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Abstract

Speculation has long been thought to have significant economic effects, but it is difficult to measure, making it challenging to examine these effects empirically. In this paper we measure speculation in the UK since 1785 by using business and financial reporting in *The Times* newspaper. Our monthly speculation index reveals four distinct epochs of speculation in the UK. Epochs of high speculation coincide with higher stock market returns and higher economic growth, while low speculation periods coincide with high levels of government debt and financial repression. We find that low interest rates foment the development of higher speculation, and that eras of higher speculation are often followed by greater banking instability.

Keywords: speculation, commodity markets, stock market, financial repression, monetary conditions, banking stability.

JEL Classification: E44, E50, G10, N13, N14, N23, N24, Q02

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I. Introduction

Speculation is the buying and selling of an asset, such as a commodity, financial security, or property, with the sole purpose of achieving a profit through capital gains.¹ In principle, this can either be stabilising, pushing prices closer to their fundamental value, or destabilising, pushing prices and fundamentals apart.² In common discourse, however, the term is primarily used to refer to destabilising speculation.³ Destabilising speculation is thought to cause procyclical asset price movements, which can in turn lead to lower consumption, investment, and output during an economic downturn.⁴ When speculative price movements are fuelled by debt, they can result in financial crises and major recessions when the bubble bursts.⁵

Speculation, however, has proved difficult to quantify and measure for the overall economy over the long run. Existing measures of speculation, such as net long positions, Working's T, and excess speculative volume, are typically designed to measure speculation within a particular well-defined market.⁶ Although speculation is thought to have macroeconomic effects, it has thus far only been measured in microeconomic contexts. In this paper, we attempt to overcome this problem by creating a monthly measure of speculation for the UK economy using newspaper reporting. Our measure of speculation is based on the business section of *The Times* from 1785 until 2019; our database consists of 640,038,132 words published in 1,205,556 articles. We use the number of times speculation or speculation-type words were used in these articles to quantify the level of speculation every month.

Our speculation index reveals that speculation in the UK has undergone four distinct epochs: before c.1825, c.1825-c.1890, c.1890 to c.1967, and c.1967 onwards. Speculation was

¹ Kaldor, 'Speculation'; Baumol, 'Speculation'.

² Crump, *The Theory*, pp.130-1; Irwin, 'The nature'.

³ See, for example, the literature review in Simsek, 'The macroeconomics'.

⁴ Simsek, 'The macroeconomics'.

⁵ Fisher, 'The stock market panic'; Kindleberger, *Manias, Panics, and Crashes*; Minsky, *Stabilizing*; Quinn and Turner, *Boom and Bust*, pp. 7-11; Quinn and Turner, 'Bubbles in history'.

⁶ Etienne et al., 'Speculation'.

low and stable in the first and third epochs, it was high in the second epoch, and between 1967 and 2007 it was on a steady upwards trajectory. We find that the marketability of financial assets and commodities, the availability of finance for speculation, social opprobrium towards speculation, and financial repression all correlate with our four epochs. In particular, there appears to be a close connection between the levels of government debt and speculation: when government debt levels are high, speculation is low. We surmise that the government's need to finance its debt results in financial repression policies which dampen speculative activity.

It has commonly been suggested that speculative investment is associated with periods of low interest rates, as investors respond to a low return on safe assets by "reaching for yield".⁷ We therefore examine the relationship between speculation and monetary conditions using a distributed lag model that assesses the cumulative long-term impact of a change in the discount rate on our speculation index. We find that while a fall (rise) in the discount rate leads to higher (lower) speculation, the effect is not instantaneous: the cumulative effect of a change in the discount rate on the speculation index becomes statistically significant only after 33 months. This suggests that prolonged periods of low (high) interest rates lead to the gradual development of more (less) speculative investment cultures. In terms of economic outcomes, we explore the relationship between speculation and banking instability. Using a variety of banking instability measures, we find that banking crises become significantly more likely after several years of high speculation, which concurs with preexisting views of the effects of speculation on financial stability.⁸

This paper contributes to the growing trend in economics and economic history which uses text as data.⁹ More particularly, it connects to the literature which has used the news media to quantify sentiment in the UK stock market over the long run, and to the literature which has

⁷ Jordá et al, 'Leveraged bubbles'; Quinn and Turner, *Boom and Bust*.

