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Centre for Economic Policy Research
33 Great Sutton Street, London EC1V 0DX, UK
Tel: +44 (0)20 7183 8801
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JEL Classification: G01, G12, G21, N23

Keywords: Bubble, Credit Provision, Margin Loans, Investor Behavior

Fabio Braggion - f.braggion@uvt.nl
Tilburg University and CEPR

Rik Frehen - rik.frehen@gmail.com
Tilburg University

Emiel Jerphanion - e.jerphanion@tilburguniversity.edu
Tilburg University

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1 Introduction

The credit boom preceding the 2008 financial meltdown has sparked economists' interest in the relation between credit supply, trading and asset prices. Recent empirical work has shown that easy access to credit is at the root of the 2000s *housing* price boom (Mian and Sufi, 2009; Favara and Imbs, 2015; Di Maggio and Kermani, 2017). Similarly, Jordà, Schularick, and Taylor (2015) and Brunnermeier and Schnabel (2016) have related credit provision to *equity* market booms and busts. While the positive relation between credit and asset prices has been widely documented, the mechanism through which credit affects prices is still unclear.

Economic theory provides a wide array of channels linking credit to prices with different implications for trading, asset valuation and wealth transfers across investors. On the one end, the *discount rate channel* predicts that cheap credit reduces the cost of capital without trading, deviations from fundamental values or wealth transfers among traders.[1] On the other extreme, the *extrapolation channel* predicts the opposite: naive extrapolators or overoptimistic traders transfer wealth to rational arbitrageurs because they ride a bubble unsuccessfully (Fischer, 1933; Galbraith, 1955, pp. 46-50, Kindleberger, 1978, Barberis, Greenwood, Jin, and Shleifer, 2018, Bordalo, Gennaioli, Kwon, and Shleifer, 2019). In between the extremes, we find mechanisms with mixed implications, for example, loan holders could successfully ride a bubble as in Abreu and Brunnermeier (2003), or gamble on rising prices and default on their loans if their bets do not pay off as in Allen and Gorton (1993) and Allen and Gale (2000).

To determine which channel prevails we need to compare the trading behavior and realized returns of loan holders to those of non-loan holders. Such a comparison also raises an important identification question: Do some traders self-select into the loan facility (selection effect)? Or does the loan change a borrower's trading behavior (treatment effect)? To differentiate between selection and treatment, we would ideally observe different types of loans, some that allow for strategic defaults while others do not. However, an in-depth analysis of trading strategies, realized returns and loan types is empirically challenging for three reasons.

First, we typically do not observe trader identities and are therefore unable to link stock

[1] For example, this would be the implication of Tirole (1982)'s rational expectations model.

transactions to loan positions, not to mention the difficulties in distinguishing between different types of loans. Second, we may find a spurious correlation between borrowing and trading, because investors decide to buy a stock and borrow money following a (latent) macroeconomic event or a company-specific news announcement. Third, it is difficult to identify trading strategies for a representative sample of leveraged investors as most contemporary datasets focus on a particular type of trader (e.g. hedge funds or non-professional investors).

We tackle these issues by studying margin loan provisions in the London equity market during the 1720 South Sea episode, a financial boom and crash that is widely considered as a classical example of a bubble. In the spring of 1720, the South Sea Company offers investors the opportunity to borrow cash by collateralizing South Sea shares and the Bank of England follows suit by allowing to collateralize Bank shares. The loan facilities differ in one important aspect: Bank loan holders are entirely liable for their losses, as the amount they borrow is always well below the value of the collateral. In contrast, South Sea borrowers may strategically default when trading losses become too large.[2] We hand-collect *every* single equity transaction with buyer and seller identities for three major British companies and link the transactions to loan positions in both facilities. The three companies represent about 50% of the market in terms of pre-bubble market capitalization. We also link the trading and loan data to the complete list of subscribers of new share offerings initiated by highly overvalued companies. We are able to control for pre-bubble trading strategies and performance since our data coverage starts five years prior to the bubble.

Our data has the scope and level of detail to address each of the three empirical challenges outlined above. First, our main data source consists of trader-specific ledger accounts that record trader and borrower identities and enables us to observe each trader's daily holdings, loan positions

[2]The loan-to-value ratio of Bank loans ranges between 0.5 and 0.7, implying that any trading loss is fully taken by the borrower, even if she defaults. In contrast, the loan-to-value ratio of the South Sea Company loans more regularly exceeds one. The borrower may thus have an incentive to undertake risky trading strategies as the lender absorbs part of the trading losses in case of a default. Anecdotal evidence confirms that also ex ante it was reasonable for investors to expect that the South Sea loan facility would include a strategic default option, whereas the Bank loan would not. For instance, stockbroker Peter Crellius wrote on 16 January 1720: *"the general opinion is that they [shares] will all continue to rise. Bank shares are not mounting as rapidly as the others, but opinion ranks them the safest of all: most of the speculation is falling on the South Seas"* (Wilson, 1941, p.124). Notice that a necessary condition to observe strategic defaults is that borrowers are protected by limited liability. This was indeed the case in Britain. Since 1704, British bankruptcy law allows the borrower to be discharged from her debt in case of good conduct and if at least 80% of lenders agree.

and share trades. Because we link stock trading to loan positions in facilities *with* and *without* strategic default opportunities, we can differentiate between selection and treatment effects. At the same time, we are able to accurately measure wealth transfers between loan holders and other investors since we observe the entire universe of investor holdings and trades. Second, we observe each trader's daily behavior across firms. Hence, we can control for company-specific events and changes in the macroeconomic environment. Third, we do not focus on a particular type of trader as we observe the loan positions and stock transactions of *all* shareholders. The broad market coverage and representativeness of our data allows us to make general statements about the relationship between debt and trading strategies.

Before studying the trading behavior and realized returns of loan holders, we analyze who takes a loan. We find that physical proximity to the market, trading experience and trading frequency are major determinants of the propensity to take a loan. In particular, investors who do not hold any shares before 1720 and investors who are in the top percentile of the trading frequency distribution, are more likely to take a loan. We also find that shareholders living close to the market are significantly more likely to collateralize their shares.

Our analysis shows that investors with Bank loans behave as extrapolators, that is, they are more likely to buy (sell) following days of high (low) share returns. For instance, in the spring of 1720, Bank loan holders are approximately 65% more likely to buy shares vis-à-vis other traders. Consistent with these results, they are also twice as likely to subscribe to new share offerings when these stocks trade at peak prices (six à eight times pre-bubble quotes). Even without taking returns on these share subscriptions into account, borrowers incur large trading losses. Bank of England loan holders realize a 14 to 23 percentage point lower return than the average investor. As Bank of England loan holders cannot strategically default on their loans, these findings reveal a selection effect, i.e. margin loans relieve credit constraints on investors who intend to ride the bubble. We also provide evidence of a treatment effect as our findings on extrapolative trading behavior and performance strengthen both in economic and statistical terms after we incorporate South Sea loans with a strategic default option. We further show that 79% of loan holder capital holds positions that are inconsistent with reverting prices to fundamental values. In particular,

they hold long positions in bubbling stocks when prices are near (or at) peak values or subscribe to overvalued equity in the summer of 1720. In additional tests, we show that our findings cannot be explained by information asymmetries between investors (Brennan and Cao (1996, 1997); Brennan, Cao, Strong, and Xu (2005)), investors' portfolio rebalancing or destabilizing short selling (Lamont and Stein (2004); Hong, Kubik, and Fishman (2012)).

Even though the opening of the loan facility coincides with the origination of the bubble, it seems unlikely that a (latent) company-specific or macroeconomic news event has caused both the creation of the loan facility and the genesis of the bubble. Our main specifications control for company×date fixed effects that absorb any time-varying company event that could drive both credit decisions and trading strategies. Moreover, we show that traders take margin loans rather uniformly over our sample period (see Figure 7), which is inconsistent with a particular event causing both the decision to take a loan and buy (sell) shares. It is also unlikely that changes in investor sentiment drive the investor's decision to (i) take margin loans and (ii) buy bubbling stocks (see Geanakoplos (2003); Geanakoplos (2010)). We control for trader×date fixed effects, which absorb time-varying trader characteristics such as daily variation in optimism about the equity market. The inclusion of trader×date fixed effects thus raises the bar for an alternative reading of our findings, because such an explanation should also be stock-specific. Put differently, it should explain why a loan holder is more enthusiastic about a particular stock than another trader, when that stock has realized a positive return.

Our sample ranges from January 1 to October 6, 1720, which means that we do not capture the full unwinding of the bubble. We end our sample on October 6 because a confounding event takes place on that date. The Bank of England agrees to bail out the South Sea Company and unexpectedly calls all outstanding loans on October 6 to raise cash. If we extend the sample period and include this margin call, we mechanically reinforce our findings because loan holders are forced to sell when prices are already falling.[3]

Our paper makes three contributions. First, we contribute to the literature on leverage, margin loans and the behavior of asset prices. A large number of papers studies whether credit provision

[3]We indeed find that extending the time period of our analysis strengthens our results.

destabilizes financial markets by increasing stock price volatility (Salinger, 1989; Schwert, 1989; Hardouvelis, 1990; Hardouvelis and Peristiani, 1992; Hardouvelis and Theodossiou, 2002; Kahraman and Tookes, 2017; Hansman, Hong, Jiang, Liu, and Meng, 2019). Rather than focusing on the effect of credit on asset prices, we complement this literature by analyzing the mechanism through which margin lending affects asset prices. Consistent with the *extrapolation channel*, we find evidence suggesting that credit is used by naive extrapolators that ultimately realize large losses on their trades.

Second, we contribute to the literature on trading strategies during financial bubbles. In particular, we highlight that margin loan holders behave as extrapolators as predicted by various bubble theories. Our findings are also in line with theories predicting that debt can contribute to fuel bubbles as in Allen and Gorton (1993); Allen and Gale (2000); Geanakoplos (2003, 2010); Simsek (2013); Scheinkman (2014); Bordalo, Gennaioli, and Shleifer (2018). Furthermore, we show that extrapolative strategies employed by margin loan holders lead to poor performance. This finding adds to the literature on trading strategies and their profitability during financial bubbles (Brunnermeier and Nagel, 2004; Temin and Voth, 2004; Dass, Massa, and Patgiri, 2008; Greenwood and Nagel, 2009; Griffin, Harris, Shu, and Topaloglu, 2011; Xiong and Yu, 2011; Barberis, Greenwood, Jin, and Shleifer, 2018; Bordalo, Gennaioli, Kwon, and Shleifer, 2019; An, Bian, Lou, and Shi, 2020).

Third, our paper also contributes to the literature that relates the use of margin loan accounts to trading behavior (Barber, Huang, Ko, and Odean, 2019; Bian, Da, Lou, and Zhou, 2019; Bian, He, Shue, and Zhou, 2019; Heimer and Simsek, 2019; Heimer and Imas, 2020). In contrast to earlier work, we do not focus on a particular type of loan holder (e.g. non-professional investors), but observe the entire universe of loan holders. This allows us to accurately identify wealth transfers between loan holders and other traders, which is critical in discerning mechanisms with different implications on loan holder performance.

The remainder of the paper is organized as follows. Section 2 discusses the 1720 London securities market and the historical setting of the margin loan facility. In sections 3 and 4 we describe the data and discuss the empirical results respectively. In section 5 we test the robustness

of our results. We conclude in section 6.

2 Historical setting

2.1 The South Sea Scheme

The South Sea Company is established in 1711, as a result of the Peace of Utrecht and is granted the trade monopoly between Britain and South America. Rather than being involved in international trade, the directors gear the South Sea Company's business into finance and in particular sovereign lending. During the war campaigns of the early eighteenth century, the British government accumulates a large amount of debt. The government pays relatively high yields because its debt is illiquid.[4] The South Sea Company proposes to swap government debt with South Sea Company shares and bonds. In theory, such a scheme would make everybody better off. The government would profit as it would pay a lower yield to the South Sea Company; the public would hold a more liquid and standard financial asset; and the South Sea Company would earn a spread between the yield received by the government and the yield paid to its bondholders. Two swaps of limited size work out successfully in 1711 and 1719, and the company proposes a more ambitious scheme in 1720. The new plan considers the swap of almost the entire British government debt with South Sea Company claims.

The Bank of England also bids for a similar scheme, and it is believed that the competition between the two companies leads the South Sea Company to overpay in order to be granted the swap (Dale, 2004, p.75). In the final agreement, the company pays the government a *fixed* amount of £7.6 million to receive the right to exchange government annuities for South Sea Company equity and bonds. The terms of the agreement give strong incentives to the South Sea Company to raise share prices. The debtholder trades her annuity for shares valued at *market* prices: a higher market price implies that the company can purchase the outstanding government debt with fewer shares. The government further allows the company to raise £31.5 million of *nominal* capital to finance the debt acquisition. If the South Sea Company needs less than £31.5 million to

[4]The illiquidity is caused by large denominations and because annuities are assigned to a particular person and therefore difficult to transfer (see Dale (2004), p.25).

swap the annuities, it can use the leftover to issue new shares in the market against (high) prices. Government debtholders respond enthusiastically to the swap. The price of South Sea Company's stock rises from £200 per share in February to almost a £1,000 per share in June and the company undertakes various new offerings in the summer of 1720.

2.2 Bank of England and South Sea Company margin loan facilities

On May 10th 1720, the Bank of England creates a margin loan facility that undercuts prevailing interest rates.[5] Dickson (1967, pp. 192-193) argues that the bank's initiative is a direct response to the opening of a margin loan facility by the South Sea Company on April 25th. However, the court of director minutes remain vague about the motives for providing cheaper credit: *"it may be for the service of this bank to lend money to the proprietors upon this bank stock"*. Shareholders can borrow cash by depositing Bank of England shares against 5% interest per year (lowered to 4% on July 14th, 1720). The Bank gives an amount of cash equal to the nominal value of the shares deposited as collateral.[6] Throughout our sample period, the Bank of England's market price is at least 30% higher than the par value of its shares, implying that the loan to value ratio is significantly smaller than one.[7] In case of default, loan holders are personally liable for their losses, and it is unlikely that moral hazard may drive borrowers to undertake risky trading strategies (as in Allen and Gorton (1993) and Allen and Gale (2000)) and strategically default if such strategies do not pay off.[8]

In early September 1720, the South Sea Company is in financial difficulties and needs immediate funding to finance its operations. Perhaps giving in to political pressure, the Bank of England decides to assist in resolving the South Sea Company issue by agreeing to buy subscription shares for a total of £3.75 million against a *pre-determined* price (Neal, 1993, p.115). Shortly after, the

[5] Temin and Voth (2004) report that in April 1720 interest rates on collateralized loans were 10% per month and became 1% per day thereafter.

[6] Since the Bank of England always lends an amount equal to the nominal value of the shares deposited as collateral, the investors' borrowing capacity declines when share prices increase. If any, this feature should prevent investors from buying overvalued assets.

[7] Between January 1711 and December 1725, we never observe the price of Bank of England shares going below £100.

[8] We find only two Bank of England loan holders that default on their loans in October 1720. The Bank sells their shares and uses the proceeds to redeem the loan and pay transaction fees. After all these payments, there is still a small amount left which is returned to the borrower.

financial problems of the South Sea Company spill over to the Bank of England.[9] The South Sea Company's prime bank (Sword Blade Bank) defaults on its payments and the South Sea Company share prices dive well below the Bank of England's purchase price, generating large losses for the Bank. The Bank of England's directors address these financial difficulties by recalling all outstanding Bank of England loans and offer an interest rate discount to margin loan holders who repay on a short notice (Neal, 1993, p.112). On October 6th, the Bank officially announces the full annulment of the loan facility: *"no loans to be made upon bank stock until further order"*.

