Fontaine, 'L'économie morale'; Greif, 'Reputation and coalitions'; Muldrew, *Economy of obligation*; Rocha, 'Crédito privado'; Costa, Rocha, and Araújo, 'Social capital and economic performance'; Neal and Quinn, 'Markets and institutions'.

²⁴ Hoffman et al., *Priceless markets*.

²⁵ Literature has proliferated since the classical works of Ramon Carande and Felipe Ruiz Martin. For the contours of the issue currently in question, see Drelichman and Voth, *Lending to the borrower from hell*; Álvarez-Nogal and Chamley, 'Debt policy under constraints'.

²⁶ For the premium on liquidity, see Mayhew, 'Population'; Coleman, 'Sir John Banks'; Spufford, *Money*; Capie, 'Money and economic development'; Neal, 'How it all began'. For a critical view, see Bolton, 'Crisis of credit'.

²⁷ Palma, 'Harbingers of modernity'; O'Brien and Palma, 'Danger'. For the view on money stock providing a measure for international comparisons of financial systems, see Goldsmith, *Premodern financial systems*.

with a reasonable level of accuracy.²⁸ In the next section we provide the data on the gold stock in the Portuguese economy.

II

Throughout the eighteenth century, after the discovery of the first reserves in the 1690s, Portugal received 557 tons of gold from Brazil, the equivalent of 271 billion *réis* (75 million pounds).²⁹ This inflow constituted a double rent. On the one hand, it included a monopoly rent analogous to any other rent that was extracted from trade in the colonial system. It bore additional advantages, though, since it had lower transactional, storage, and market costs. Besides, its irregular supply would not saturate the markets immediately after the ships with gold arrived, as sometimes occurred with tobacco and sugar. On the other hand, it included a financial rent, because the inflow took the form of a highly liquid asset that could finance public or private endeavours that generated positive interest. This section describes the potential accumulation of this metal in Portugal which, apart from the state's share, arrived mostly coined.

In our estimation of the gold stock in Portugal, we rely on primary and secondary sources. Archival evidence on the 1% ad valorem tax levied on each gold remittance (whether or not it was already coined) allowed for the assessment of the amounts of arrivals.³⁰ The lack of Portuguese official trade statistics from 1700 to 1776 confined the estimation of outflows to the use of secondary sources that refer to the trade statistics of Portugal's principal commercial partners.³¹ Foundational studies on Portuguese foreign relations have demonstrated the overwhelming part played by Great Britain in Portugal's trade relations, allowing only a minor share to other economies, such as France, Spain, or the Baltic region.³²

Through Great Britain's intermediation, and specifically through the services of English intermediaries in the discounting of bills of exchange, Portugal settled deficits not only with Great Britain itself but also with other partners, including the Netherlands and Germany.³³ Therefore, data on exports of gold to Britain are taken as highly representative of its outflows. After 1776, Portuguese official trade balances can be used in the estimation of outflows. Decreasing deficits characterized the last decade of Portuguese foreign trade in the eighteenth century. By that time, major imbalances had been caused by trade with the Baltic region (mainly with Russia), which also demanded gold transfers. However, Portuguese bilateral trade with the Baltic region was on a much smaller-scale than Portuguese bilateral trade with Great Britain.³⁴

²⁸ Costa et al., *O ouro do Brasil*.

²⁹ For the amount of gold unloaded each year in Lisbon, see *ibid.* This study revised Morineau's work on the Dutch economic press; Morineau, *Incroyable gazettes*.

³⁰ Arquivo Histórico da Casa da Moeda de Lisboa, *Livros de Manifesto do 1% do ouro*, in Costa et al., *O ouro do Brasil*, ch. 1. Raw data are available at Lisbon School of Economics and Management, 'Bases de dados', <https://aquila1.iseg.ulisboa.pt/aquila/investigacao/ghes/investigacao/bases-de-dados>, tab. III, where exchange rates considered in estimations are indicated.

³¹ Fisher, *Portugal trade*; Labourdette, *La nation française à Lisbonne*.

³² Sideri, *Trade and power*; Fisher, *Portugal trade*.

³³ Fisher, *Portugal trade*, pp. 133–6.

³⁴ Costa, Lains, and Miranda, *Economic history of Portugal*, pp. 194–203.

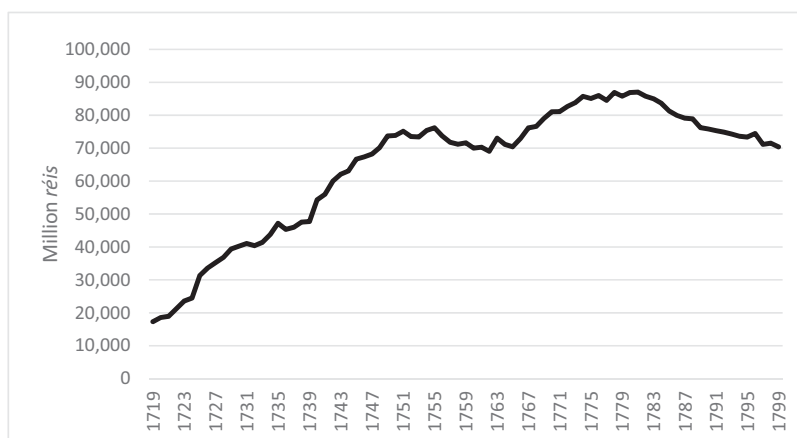


Figure 1. *Gold stock*

Source: Costa et al., *O ouro do Brasil*. Raw data are available at Lisbon School of Economics and Management, 'O ouro do Brasil: remessas e agentes, 1720–1807', <https://aquila.liseg.ulisboa.pt/aquila/investigacao/ghes/investigacao/bases-de-dados>, tab. III.

Exploring the aforementioned categories of data, figure 1 assumes the drainage of gold (bullion or coins) cleared Portugal's trade deficits.³⁵ Thus, foreign relations evolved in a way that allowed for an extraordinary increase in the gold stock until 1781. In 1720, it accounted for 1,149 million *réis*, approximately 2.4 per cent of GDP, and in the middle of the century it may have equalled GDP (58 billion *réis*). Gold stock grew at a rate significantly higher than any existing estimation for GDP, which could have been close to 0.5 per cent.³⁶

The positive growth was temporarily halted in the aftermath of the earthquake of 1 November 1755.³⁷ Apart from the high number of casualties, the destruction caused throughout the whole Portuguese kingdom may have amounted to nearly 75 per cent of GDP.³⁸ In Lisbon alone, 10 per cent of the housing stock crumbled, and 30 per cent of homes became uninhabitable. However, one central public building, the Mint House, was saved. Reports from that time commented on the significance of this fortuitous event, because a considerable number of private remittances in gold coin that had arrived in the latest fleets from Brazil continued to be stored there.³⁹

The rebuilding of residential capital boosted imports of intermediate goods and aggravated Portugal's trade deficits. Increasing gold exports used to settle trade deficits resulted in the stabilization of the level of the stock. Shortly after the earthquake, the upward trend resumed and gold stock reached its peak for this time series in the 1780s. Finally, Portugal's positive trade balances for several years during the 1790s did not mitigate the negative effects of lower remittances since

³⁵ Costa et al., *O ouro do Brasil*, pp. 89–90, 95–100.