⁸ Kindleberger, *Manias, panics and crashes*; Quinn and Turner, *Boom and bust*.

⁹ Gentzkow et al, 'Text as data'; Toms, 'Economic freedom'; Toms, 'Financial scandals'.

used the news media to construct measures of historical economic policy uncertainty in the UK.¹⁰

It also contributes to the literature on speculation and its role in economic activity.¹¹ Following John Maynard Keynes, scholars have emphasised the role of animal spirits in producing speculation and fluctuations in markets.¹² This paper takes a different approach in that we explore the macroeconomic environment that is conducive to speculation. Our findings are consistent with previous literature showing that individual investors have a greater appetite for risk when interest rates are low.¹³ We document this effect on a long-run macroeconomic level, showing that the country-level investor response to interest rate changes is gradual rather than instantaneous.

The rest of the paper is structured as follows. Section II outlines our data sources and the construction of our speculation index. Section III presents our index and explains the broad movements in it over 235 years. Section IV examines the economic environment in which speculation is fostered as well as the consequences of speculation on the stock market and monetary conditions. Section V explores the relationship between the discount rate and speculation. Section VI analyses whether periods of high speculation are followed by banking instability. Section VII summarises our principal findings and highlights the ways in which other scholars might use our index or create speculation indexes for other countries.

II. Creating a Speculation Index

To assess the amount of speculation in the wider economy, we use newspaper reporting to generate a measure of speculation. As we will show in later analysis, this reporting reflects

¹⁰ Hanna et al, 'News media'; Lennard, 'Uncertainty'.

¹¹ Crump, *The Theory*; Kaldor, 'Speculation'; Baumol, 'Speculation'.

¹² Keynes, *The General Theory*; Shiller, *Irrational Exuberance*; Akerlof and Shiller, *Animal Spirits*.

¹³ Lian et al., 'Low Interest Rates'.

(imperfectly) the perceptions of market participants regarding the degree of speculation undertaken in markets.

We use *The Times* newspaper to build our measure of speculation; we do so for four reasons. First, *The Times* is by some distance the oldest of the UK's quality daily newspapers, commencing publication in 1785. It has been published without interruption since then, except for the 11-month strike in 1979. This means that we have a consistent source to generate our speculation measure over 235 years. Second, throughout this period, *The Times* was the leading UK daily newspaper both in terms of circulation and influence.¹⁴ As the nation's chief newspaper, it would have given readers a gauge of the level of speculation occurring in the economy. Third, *The Times*' coverage of business and markets has been described as staid and dull because it simply reported the facts as observed by its reporters.¹⁵ This meant that it was not prone to overhyping things, nor was it a vehicle for puffing up stock and commodity markets through its coverage. Indeed, if anything, after it called out the excessive speculation during the Railway Mania in 1845, its credibility as an impartial reporter on business and financial affairs increased.¹⁶ Competition in the UK newspaper market, reader heterogeneity, and independent sources of *ex post* verification have contributed to this outcome.¹⁷ Finally, the digital version created by Gale Digital Scholar has helpfully curated and classified articles that belong in the newspaper's business section. This means that we have a cleanly identified set of articles covering business, economic, and financial news.

In total, over the 235 years, there are 1,205,556 articles in the business section of *The Times*, with 640,038,132 words. Data is collected from these articles, including details such as headlines, linguistic characteristics, and word counts. We searched each article for speculation-

¹⁴ Brown, *Victorian News*; Parliamentary Papers. *Return of the Number of Newspaper Stamps*; Simmons, *The Victorian Railway*, p.240.