In April 1720, few weeks before the Bank of England, the South Sea Company opens a loan facility designed to lend money to its shareholders using South Sea Company shares as collateral. The terms are more generous than those established by the Bank. The initial interest rate is set at 5%, but then reduced to 4% in May 1720. A South Sea shareholder can borrow £2.5 for each £1 of nominal South Sea capital. At these conditions, the loan to value ratio is above 1 for about 42% of the trading days in 1720 and, in particular, when the bubble bursts in September 1720.[10] The terms of the South Sea company loan facility can therefore induce borrower's moral hazard, since the value of the collateral can be lower than the amount borrowed.[11]

All in all, the Bank of England and South Sea Company margin loans create a substantial influx of capital. Between May 10th and October 6th, 1720 the Bank of England lends a total of £1,476,350 in 958 loans to 659 different shareholders, while it has been estimated that the South Sea Company lent about £9 million on the security of its stock (Dickson, 1967, p.143).

2.3 The London Financial Market in the Early Eighteenth Century

The basic structure of the London financial market in 1720 is very similar to the set up of contemporary financial markets (Cope, 1978). The trading is organized in a system of brokers and market markers (known as jobbers). An investor who wants to undertake a transaction contacts

[9] Scott (1912) Volume III - p.327 reports that there were rumors that Robert Walpole, a prominent member of the liberal party soon to become prime minister, induces the Bank of England to grant financial support to the South Sea Company.

[10] Between 1711 and March 1720 the price of the South Sea shares has never been above £250.

[11] The bankruptcy law approved in 1706 also encourages moral hazard, as the borrower can have his/her debt discharged provided that his/her pre-default behavior conforms to a list of good-conduct standards and the 80% of creditors agreed. See Carlos, Kosack, and Penarietta (2019)

a broker, who in turn inquires about the best price with various jobbers and eventually takes the best deal on behalf of his client. As today, the price system is based on bid and ask prices. Investors obtain information about securities and trends in the market from newspapers usually available in the coffee houses surrounding the Exchange. In the Royal exchange both equity and bonds are traded. A derivative market is also well established, with options, futures, forwards and naked-shorts being traded on various British securities (Dickson, 1967, pp. 498-505; Cope, 1978). However, such contracts are privately negotiated and few survived. It is therefore difficult to obtain exact figures that indicate the liquidity and depth of these markets.

3 Data

3.1 Stock ledgers and Transfer Files

Our main data sources are the Bank of England and East India Company stock ledgers which consist of trader-specific accounts recording buys, sells and Bank of England share loans for every trader (see Figure 1a). Each account is linked to an index containing trader names and characteristics (titles, street address and occupation, see Figure 1b). In addition to trader-specific accounts, transactions are also signed by both buyers and sellers in so-called transfer files, which correspond to the actual shares' sale agreement. Bank of England transfer files often contain more trader information than ledger books (and indexes) and we use this additional information to enrich our database. We combine the universe of transactions in the Bank of England and the East India Company with all 1720 trades in a major new share issue of the Royal African Company. Unfortunately, the Royal African Company ledger books have not survived and we have to retrieve names and compute holdings from the Royal African transfer files.

We present an example of how share transactions were recorded in the Bank of England ledger book in Figure 1a. Figure 1a shows the sale side John Myster's Bank of England ledger account. The first entry records a share sale for £500 nominal to Henry Dobson on March 3rd, 1719 under transaction number 8,607. This transaction is recorded as a buy in Dobson's account on page 5,509 with the same transaction details. Figure 1b displays Myster's ledger index entry and shows

that he is a goldsmith living at Charterhouse Square in London. We hand-collect every Bank of England transaction between 1st August, 1715 and 29th September, 1725 and every East India transaction between 24th June, 1715 and 25th March, 1723. This implies that we observe every transaction for each individual trader in our sample period with buyer and seller identities and trader characteristics. Moreover, we compute holdings and trading gains for each trader on a daily basis. In this paper, we study the transactions that took place during the South Sea Bubble episode. Our sample period begins on January 1, 1720 and it ends on October 6, 1720, the day the Bank of England wound up the loan facility.[12] Figure 3 shows that our sample consists of 4,657 Bank of England traders, 1,982 East India traders and 1,814 Royal African traders. The average trader holds £819 (see Table 1) and Figure 3 shows that there is a fair amount of overlap across companies since 1,519 traders are active in multiple firms and 134 traders hold shares in all three companies. Our sample covers about 50% of the market in terms of January 1720 market capitalization (see Anderson (1787, pp.104-107)).

[Figure 1 about here.]

[Figure 2 about here.]

[Figure 3 about here.]

[Table 1 about here.]

3.2 Share loans

This section describes data sources and descriptive statistics of the loan facilities discussed in section 2.2. We collect loan holder data from the Bank of England's ledger books and, because of the accurate internal recording system of the Bank, we are able to precisely link each investor's daily loan positions to her share trading activities. The loan ledger book provides various details of the loan contract: name of the borrower, origination and repayment date as well as interest due. As Bank shares are used as collateral, the Bank also records a loan initiation (repayment) as a

[12] We stop our sample period on October 6 to make sure that our results are not driven by the margin call made the Bank of England.

share sale (purchase) in its stock ledger books. Figures 2a and 1a show an example of a loan book record and the matching entry in the stock ledger where John Myster 'sells' shares to an account registered in the names of five Bank directors (John Hanger, Thomas Scawen, Peter Delmé, Gerard Conyers and John Rudge) on May 31st, 1720. The loan book confirms that he borrows £1,500 in cash on May 31st, using 1,500 in nominal value of Bank shares as collateral. The ledger books thus link an individual trader's daily loan positions to daily share trades allowing us to study the relationships between credit provision and trading behavior for a large cross-section of investors.

We use the House of Lords' investigation into the South Sea affairs to extract names of South Sea Company loan holders as well as the amount they borrowed (see Figure 2b).[13] The House of Lords investigation was initiated in the Fall of 1720 and it was entrusted to document the dynamics of the South Sea affair. One important piece of evidence that the inquiry produces is the list of the South Sea Company loan holders at the time of the investigation (i.e. Fall 1720). We match the South Sea Company loans to stock traders based on trader (borrower) names. We use the data on this additional loan facility in differentiating between selection and treatment effects since the terms of the South Sea loan facility provide borrowers with a strategic default option. In total our sample contains 659 (450) unique shareholders who hold a Bank (South Sea) loan. Table 1 describes the sample of investors who take up a Bank of England loan and shows that the average loan holder holds 1,018 in equity (vis-à-vis 819 for the average investor). Furthermore, the Table suggests that loan holders trade more actively, and are more likely to subscribe new share issues.

3.3 Subscription lists

At the height of the South Sea boom, many companies take advantage of high valuations by issuing new shares. In this section we explain that investors who subscribe to receive new shares take large risks and almost certainly incur losses. The South Sea Company is the first company that takes advantage of high valuations by opening a third subscription on the 17th June and a fourth on the 24th August (see also Section 2.1), and the London Assurance Company follows suit by issuing new shares on the 12th August (see also Figure 4). Investors subscribe to these new stocks

[13] *An abstract of the ledgers of the loan of stock*, box 157, parchment collection, House of Lords Records Office.

by making a down-payment and writing down, before a company official, their names and desired share amounts on lists set up by the company.[14]

New South Sea shares are sold to investors at a price of £1,000 per share when the market price is about £750, on June 17 1720 - the time of the third subscription -, and £820 on August 24, the day of the fourth subscription.[15] In the third subscription, subscribers are required to pay 10% of the subscription price, whereas in the fourth subscription 20% of the subscription price: the remaining amounts will be paid in subsequent installments defined by the subscription plan. Once the company completes the list of the new shareholders, receipts certifying the right to receive the shares are delivered to the subscribers. However, as a result of the South Sea Company's financial troubles, the receipts of the third and the fourth subscription have never been delivered.

As the price of South Sea shares in the secondary market never reaches £1,000, ex-post, South Sea subscribers can only lose money even if they receive the share. There is a secondary market for subscription receipts, but it is difficult to generate profitable trading strategies as most of the transactions in this market are "for time". In "for time" transactions, the seller promises to deliver her receipts to the buyer once she receives them from the company and the buyer defers payment until the receipt is received. As the receipts of the third and fourth subscriptions are never delivered, "for time" transactions cannot be executed, and, also in this case, the original subscriber makes a loss.[16]

The London Assurance issues shares in August 1720. Differently from the South Sea subscriptions, the company does not design any installment plan and the shares have to be paid in full. While the call for subscription is set for August 12, shares are given to the investors only in September 1720. As the issue prices is £100 per share and the price in September is between £60 and £80 per share, ex-post, any subscriber of London Assurance shares can only lose money.

[14] Unfortunately, neither ledgers nor transfer files have survived for these two companies.

[15] The South Sea Company also issues shares before the Bank of England opens its loan facility: on April 14 and April 29, 1720. The price of the first subscription, £300 is in line with the market price. The price of second subscription, £400, is about 10% higher than the market price.

[16] Dale (2004, p.164) also reports the existence of a secondary market of subscription receipts "for money". In "for money" transactions, buyers pay cash up front in anticipation of receiving a receipt when they become available. We found evidence of the existence of "for money" transactions only for the third South Sea subscription and according to the House of Lords investigation these transactions appear to be driven by South Sea company insiders as they involve South Sea directors selling their receipts.

We collect subscriber names and amounts of new share offerings of the South Sea (third and fourth subscription) and London Assurance company (second subscription). We relate loan positions and trading behavior to investor demand for the South Sea and London Assurance shares through subscription lists. We obtain information about 4,481 (2,569) traders for the South Sea third (fourth) subscription and 618 traders for London Assurance's second subscription list.[17].

South Sea Company subscription lists only record first and last name which makes it more challenging to match them to our ledger sample. To the contrary, London Assurance subscription lists often contain addresses, titles and professions and consequently allow for a more accurate matching. We link subscribers manually and sometimes face ambiguity.[18] We ultimately match 1,785 (974) South Sea investors in the third (fourth) subscription and 322 London Assurance subscribers.

Figure 4 relates share prices to the timing of new issues and confirms that new subscribers face large risks because 1720 share prices are very volatile.[19] More importantly, subscribing for highly bubbling stocks seems inconsistent with the discount rate channel that implies fair valuation and no trading.

3.4 Prices and dividends

We retrieve price data for the Bank of England, East India Company, Royal African Company, South Sea Company and London Assurance Company from Castaing's Course of the Exchange. Dividend amounts and dividend payment dates are obtained from the court of director minutes.[20]

[17]The South Sea subscription lists have been retrieved from the House of Lords archive: HL/PO/JO/10/5/57-63, and the London Assurance subscription lists are collected from the London Metropolitan Archives: MS 8725/3.

[18]In case of large uncertainty we do not match: for example, we cannot link a South Sea subscriber named John Smith because our ledger sample contains 26 John Smiths and we would need more characteristics to find unique matches.

[19]While Figure 4 may suggest that new subscribers who sell early realize profits this is not the case because vertical lines represent the *opening* days of subscription books and shares are only allocated to investors after prices have commenced to fall. The minutes of the London Assurance court of directors (MS 8729) reads on August 26th, 1720 that *"The Governor and Company of the Corporation of the London Assurance Company gives Notice that Attendance will be given on Tuesday & Wensday next 30 & 31 Instant and no Longer att their house in Cornhill from the hours of Eleven in the Morning to One & from four to six in the Afternoon in Order to take in the Remaining part of the Receipts commonly called Ram & Colebrook"*. The subscription book is referred to as "Copy of the Subscription Book of Ram and Colebrooks Receipts into the Capital Stock of the Ship Charter".

[20]Bank of England court minutes can be extracted from the archive's website: http://www.bankofengland.co.uk/archive/Pages/digitalcontent/archivedocs/courtminutes.aspx. East India Company court minutes are also available online: http://www.eastindiacompany.amdigital.co.uk/Documents/Era/

The Royal African Company does not pay dividends during our sample period.[21] Prices are interpolated over a maximum of three days (see also Pastor and Veronesi (2009)). Figure 4 shows price series for companies in our sample and documents large cross-sectional dispersion in bubble size with London Assurance, South Sea Company and Royal African Company bubbling much stronger than the other companies.[22]

3.5 Performance measures

We measure trader's performance using a capital-weighted approach (following for example Barber and Odean (2000)), that attaches more weight to returns that are realized in periods with more capital invested. The annualized investor-specific realized portfolio returns (R^i) are expressed as follows

$$R^i = 170 \sum_{t=t_{0ij}}^{T_{ij}} \sum_{j \in J} w_{ijt} \frac{P_{jt}(Sells_{ijt} - Buys_{ijt}) + Div_{jt}}{\overline{H}_{ij} D_{ij}} \tag{1}$$

$$\overline{H}_{ij} = \frac{1}{T_{ij} - t_{0ij}} \sum_{t=t_{0ij}}^{T_{ij}} H^N_{ijt} \tag{2}$$

$$w_{ijt} = \frac{H_{ijt}}{\sum_{j \in J} H_{ijt}}, \tag{3}$$

with $Buys_{ijt}$ and $Sells_{ijt}$ nominal amounts bought and sold by investor i of stock j at t, P_{jt} stock j's price at t and Div_{jt} stock j's dividend at t. $P_{jt}(Sells_{ijt} - Buys_{ijt}) + Div_{jt}$ thus captures investor i's trading revenues for stock j at time t.[23] For each trader, we sum stock-specific trading revenues over the period $[t_{0ij}, T_{ij}]$ and scale our measure by average *nominal* holdings ($\overline{H}_{ij} = \frac{1}{T_{ij} - t_{0ij}} \sum_{t=t_{0ij}}^{T_{ij}} H^N_{ijt}$) to facilitate interpretation and differentiate between realized performance and portfolio size in our

17161757WarwithFranceandIndianstates?page=1&returning=true.

[21] See Scott (1912) Volume II - p.35.

[22] Since there are no price quotations available for the new 'engrafted' Royal African shares in the first few weeks of May we adopt an algorithm to infer prices for this period from the price quotes of the old Royal African Company. In the Appendix, we spell out in detail how the algorithm works.

[23] The trading revenues equal Berk and van Binsbergen (2015)'s realized value added. We treat positive holdings at the start (end) of our sample period as purchases (sales). We do not subtract benchmark returns because it is hard to define an appropriate benchmark. The market consists of few stocks dominated in size by the Bank of England, the East India Company and South Sea Company.

cross-sectional analysis.[24] We also scale trading revenues by the average number trading days that trader i has positive holdings in stock j (D_{ij}) and multiply by the average number of trading days per year in our sample (170). This implies that an investor who realizes a £400 revenue over a holding period of 2 years with £4,000 invested thus realizes a 10% return over 2 years. This translates into 5% annual performance and without any intermediary buys and sells our measure is equivalent to the investor's realized annual return. In a final step, we take value-weighted averages across all stocks and over all dates in trader i's portfolio. Equation (3) shows that stock-specific weights are defined by daily *market-value* holdings.[25]

Table 1 shows that the average trader gains 4% per annum in the years leading up to the bubble and 15% in the bubble year. As expected, 1720 also stands out in terms of volatility. The 10th percentile trader loses 79%, while the 90th percentile trader makes a 70% return in the bubble year. The cross-sectional dispersion is thus much larger than during a non-bubble year, where the difference between the two percentiles is only 8%.

Realized returns as defined in equation (1) serve as the main work horse in our empirical analysis and its main advantage lies in the fact that it captures trader-specific *realized* trading gains *over the bubble year*. However, the measure does not capture short-term performance. We therefore also compute trader-specific value-weighted portfolio returns over the interval of 14, 20 and 30 days.

$$R_{it+\tau} = \sum_{j=1}^{J} w_{ijt} R_{jt+\tau}, \tag{4}$$

where $R_{jt+\tau}$ represents security j's return over the next τ days at t, and w_{ijt} is defined as in equation (3). This measure captures the return that investor i could have realized with an isolated trade over the next 14, 20 and 30 days (Temin and Voth, 2004).