³⁶ Palma and Reis, 'From convergence to divergence'.

³⁷ For a thorough estimation of the demographic and short-term economic effects of the earthquake, see Pereira, 'Opportunity of a disaster'.

³⁸ Cardoso, 'Pombal', p. 166.

³⁹ Serrão, 'Os impactos económicos do terramoto', p. 161.

1775. The gold stock was markedly lower in 1800, when it fell 16 per cent below the level attained in 1781.

Approximately one-fifth of these resources were derived from a royal duty on production, the so-called *quinto* (the fifth), which made up 9–11 per cent of public revenues from 1716 to 1776.⁴⁰ The remaining four-fifths of the gold stock were privately owned, mostly in the form of currency issued in Brazil.⁴¹ The Lisbon Mint House minted gold coins mainly from the state's share that had been shipped in bullion or dust. Minting silver coins constituted a residual part of the Lisbon Mint's activity, so that the silver stock hovered around 3 to 5 per cent of the gold stock from 1730 to 1797.⁴² English sources dating from the 1730s attest to the monetary effect of this imbalance, claiming that silver coins rarely circulated in the market.⁴³ Indeed, silver rarely appears in the cargo registers of the Brazilian fleets, since the Portuguese Crown had no fiscal rights on mining, and the 1 per cent tax on shipping was levied on gold remittances only. In this sense, it is difficult to suppose that silver could have had an endowment effect similar to that of gold.

In the Portuguese monetary system, gold specie had a denomination worth no less than 2,400 *réis*, but most coins entering Portugal were worth 6,400 *réis*, an amount that would pay for 30 working days of unskilled labour.⁴⁴ Being inappropriate for use in current transactions, gold specie constituted a safe value. They could be hoarded or invested in either publicly or privately issued interest-bearing instruments. In the next section we focus on the state's intervention in the uses of gold in the credit market.

III

Several decades ago, renowned scholars discussed the significance of colonial proceeds in Portuguese public finances with regard to the royal right to the *fifth*, but the sovereign's capacity to borrow was rarely a subject of enquiry.⁴⁵ Hence, studies on Portuguese public credit in the early modern period are scarce, in spite of the regular issuing of perpetual redeemable annuities (*padrões de juro* and *tensas*) dating back to the middle of the sixteenth century.⁴⁶ A rather unique publication from 1883 reports the state's intervention to redeem perpetuities in the eighteenth century.⁴⁷ It refers to the rolling over of old debt from 1719, when the state converted bonds paying 6.25 per cent and 5 per cent interest into bonds paying 4.5 per cent.⁴⁸ Decades later, in 1753, new debt paid 4 per cent interest and in the early 1780s bonds were issued at 3.5 per cent. Finally, in 1791, the royal treasury

⁴⁰ Thomaz, 'As finanças do estado pombalino', tab. IV, p. 376.

⁴¹ Private remittances were 91% in specie against 29% for state remittances; Costa et al., *O ouro do Brasil*, pp. 87–92.

⁴² Sousa, *Moeda e metais preciosos*, pp. 109–15. Raw data are available at Lisbon School of Economics and Management, 'Bases de dados', <https://aquila1.iseg.ulisboa.pt/aquila/investigacao/ghes/investigacao/bases-de-dados>, tab. III, sheet metallic money supply.

⁴³ Fisher, *Portugal trade*, pp. 31–3.

⁴⁴ Sousa, *Moeda e metais preciosos*, p. 147; wages are available at 'Prices, wages and rents in Portugal 1300–1910', <http://pwr-portugal.ics.ul.pt/>.

⁴⁵ Macedo, *A situação económica*; Godinho, 'Finanças públicas'; Azevedo, *Épocas de Portugal*.

⁴⁶ Pedreira, 'Costs and financial trends', p. 57.

⁴⁷ Gomes, *Collecção de leis*.

⁴⁸ *Ibid.*, p. 10.

acknowledged the existence of a considerable level of liquidity stored in the coffers of a few organizations and issued perpetuities at 3.25 per cent, which was a rate similar to that observed for British public credit.⁴⁹

State bonds were transferable and were deemed a trustworthy source of revenue; they were thus accepted as collateral in private obligations. We do not know how yields evolved in the secondary market, and whether they showed a declining trend as they did in Spain.⁵⁰ We are only aware that bonds paying increasingly low interest were issued.

The net change in the gold stock in public coffers was not viewed as a policy instrument designed to affect the aggregate liquidity or interest rates of the economy, as is the case in modern open market operations. The interest paid on Portuguese state bonds, however, had two consequences that resemble those of modern open market operations. First, liquidity in government coffers reduced the volume and cost of the outstanding debt, as mentioned earlier. Second, interest paid on Portuguese state bonds signalled a lower probability of the king's default or of his resorting to expropriation, thereby potentially reducing interest rates. Both of these consequences seem to provide an answer to an apparent conundrum about the Portuguese economy: despite having a thinner financial market, lacking organized public stock exchanges or private and chartered banks, public credit in Portugal benefited from the credible commitment of the state, which pressed interest rates down, as was normally witnessed in much deeper financial systems in Europe.

This similarity of experiences between long-term public credit in Portugal and other European states occurred against the backdrop of a distinct institutional framework. Public credit in Portugal still displayed the characteristics of a personal service to the monarch. The state's perpetuities were issued with the assistance of the Treasury and each credit transaction was registered in the Royal Chancery. As such, this kind of transaction was not distinguished from any other decision taken by the state that was usually recorded in the Royal Chancery's books, such as the nomination of an officer for a public post. Furthermore, the bonds could be traded on a secondary market, but the new creditor had to ask for his name to be listed in the records of the Royal Chancery in order to be entitled to receive interest. The rentier nature of such credit bonds surfaced in probate inventories of aristocratic houses and in dowries, wherein they were deemed an investment that was as safe as real estate.⁵¹

The significance of personal ties was even clearer in the provision of public, short-term credit, in spite of the fact that the lenders in this segment of the market had belonged to the middling sort since the sixteenth century.⁵² Yet public finance in the eighteenth century gave rise to a rank of merchants for whom short-term lending

⁴⁹ *Ibid.*, p. 248; North and Weingast, 'Constitutions and commitment'; Homer and Sylla, *History of interest rates*, pp. 153–9. There is no clear evidence that the Portuguese state resorted to '*crecimiento*' in the eighteenth century to reduce the debt, as occurred in Castile in the seventeenth century. Through *crecimiento*, the creditor's annual income was held constant and required an augmentation of the capital of the loan. See Álvarez-Nogal and Chamley, 'Debt policy under constraints', p. 196.