¹⁵ Kynaston, *The Financial Times*, p.3.

¹⁶ Campbell et al, 'The role of the media'; Turner et al., 'Media coverage'.

¹⁷ Gentzkow and Shapiro, 'Media bias'; Mullainathan and Shleifer, 'The market for news'.

type words. The first words we searched for were those with the root “speculat*”. To this search, we added the words “bubble” and “mania” because they can be used to describe extreme forms of speculation. Because gamble can be used as a synonym of speculate, we added the word “gambl*” to our search. Finally, to capture the potential use of the word overtrading, an archaic synonym for speculation, we added “overtrad*” to the search.

To generate our speculation index, articles are firstly scored on their content. If an article contains no words associated with speculation, it is given a score of zero. The content score increases by one if an article contains any of our five key speculation and speculation-adjacent words. The content score, κ_a , for each article is:

$$\kappa_a = \sum_{i=1}^5 f_i$$

where f_i increases by one for every key word the article contains. The maximum content score for an article is therefore five.

To obtain the speculation index for a given month, article content scores, κ_a , are summed. To adjust for changes in the size of *The Times* and its business section over time, this number is divided by the total number of words published in the business section for each month. Rather than reporting the index with strings of leading zeroes or exponential notation, we multiply its value by 10,000. We use word counts instead of article counts because the length of articles varies considerably over the period.

One concern with this approach is that the word speculate could be used by journalists when they are not writing about speculation. For example, a journalist could write: “There was speculation today about the impending retirement of ICI’s Chairman being brought forward”. This is clearly not referring to speculation in the economic sense. To address this issue, we manually examined the headline for each article that referenced speculation or speculation-adjacent words to ensure that the article was referring to economic speculation. This has the

added advantage of giving some insight into the objects of speculation and how these changed through time.

To further ensure that articles referencing speculation were actually talking about speculation, we extracted 50 words either side of the appropriate word and examined the content using word clouds for a small number of years. The word clouds for 1800, 1850, 1890, 1900, 1929, 1950, 1986, and 2000 are included as examples in Figure 1. Our examination of headlines and word clouds reveals that nearly all references to speculation and speculation-adjacent words are referring to economic speculation.

<<INSERT FIGURE 1>>

Over the sample period, from the 1,205,556 articles in the business section, 68,725 reference *speculation*, 9,479 *gamble*, 3,226 *bubble*, 1,670 *mania*, and 478 *overtrading*. In total, therefore, 80,438 or 6.7 per cent of business section articles reference *speculation* and speculation-adjacent words and 5.7 per cent of articles directly reference *speculation*.

Figure 2 reveals the use of speculation and speculation-adjacent words at an annual level. There are several things worthy of note at this stage. First, most of the time variation is in the word speculation rather than in the speculation-adjacent words. The general trends shown in the index would therefore not be significantly altered by the exclusion of any of the other terms. Second, one can see that overtrading is an archaic word which was only used in the second quarter of the nineteenth century. Third, the word bubble, whilst used during the railway mania of the 1840s, has become much more commonly used since the 1990s, which is in accordance with the view that they have become more common.¹⁸ Fourth, the word mania was only extensively used during the railway, bicycle and brewing manias in the nineteenth century.¹⁹ Fifth, gamble has been used throughout the period as a synonym for speculate, but

¹⁸ Quinn and Turner, *Boom and Bust*.

¹⁹ Acheson et al, 'Happy hour'; Campbell, 'Myopic rationality'; Quinn, 'Technological revolutions'.

it has been increasingly used since the 1960s. Keynes in his *General Theory* referred to some forms of speculation as being like a casino, and his idea that gambling was a synonym for some types of speculation had become more widely accepted by the 1960s.²⁰

<<INSERT FIGURE 2>>

An additional concern is whether changes in the language of *The Times* drive variation in speculative language and, in turn, our speculation index. Figure A.1 (in the Appendix) categorises all words in the business section by year. Although the newspaper's language has evolved, there is no systematic pattern that would bias our results. Consistency is also evident in the 10-year rolling Jaccard test in Figure A.2 (see Appendix), which measures the percentage of vocabulary shared between periods. Similarity is high on average (mean ≈ 0.84) and never falls below 0.60, confirming that language use in *The Times* is broadly stable across 1785–2019.