[24] We divide by *nominal* holdings because market value holdings increase sharply as a result of the bubble which decreases realized returns. This assumption facilitates the interpretation but does not change our main findings.

[25] Defining weights based on nominal or time series average holdings does not change our main results.

4 Credit provision and bubble trades

4.1 Who takes the margin loans?

We start our analysis by asking the simple question: which investors collateralize their shares? More specifically, we examine whether loan holders are systematically different from the average investor. In our baseline specification, we run a probit analysis on a dummy that equals one if an investor takes a margin loan from the Bank of England and zero otherwise. We present the marginal effects of the probit regression in Table 2.

In the first column, we relate investors' probability of having a margin loan to her trading frequency and performance. In particular, we compute the number of trades and the realized returns in the 5 years before 1720, as specified in section 3.5. We take this measure as an informative indicator of investors' trading skills, measured in the pre-bubble period. We also examine a dummy variable, New Investor, that takes the value of 1 if an investor has never traded in any of the stocks in our sample before 1720, and 0 otherwise.

Table 2, column 1 reveals that realized returns between 1715 and 1719 are positively associated with the probability of taking a margin loan, but the coefficient is not statistically significant. Both new investors and investors that traded frequently are more likely to take a margin loan. A 1% increase in the pre-1720 number of trades increases the probability of obtaining a loan by approximately 6 percentage points. As about 12% of the investors in the sample take a margin loan, this estimate corresponds to a 50% probability increase. A new trader is almost 17 percentage points more likely to take a margin loan.

Column 2 studies other investors' characteristics, in particular we examine the role of the place of residence: whether the investor is a foreigner or lives in London. We see that investors living in London (and hence closer to the Exchange) are 3.8 percentage points more likely to collateralize their shares, whereas foreign investors are about 10 percentage points less likely to have a margin loan.[26] Column 3 adds additional information about the investors, in particular whether he/she is an aristocrat or a broker: in both cases, we find no statistically significant relation between these

[26]The reference group of the location dummies are investors living in Britain outside of London.

characteristics and the probability of taking a margin loan. Column 4 looks at the gender of the investor and reveals that male investors are 6 percentage points more likely to take the loan.

Column 5 explores in more detail the relationship between the probability of taking a loan and the number of trades for each investor between 1715 and 1719. Investors who trade a lot could be either market makers or individual investors who just have a high willingness of transacting in financial markets. The former group is more likely to contain rational arbitrageurs, the latter is more likely to have noisy/irrational traders as recent works have shown (Barber and Odean, 2000, 2001). Based on this conjecture, we divide traders in two types and generate two dummy variables: "Active investor p1" and "Active investor p50". "Active investor p1" takes the value of 1 if a trader is in the top 1% of the distribution of number of trades between 1715 and 1719: most likely these are market makers. "Active investors p50" takes the value of 1 if an investor is between the 1st and 50th percentile of the number of trades distribution between 1715 and 1719. Most likely, these investors just display a high propensity to trade. Column 5 reveals that both categories are more likely to take a loan: traders in the top 1% of trades distribution are 24 percentage points more likely to have a bank of England loan; traders between the 1st and the 50th percentile are almost 9 percentage points more likely to take a margin loan.[27] Column 6 repeats the specification of column 4, however we focus on the probability of an investor to take a margin loan either provided by the Bank of England or the South Sea Company. The dependent variable is in this case a dummy that takes the value of 1 if an investor takes either a Bank of England or a South Sea Company margin loan, and 0 otherwise. The results are broadly consistent with those displayed in first four columns with two exceptions: large holdings between 1715 and 1719 are associated with a lower probability of taking a loan, and aristocrats are about 12 percentage points more likely to take a loan. Both effects are statistically significant at the 1% level.

All in all, these results suggest that less experienced individuals, investors who trade actively and male investors are more likely to take margin loans. In the current finance literature, male investors and frequent traders are often associated with poor trading performance (Barber and Odean, 2000, 2001). We also find that foreign investors, despite often being experienced traders,

[27] In total, investors in the top 1% of the trades distribution obtain £106,100 in margin loans from the Bank of England; investors between the 1st and 50th percentile £903,050.

exhibit a lower probability of taking a margin loan. Most likely, distance and perhaps a strong domestic network result in access to cheaper loans in their own country. Overall, the results suggest that physical market proximity, trading experience and trading frequency predict whether investors take a loan.

[Figure 4 about here.]

[Table 2 about here.]

4.2 Do loan holders behave as extrapolators?

In the previous section we examine what type of investor takes a margin loan, in this section we study whether loan holders trade differently than the average investor. In particular, we test whether investors tilt their portfolio towards stocks that have experienced high returns in the recent past. An extrapolator is more likely to buy (sell) following high (low) share returns, whereas a contrarian does the opposite. Under the Null hypothesis of the discount rate channel we expect no trade and past returns should therefore have no predictive power for stock purchases ($\gamma = 0$). We focus primarily on buying activities and proceed by estimating the following equation:[28]

$$Buy_{ijt} = \rho_{jt} + \kappa_{it} + \gamma Loan_{it} \times R_{j,t-\tau} + \eta_{ijt}, \tag{5}$$

where Buy_{ijt} is a dummy variable that takes the value of 1 if investor i purchases a share of company j at time t, and 0 otherwise. $Loan_{it}$ is a dummy variable that takes the value of 1 if the investor holds a margin loan at time t, and 0 otherwise. In most specifications, we examine Bank of England margin loans ($Loan_{it}^{BOE}(d)$), to identify the effect of traders self-selecting into the loan facility. In order to identify a treatment effect we run an additional test where we consider investors with margin loans provided either by the Bank of England or by the South Sea Company ($Loan_{it}(d)$) since the South Sea loan facility allows for strategic defaults. $R_{j,t-\tau}$ indicates the stock return of company j in the past τ trading days. The main object of interest

[28] We primarily focus on the buying decision because the purpose of our paper is to identify the mechanism through which credit boosts prices and sell decisions give little insight in that mechanism.

is the coefficient γ, because a positive (negative) γ indicates that a margin loan holder acts as an extrapolator (contrarian), while the discount channel predicts a γ equal to zero.

We progressively saturate the equation with fixed effects. κ_{it} are trader×date fixed effects, which absorb any *time-varying* characteristic of trader i. ρ_{jt} are company×date fixed effects which control for any *time-varying* characteristic of company j and consequently picks up daily company-specific news events. The combination of both fixed effects also captures macroeconomic news.

We display the results in Table 3. Columns 1-3 consider the relationship between the probability of buying a stock and the interaction of margin loan dummies and past returns, without controlling for any set of fixed effects. We vary the window of past returns from a short time horizon of four trading days (column 1) to a longer time horizon of fourteen trading days (column 2). Column 3 considers an intermediate time horizon of six trading days, corresponding to a trading week. In each of the three specifications, we find a positive coefficient on the interaction term between the margin loan dummy and past returns, indicating that margin loan holders are *more* likely to buy shares with high realized returns in the past trading period. The effect is statistically significant and economically sizeable. For instance, in our sample, the average share return in the past trading week is 0.75%, which implies that loan holders are 27% more likely to buy. In contrast, in the run-up phase of the bubble, between May 1 and June 15, the average return in the past trading week equals 1.9% which implies that loan holders are 67% more likely to buy vis-à-vis the average trader.

In columns 4 and 5 of Table 3, we progressively add fixed effects to the regression, while fixing the past return window to six trading days. In column 4 we include company×date fixed effects and thereby control for time-varying company characteristics such as company specific news. We still find that the interaction term has a positive and statistically significant coefficient. Column 5 controls for both company×date fixed effects and trader×date fixed effects. The coefficient on the interaction term is still positive and statistically significant at the 10% level. Its magnitude is about 30% lower than the coefficient in column 3. This result indicates that controlling for time-varying company characteristics and time-varying trader characteristics is important, and

confirms that margin loans are not randomly distributed within the population of investors (in line with our findings in Table 2).

In column 6 we study both the margin loans provided by the Bank and South Sea Company. $Loan_{it}$ represents a dummy variable that takes the value of 1 if the investor has a loan either from the Bank of England or the South Sea Company. Also for this broader set of margin loans, we find a positive coefficient on the interaction term between the loan dummy and past returns. The economic significance is sizeable and larger than our findings using only Bank of England loans. Margin loan holders are 88% more likely to buy in the bull market of May 1 - June 15, vis-à-vis 67% for Bank loan holders only. Since the loan-to-value ratio of the South Sea Company is largely above one, this result is consistent with the notion that margin loans may change a borrower's behavior and lead to moral hazard. Loan holders reap the full gain when their extrapolative strategies are successful, however, lenders have to share in the losses when extrapolative strategies fail.

Column 7 considers the probability of selling rather than buying, following past returns, for Bank of England loan holders only. We again estimate equation (5), but we substitute the dependent variable with a dummy variable equal to 1 if investor i sells shares of company j at date t and 0 otherwise. For the sales regression, we impose two filters to the data. First, we only consider investors who hold a positive number of shares at the beginning of the trading day, because investors with no holdings cannot sell. Second, if the investor holds a Bank of England loan, she needs to own more shares than those collateralized with the Bank. This is because shares deposited as collateral cannot be sold. Consistent with the extrapolation hypothesis, we find that investors are more likely to sell following poor company returns, a result that is statistically significant at the 5% level. This finding is not in line with the well-known disposition effect that predicts that investors sell stocks that have recently performed well. Again, the economic significance of this finding on extrapolative trading behavior is sizeable. Our estimate implies that following an average trading week return of -2.3%, which we compute when the stock market valuations steeply decline between September 15 and October 6 1720, margin loan holders are three times more likely to sell compared to the average investor. Summarizing, the findings in Table 3 are in line with

the extrapolation hypothesis and inconsistent with contrarian trading behavior and the discount rate channel.

[Table 3 about here.]

4.3 Do loan holders subscribe to new share issues?

In addition to the extrapolative trading regressions in the previous section, we test whether loan holders are more likely to subscribe to new share issues. The South Sea Company and London Assurance Company initiate new offerings when shares trade against six to eight times their pre-bubble values. Given the strong run-up prior to the offering, it seems reasonable to assume that loan holders who subscribe also exhibit extrapolative beliefs. Moreover, subscribing also leads to a wealth transfer because a subscriber will almost certainly lose money (as explained in section 3.3). Summarizing, the results in this section serve the main purpose of the paper: identifying the channel through which credit provision affects prices by examining wealth transfers and purchase decisions.

The London Assurance Company issues shares in August 1720. We regress the probability of subscribing to London Assurance Company shares on a margin loan dummy and a set of investor characteristics. In these regressions, we define the margin loan dummy ($Loan_i^{BOE}(d)$) as a variable that equals one if investor i holds a Bank of England loan in the week leading up to the date of subscription. Similarly, we define the margin loan dummy ($Loan_i(d)$) as a variable that equals one if the investor holds either a Bank of England or South Sea Company loan in the week prior to the subscription date. We display the results in Table 4.

Column 1 looks at the univariate relationship between the probability of subscribing to London Assurance Company shares and having a Bank of England margin loan. It shows that investors with a Bank loan are 6 percentage points more likely to take the subscription. Since on average, about 4% of the Bank of England shareholders subscribe to the London Assurance Company, our estimate implies that a margin loan holder is 1.5 times more likely to subscribe to newly issued London Assurance shares. In column 2, we control for a set of investor characteristics. The loan holders' probability of taking the subscription halves, but is still economically large: 3 percentage

points (75% of the unconditional mean) and statistically significant at the 1% level. Columns 3 and 4 consider whether margin loan holders of either the Bank of England or the South Sea Company were more likely to take London Assurance subscription. We find a positive coefficient that is statistically significant at the 1% level. The regressions also show that male investors and investors that traded more frequently in the past are more likely to subscribe to new London Assurance shares.

We run a similar regression that estimates the probability that a margin loan holder subscribes to the third and fourth share offering of the South Sea Company. We present the results in Table 5. Similar to the London Assurance subscriptions, margin loan holders are more likely to subscribe to both South Sea subscriptions. A Bank of England margin loan holder is between 8 and 16 percentage points more likely to subscribe to the third offering of South Sea shares (columns 1 and 2). Given that 17% of the Bank shareholders acquire third subscription shares, these estimates correspond to an increase of 47% and 94%, respectively. For the fourth South Sea subscription, Bank of England margin loan holders are between 10 and 14 percentage points more likely to subscribe (columns 4 and 5). This corresponds to an increase of 103% and 144% respectively, given that 9.7% of the Bank of England shareholders subscribes. Both for the London Assurance and South Sea subscriptions, we find that the point estimates of the margin loan dummies become smaller after controlling for trader characteristics, confirming again that trader selection into the loan facilities is not random. Moreover, the economic effects become larger when we consider both Bank of England and South Sea margin loans, consistent with the notion that South Sea margin loans may induce moral hazard.

Summarizing, the findings of our subscription analysis are also consistent with the extrapolation channel. Loan holders are more likely to increase their position in bubbling companies after a run-up and lose money vis-à-vis other traders.

[Table 4 about here.]

[Table 5 about here.]

4.4 Trading performance of loan holders

In this section we relate loan holder trading behavior to performance. In particular, we identify wealth transfers between loan holders and other traders as a result of trading behavior during the bubble. This analysis is important because bubble theories produce different predictions regarding performance. On the one hand, arbitrageurs may ride the bubble successfully as predicted in Abreu and Brunnermeier (2003). On the other hand, Tirole (1982) and Barberis, Greenwood, Jin, and Shleifer (2018) predict that investors who ride the bubble lose money. We document in section 4.2 that loan holders follow extrapolative strategies. In this section, we test whether they gain or lose money as a result of the extrapolative strategies during the bubble.

We first relate the measure of realized performance as presented in equation (1) to a loan dummy taking the value of one if the investor holds a loan in our sample period. We present the results in Table 6. Column 1 looks at the univariate relationship between realized returns and the Bank of England margin loan dummy. In this specification, the constant corresponds to average realized returns for Bank of England shareholders without margin loans. Interestingly, the constant is positive, statistically significant at the 1% level and sizeable. Bank of England shareholders without a loan realize an annual return of 11.7%. Column 1 also reveals that loan holders display negative performance: the coefficient on the dummy is negative, equal to 22.9 percentage points, and statistically significant at the 1% level. Margin loan holders thus lose 11.2% percentage points on their investments in the Bank, East India Company and Royal African Company (11.7% -22.9%=-11.2%).

Column 2 adds various investor characteristics. We still find that Bank of England margin loan holders underperform the average Bank of England shareholder. The coefficient in column 2 implies that a loan holder underperforms the average investor, who realizes a 16% return, by approximately 30 percentage points. Also notice that the coefficient on $Loan_i^{BOE}(d)$ in column 2 is 40% smaller, in absolute value, than the coefficient in column 1. This suggests that selection into the loan facility is an important channel in explaining the performance results. However, after controlling for trader characteristics, margin loan holders still underperform non-loan holders. An additional finding in column 2 is that New Investors perform very poorly during the bubble.

Columns 3 and 4 replicate the regressions in the first two columns, but consider individuals holding margin loans either from the Bank of England or the South Sea Company. Results are similar to those for Bank of England loan holders only: margin loan holders underperform investors without loans. The result is statistically significant at the 1% level in the univariate specification (column 3) and statistically significant at the 10% level in column 4. The point estimates are smaller than those in columns 1 and 2, but still economically large. Loan holders outperform other traders by almost 8 percentage points, after controlling for trader characteristics. It should also be kept in mind that our realized returns do not take into account the losses that investors incur on London Assurance and South Sea subscription positions. This is important because we point out in Section 4.3 that loan holders are more likely to subscribe to new issues of overvalued equity. Taking the subscriptions into account would certainly enlarge the gap between loan holders and other traders.