⁵⁰ Grafe and Irigoin, 'Stakeholder empire', p. 628, n. 65. For extended use of perpetuities as a financial instrument, including as collateral in large transactions, see Álvarez-Nogal, *Oferta e demanda*, p. 80 and tab. A1.

⁵¹ Monteiro, *O crepúsculo dos grandes*, pp. 258, 263, 358.

⁵² Boyajian, *Portuguese bankers*.

to the state was tightly bound to tax farming. Prosperous businessmen combined contracts for tax farming with participation in the colonial trade and with long- and short-term lending to both private and public borrowers. This powerful moneyed elite consisted of investors, rather than bankers, since there is no documentary evidence relating their activity to specialized financial intermediation.⁵³

The personal characteristics of the public credit market did not prevent the state from establishing a 5 per cent interest rate ceiling in 1757. The wording of the law that put this ceiling in place specifies neither the reasoning behind nor the purposes of the regulation. The earthquake of 1755 is not mentioned as a justification, but the existence of credit transactions at 1 per cent interest per month is acknowledged. The state's intention to hinder bottomry loans from financing Brazilian shipping was clear, whereas the same did not apply to Asian shipping, which was left unregulated.

It appears that the government of the Marquis of Pombal (1750–77) intended to create opportunities for liquidity dishoarding and investment diversification. The establishment of chartered companies, statutorily devoted to administration and commerce with Brazil (*Companhia do Grão Pará e Maranhão*, 1755; Pernambuco and Paraíba, 1756), might have been the motive for the imposition of a ceiling on interest rates. Although the statutes of these companies preceded the enactment of the law, the truth is that their capital was mostly gathered after April 1757.⁵⁴

To sum up, the ruler's motives for establishing an interest rate ceiling are not clear. The opportunities created for the diversification of investments might have diverted some hoarded liquidity, but archival evidence shows that one of the most common applications of gold before and after the 1757 law was short-term credit, as numerous notarized contracts document. In the next section we examine the institution that provides us with the best information on this market.

IV

Portugal lacked specialized financial intermediation in the early modern period. While public banks had already developed in Castile in the sixteenth century, evidence for their establishment in Portugal cannot be found.⁵⁵ Yet studies on the moneyed class in early modern Portugal reveal a world of investors whose ledgers, last wills, or inventories report their personal balance of debts and credits, and the discounting of bills of exchange, but none refer to the existence of deposits as a liability.⁵⁶ This documentary corpus, together with data on probate inventories from diversified social ranks, shows that lending money was a socially widespread practice, making eighteenth-century Portugal no different from seventeenth-century England.⁵⁷ Nevertheless, the resemblance does not extend any further. The move towards specialized financial intermediation in Portugal occurred much later, in the liberal period, when some members of the aforementioned moneyed elite invested in the first bank (the Bank of Lisbon, chartered in 1821).⁵⁸

⁵³ Costa, 'Capitalistas e serviços'.

⁵⁴ Marcos, *As companhias pombalinas*.

⁵⁵ Reis, *O Banco de Portugal*; Valério, ed., *History of the Portuguese banking system*.

⁵⁶ Pedreira, *Homens de negócio*; idem, 'Tratos e contratos'.

⁵⁷ Muldrew, *Economy of obligation*; Rocha, 'Crédito privado'.

⁵⁸ See Cardoso, *Novos elementos para a história bancária*.

Until then, religious orders, particularly brotherhoods (*misericórdias*), played a role in credit transactions.⁵⁹ After 1776, a legal act banned them from lending, thus forcing the *misericórdias* to channel their funds towards financing the state.⁶⁰ Like *misericórdias*, other charitable institutions, as well as the orphans' courts, participated in credit transactions. In spite of their intense contribution to the credit supply, the archives of these institutions do not provide homogeneous data which would allow for the construction of an interest rate time series that could be used for statistical analysis.

Notarized contracts are, for that purpose, the best source available, because the notarial institution played a significant role in financial contracting. Furthermore, the contracted obligations have the very convenient characteristic of explicitly indicating the contractual interest rate, which allows us to build a market interest rate series that will be presented in the next section.

To assess whether notarial deeds were indeed representative of Portugal's institutional context we first checked whether notarized credit was a common practice in Lisbon, and how this situation compared to that of noteworthy European financial centres, such as Amsterdam, and other cities with royal courts, such as Paris. Then, through a qualitative appraisal of the clauses of contracts, we checked the possible impacts of the earthquake (1755) and of the legal interest rate ceiling (1757) on the representativeness of the source.

Notaries in Portugal had been in a 'public' position since the medieval period. Each body of notarial agencies working locally was regulated by a central law that fixed the number of offices, independently from the demand for public deeds. Since the sixteenth century there had been 18 notarial offices in Lisbon. As was the case for many public positions in early modern Europe, the notarial agencies bore patrimonial features, and could be inherited or purchased.⁶¹

Evaluation of notarial activity in Lisbon can rely on the registers of an institution that was officially empowered to assign services to the notaries operating in a given market, known as the Distribuidor (Distributor). These ledgers comprise a practically complete index of all sorts of deeds drawn up in Lisbon until 1776. The documentation dating after 1776 displays serious lacunae and few books can be found until 1802.⁶² The Distribuidor's archive makes it possible to quantify notarial activity in its entirety, which allows comparisons between this city and the other European cases, despite two-thirds of the original deeds being missing due to the massive destruction caused by the earthquake in 1755. The archive also enables us to select one office, among the six preserved, that best supports sampling.

The Distribuidor's ledgers reveal that the distribution of acts was quite uneven, and particularly so before 1755. Some offices, mostly active in the first half of the century and escaping from destruction, appear to have been noticeably affected by the consequences of the earthquake. The number of their deeds declined significantly after 1755 and did not recover until the 1790s. This led us to discard the most active notaries in the first half of the century, since their lower production

⁵⁹ Sá, *As misericórdias portuguesas*; Amorim, 'Património e crédito'.

⁶⁰ Gomes, *Collecção de leis*, p. 290.

⁶¹ Adrião, *Ensaio de bibliografia*.

⁶² See online app. S1 for explanation of the Distribuidor's office and how we explored this archive to select a notary for sampling.