III. The Speculation Index

Figure 3 contains a plot of our speculation index at a monthly frequency. One thing which is readily apparent is that there are four distinct epochs of speculation. The first epoch is the era of low speculation before c.1825. Then there is the epoch of very high speculation between c.1825 and c.1890, followed by the third epoch of very low and stable amounts of speculation from c.1891 until c.1967. The final epoch from c.1967 to 2019 is one of steadily rising and then falling speculation. The chief question which will be addressed in this section is whether these four epochs and the peaks within each are consistent with what we know about the wider economic, financial, legal, and institutional history of the UK.

<<INSERT FIGURE 3>>

²⁰ Keynes, *The General Theory*, pp.158-9; Borna and Lowry, 'Gambling and speculation'.

The amount of speculation will ultimately be determined by a variety of factors. First, the marketability of financial assets and commodities – the ease with which they can be bought and sold – will affect the degree of speculation. Second, the availability of finance to fund the buying and selling of assets and commodities will affect the degree of speculation. Third, social opprobrium towards speculation may be strong enough to limit its extent. Fourth, governments affect the degree of speculation either through regulation or forms of financial repression.

There are at least four reasons as to why speculation was low in the first epoch. First, there were a limited number of organised venues for speculating in commodities and financial assets. The market for financial assets such as shares and government debt was largely informal until the creation of the London Stock Exchange in 1801, and even then, its chief focus was the trading of various types of government debt securities.²¹ As a result, speculation in this market was sporadic.²² Commodity exchanges in the UK, such as those in the Royal Exchange building or the market in Liverpool, were also informal in nature and had yet to fully develop standardisation, contract enforcement mechanisms, settlement arrangements, and the ability to use forward contracts.²³

Marketability was also affected by the limited supply of company shares traded on the stock market. The Bubble Act of 1720 meant that companies with freely transferable shares were illegal unless authorised by Parliament or the Crown. Although there were clever legal workarounds to create what were known as unincorporated companies, the shares of these companies were not freely transferable and therefore not typically traded on the London market.²⁴ The Corn Laws and the Assize of Bread, which regulated the price and quality of bread until 1836, tightly controlled the price of all types of corn, leaving little room to speculate in this important commodity.

²¹ A stock exchange was opened in Dublin in 1799 (Thomas, 'The evolution', p.536).

²² Michie, *London stock exchange*, p.26.

²³ On this, see Aldous and Coyle, 'Examining the role'.

²⁴ See Harris, *Industrializing*; Freeman et al, *Shareholder democracies*; and Turner, 'Three centuries'.

There was also widespread societal opposition to speculation during this era. Following the 1720 South Sea Bubble, there was a renewed moral hostility to speculation equating it to gambling which was illegal.²⁵ A century year later, this view was still prevalent, with *The Times* in 1824 referring to speculation as a form of “gambling” and speculators as “gamesters”.²⁶ The rationale for the passing of the Bubble Act in 1720 was to make sure that funds were not being diverted away from the South Sea Company’s scheme to refinance the government’s debt.²⁷ In other words, the government restricted speculation to ensure that its own debt would be financed. This final reason as to why speculation was low in this era is illustrated by Figure 4, which plots our speculation index against the government debt/GDP ratio. The national debt levels were high at the start of this epoch because of the various conflicts Britain had fought just prior to it. Then, during the epoch, the increase in government debt arose from the need to finance the French Revolutionary and Napoleonic Wars. Finance for speculation was also restricted in this era because banking was underdeveloped due to the presence of a six-partner restriction and the Bank of England’s semi-monopoly of note issuing.