In addition to the *long-run* performance in Table 6 (note that we measure performance over the entire sample period), we also test whether loan holders are more successful in the *short* run. More specifically, we compare ex-ante, buy-and-hold portfolio returns of loan holders to those of other traders over horizons of 14, 20 and 30 days. In particular, for each company and day we compute the realized return for the next 14, 20 and 30 days. We approximate the investor's portfolio return on that particular day by a weighted average of the company returns. We use investor-specific ex-ante share holdings to determine the daily weights hat we attach to each share. The findings in Table 7 show that margin loan holders also underperform other traders in the short run. Since the absolute value of the negative coefficient is higher than the intercept, margin loan holders also lose money in the short run.

In Figure 5, we study how the short-term performance difference between Bank of England loan holders and other traders evolves over time.[29] For every trading day in our sample, we regress each trader's 30-day buy-and-hold portfolio return (as in Table 7) on a dummy that takes the value of one if a trader holds a Bank of England loan on that trading day. Figure 5 displays the loan dummy coefficients for every trading day in our sample. The figure shows that loan holders

[29]We thank Bige Kahraman for suggesting this test to us.

outperform other traders until June 1, a period that is characterized by rising prices across the board. From June 1 onwards, loan holders underperform the average investor and Figure 5 displays that the performance gap widens sharply in early September when prices start to decline. These results indicate that loan holders do better than the average investor only when prices are rising, but underperform in an environment with high and relatively stable prices (between June 1 and September 15) and when prices are falling (after September 15).[30]

Previous work has shown examples of sophisticated investors that skillfully and successfully ride a bubble (Brunnermeier and Nagel, 2004; Temin and Voth, 2004). Potentially, sophisticated investors could take up credit and ride the bubble. However, the individual trading performance of about 50% of investors in the market reveals that, on average, credit is not used to ride the bubble successfully. Our findings thus indicate a relative wealth transfer from loan holders to other traders.

[Table 6 about here.]

[Table 7 about here.]

[Figure 5 about here.]

4.5 Summarizing speculative positions

The previous sections document that the average loan holder exhibits extrapolative beliefs and underperforms relative to other traders. However, if a sufficient amount of loan capital acts as contrarian, the aggregate effect of loan holders trading behavior on prices could be small. This section therefore quantifies the amount of loan capital that is involved into speculative positions, i.e. positions that are incompatible with contrarian behavior. We define a speculative position as a situation where the margin loan holder undertakes at least one of the following strategies: (1) subscribes to the London Assurance Company in August 1720; (2) subscribes to the third or fourth subscription of South Sea Company shares; (3) has a long position in either East India

[30] Notice that this analysis treats each day equally and it does not consider the amount of buys and sells undertaken by the investors on each different date. The realized returns analysis at the beginning of this section directly considers the daily amounts of buys and sells.

Company or Royal African Company shares at the dates of their respective peak values; (4) has a long position in South Sea Company shares.[31] We believe that our definition is conservative as we don't include long positions in the Bank of England since this company experienced the least bubbling stock price and was considered to be a relatively safe investment by many contemporary traders (Neal, 1993, p.113). In Figure 6, we plot the share of the total loan capital extended by the Bank of England that is associated with these positions. The Figure shows that 79% of the loan capital holds at least one position that is incompatible with contrarian behavior. More than 30% of the loan capital subscribes to the third and the fourth South Sea subscription or is long in the East India Company on its peak date. These findings suggest that it is unlikely that a large amount of loan capital counteracts extrapolative behavior.[32]

[Figure 6 about here.]

4.6 Loan holder trading and stock prices

We now study the relation between loan holder buying pressure and equity prices. More specifically, we test whether the buying power of loan holders is sufficiently large to further inflate the bubble. Since our dependent variable is share returns, we need to aggregate our data to company-date level. We estimate the following regression equation:

$$R_{jt} = \alpha + \beta BuyPress_{jt}^{Loan} + \Omega X_{jt} + \eta_{jt}, \tag{6}$$

where R_{jt} is the end of trading day return of company j at date t.[33] $BuyPress_{jt}^{Loan}$ is the buying pressure of margin loan holders for the shares of company j at date t. Following Lakonishok, Shleifer, and Vishny (1992), it is defined as the ratio of the volume of buys minus the volume

[31] If an investor had a South Sea Company loan registered in the inquiry of the House of Lords it means that she must have had a long position in the South Sea Company before the burst of the bubble.

[32] The date of the peak value of the East India Company is June 12, whereas June 9, is the peak value of the Royal African Company. Results are not particularly sensitive to the choice of the peak value days. For instance, the results remain unchanged if we define a speculative strategy being long on East India Company or Royal African Company around September 15, right before the burst of the South Sea bubble.

[33] We use end of trading day returns in order to rule out that traders are chasing daily returns, but cannot rule out intraday trend chasing.

of sells of loan holders at date t, divided by total volume traded by loan holders at date t. The precise definition of buying power is as follows:

$$BuyPress_{jt}^{Loan} = \frac{\sum_{i \in Loan_t} Buy_{ijt} - Sell_{ijt}}{\sum_{i \in Loan_t} Buy_{ijt} + Sell_{ijt}}. \tag{7}$$

Similarly, we define the buying pressure of traders without a Bank (or without a Bank or South Sea) margin loan as:

$$BuyPress_{jt}^{NonLoan} = \frac{\sum_{i \notin Loan_t} Buy_{ijt} - Sell_{ijt}}{\sum_{i \notin Loan_t} Buy_{ijt} + Sell_{ijt}}. \tag{8}$$

We regress end-of-the-day trading returns on buying power and present the results in Table 8. In the first column, we consider investors with Bank of England margin loans, and we control for the buying pressure of investors without margin loans. In the second column, we also control for one trading day lagged measures of buying pressure both for investors with and without margin loans. We see that loan holders' buying pressure at date t has a positive and statistically significant coefficient. The economic significance is important: multiplying the standard deviation of buying pressure (0.504) by the coefficient, we obtain $0.007 \times 0.504 = 0.3\%$. Since the average daily return is 0.84%, a standard deviation increase in loan holders' buying pressure increases daily returns by approximately 35% of the mean. Interestingly, column 1 also reveals that the buying pressure of investors without a margin loan has a positive but statistically insignificant coefficient. These results are consistent with the conjecture that loan holder stock purchases are related to price increases. This could be because loan holders generate excess demand that is not met by supply provided by non-loan holders. However, the results are also consistent with loan holders trading on days with low liquidity. Moreover, we need to treat the results in Table 8 with caution because we cannot rule out that loan holders react to intraday price movements.

In column 3, we add company fixed effects to the specification in column 2, and the results do not change materially. Column 4 addresses issues related to reverse causality, and also controls for the company returns in the past trading day: the results are again unchanged. Column 5 considers the buying pressure of traders with either a Bank of England or a South Sea Company

loan. We find that the buying pressure of loan holders is still positive, but no longer statistically significant. This may be due to South Sea Company loan holders being more involved in South Sea share trading than Bank of England, East India Company and Royal African Company equity (as also suggested by the performance results we present in Table 6)). As a result, the buying pressure measure we consider in column 5 may be noisy. Overall, the results are in line with the notion that extrapolative trading behavior is related to price movements. This is also consistent with Goetzmann and Massa (2002) who show that momentum activity correlates positively with security prices.

[Table 8 about here.]

5 Robustness

5.1 Is the opening of the loan facility endogenous?

A potential concern is that the opening day of the loan facilities could be endogenous. Hence, our results could be driven by a latent factor (news event and/or a change in macroeconomic conditions) that jointly drives the decision of the Bank of England and/or South Sea Company to provide credit and investors' decisions to take loans and speculative positions. We address this issue by including company×date and trader×date fixed effects in equation (5) in Table 3. The first set of fixed effects controls for changes in macroeconomic conditions and company-specific events that could induce the Bank to open the loan facility and investors to take speculative positions. The second set of fixed effects controls for time-varying investor characteristics and includes, for instance, the sensitivity of trading behavior to changes in the macroeconomic environment.

To provide further reassurance that our results are not driven by latent factors, we plot the daily number of margin loans issued by the Bank of England in Figure 7. If a particular company-specific or macroeconomic event drives credit provision and the propensity of traders to take a loan, we would expect loan issuance to be concentrated in early May, right after the loan facility was opened. Figure 7 shows that this is not the case. Investors take up margin loans uniformly throughout the period. Interestingly, the day with the largest number of new loan issues is June

17: the day that the third South Sea subscription opens. This lends further support to our reading that margin loans are used to buy overvalued stock.

[Figure 7 about here.]

5.2 Information asymmetry and price reversals

We document that loan holders buy after price increases and we interpret these results as evidence of extrapolation of past returns. However, this trading behavior is also consistent with a model of slow information revelation and information asymmetry (Brennan and Cao, 1996, 1997; Brennan, Cao, Strong, and Xu, 2005). These models assume rational agents, some more informed than others about the true value of the assets, and slow diffusion of information. Under these assumptions, they make three important predictions on the welfare and trading behavior of extrapolators and other traders. First, poorly informed traders behave as trend chasers, while better informed traders follow a contrarian strategy. Second, prices slowly converge to fundamental values.[34] Third, both better and worse informed traders experience welfare gains because trading leads to improved risk sharing among them.[35] In this section we test these predictions of the slow information revelation and information asymmetry models.

First, we construct trader-specific measures that proxy for information asymmetries in the London equity market. We interact them with past returns and use them as additional controls in equation (5). We first follow Brennan and Cao (1997) and Brennan, Cao, Strong, and Xu (2005), and proxy for asymmetric information using a foreigner dummy. British investors should be better informed about stocks traded in London than foreigners, especially in the eighteenth century when information travels more slowly from one country to another. In an additional specification we proxy for information asymmetry by including a dummy that equals one for investors who live in London. Londoners are probably better informed about stocks trading on the London stock exchange than traders residing elsewhere. Our last proxy for information asymmetry is a dummy

[34] Brennan and Cao (1996, pp. 168): "So that the precision of public information about the payoffs increases through time."

[35] Utility gains are measured vis-à-vis a model with one trading round that is not Pareto efficient because there are unexploited gains from trade: Brennan and Cao (1996, pp. 172): "The effect of increased public information flow after the initial trading sessions, is to increase welfare for all investors by improving risk sharing opportunities."

that takes the value of one for new investors, i.e. investors who have never traded Bank of England, East India Company and Royal African Company stocks prior to 1720. We present the results in Table 9. In every specification, our main interaction term ($Loan_{it}^{BOE}(d) \times R_{jt-6}$) is always positive and statistically significant, suggesting that our findings cannot be explained by information asymmetries between extrapolating loan holders and other traders. These findings are also in line with Table 2, where we document that frequent traders and investors with better market access are more likely to collateralize their shares.

Second, we consider the prediction that prices slowly converge to their fundamental value. This implies that prices should not be subject to reversals. However, Figure 4 shows strong evidence of price reversals which are characteristic for bubble periods. This evidence is in line with the extrapolation hypothesis because extrapolative behavior leads to overvaluation, which is followed by long-term reversal to fundamental values.[36] However, reversal patterns are not in line with increased informativeness of prices as in Brennan and Cao (1996).

Third, Brennan and Cao (1996) argue that extrapolative strategies should not lead to trading losses, while the extrapolation hypothesis predicts a wealth transfer from extrapolators to other traders. In fact, under the Null of the slow information revelation model, both extrapolators and other traders should realize welfare gains over the trading rounds. However, Tables 6 and 7 show that extrapolators lose money over the course of the bubble (both in the short and long run), which is inconsistent with the welfare gain predicted by Brennan and Cao (1996).[37] In addition, we find that extrapolators also lose in relative terms. In particular, we regress 30-day buy-and-hold portfolio returns on a loan holder dummy for every trading day in our sample and display the dummy loading in Figure 5. The figure shows that already early in the sample period (from June 1 onwards), extrapolators are outperformed by other traders. This evidence is consistent with the extrapolation hypothesis, but not in line with slow revelation of information.

[Table 9 about here.]

[36] Notice that this reversal is different and based on a longer time period than the liquidity reversal documented by Kahraman and Tookes (2017).

[37] We document in unreported results that realized portfolio variances are also higher for extrapolators than for other traders. Hence, the extrapolators do not increase welfare by decreasing risk.

5.3 Optimal leverage and portfolio rebalancing

The results in Table 3 are also consistent with portfolio rebalancing by investors who seek to maintain a constant (optimal) leverage ratio.[38] For instance, an investor with a power utility function and constant risk premium has an optimal leverage ratio that is time invariant ($\frac{\mu - r_f}{\gamma \sigma^2}$). If we define an investor's leverage ratio as the value of the risky assets divided by the investor's wealth

$$\frac{\sum_{i=1}^{N} P_s * N_s}{\sum_{i=1}^{N} P_s * N_s + C - B}, \tag{9}$$

where P_s represents the price of stock s, N_s the number of stocks s held, C the investor's cash holdings and B the amount borrowed by the investor. Then, it is straightforward to see that positive price shocks have a deleveraging effect, when cash holdings (C) are smaller than B. It is also important to note that share sales and purchases affect the numerator of the leverage ratio in equation (9) but not the denominator. Because a purchase (sale) creates a cash-outflow (cash-inflow) equal to the value of the purchase (sale). This implies that an investor who experienced a positive price shock - and therefore a drop in leverage ratio - can bring the leverage ratio back to its original level by buying stocks. This rebalancing mechanism is thus consistent with our finding that investors buy shares after a recent price increase.

However, there is one important difference between the rebalancing mechanism described above and our extrapolation hypothesis. Equation (9) shows that an investor can buy *any* share to lever up. In contrast, the extrapolation hypothesis predicts that an investor who has experienced a positive shock to share j, will buy that particular share j. The prediction of the extrapolation hypothesis can thus be regarded as a special case of the rebalancing mechanism. We design a simple test to determine whether our findings are simply a manifestation of a broader rebalancing exercise. More specifically, we test whether an investor who has realized a positive return on a particular stock, say the Royal African Company, is also more likely to buy Bank of England or East India Company shares to bring the leverage ratio back to its initial position:

[38] We thank Michael Brennan for this valuable suggestion.

$$Buy_{ijt} = \lambda_i + \delta_t + \gamma Loan_{it}^{BOE} \times \sum_{s \neq j} w_{is} R_{s,t-\tau} + \eta_{it}, \tag{10}$$

where Buy_{ijt} is a dummy variable that takes the value of 1 if investor i buys share j at time t. λ_i are investor fixed effects and δ_t date fixed effects. $R_{s,t-\tau}$ denotes the return on security s over the past τ trading days and $w_{is} \in [0, 1]$ investor i's portfolio weight for security s and $Loan_{it}^{BOE}$ a dummy that takes the value of one if investor i holds a Bank of England loan at t. Portfolio rebalancing predicts a positive γ, because investors can buy *any* risky asset to revert leverage ratios. Investors don't necessarily need to buy the security that recently experienced a positive price shock. We present the results in Table 10 using 6 trading days past returns (as in the main specifications of Table 3). Column 1 considers whether investor i buys Bank of England stock at date t as a function of the past returns of the East India Company and Royal African Company. Similarly, in column 2 and 3 we study the East India Company and Royal African Company buys as a function of the returns on the other two companies in our sample. The results show that there is no statistically significant relationship between past portfolio returns and the probability to buy another stock. These findings are inconsistent with a broader rebalancing mechanism predicting that investors buy *any* share after experiencing a deleveraging through a price increase.

[Table 10 about here.]