Table 1. *Notarized credit in Lisbon and in other European cities in 1740*

	Paris	Lisbon	Antwerp	Amsterdam
Population	576,000	140,136	62,500	220,000
Credit contracts per 1,000 inhabitants	11	6,1	1,8	2,4
Average loan size in grams of silver	31,857	29,548	9,014	30,713
Average maturity (years)	11	5	3	2,5
Daily wage in grams of silver	8.2	9	11.5	11.7
Average loan size/daily wage	3,885	3,277	783	2,625

Sources: Lisbon: population: Pereira, 'Opportunity of a disaster'; total credit contracts: ANTT, Cartório do Distribuidor; loan sizes, Barbuda office, ANTT, Lisbon notarial ledgers, office 2, boxes 101–2, ledgers 472–6; maturity: Arquivo Histórico do Tribunal de Contas, Lisbon, *Livros de Décimas de Juro*, DC 731J-DC 742J, *décima* tax on interest, parish of S. Sebastião. Wages in Lisbon: 'Prices, wages and rents in Portugal 1300–1910', <http://pwr-portugal.ics.ul.pt/>. Wages in other cities: Allen, 'Great divergence'. Population and credit in Paris: Hoffman, Postel-Vinay, and Rosenthal, *Priceless markets II: time and space*, online app. (<http://people.hss.caltech.edu/~jlr/events/2013-HPVR.pdf>), p. 24. Population and credit in Dutch cities: Gelderblom et al., 'Notaries'.

after 1755 may have had many causes and could bias our conclusions.⁶³ This was the primary reason for selecting the office of the Barbuda family, which was well preserved, and whose activity did not display the drawbacks affecting the other offices.

Two other motives reinforced our choice of Barbuda's office. One concerned the chain of proprietors of each office, and the other the structure of clientele. The notary who replaced Barbuda in 1750 was still in charge in 1792. So any possible differences we might appraise after 1755 or 1757 in the wording of contracts should not be attributed to the idiosyncrasies of the notary. As for checks on the clientele, we took two samples among the records of the Distribuidor that had detailed summaries and encompassed the years after the enactment of the ceiling (1757–9 and 1770–2). We found no critical differences in the clientele of the selected office.⁶⁴

As a first step towards gauging the representativeness of notarial mediation in the credit market in Lisbon, we took 1740 as a benchmark. To compare Lisbon with Paris, Amsterdam, and Antwerp (table 1), we relied on the index of the Distribuidor for an assessment of the total number of obligations, whereas any detail of the clauses of the credit contracts required a reading of the originals in our sample. To obtain a more precise notion of maturities, when contracts established the possibility of extending a one-year term, we completed the information from a fiscal source referring to a tax on interest (*décima de juros*).⁶⁵

Notarial mediation appeared to be more frequent in Lisbon than in Amsterdam and Antwerp. Nevertheless, Paris led in all dimensions. The average loan amounted to 3,885 daily wages in grams of silver there, while in Lisbon it was equivalent to 3,277 daily wages, above Amsterdam (2,625 daily wages) and well above Antwerp (783 daily wages). The value of loans is thought to reflect the social profile of the contracting agents. In Paris, 'most of the parties to loans occupied [more] elevated rungs'; in fact, at one time, '64 percent of private borrowers were nobles

⁶³ Two offices with that profile were preserved.

⁶⁴ See online app. S1.

⁶⁵ Arquivo Histórico do Tribunal de Contas, Lisbon, parishes: S. Paulo; S. Sebastião; Madalena; Mártires; DC 700MJ-DC 717J; DC 731J-DC 742J; DC 889J-DC 907J; DC 1128J-DC 1147J.

and officers'.⁶⁶ Hence, the demand for notarial services in Lisbon involved a higher average loan than in a deeper financial market, such as Amsterdam, but, as will be seen later, it embraced a wider social range of agents than that in Paris, where aristocratic and educated participants were predominant. This suggests that notaries in Lisbon may have performed a particular role, meeting the demand of socially diversified participants, many of whom would otherwise lack financial intermediation.

The next step in the critical analysis of the information we intend to explore involves pinning down the possible changes in the working of the credit market due to the state's regulation of interest rates from 1757. This requires a qualitative reading of the main clauses of contracts in our sample extracted from Barbuda's office.

The obligations we analyse date from 1715 to 1800, amounting to 2,854 contracts. The time benchmarks were predetermined by the availability of data on the gold stock and account for the consequences of the war in Europe in the late eighteenth century, which compelled the state to issue paper money to finance public debt. The years 1797–1800 mark the onset of an entirely new phase in Portuguese financial and monetary history. The sample comprises three sorts of liabilities: new loans, acknowledgements of an outstanding debt, and unpaid transactions for services or goods. New debt accounted for the vast majority of cases, totalling 1,890 million *réis*, of which 89 million were borrowed as bottomry loans for overseas trade. The second and third types of obligations accounted for 330 million *réis* and 176 million *réis*, respectively. Our study takes into account new debt but excludes bottomry loans because an insurance premium and maritime contingencies were implied in the interest rates charged. Hence, the 1,801 million *réis* of credit documented by the remaining 2,565 obligations is the subject of our analysis.

The annual volume of credit was quite volatile. The amounts ranged from 3,200 *réis* to 24.8 million *réis*. Considering the entire series, the average size of a loan was 1.5 million *réis*. Notwithstanding volatility, an upward trend in the credit volume throughout the first half of the century and a spike in 1757–8 were detectable features. Starting in 1759, a declining tendency pointed to credit contraction. To gauge the significance of this trend, we used the fiscal source of the *décima*, which singles out taxes on interest.⁶⁷ A parish in Lisbon such as São Sebastião, which grew after the earthquake, recorded decreasing amounts of taxes on interest, which suggests that the tax base was shrinking.⁶⁸ The examination of the records of the *décima* on interest suggests that fiscal policy affected the volume of credit. The tax rate increased from 4 to 10 per cent after 1762, and legislation in 1771 forced notaries to deliver information to validate taxpayers' declarations of earnings. Other factors not strictly connected to credit operations, such as fiscal costs, could also have impacted on the quantity of credit allocated through public deeds. Hence, in our sample, trends in the volume of credit should be read with caution. At any rate, we can say that notarial mediation secured a larger number of loans of greater values after the 1757 ceiling (figure 2).

⁶⁶ Hoffman et al., *Priceless markets*, p. 163.

⁶⁷ In 1762, the levy on loans, whether charged with interest or not, came to be registered in autonomous books.

⁶⁸ Pereira, 'Opportunity of a disaster', tab. 1, p. 470.

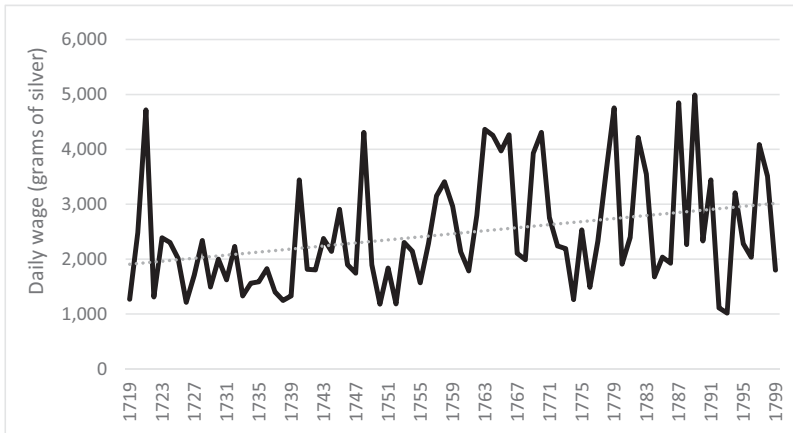


Figure 2. *Average loan*

Sources: Wages in Lisbon: see data at 'Prices, wages and rents in Portugal 1300–1910', <http://pwr-portugal.ics.ul.pt/>. Contracts: Barbuda office, ANTT, Lisbon notarial ledgers, office 2, boxes 74–141, ledgers 358–670.

Apart from this slight change, the wording of contracts does not reveal significant alterations from which we could infer the existence of credit rationing. Both before and after 1757, the maturity could be a one-year term or an extendable one-year period.⁶⁹ Unsurprisingly, credit for rebuilding Lisbon soared immediately after the earthquake, but throughout the entire period the structure of applications was stationary. The consumption of durable goods and households' occasional shortcomings led borrowers to demand liquidity in approximately 63 per cent of the volume transacted. These uses of loans, together with the rollover of old debt by contracting more credit, amounted to 86 per cent of cases.

The supply and demand sides of the credit market accommodated an array of social statuses and occupations. Lenders belonged mainly to the social categories of commerce and professionals, while the nobility, knights, and higher honourable ranks of the military orders (*comendador*), as well as members of the aristocracy, participated mainly as borrowers (table 2). Women were in a similar position on both sides of the market, although widows (approximately half of the female group) could have been included in the categories of professionals or commerce depending on their husbands' predominant social profiles. In any case, both the group of borrowers and lenders extended to craftsmen or skilled labourers, who signed the most contracts as borrowers before and after 1757 (20.8 and 20.3 per cent), albeit for relatively small loans.

The structure of the clientele did not change after 1757, but the 'commerce' category relied more on notarial mediation than it did before. This may signal greater aversion to risk and credit rationing, since lending at 5 per cent interest required additional means of protection through public contracting.

The analysis we will carry out later addresses the consequences of the 1757 legal act. For now, we recall that every contract specified a nominal interest rate, even when parties declared their intention to make a deal at zero cost. As in other

⁶⁹ In 80 cases the maturity of the loan is not specified.

Table 2. *Social categories in total contracts*

Categories	Proportion of categories: 1715–56				Proportion of categories: 1757–99			
	Lender		Borrowers		Lender		Borrowers	
	Number (%)	Value (%)	Number (%)	Value (%)	Number (%)	Value (%)	Number (%)	Value (%)
Administration and clerks	4.4	3.5	5.9	8.2	4.6	3.0	6.7	5.3
Farmers and fishermen	1.9	0.7	5.9	1.4	0.7	0.1	3.5	1.0
Craftsmen and labourers	14.8	6.5	21.8	9.3	10.4	5.7	20.3	8.7
Foreigners	2.5	4.1	1.4	2.7	1.0	0.5	1.2	1.5
Women	14.9	17.0	13.0	15.6	14.5	14.8	12.3	12.6
Services	3.0	1.3	1.9	1.1	3.3	1.5	4.3	2.6
Transport	0.5	0.1	1.6	1.1	1.0	0.2	1.7	1.1
Military	3.9	4.0	3.5	2.6	5.6	3.5	5.7	8.5
Professionals	16.8	21.5	11.1	12.9	18.2	19.0	11.0	13.7
Proprietors	5.7	8.4	6.8	4.5	4.2	2.1	6.1	2.9
Commerce	13.1	12.1	8.8	9.6	20.7	28.4	13.4	13.2
Nobility	4.8	6.0	7.7	16.1	5.6	8.8	6.1	14.4
Religious institutions	1.3	1.8	1.2	2.8	3.8	5.6	2.2	6.4
Non-classified	12.4	13.1	9.5	12.1	6.4	6.8	5.4	8.3

Note: For each category the first column, ‘Number’, reports the percentage of the number of contracts in each occupation; the second column, ‘Value’, reports the percentage weighted by the value of the contracts in each occupation.

Source: ANTT, Lisbon notarial ledgers, office 2, boxes 74–141, ledgers 358–670.

places and institutional environments, this sort of agreement did not necessarily conceal usury interest rates.⁷⁰ To sum up, we find some signs of higher moral hazard concerns when notarial mediation was used in contracts charging zero per cent interest rates, or to secure loans of higher average value. Yet the social structure of participants appears unchanged, which we would not expect under credit rationing.⁷¹

The qualitative reading of the contracts did not clearly disclose structural changes after 1755 or 1757. In the next section we focus on the contracts that indicate a positive interest rate to extract the necessary information for building a market interest rate series.

V

Our analysis so far has concentrated on the words of contracts that were drawn up between two individuals. This does not allow us to estimate demand and supply schedules. To determine the market interest rate, we must look at how the borrower and the lender reached the contracted interest rate. This includes two components: a risk premium, which has an aggregate nature affecting all private credit (including gold inflows); and an idiosyncratic premium, which is specific to the two parties involved in a particular contract.

The method we propose to estimate a market interest rate is to extract the idiosyncratic component. The categorization of borrowers and lenders (table 2) is valuable in this regard, particularly when referring to early modern economies

⁷⁰ Fontaine, *L'économie morale*; Quinn, ‘Glorious Revolution’s effect’; Temin and Voth, *Prometheus shackled*, p. 60.

⁷¹ Temin and Voth, *Prometheus shackled*, pp. 83–91.

in Europe, where rank, occupation, or any other form of differentiation signalled a positive (or negative) reputation of individuals. Thus, each category of agents bears inherent information that we can analyse, especially in the face of the socially diverse range of parties included in our sample.