5.4 Forward contracts

Another possible concern is that our transaction data may contain settlements of future contracts that were closed on days prior to the recorded transaction date. We address this issue in two ways. First, we exclude transactions where either the buyer or the seller is a broker, as brokers mostly served as counterparty on forward contracts. We then classify traders as brokers if they are either labeled as a broker in the index books (Panel A), or if they are among the 1% most active traders (Panel B). Panel A and B of Table 11 show that our main findings do not change if we exclude brokers and frequent traders (market makers). Second, we exclude days with a higher probability

of forward trading. More specifically, we take out trading days that follow immediately after the re-opening of the companies' books. Books were closed for a few weeks around dividend payment dates to allow the companies' clerks to compile the list of shareholders that were entitled to receive a dividend. In these periods, forward stock transactions may take place and these transactions are usually settled right after the re-opening of the books. We collect the dates for which the Bank of England and East India Company books are closed from John Freke's *'Prices of Stocks'*.[39] Panel C of Table 11 shows that the extrapolation results remain unchanged after taking out re-opening days.

[Table 11 about here.]

5.5 Destabilizing Short Sellers

Another potential concern is that margin loan holders trade as extrapolators because we capture credit-constrained arbitrageurs that need to finance a short position with a broker and we do not observe these short positions. As it becomes more expensive to maintain a short position during the run up of the bubble, investors may reduce or wind up their positions by buying back borrowed stocks (see Lamont and Stein (2004) and Hong, Kubik, and Fishman (2012)). As a result, we would observe that loan holders buy stocks following positive past returns to reduce their short position. Two important arguments contradict this alternative explanation for extrapolative trading behavior of loan holders. First, trading stocks to maintain a short position is incompatible with the finding that margin loan holders are twice as likely to subscribe to new (overvalued) share issues. Figure 6 also shows that many loan holders subscribed to these risky new share issues. Second, Lamont and Stein (2004) and Hong, Kubik, and Fishman (2012) explain that destabilizing short positions are largely driven by open end funds that experience redemptions by investors and are therefore forced to close their short positions for lack of funds. However, our sample does not contain any open end mutual funds that are subject to redemptions.

[39]Since the books were typically only closed in order to determine the dividend payments, the Royal African Company books were open during our entire sample period as they didn't pay dividends in 1720.

6 Conclusion

This paper studies the relation between margin lending, individual trading behavior and stock prices during a bubble. In theory, credit provision could fuel asset prices through different channels. On the one end, cheaper credit could lower the cost of capital and consequently discount rates. This would lead to a price increase without misvaluation, extensive trading or wealth transfers between groups of investors. On the other extreme, extrapolators could use credit to buy overvalued shares and thereby fuel a bubble. This would lead to a wealth transfer from extrapolators to other traders. The channel through which credit affects prices is thus theoretically ambiguous and can be identified by studying the effects of credit provision on trading and realized returns.

We collect every single stock transaction with buyer and seller identities for three large British companies during the classical 1720 South Sea Bubble. In May 1720, the Bank of England grants its shareholders the right to borrow cash by collateralizing their shares. Each investor can borrow up to the nominal value of the share and loans are recorded in the stock ledger books of the Bank. The meticulous documentation of the transactions allows us to link, on a daily basis, each investor's share trading to her loan positions. Our data covers the daily equity transactions of about 50% of the British market capitalization over the course of the bubble and five years before.

Our findings are consistent with an extrapolation channel. First, we document that a loan holder acts as an extrapolator by buying stocks that have experienced high returns in the recent past. Second, we find that borrowers realize lower returns than investors without a loan. Third, we find that margin loan holders are more likely to subscribe to new share offerings at peak prices. This strategy is also extrapolative and extremely risky. We can ex-post determine that it leads to negative returns. Finally, we show that there is a positive relation between loan holder buying pressure and stock prices during the bubble.

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A Appendix

A.1 Organization of the Ledger Books

Bank of England ledger and index data are retrieved from Bank's archives and split into two periods. The first set of ledgers[40] and indexes[41] cover 1st August, 1715 to 29th September, 1720 and the second set (contains index entries[42] [43]) covers 29th September, 1720 to 29th September 1725. Similarly, we collect East India Company trades, holdings and trader characteristics for the period 24th June, 1715 to 15th March, 1719[44] and for the period 15th, March, 1719 to 25th march, 1723[45].

A.2 Transfer files

In addition to ledger book entries, transactions are filed in so-called transfer books where buyer and seller sign an agreement transferring legal rights associated with holding stocks.[46] Bank of England transfer files often contain information about a trader that is not recorded in the ledger index. For example, Samuel Turner has no ledger characteristics, while his transfer files mention Chancery Lane in the city of London as home address. In such cases, we augment trader entries using transfer file information. In rare cases where Bank of England ledger books are unreadable or buyer and seller entries do not match, we also validate ledger entry details (nominal amount, transaction date and trader identity) using transfer file data.

Because Royal African Company ledger books have not survived, we use transfer files to infer Royal African holdings and transactions. On May 2nd, 1720 the Royal African Company issues a new batch of shares, four times the size of all outstanding shares. We collect all transfer files of the brand new 'engrafted' shares[47] for the period May 2nd, 1720 to October 27th, 1720 and compute individual daily holdings, buys and sells for each individual Royal African trader. In

[40] AC27/424-429
[41] AC27/415-416
[42] AC27/430-433
[43] AC27/434-437
[44] IOR L/AG/14/5/3
[45] IOR L/AG/14/5/4
[46] Bank of England transfer files are retrieved from AC28/1537-1554.
[47] National Archive: T70/199-202.

order to compensate the senior shareholders for share dilution a dividend of 10% in April 1721 was promised exclusively to the senior stock holders (Carlos, Moyen, and Hill, 2002). This difference in dividend payments led to different market prices for the senior stock and the new 'engrafted' stock.

A.3 Computing Royal African Company prices in the first few weeks of May

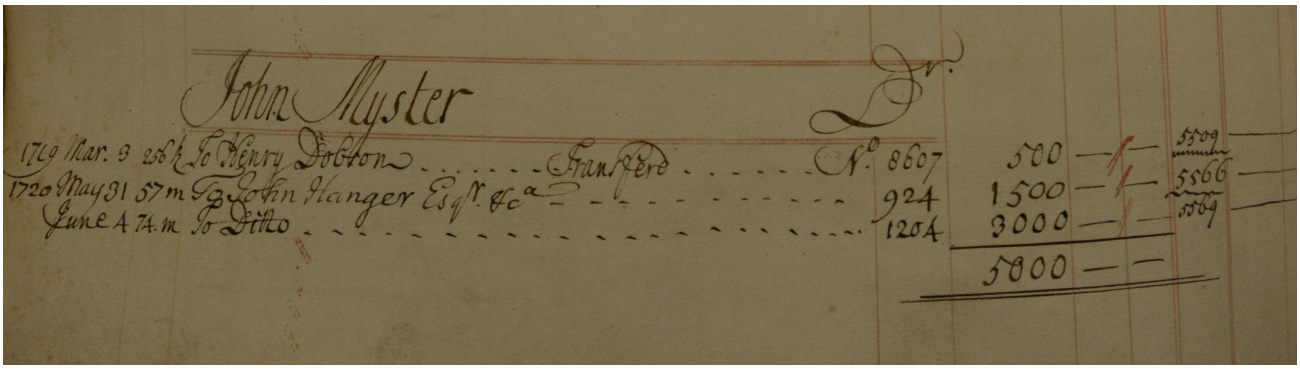
Since there are no price quotations available for the new 'engrafted' Royal African shares in the first few weeks of May we adopt an algorithm to infer prices for this period from the price quotes of the old Royal African Company.[48] We exploit the fact that the 'engrafted' and old Royal African shares are claims to the same stream of future cash flows except for the promised April 1721 dividend. This notion is confirmed by Carlos, Moyen, and Hill (2002) as they document that old and new Royal African prices are unsurprisingly highly correlated: 0.9962. The procedure is straightforward as we first regress old prices on new prices using a sample period of June 1st, 1720 to August 31st, 1720.[49] In the second step we use the estimated coefficient and the available old Royal African price quotes to infer daily prices of the 'engrafted' Royal African shares up to May 28th. This procedure produces a floating price of £51.20 on May 2nd, which is well above the underwriter's price (Joseph Taylor paid £4.84) but considerably lower than the nominal book value of £100.

[48] The first price quote of Royal African subscription shares by Castaign was on May 28th, 1720.

[49] We select this specific period to exclude the potential effect of periodic installment payments of subscribers on the price of the new Royal African Company. The procedure required buyers of the new Royal African shares to pay an initial payment of £8 and three remaining installment payments that were due on on 1 June (£8), 1 September (£5) and 1 December (£7).

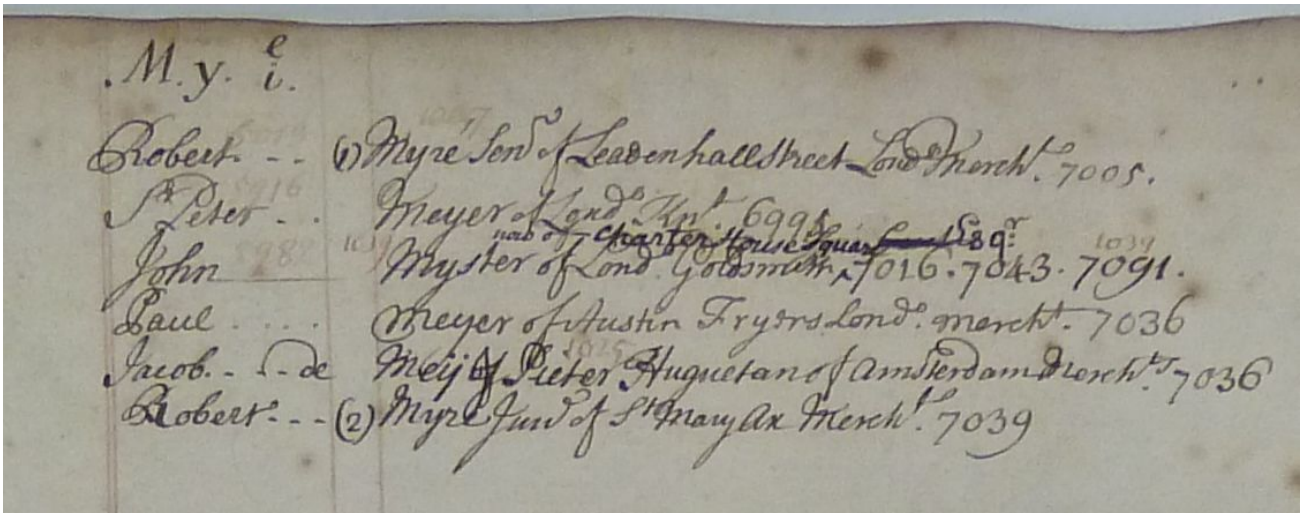
Figure 1: John Myster's Financial Records

(a) John Myster's stock sales



This Figure displays John Myster's stock sales and was retrieved from the Bank of England stock ledger book.

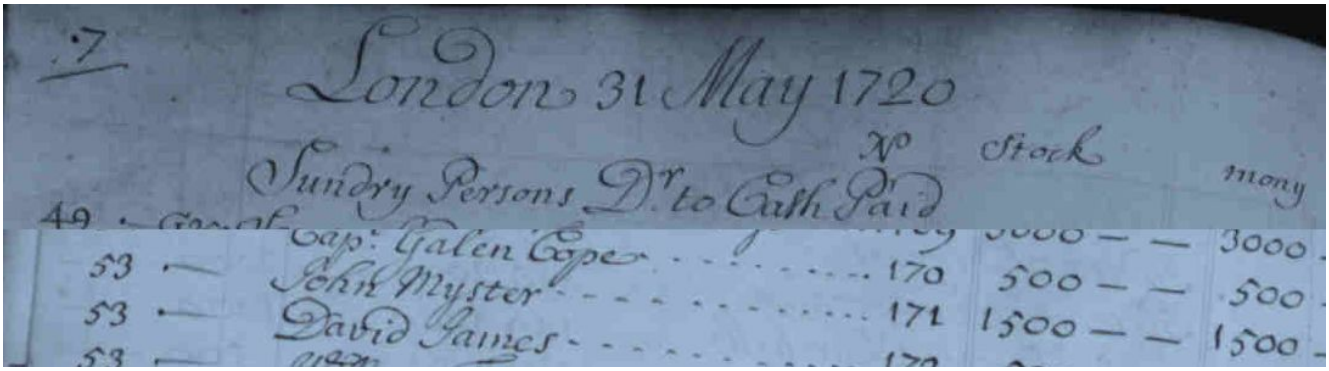
(b) John Myster's index entry



This Figure displays John Myster's ledger index entry. The numbers indicate pages in the ledger book where Myster's accounts are registered.

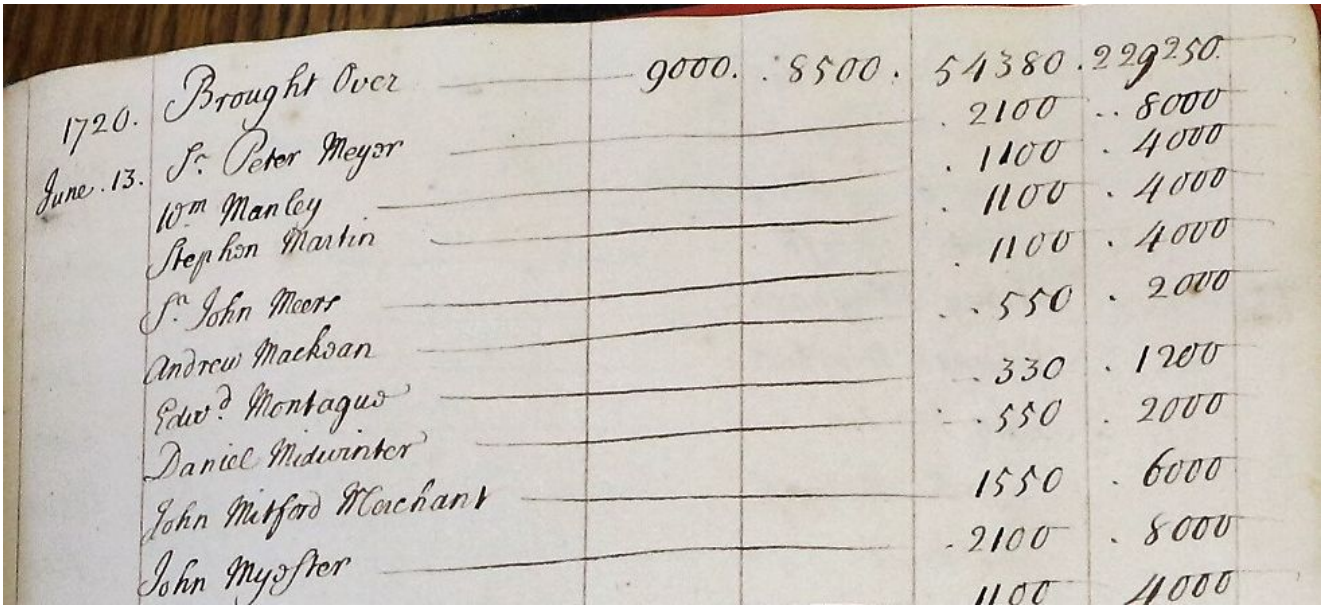
Figure 2: John Myster's Loan Positions and Subscriptions

(a) John Myster's Bank of England Loan



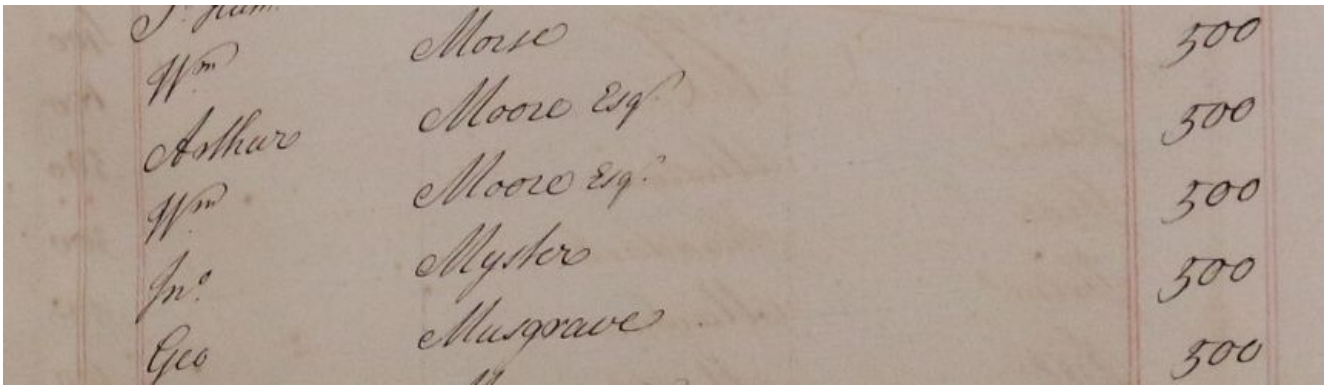
This Figure displays John Myster's Bank of England stock loan as recorded in the loan book.