Consider a specific borrower–lender pair, indexed by (b, l) , successfully matched in a contract j . The contract j is characterized by the pair (i_j, l_j) , where i_j is the observed interest rate and l_j is the logarithm of the level of the credit contracted. We assume that the supply and demand functions are:

$$l_j^l = \alpha_0^l + \alpha_i^l i_j + \alpha_X^l X_j + \alpha_j^l \quad (1)$$

$$l_j^b = \alpha_0^b + \alpha_i^b i_j + \alpha_X^b X_j + \alpha_j^b \quad (2)$$

where X is the vector of information shared by both parties, which is unobservable to us, and α_j^l and α_j^b are the idiosyncratic components for lenders and borrowers, respectively. Higher α_j^l means that the lender's monitoring capabilities are higher for lender l and higher α_j^b means that the moral hazard risk is lower for borrower b . The contract (i_j, l_j) is the (ex post) solution of equations 1, 2 together with the market clearing condition which is $l_j = l_j^l = l_j^b$.

If we eliminate X_j in equations 1 and 2 and pick up the resulting equation for l_j , we find a reduced form relationship for the contracted loan, as a function of the interest rate and the idiosyncratic components of both parties:

$$l_j = \beta_0 + \beta_i i_j + \beta_j^l + \beta_j^b, \quad (3)$$

where $\beta_j^l = \beta^l \alpha_j^l$ and $\beta_j^b = \beta^b \alpha_j^b$. The reduced form parameters affecting the idiosyncratic components β_j^l and β_j^b correctly identify the structural parameters,⁷² α_j^l and α_j^b . This allows us to consider two types of equilibria: a separating equilibrium if one idiosyncratic parameter is significantly different from zero, or a pooling equilibrium if at least one is statistically equal to zero.

We interpret the first case as an instance in which one party was able to observe the characteristics of the other contracting party and to adapt the contract's wording accordingly. A positive (negative) β_j^b is evidence of the borrower contracting more (less) than the market average for a given interest rate. A positive (negative) β_j^l is evidence of category l lending higher (lower) amounts than the market average for a given interest rate. The cases in which β_j^b and β_j^l are equal to zero are taken as those in which generic moral hazard is pervasive across the entire private credit market based on bilateral contracts.⁷³ There is usually equilibrium credit rationing in this case, but we cannot observe the extent of such rationing because of survivorship bias, since our data only contain successful contracting. We regard these pooling equilibria contracts as an instance of the contracting at prevailing equilibrium market conditions.

⁷² See online app. S2 for a proof.

⁷³ If the lender cannot observe the borrower's characteristics, we have a case such as that found in Stiglitz and Weiss, 'Credit rationing'. However, it is also possible that the borrower cannot observe the lender's characteristics.

Table 3. *Categories and idiosyncratic components*

<i>Signs of borrowers</i>	
β^b	
Zero	Clerks, foreigners, women, military, professionals, commerce
Positive	Nobility, religious institutions
Negative	Farmers, craftsmen, services, transport, proprietors
<i>Signs of lenders</i>	
β^l	
Zero	Clerks, farmers, craftsmen, foreigners, women, military, professionals, commerce
Positive	Proprietors, nobility, religious institutions
Negative	Services, transport

Source: As for tab. 2.

We run the following regression:

$$l_j = \beta_0 + \beta_i i_j + \sum_{b=1}^{14} \beta_j^b D_j^b + \sum_{l=1}^{14} \beta_j^l D_j^l + \varepsilon_j \quad (4)$$

where ε_j is the error term, and D_j^b (D_j^l) is a dummy variable, which takes a value of 1 if category b (l) is involved in contract j as a borrower (lender). Table 3 presents the main results.⁷⁴

When compared with other social categories, the nobility and religious institutions borrowed more for the same interest rate or obtained a lower interest rate for a loan of the same size. This indicates that the perceived creditworthiness of those borrowers was higher than the average, meaning that the reputation inherent in their social status and, possibly, in their collateral had a measurable effect on the contracts in which they were involved. These two categories, together with that of proprietors, also tended to lend more or charged a lower interest rate for the same level of credit. We regard these results as a reflection of the higher monitoring capability and/or greater resource availability for these social categories, which would increase the likelihood of the lender resorting successfully to the judicial system to enforce the contract.⁷⁵ In the case of the nobility, the positive sign is consistent with this group's preference for lending to peers from the same social stratum, which suggests low monitoring costs based on the informal rules embedded in the group's social ties.

Other categories represent the reverse of the situation described above. Providers of services, which included a large share of domestic servants, together with those

⁷⁴ Tab. 3 was based on the regression results, using three different kinds of estimators, which are presented in online app. S2.

⁷⁵ Credit for rollover of debts often indicated the prior judicial execution of collateral. The broader solicitation of court justice is the flipside of a socially diverse range of participants in credit transactions, and the perception of impartial justice to enforce the contracts may have driven the demand for notarial mediation in Lisbon. These inferences point to the significance of the social statuses of the participants for the weighting of the idiosyncratic component of the interest rates. In our case we confirm that lending to high-status individuals was not particularly riskier due to any judicial bias in favour of high-ranking individuals, as was the case in the Ottoman Empire according to Kuran and Rubin, 'Financial power of the powerless'.

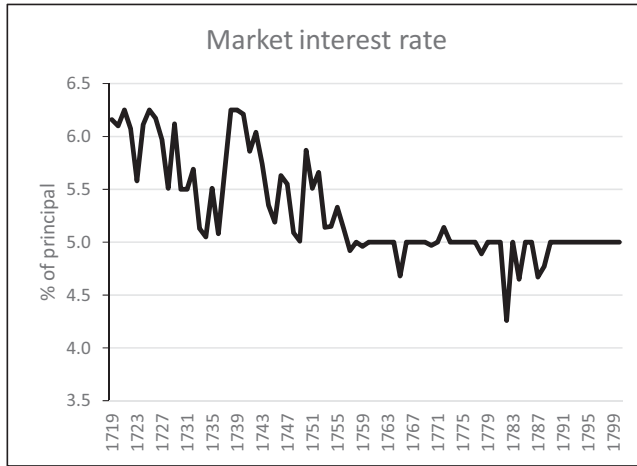


Figure 3. *Interest rates*

Source: ANTT, Lisbon notarial ledgers, office 2, boxes 74–141, ledgers 358–670.

working in transport, contracted lower amounts as lenders. As borrowers, members of the services category joined farmers, craftsmen, and proprietors in having a negative idiosyncratic component, indicating lower wealth and/or a negative information assessment by the other party.