(b) John Myster's South Sea Loan



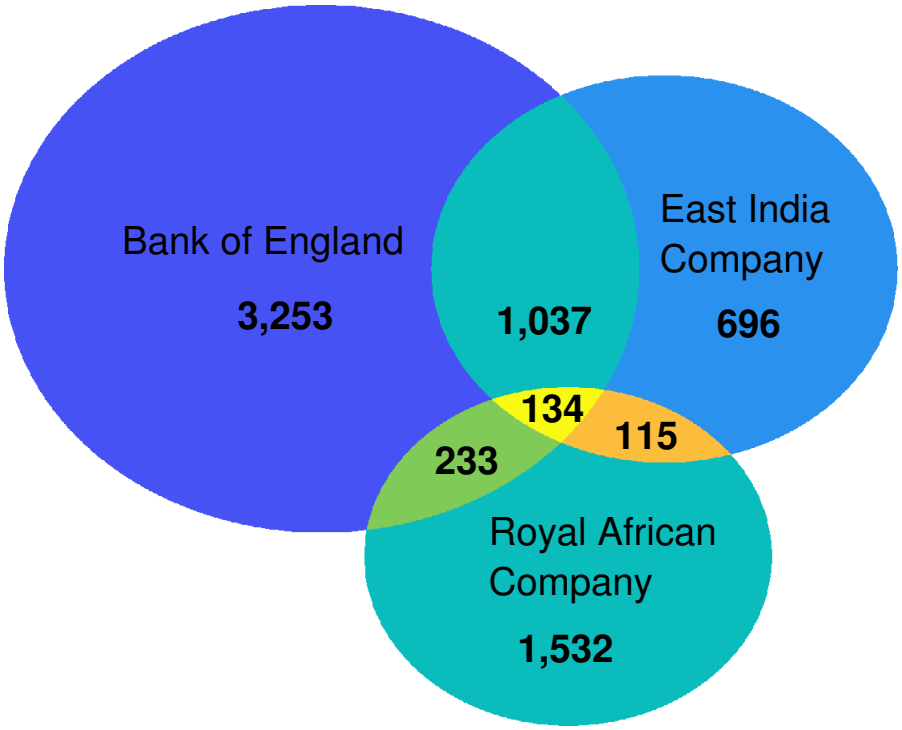
This Figure displays John Myster's South Sea Company loan.

(c) John Myster's fourth South Sea Subscription



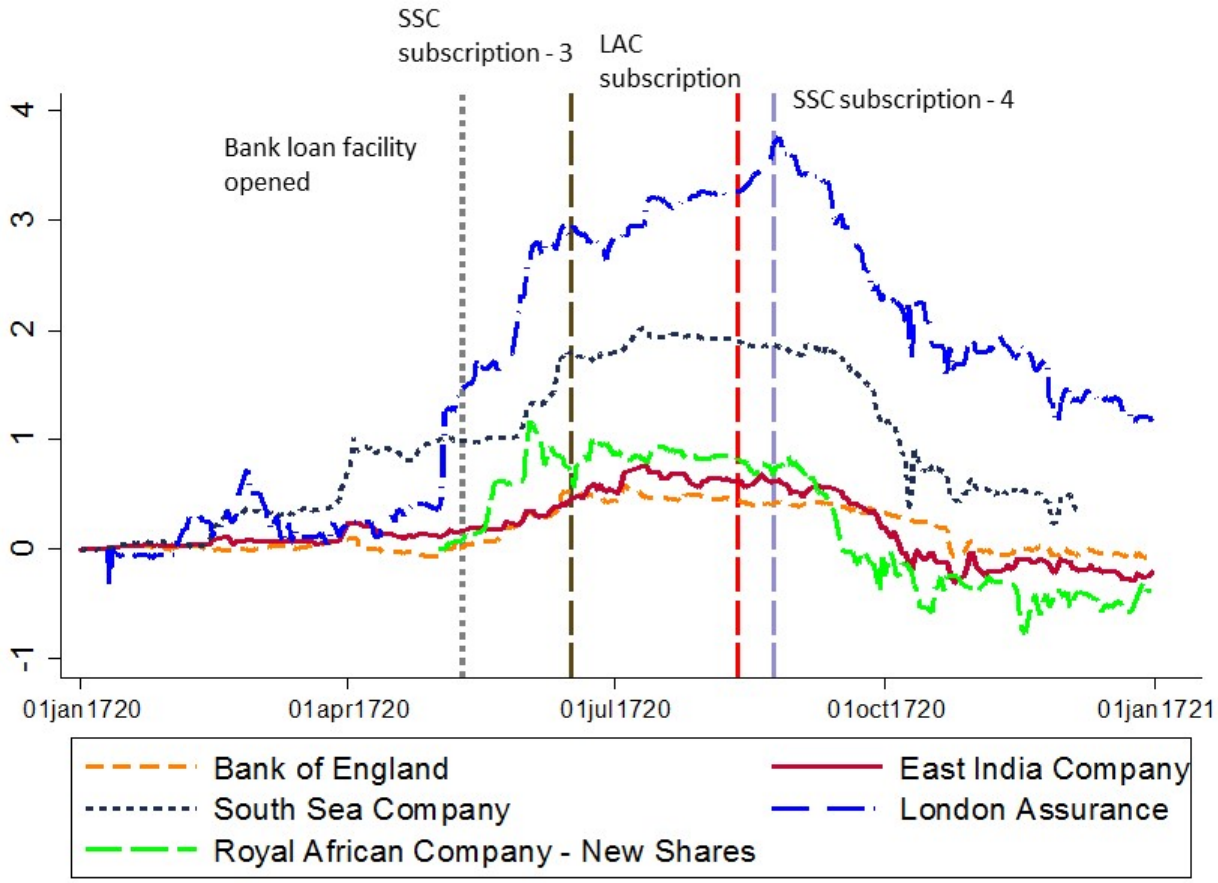
This Figure shows John Myster's fourth South Sea Company subscription.

Figure 3: Number of traders per company



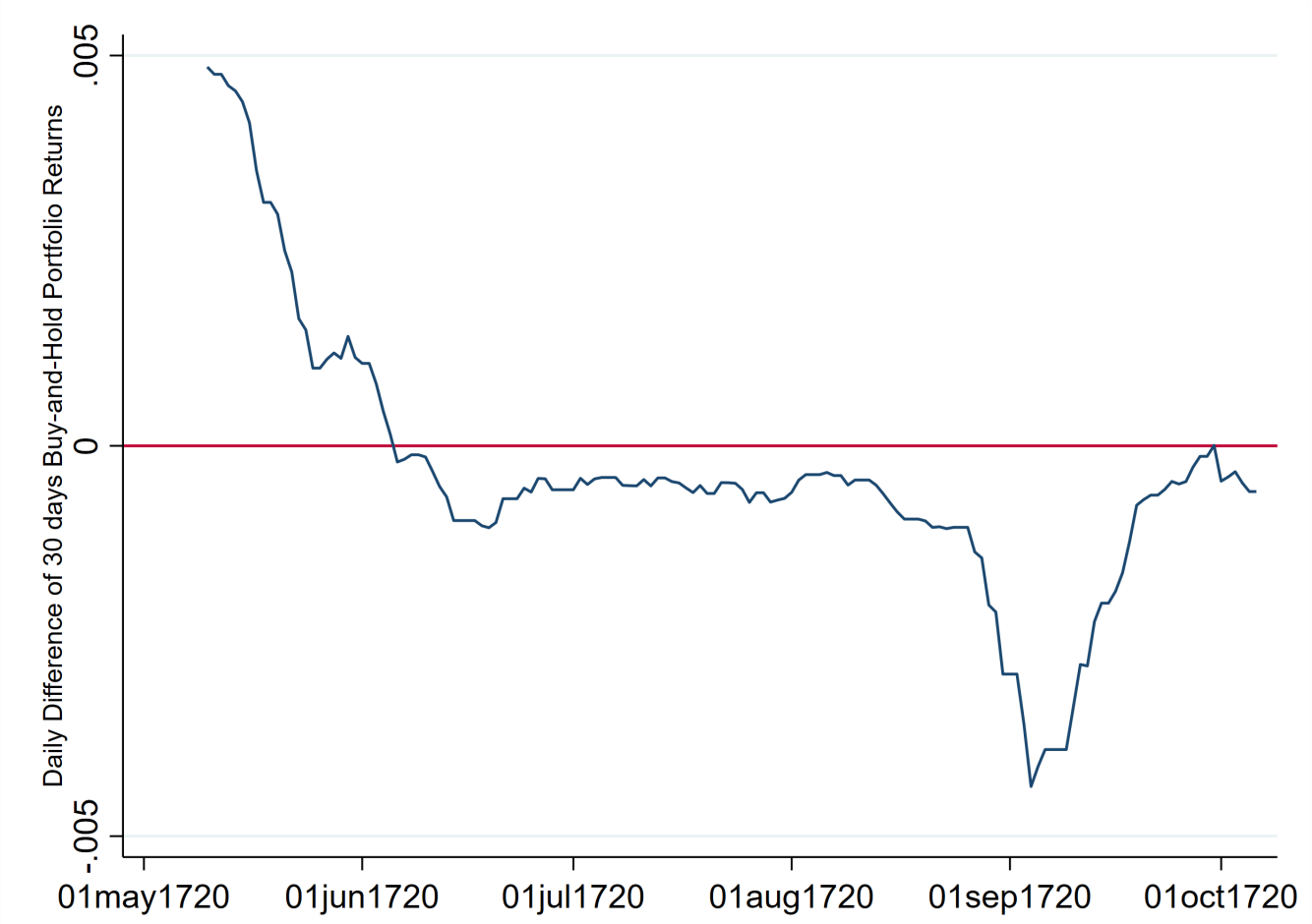
This Figure shows how many traders are active in each of the companies in our sample, with overlapping areas indicating that traders are active in more than one company.

Figure 4: Bubbles, margin loans and new subscriptions



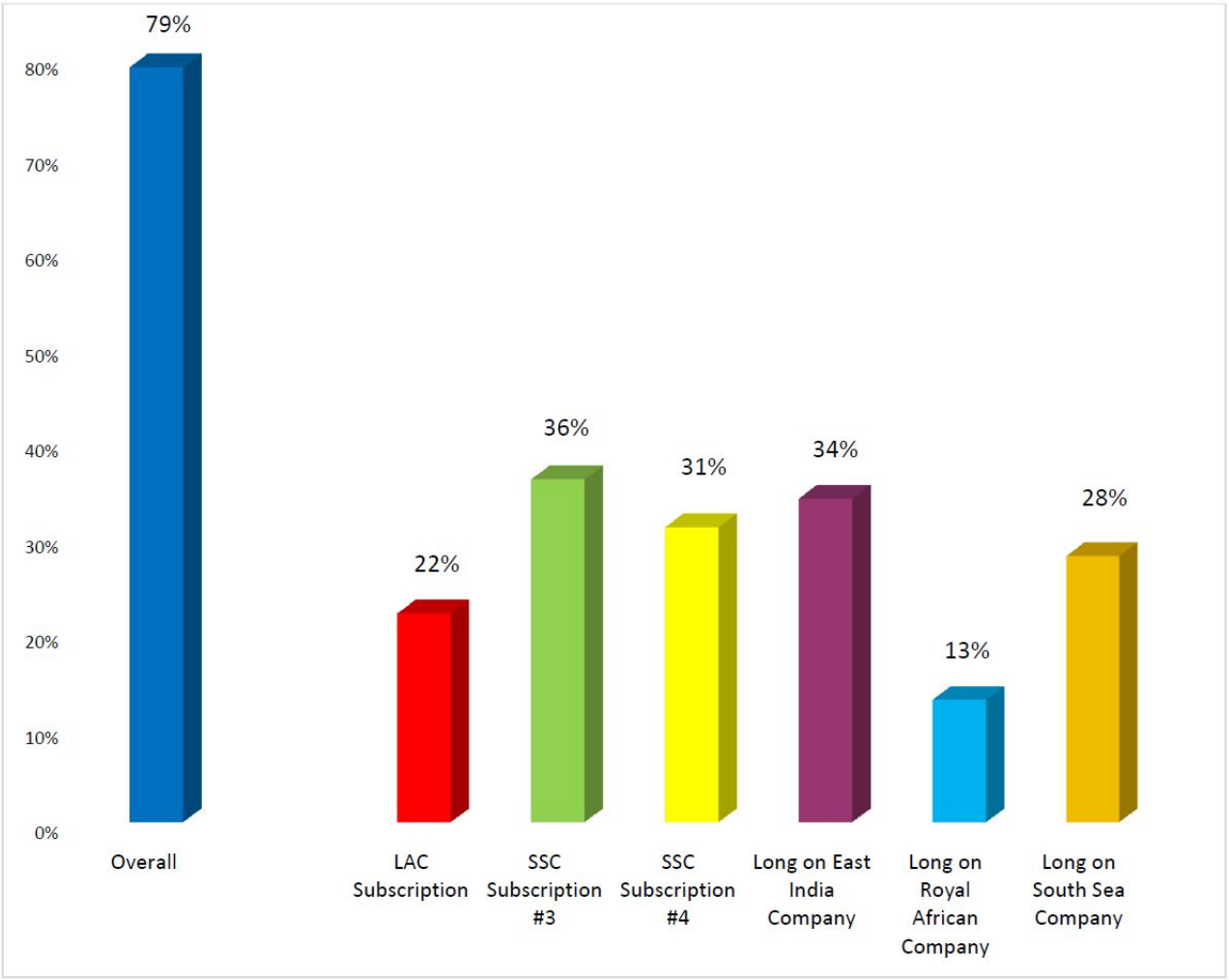
This Figure displays market prices for Bank of England, East India Company, South Sea Company and London Assurance Company for the year 1720. The first vertical line indicates the opening of the Bank of England loan facility (10th May, 1720), the second vertical line represents the opening date of the South Sea Company's third share subscription (17th June, 1720), the third vertical line the opening of London Assurance Company's second share subscription (12th August, 1720) and the fourth vertical line the opening date of the South Sea Company's fourth share subscription (24th August, 1720).