Finally, women, professionals, clerks, the military, businessmen (commerce), and foreigners (mainly members of the city’s merchant communities) are the social categories for which idiosyncratic parameters are statistically equal to zero, thus including pooling equilibrium contracts. We include a set of contracts in which these categories were involved to determine the annual market interest rate as the weighted average:

$$i_t^m = \sum_k w_{kt} i_k$$

where $i_k \in \{2.5\%, 3\%, 3.25\%, 3.5\%, 4\%, 4.5\%, 5\%, 5.5\%, 6\%, 6.25\%\}$ are the observed interest rates in all the contracts performed during the period under study, and $w_{k,t}$ is the weight of the value of contracts in which interest rate i_k was agreed to in year t . This series is illustrated in figure 3.⁷⁶

In 1719 the interest rate started hovering around 6.25 per cent, and tended to decline. By the time of the earthquake it was at 5 per cent and the boost in credit in 1756 was contracted at this rate. Shortly afterwards, the Marquis of Pombal passed the 5 per cent ceiling law. Although compliance with the law may have determined the contractual rate from 1757 onwards, the existence of some observations below the legal ceiling from 1778 to 1788, together with the issuance of sovereign debt at 3.5 per cent interest, suggest the cap could be close to or even above the (notional) equilibrium interest rate. We will address this conjecture in the next section. For now, it is worth noticing that interest rates fell by 1.25 percentage

⁷⁶ Data are provided in online app. S3.

points, and thus the average price of short-term loans in Lisbon in 1780 was not critically higher than that estimated for London, Amsterdam, or Paris (4.12 per cent, 4.17 per cent, and 4.76 per cent, respectively).⁷⁷ These cities were integrated into economies with greater financial development than Lisbon and, above all, they had not been subjected to a massive destruction of capital due to a natural disaster. The comparative view on interest rate trends in different places and social contexts raises the question of whether gold inflows contributed to the observed evolution of interest rates in Lisbon.

VI

The workings of the private credit market can be broken down into two sub-periods: one up to 1756, when interest rates were free from explicit usury laws; and another after April 1757, when the legal cap was imposed. This cap would only be in place if there was excess demand at 5 per cent. Because we are lacking data on the volume of credit transacted in the market, we cannot estimate demand and supply schedules. We may, however, conjecture that equilibrium interest rates were present in the first period, while disequilibrium interest rates with credit rationing characterized the second period.

The regression of market interest rates on the time series of monetized gold stock concerns the first period. Accepting the conjecture that we have equilibrium interest rates until 1756, and assuming that there was no major structural change in the credit market afterwards, we can provide a confidence interval by performing an out-of-sample prediction for the interest rate after 1757. Comparison of results with the observed interest rates will tell us how far the legal ceiling diverged from a notional interest rate.

The hypothesis we put forward is based on a model of the temporary equilibrium for the credit market in the first half of the eighteenth century in Lisbon. The predominant uses of credit (approximately 63 per cent for personal purposes, of which two-thirds was for consumption) leads us to conclude that the main purpose of contracts was linked to intertemporal consumption smoothing by both lenders and borrowers, and not to savings leading to productive investment and further income growth.⁷⁸ Lenders tended to be people with excess liquidity; after they used money for immediate consumption, they had few options left for the remaining liquidity other than lending through credit contracts. They had the prospect of extra financial income, allowing for higher levels of future consumption (including services from durable goods or real estate). Therefore, the supply of liquidity would increase with the initial amount of monetized gold received. However, the prospect of further increases in rents, materialized in gold inflows, would be a substitute for the interest income that resulted from lending. This could cause an endowment effect which would tend to increase the initial consumption, thus acting against the supply of liquidity.⁷⁹ We expect the contemporaneous stock of gold to have exerted

⁷⁷ Nogues-Marco, *Tipos de cambio*, p. 60.

⁷⁸ This is a major reason for the existence of the credit market, going back at least to Fisher, *Theory of interest*.

⁷⁹ Here gold, seen as money, plays two roles. Using the classification of Gurley and Shaw, *Money in a theory of finance*, p. 73, it is both outside money (being an endowment) and inside money (being liquidity that could be transferred).

a downward pressure on the interest rate (the liquidity effect) and the future stock to have done the opposite (the endowment effect).

Borrowers were in a parallel situation. When they signed the contract, they wanted to consume at a higher level than their available resources would allow them to finance. They were willing to forego future consumption by paying the loan interest and the principal. Conceptually, we have the same case for both non-durable and durable goods. In the case of durable goods, such as buying a house financed by a loan, such a purchase allowed for consumption smoothing because it generated a steady stream of sheltering services for the borrower, and thus spared them the need to pay a rent. Alternatively, the borrower could just rent a house. If they expected their income to increase, their capacity for servicing the loan would increase as well, which would allow them to sacrifice less of their present consumption, and to make a contract for a higher loan. Therefore, while existing income reduced the demand for credit, future income would increase it. Then, the former would exert downward pressure on the interest rate and the latter would do the opposite.

This is partial or temporary equilibrium reasoning. General equilibrium effects would call for the analysis to be supplemented with feedback effects from the interest rate into the gold flows as we measured them. Two types of such effects could be considered: financial effects related to international portfolio decisions, or real effects impacting on the production of gold. The first type of effects could have changed the currency exchange rate, particularly with the pound sterling. This was not the case, however. The second type of effects would have worked through investment in physical capital, by expanding exports to Brazil which could have been cleared by further increases in gold extraction. Given the use of the credit extended (for consumption rather than investment) and the nature of gold extraction, we think this effect did not play a major role either. Although we do not claim that these feedback effects were totally absent, we conjecture that the main causal effects emerged between the gold inflows and the interest rate, and not the other way around.

The previous considerations led us to the following equation:

$$i_t^m = \beta_0 + \beta_{M1} \log(M_{t-1}) + \beta_M \log(M_t) + \beta_{W1} \log(W_{t-1}) + \beta_W \log(W_t) + \varepsilon_t \quad (5)$$

where M_t is the gold stock in year t and M_{t-1} is the gold stock in the previous year; W_t and W_{t-1} is the aggregate wage; ε_t is the error term β_{M1} and β_{W1} are expected to be negative and β_M and β_W to be positive.⁸⁰

Regressing equation 5 with annual data for the years 1719–56 and using robust least squares regression, we arrive at:

$$i_t^m = \underset{(0.43)}{7.22}^{***} - \underset{(0.89)}{2.00}^{**} \log(M_{t-1}) + \underset{(0.97)}{1.57}^* \log(M_t) \quad (6)$$

⁸⁰ We present a formal derivation of this equation in online app. S3.