Figure 5: Daily Difference of 30 day Buy-and-Hold Portfolio Returns: Loan holders vs. non-loan holders



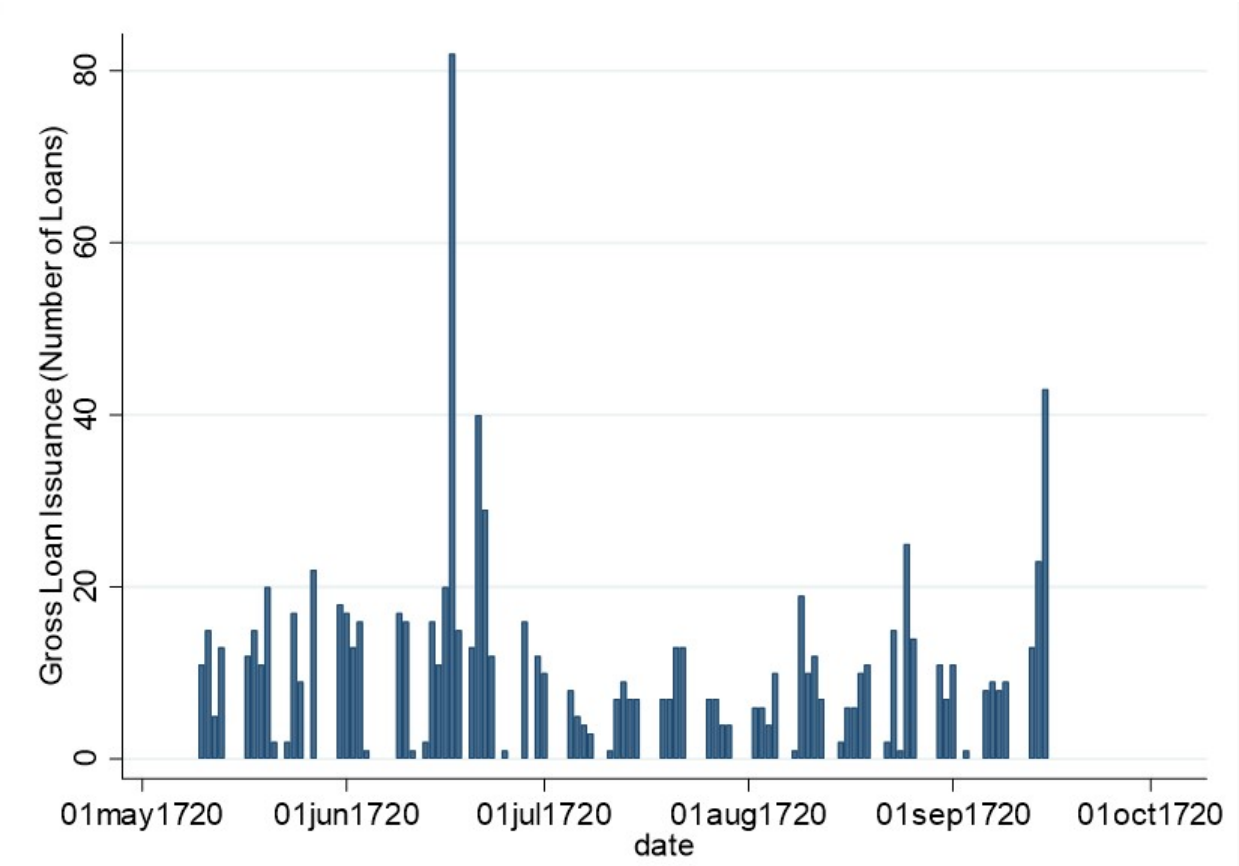
This figure shows the difference in performance between Bank of England loan holders and other traders. We measure performance using 30 day buy-and-hold portfolio returns. On each trading day, we regress each investor's 30 day buy-and-hold portfolio return on a dummy variable that takes the value of 1 if the investor is a Bank of England loan holder and 0 otherwise. We then plot the loadings on the Bank of England loan holder dummy for each trading day.

Figure 6: Percentage of Bank loan holders taking speculative positions



This Figure shows the total percentage of Bank of England loan holders taking speculative positions in the first bar. The percentage of Bank loan holders subscribing for the London Assurance, South Sea Company third and fourth subscription respectively in the second, third and fourth bar. We plot the percentage of Bank loan holders having long positions in the East India Company, Royal African Company and South Sea Company at their respective peak values in the last three bars.

Figure 7: Gross Loan Issuance



The Figure shows the number of Bank of England margin loan issued on each day from May 12, 1720 until October 6, 1720.

Table 1: **Summary Statistics**

This Table reports summary statistics for our main variables of interest. We report mean, 10th percentile and 90th percentile for traders who use the Bank's loan facility ($Loan_{BOE}$) and for all traders (All). We sum daily market value of holdings (number of trades) for every trader across shares for the period 1715-1719 in the first (second) row. Row three (four) shows daily market values of share volumes bought (sold) per trader. Rows five and six display realized returns as defined in equation (1) over the years 1715-1719 ('Realized Returns 1715-1719') and the bubble year 1720 ('Realized Returns 1720') respectively. Active Investor, p1 (d) and Active Investor, p50 (d) are dummies that represent the top 1 and 50 percentile of investors with most transactions in the period 1715-1719. Rows seven and eight show dummies taking the value of one for Bank of England loan holders ('$Loan_{it}^{BOE}(d)$') and Bank or South Sea loan holders ('$Loan_{it}(d)$'). Rows nine to fourteen show 'New Investor (d)' a dummy taking the value of one if an investor does not appear in our sample prior to January 1st, 1720, 'Foreign (d)' a dummy for investors not living in Great Britain (including Ireland), 'London (d)' a dummy variable for traders living in the greater London area (City of London, Holborn, Wapping, Moorfields, Westminster, Middlesex, Bethnal Green, Sepulchre, Covent Garden, Shadwell), 'Aristocrat (d)' a dummy for nobility (Lady, Dutchess, Marquess, Viscountess, Baroness, Princess, Countess, Prince, Graf, Marquis, Duke, Honorable, Earl, Baron, Count, Viscount, Lord), 'Broker (d)' a dummy for brokers, 'Male (d)' a dummy for male investors. Rows fifteen to seventeen display 'Subscribe SSC 3(d)' a dummy taking the value of one for investors subscribing for the South Sea third subscription, 'Subscribe SSC4 (d)' a dummy taking the value of one for investors subscribing for the South Sea fourth subscription, 'Subscribe LAC(d)' a dummy taking the value of one for investors subscribing for the London Assurance second subscription.

	Mean		p_{10}		p_{90}	
	$Loan_{BOE}$	*All*	$Loan_{BOE}$	*All*	$Loan_{BOE}$	*All*
Average Holdings 1715-1719	1,018	819	0	0	2,715	1,912
Number of Trades 1715-1719	11	6	0	0	24	11
Active Investor, p1 (d)	0.03	0.01	0	0	0	0
Active Investor, p50 (d)	0.51	0.45	0	0	1	1
$Buys_{ijt}$	8,979	3,941	0	0	20,345	6,394
$Sells_{ijt}$	6,989	3,905	0	0	18,130	6,794
Realized Returns 1715-1719	0.04	0.04	0.00	0.00	0.08	0.09
Realized Returns 1720	-0.01	0.15	-0.83	-0.79	0.42	0.70
$Loan_{it}^{BOE}(d)$		0.13		0.00		1.00
$Loan_{it}(d)$		0.19		0.00		1.00
New investor (d)	0.35	0.24	0.00	0.00	1.00	1.00
Foreign (d)	0.01	0.06	0.00	0.00	0.00	0.00
London (d)	0.80	0.68	0.00	0.00	1.00	1.00
Aristocrat (d)	0.04	0.03	0.00	0.00	0.00	0.00
Broker (d)	0.02	0.01	0.00	0.00	0.00	0.00
Male (d)	0.91	0.81	1.00	0.00	1.00	1.00
Subscribe SSC 3(d)	0.31	0.17	0.00	0.00	1.00	1.00
Subscribe SSC 4(d)	0.23	0.10	0.00	0.00	1.00	0.00
Subscribe LAC(d)	0.11	0.04	0.00	0.00	1.00	0.00

Table 2: **Who takes a margin loan?**

This Table reports marginal effects and corresponding standard errors (in parentheses) for a probit regression of trader-specific loan holder dummies taking the value of one if trader i holds a share loan with the Bank of England only ($Loan_i^{BOE}(d)$) or with the Bank of England or South Sea Company ($Loan_i(d)$) at any time during our sample. We regress loan holder dummies on trader characteristics. 'Realized Returns 1715-1719' represents value-weighted trader-specific realized portfolio returns from 1715 to 1719, 'Average Holdings 1715-1719' value-weighted average of the logarithm of trader-specific stock holdings from 1715 to 1719, 'Number of Trades 1715-1719' refers to the logarithm of total number of trader-specific transactions per trader from 1715 to 1719, 'New Investor (d)' is a dummy taking the value of one if an investor does not appear in our sample prior to January 1st, 1720, 'London (d)' a dummy variable for traders living in the greater London area (City of London, Holborn, Wapping, Moorfields, Westminster, Middlesex, Bethnal Green, Sepulchre, Covent Garden, Shadwell), 'Foreign (d)' a dummy for investors not living in Great Britain, 'Aristocrat (d)' a dummy for nobility (Lady, Dutchess, Marquess, Viscountess, Baroness, Princess, Countess, Prince, Graf, Marquis, Duke, Honorable, Earl, Baron, Count, Viscount, Lord), 'Broker (d)' a dummy for brokers, 'Male (d)' a dummy for male investors and N the number of observations. Active Investor, p1 (d) and Active Investor, p50 (d) are dummies that represent the top 1 and 50 percentile of investors with most transactions in the period 1715-1719.

	$Loan_i^{BOE}(d)$	$Loan_i^{BOE}(d)$	$Loan_i^{BOE}(d)$	$Loan_i^{BOE}(d)$	$Loan_i^{BOE}(d)$	$Loan_i(d)$
Realized Returns 1715-1719	0.020	0.012	0.011	-0.004	0.005	0.048
	(0.079)	(0.076)	(0.075)	(0.074)	(0.072)	(0.081)
Holdings 1715-1719	-0.004	-0.002	-0.002	-0.003	0.002	-0.011***
	(0.004)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)
Number of Trades 1715-1719	0.060***	0.053***	0.052***	0.047***		0.081***
	(0.005)	(0.005)	(0.005)	(0.005)		(0.007)
New Investor (d)	0.167***	0.159***	0.156***	0.142***	0.164***	0.150***
	(0.032)	(0.031)	(0.031)	(0.030)	(0.033)	(0.032)
London (d)		0.038***	0.040***	0.037***	0.040***	0.043***
		(0.010)	(0.010)	(0.010)	(0.010)	(0.012)
Foreign (d)		-0.105***	-0.105***	-0.103***	-0.104***	-0.154***
		(0.010)	(0.010)	(0.010)	(0.010)	(0.012)
Aristocrat (d)			0.042	0.036	0.042	0.115***
			(0.033)	(0.032)	(0.032)	(0.042)
Broker (d)			0.028	0.020	0.036	0.002
			(0.049)	(0.046)	(0.050)	(0.053)
Male (d)				0.060***	0.064***	0.098***
				(0.010)	(0.009)	(0.012)
Active Investor, p1 (d)					0.249***	
					(0.067)	
Active Investor, p50 (d)					0.088***	
					(0.013)	
N	5,110	5,110	5,110	5,110	5,110	5,110

Table 3: **Do loan holders behave as extrapolators?**

This Table reports parameter estimates and corresponding standard errors (in parentheses) for a linear probability regression of buy (sell) dummies on a loan dummy ($Loan_{it}^{BOE}(d)$), realized returns over the past six trading days (R_{jt-6}) using opening prices and the interaction of a loan dummy and realized returns. $Buy_{ijt}(d)$ ($Sell_{ijt}(d)$) takes the value of one if investor i buys (sells) share j in day t. $Loan_{it}^{BOE}(d)$ takes the value of one if investor i has a share loan outstanding with the Bank of England at t and $Loan_{it}(d)$ takes the value of one if trader i has a share loan outstanding with the South Sea Company or the Bank of England at t. $Holdings_{ijt}$ denotes the natural logarithm of investor i's holdings in share j at t and $SumTrades_{ijt}$ the natural logarithm of the total number of trades by investor i in share j until t. R_{jt-4} (R_{jt-14}) represents the realized return for share j over the past four (fourteen) trading days using opening prices. We also report adjusted R^2s (R^2) and the number of observations (N). We control for trader×date fixed effects ($Trader \times DateFE$) and company×date fixed effects ($Company \times DateFE$). Standard errors are double clustered at the trader and date level.

	$Buy_{ijt}(d)$	$Buy_{ijt}(d)$	$Buy_{ijt}(d)$	$Buy_{ijt}(d)$	$Buy_{ijt}(d)$	$Buy_{ijt}(d)$	$Sell_{ijt}(d)$
$Loan_{it}^{BOE}(d) \times R_{jt-4}$	0.046***						
	(0.015)						
$Loan_{it}^{BOE}(d) \times R_{jt-14}$		0.060**					
		(0.025)					
$Loan_{it}^{BOE}(d) \times R_{jt-6}$			0.063***	0.055***	0.041*		-0.223**
			(0.023)	(0.021)	(0.024)		(0.095)
$Loan_{it}(d) \times R_{jt-6}$						0.072***	
						(0.022)	
$Holdings_{ijt}$	0.003***	0.003***	0.003***	0.003***	0.004***	0.004***	0.014***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
$SumTrades_{ijt}$	0.015***	0.015***	0.015***	0.017***	0.013***	0.013***	0.020***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.005)
R^2	0.018	0.018	0.018	0.022	0.527	0.527	0.868
N	1,696,852	1,707,074	1,701,963	1,701,963	1,701,963	1,701,963	535,027
$Company \times DateFE$	No	No	No	Yes	Yes	Yes	Yes
$TraderFE \times DateFE$	No	No	No	No	Yes	Yes	Yes

Table 4: **Do margin loan holders subscribe to the London Assurance Company?**

This Table reports marginal effects and corresponding standard errors (in parentheses) for a probit regression of a dummy taking the value of one if a trader subscribes to London Assurance Company $LAC_i(d)$ on a set of trader characteristics. $Loan_i^{BOE}(d)$ is a dummy taking the value of one if an investor holds a Bank of England margin loan in the week leading up to the subscription date of August 12, $Loan_i(d)$ is a dummy if the investor holds a margin loan in either the Bank of England or South Sea. 'Realized Returns 1715-1719' represents value-weighted trader-specific realized portfolio returns from 1715 to 1719, 'Average Holdings 1715-1719' value-weighted average of the logarithm of trader-specific stock holdings from 1715 to 1719, 'Number of Trades 1715-1719' refers to the logarithm of total number of trader-specific transactions per trader from 1715 to 1719, 'New Investor (d)' a dummy taking the value of one if an investor does not appear in our sample prior to January 1st, 1720, 'London (d)' a dummy variable for traders living in the greater London area (City of London, Holborn, Wapping, Moorfields, Westminster, Middlesex, Bethnal Green, Sepulchre, Covent Garden, Shadwell), 'Aristocrat (d)' a dummy for nobility (Lady, Dutchess, Marquess, Viscountess, Baroness, Princess, Countess, Prince, Graf, Marquis, Duke, Honorable, Earl, Baron, Count, Viscount, Lord), 'Broker (d)' a dummy for brokers, 'Male (d)' a dummy for male investors and N the number of observations. No foreigners subscribe for the London Assurance. Standard errors are clustered at the trader level.