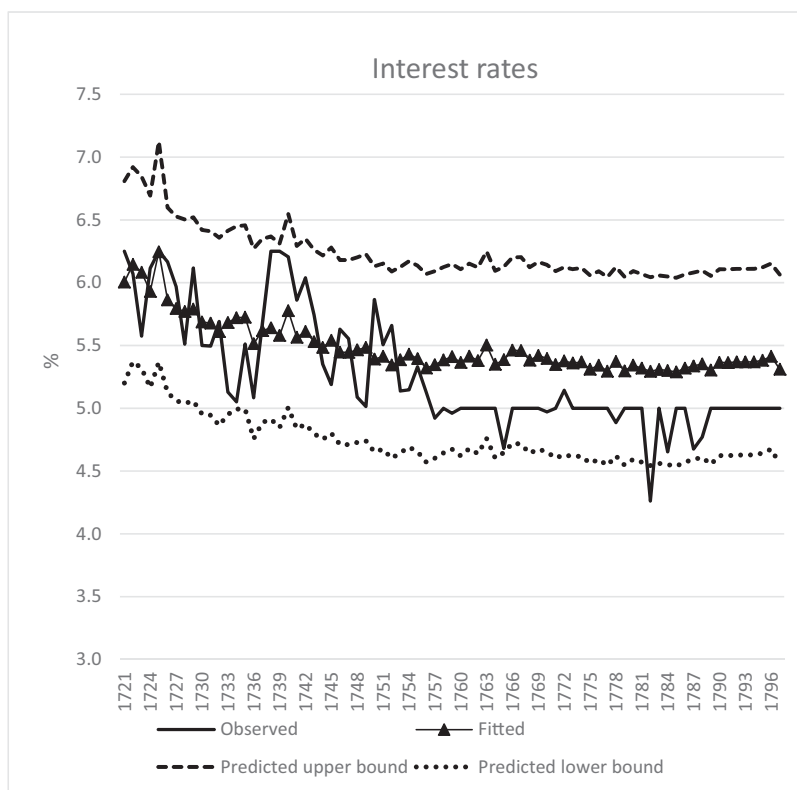


Figure 4. *Interest rates in Lisbon; in-sample and out-sample prediction*

Source: As for fig. 3.

where ***, ** and * refer to p -values smaller than 1, 5, and 15 per cent, respectively, and β_W and β_{W1} are not significantly different from zero.⁸¹

All the regressions we ran produce a parameterized function which supports the hypothesis that the liquidity effect would have reduced the interest rate and the endowment effect (the prospect of a future increase in income) would have increased it. We find that the liquidity effect was dominant. Our results indicate that if the money stock remained stationary in a period and its level was raised by 1 per cent in a subsequent period, interest rates decreased by 0.43 points.

Figure 4 presents our series for the market interest rate (as explained in section V), (i_t) , the fitted interest rate (i_t^m) , and a 95 per cent confidence interval. As can be seen, for the sample period, 1719–56, equation 6 fits the trend of the observed interest rates quite well. The out-of-sample prediction produces a forecast of a stationary interest rate of around 5.5 per cent.

The reason for this performance is related to the dynamics of gold inflows. If we accept there were no major structural changes in the behaviour of the contracting

⁸¹ All the regressions performed had the correct signs but the coefficients for the wage rate were not statistically significant. See online app. S3. Skilled wages are taken from 'Prices, wages and rents in Portugal 1300–1910', <http://pwr-portugal.ics.ul.pt/>.

agents, we can conclude that the credit ceiling may have caused credit rationing, but the degree of imbalance thus introduced may not have been very large. In fact, statistically, the observed interest rate fell almost every year within the confidence interval.

The average interest rate estimated for Lisbon was somewhat higher than that estimated for London, Amsterdam, or Paris. This is surprising given the amount of potential collateral destroyed in Lisbon in 1755 and the need for the reconstruction of the city following the earthquake.⁸² The forecast of a stationary interest rate hovering around 5.5 per cent, together with the remuneration of the state's bonds at 3.25 per cent in the early 1790s, suggest there was a common exogenous force acting in the Lisbon market until the Napoleonic Wars: monetary injections.

In the final years of the century, however, credit operations were carried out in a quite different scenario. The state borrowed large quantities domestically to finance military expenditure. To get short-term loans, contracted according to the rules of the old '*asientos*',⁸³ Queen Maria I was forced to pay 6 per cent interest to lenders from the moneyed elite, who rejected honorific royal graces as compensation for lending at 5 per cent.⁸⁴ The financial arrangements between a small group of investors and the state in 1797 indicate that the effect of the deluge of money may have reached an end on the eve of the French invasions (1808).

VII

This article aimed to identify fluctuations in interest rates in the private credit market and to analyse whether gold inflows could have been a major explanatory variable. The hypothesis stemmed from the wording of thousands of obligations drawn up by notaries in Lisbon throughout the eighteenth century, which reported the widespread use of the gold from Brazil as a credit instrument. Contracts involved a socially diverse range of parties, which provided a sample that allowed us to estimate the market-based interest rate. The method considered the social statuses of the parties to unbundle the idiosyncratic and the aggregate components. The estimated time series is regarded as representative of the aggregate market equilibrium interest rate.

In the long run, interest rates fell by 1.25 percentage points. The series displayed two periods. The first, marked by a downward trend, stopped in 1757. In the second period interest rates stabilized at 5 per cent, although several observations indicated lower rates in the 1780s. Our explanation for these trends was that the arrival of gold could have had two contradictory effects. Injections of money could have had an endowment effect that would raise interest rates, but they were also a source of liquidity supply in a credit market that would reduce interest rates.

The regressions we ran produced a parameterized function consistent with our hypothesis that the liquidity effect would reduce the interest rate and the endowment effect (the prospect of a future increase in income) would raise it.

⁸² The literature reports interest rate spikes after highly destructive earthquakes; see Odell and Weidenmeier, 'Real shock, monetary aftershock'.

⁸³ *Asientos* is a Spanish word, also used in Portugal as *assentos*, referring to financial contracts between the Crown and private consortia, by which consortia extended short-term loans to the Crown.

⁸⁴ Costa, 'Capitalistas e serviços', p. 466.

Since there was a downward trend, the liquidity effect may have been dominant. By performing an out-of-sample prediction for the period after 1757, we found that although the 5 per cent ceiling may have generated credit rationing it was not very relevant because the forecasted rate was not significantly different from 5 per cent.

This case highlights the relative importance of liquid wealth in the functioning of credit markets in early modern economies. Our conclusions raise doubts on the link between political constitution and the evolution of credit markets. Based on Portugal's absolutist monarchy, we argue that the non-existence of checks on the executive seems to be of lesser importance to the understanding of interest rates' decline, both in the public and private credit markets. The state's credible commitment was backed by gold inflows, which also improved the levels of financial wealth in the private sector.

The other dimension of the debate to which our research contributes concerns the alleged links between decreased aggregate risk and economic growth. Our case demonstrates that greater financial depth was not the only cause of decreasing interest rates, as was the case for nations at the forefront of economic growth. Nevertheless, we conjecture that the drying up of liquidity near the end of the century revealed the shortcomings of a financial system that was less well developed than that of the leading European economies, as well as the power of incentives eventually to relocate the seat of empire to Brazil.

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Supporting information

Additional Supporting Information may be found in the online version of this article at the publisher's web-site:

- S1. Appendix to section IV
- S2. Appendix to section V
- S3. Appendix to section VI