	$LAC_i(d)$	$LAC_i(d)$	$LAC_i(d)$	$LAC_i(d)$
$Loan_i^{BOE}(d)$	0.063***	0.031***		
	(0.015)	(0.011)		
$Loan_i(d)$			0.078***	0.041***
			(0.012)	(0.009)
Realized Returns 1715-1719		0.024		0.023
		(0.029)		(0.028)
Holdings 1715-1719		-0.008***		-0.008***
		(0.002)		(0.001)
Number of Trades 1715-1719		0.019***		0.016***
		(0.003)		(0.002)
New Investor (d)		0.001		0.000
		(0.009)		(0.009)
London (d)		0.016***		0.016***
		(0.004)		(0.004)
Aristocrat (d)		-0.007		-0.008
		(0.013)		(0.011)
Broker (d)		0.050		0.050
		(0.032)		(0.032)
Male (d)		0.025***		0.023***
		(0.004)		(0.004)
N	5,110	4,806	5,110	4,806

Table 5: **Do margin loan holders subscribe to the South Sea subscriptions?**

This Table reports marginal effects and corresponding standard errors clustered at trader level (in parentheses) for a probit regression of a dummy taking the value of one if a trader subscribes to the third (fourth) subscription of the South Sea Company $SSC3_i(d)$ ($SSC4_i(d)$) on a set of trader characteristics. $Loan_i^{BOE}(d)$ is a dummy taking the value of one if an investor holds a Bank of England loan in the week leading up to the subscription dates of respectively June 17 (third) and August 24 (fourth), $Loan_i(d)$ is a dummy for an investor with a margin loan in either the Bank of England or South Sea. 'Realized Returns 1715-1719' represents value-weighted realized portfolio returns from 1715 to 1719, 'Average Holdings 1715-1719' value-weighted average of the logarithm of trader-specific stock holdings from 1715 to 1719, 'Number of Trades 1715-1719' refers to the logarithm of total number of trader-specific transactions from 1715 to 1719, 'New Investor (d)' a dummy taking the value of one if an investor does not appear in our sample prior to January 1st, 1720, 'London (d)' a dummy variable for traders living in the greater London area (City of London, Holborn, Wapping, Moorfields, Westminster, Middlesex, Bethnal Green, Sepulchre, Covent Garden, Shadwell), 'Foreign (d)' a dummy taking the value of one for investors residing outside Great Britain (including Ireland), 'Aristocrat (d)' a dummy for nobility (Lady, Dutchess, Marquess, Viscountess, Baroness, Princess, Countess, Prince, Graf, Marquis, Duke, Honorable, Earl, Baron, Count, Viscount, Lord), 'Broker (d)' a dummy for brokers, 'Male (d)' a dummy for male investors and N the number of observations.

	$SSC3_i(d)$	$SSC3_i(d)$	$SSC3_i(d)$	$SSC4_i(d)$	$SSC4_i(d)$	$SSC4_i(d)$
$Loan_i^{BOE}(d)$	0.157***	0.083***		0.140***	0.099***	
	(0.033)	(0.026)		(0.020)	(0.019)	
$Loan_i(d)$			0.214***			0.147***
			(0.026)			(0.016)
Realized Returns 1715-1719		0.201***	0.198***		-0.005	-0.009
		(0.072)	(0.072)		(0.090)	(0.055)
Holdings 1715-1719		0.001	0.002		-0.006**	-0.005*
		(0.004)	(0.004)		(0.003)	(0.003)
Number of Trades 1715-1719		0.053***	0.045***		0.039***	0.033***
		(0.006)	(0.006)		(0.004)	(0.004)
New Investor (d)		0.078***	0.075***		0.044*	0.033
		(0.029)	(0.029)		(0.022)	(0.021)
London (d)		0.058***	0.056***		0.015*	0.012
		(0.011)	(0.011)		(0.009)	(0.009)
Foreign(d)		-0.122***	-0.117***		-0.060***	-0.055***
		(0.015)	(0.016)		(0.012)	(0.012)
Aristocrat (d)		0.306***	0.287***		0.082***	0.065**
		(0.044)	(0.044)		(0.031)	(0.028)
Broker (d)		0.060	0.057		-0.012	-0.017
		(0.061)	(0.062)		(0.033)	(0.028)
Male (d)		0.069***	0.063***		0.036***	0.030***
		(0.012)	(0.012)		(0.009)	(0.009)
N	5,110	5,110	5,110	5,110	5,110	5,110

Table 6: **Do loan holders gain or lose during the South Sea Bubble?**

In this Table we regress individual realized returns for the year 1720 '$R_{1720,i}$' as defined in equation (1) on trader characteristics and report parameter estimates and corresponding standard errors (in parentheses). The number of observations is lower than in Tables 2, 4, 5 since 90 investors only make intra-day trades (i.e. buy and sell same amount within the same day). These investors are dropped since their performance is not properly defined in equation (1). $Loan_i^{BOE}(d)$ is a dummy variable taking the value of one if the trader takes a Bank of England margin loan, $Loan_i(d)$ is a dummy variable taking the value of one if a trader takes a Bank of England or South Sea Company margin loan, 'Realized Returns 1715-1719' are returns realized over the interval 1715-1719 (following equation (1)), 'Holdings 1715-1719' are value-weighted average of the logarithm of trader-specific holdings over the period 1715-1719, 'Number of Trades 1715-1719' is the logarithm of the total number of trader-specific transactions between 1715 and 1719, 'Broker (d)' a dummy for brokers, 'Foreign (d) a dummy for investors residing outside Great Britain, 'London (d)' a dummy variable for traders living in the greater London area (City of London, Holborn, Wapping, Moorfields, Westminster, Middlesex, Bethnal Green, Sepulchre, Covent Garden, Shadwell), 'Aristocrat (d)' a dummy for nobility (Lady, Dutchess, Marquess, Viscountess, Baroness, Princess, Countess, Prince, Graf, Marquis, Duke, Honorable, Earl, Baron, Count, Viscount, Lord), 'Male (d)' a dummy for male investors, 'R^2' the adjusted R^2 and N the number of observations. Standard errors are clustered at the trader level.

	$R_{1720,i}$	$R_{1720,i}$	$R_{1720,i}$	$R_{1720,i}$
Intercept	0.117***	0.157**	0.118***	0.160**
	(0.018)	(0.075)	(0.017)	(0.075)
$Loan_i^{BOE}(d)$	-0.229***	-0.139***		
	(0.038)	(0.041)		
$Loan_i(d)$			-0.161***	-0.077*
			(0.044)	(0.045)
Realized Returns 1715-1719		0.659*		0.648*
		(0.385)		(0.388)
Holdings 1715-1719		0.030**		0.029**
		(0.012)		(0.012)
Number of Trades 1715-1719		-0.063***		-0.064***
		(0.019)		(0.018)
New Investor (d)		-0.280***		-0.287***
		(0.091)		(0.090)
London (d)		-0.071**		-0.074**
		(0.031)		(0.031)
Foreign (d)		0.070		0.072
		(0.065)		(0.065)
Aristocrat (d)		0.191*		0.184*
		(0.104)		(0.105)
Broker (d)		-0.388		-0.392
		(0.306)		(0.306)
Male (d)		-0.047		-0.048
		(0.033)		(0.033)
R^2	0.005	0.035	0.003	0.034
N	5,020	5,020	5,020	5,020

Table 7: **Portfolio characteristics for loan holders**

In this Table we regress trader-specific forward-looking value weighted portfolio returns over various horizons (τ) on a Bank of England loan dummy ($Loan_{it}^{BOE}(d)$), taking the value of one if investor i holds a Bank loan at t and loan dummy ($Loan_{it}(d)$), taking the value of one if investor i holds a loan at t with either the Bank of England or the South Sea Company. Forward-looking returns are defined as the return that trader i would have earned over the next τ days based on her share holdings at t (with τ=14,20,30). We report parameter estimates and corresponding standard errors (in parentheses). 'R^2' is the adjusted R^2 and N the number of observations. Standard errors are double clustered at the trader and date level.

	R_{it+14}	R_{it+20}	R_{it+30}	R_{it+14}	R_{it+20}	R_{it+30}
Intercept	0.000	0.000	0.000	0.001*	0.000	0.000
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
$Loan_{it}^{BOE}(d)$	-0.003***	-0.003***	-0.003***			
	(0.001)	(0.001)	(0.001)			
$Loan_{it}(d)$				-0.003***	-0.003***	-0.002***
				(0.001)	(0.001)	(0.001)
R^2	0.009	0.010	0.010	0.015	0.016	0.012
N	577,543	577,543	577,543	577,543	577,543	577,543

Table 8: **Loan holder trading and stock prices**

This Table shows parameter estimates and corresponding standard errors (in parentheses) of a time series regression of stock j returns (R_{jt}) on loan holder buying pressure ($BuyPress_t^L$) as defined in equation (7). In columns two to five we define loan holders as traders who use the Bank of England loan facility. We control for buying pressure of non-loan holders ($BuyPress_t^N$), lagged returns, lagged buying pressure of both loan holders and non-loan holders. In column six we define loan holders as traders who take a margin loan with either the Bank of England or South Sea Company. We include company fixed effects in columns four, five and six.

	Bank Loan				*Bank/South Sea Loan*
	R_{jt}	R_{jt}	R_{jt}	R_{jt}	R_{jt}
$BuyPress_j^{Loan}t$	0.007*	0.007**	0.009**	0.008**	0.018
	(0.004)	(0.003)	(0.004)	(0.004)	(0.023)
$BuyPress_j^{NonLoan}t$	0.017	0.017	0.016	0.016	0.017
	(0.016)	(0.016)	(0.013)	(0.013)	(0.024)
$BuyPress_{jt-1}^{Loan}$		-0.001	0.000	0.000	0.045
		(0.005)	(0.004)	(0.004)	(0.044)
$BuyPress_{jt-1}^{NonLoan}$		-0.014	-0.016	-0.016	0.036
		(0.015)	(0.014)	(0.014)	(0.050)
R_{jt-1}				0.002	-0.011
				(0.014)	(0.028)
N	336	333	333	331	331
$CompanyFE$	No	No	Yes	Yes	Yes

Table 9: **Extrapolation, Margin Loans and Investors' Characteristics**

This Table reports parameter estimates and corresponding standard errors (in parentheses) of a linear probability regression. The dependent variable $Buy_{ijt}(d)$ ($Sell_{ijt}(d)$) takes the value of one if investor i buys (sells) share j in day t, and 0 otherwise. Realized returns are computed over the past six trading days (R_{jt-6}) using opening prices. '$Loan_{it}^{BOE}(d)$' takes the value of one if investor i has a share loan outstanding with the Bank of England at t. 'Foreign(d)' is a dummy variable that takes the value of 1 if the investor is foreigner (i.e. not from the UK or Ireland) and 0 otherwise. 'London(d)' is a dummy variable for traders living in the greater London area (City of London, Holborn, Wapping, Moorfields, Westminster, Middlesex, Bethnal Green, Sepulchre, Covent Garden, Shadwell). 'New Investor(d)' is a dummy taking the value of one if an investor does not appear in our sample prior to January 1st, 1720. In the even columns we impose two additional filters to the data. First, the investor needs to have positive holdings at the beginning of the trading day, as investors with no holdings cannot sell. Second, if the investor holds a Bank of England loan, she needs to own more shares in respect to those collateralized with the Bank. We also report adjusted R^2s (R^2) and the number of observations (N). We control for trader times date fixed effects ($Trader \times DateFE$) and company times date fixed effects ($Company \times DateFE$). Standard errors are double clustered at the trader and date level.

	$Buy_{ijt}(d)$	$Sell_{ijt}(d)$	$Buy_{ijt}(d)$	$Sell_{ijt}(d)$	$Buy_{ijt}(d)$	$Sell_{ijt}(d)$
$Loan_{it}^{BOE}(d) \times R_{jt-6}$	0.043*	-0.224**	0.042*	-0.224**	0.043*	-0.208*
	(0.024)	(0.095)	(0.024)	(0.094)	(0.024)	(0.087)
$Foreign(d) \times R_{jt-6}$	0.006	0.013				
	(0.005)	(0.015)				
$London(d) \times R_{jt-6}$			0.004	-0.007		
			(0.005)	(0.010)		
$NewInvestor(d) \times R_{jt-6}$					-0.010*	-0.194*
					(0.006)	(0.117)
R^2	0.527	0.868	0.527	0.868	0.527	0.868
N	1,701,963	535,027	1,701,963	535,027	1,701,963	535,027
$Trader \times DateFE$	Yes	Yes	Yes	Yes	Yes	Yes
$Company \times DateFE$	Yes	Yes	Yes	Yes	Yes	Yes

Table 10: **Optimal Leverage and Share Purchases**

This Table reports parameter estimates and corresponding standard errors (in parentheses) of a linear probability regression. The first column we consider whether investor i buys Bank of England stock at date t ($BOE\ Buy_{it}(d)$) as a function of the past returns of East Indian and Royal African Company shares. In the second (third) column the dependent variable equals one if investor i buys East India Company (Royal African Company) stock at date t. '$Loan_{it}^{BOE}(d)$' takes the value of one if investor i has a share loan outstanding with the Bank of England at t. '$Portfolio\ Return_{it-6}$' are investor i's portfolio returns in the past 6 trading days of East India Company and Royal African Company (column 1), Bank of England and Royal African Company (column 2), Bank of England and East India Company (column 3). We also report adjusted R^2s (R^2) and the number of observations (N). We control for trader fixed effects ($TraderFE$) and date fixed effects ($DateFE$). Standard errors are double clustered at the trader and date level.

	$BOE\ Buy_{it}(d)$	$EIC\ Buy_{it}(d)$	$RAC\ Buy_{it}(d)$
$Loan_{it}^{BOE}(d)$	-0.008***	0.001	-0.011
	(0.002)	(0.001)	(0.001)
$Portfolio\ Return_{t-6}$	-0.004	-0.016	0.005
	(0.005)	(0.013)	(0.008)
$Loan_{it}^{BOE}(d) \times Portfolio\ Return_{t-6}$	-0.016	0.005	0.014
	(0.024)	(0.048)	(0.022)
R^2	0.045	0.077	0.050
N	608,090	470,120	465,010
$TraderFE$	Yes	Yes	Yes
$DateFE$	Yes	Yes	Yes

Table 11: **Robustness Extrapolation Results**

This Table reports parameter estimates and corresponding standard errors (in parentheses) for a linear probability regression of buy (sell) dummies on a loan dummy ($Loan_{it}^{BOE}(d)$), realized returns over the past six trading days (R_{jt-6}) using opening prices and the interaction of a loan dummy and realized returns. $Buy_{ijt}(d)$ ($Sell_{ijt}(d)$) takes the value of one if investor i buys (sells) share j in the six days following day t. $Loan_{it}^{BOE}(d)$ takes the value of one if investor i has a share loan outstanding with the Bank of England at t and $Loan_{it}(d)$ takes the value of one if trader i has a share loan outstanding with the South Sea Company or the Bank of England at t. We also report the number of observations (N). We control for date fixed effects ($DateFE$), company fixed effects ($CompanyFE$), trader times date fixed effects ($Trader \times DateFE$), company times date fixed effects ($Company \times DateFE$). Standard errors are double clustered at the trader and date level.

Panel A: excludes all brokers				
$Loan_{it}^{BOE}(d) \times R_{jt-6}$	0.066***	0.059***	0.055**	
	(0.022)	(0.020)	(0.024)	
$Loan_{it}(d) \times R_{jt-6}$				0.073***
				(0.022)
N	1,687,311	1,687,311	1,687,311	1,687,311
Panel B: excludes most active traders (top percentile)				
$Loan_{it}^{BOE}(d) \times R_{jt-6}$	0.061***	0.052**	0.032	
	(0.023)	(0.021)	(0.022)	
$Loan_{it}(d) \times R_{jt-6}$				0.060***
				(0.019)
N	1,680,313	1,680,313	1,680,313	1,680,313
Panel C: excludes all trades in the week after the transferbook was closed				
$Loan_{it}^{BOE}(d) \times R_{jt-6}$	0.057***	0.053***	0.043*	
	(0.021)	(0.020)	(0.024)	
$Loan_{it}(d) \times R_{jt-6}$				0.072***
				(0.022)
N	1,630,409	1,630,409	1,630,409	1,630,409
$DateFE$	No	Yes	No	No
$CompanyFE$	No	Yes	No	No
$TraderFE \times DateFE$	No	No	Yes	Yes
$Company \times DateFE$	No	No	Yes	Yes