<<INSERT FIGURE 4>>

As can be seen from Figure 3, there are several spikes in speculation during this first epoch. Three of them occurred during the French Revolution and one occurred in October 1798 when, as a final desperate act in the 1798 rebellion, the French navy was defeated in its attempt to land a major consignment of troops in the northwest of Ireland. Only one – in 1808 – occurred during a period identified in the historiography as a speculative boom. In 1807-8 there was a small promotion boom, with Thomas Tooke recording 42 companies being established.²⁸ Because these enterprises did not have Parliamentary authorisation to act as a company, their shares were theoretically not freely transferable and trading in their shares was therefore illegal.

²⁵ Hoppit, ‘Myth’.

²⁶ *The Times*, 15 April 1824.

²⁷ Quinn and Turner, *Boom and Bust*.

²⁸ Tooke, *A History of Prices*, pp.278-80.

As a result, the Attorney-General invoked the Bubble Act for only the second time in its history against these enterprises.²⁹

The only episode in the historiography that does not register in our speculation index is what has become known as the canal mania. Between 1790 and 1794, 51 canal companies with tradeable shares were authorised by Parliament. But the ‘mania’ label appears to have referred to the promotion of canal companies rather than speculation in canal shares, which had an extremely thin market.³⁰

The second epoch (c.1825 – c.1890) of the four we identify is the one marked by the highest speculation. There are several reasons why this was the case. First, there was a substantial increase in organised venues for speculating in financial assets and commodities. Stock exchanges, for example, were opened in Liverpool and Manchester in 1836 and Glasgow, Aberdeen, Edinburgh and 12 English cities in 1844-45.³¹ By 1890, there were over 25 stock exchanges in the UK.³² The development of the telegraph, cables and telephones connected these exchanges to one another and to London as well as to outside stockbrokers.³³ As a result of all these developments, the stock market became much more liquid and therefore could facilitate much more speculation.³⁴

The marketability of the stock market was given a major shot in the arm with the liberalisation of company law in the UK. This liberalisation started with the repeal of the Bubble Act in 1825 and ended with the 1862 Companies Act. As a result of this deregulation, limited liability joint-stock companies could be freely established simply through a process of

²⁹ Day, *A Defence of Joint Stock Companies*.

³⁰ Ward, *The Finance of Canal Building*, p.164; Quinn and Turner, *Boom and Bust*, pp.39-40.

³¹ Killick and Thomas, ‘The provincial’; Thomas, *The provincial*, pp. 28-69; Michie, *London stock exchange*, p.117.

³² Rogers et al., ‘From complementary to competitive’.

³³ Michie, ‘The London’.

³⁴ Campbell et al., ‘The liquidity’.

registration. Subsequently, there were several booms in company promotion, with thousands of companies being listed on UK stock markets.³⁵

There were also major leaps forward in commodity trading. The Liverpool Cotton Brokers' Association was founded in 1841. It quickly developed the use of forward contracts, and, in the mid-1860s, it began to develop its futures market.³⁶ Cotton therefore became a commodity which attracted the attention of speculators. Other organised commodity exchanges opened subsequently, such as the Liverpool Corn Trade Association in 1853, the London Metal Market and Exchange Company in 1877, and the London Corn Trade Association in 1878.³⁷ The marketability of all corn was given a major boost by the repeal of the Corn Laws in 1846.

Alongside the increased number of companies on the market, there was an increase in the wealth of the middle class during this epoch. The middle classes thus became an important group of investors and, as a result, attitudes towards speculation became much less censorious. Investor guides appeared with the word 'speculation' in their title, and moralising about speculation was increasingly confined to isolated bubble episodes.³⁸ Nevertheless, short selling or speculating for the fall roused social opprobrium, with short selling being labelled sinful activity and short sellers getting no sympathy from law courts or the press whenever they lost money.³⁹

Victory for Britain in the Napoleonic Wars ushered in the Pax Britannica, leading to lower demand for government finance to fight wars. As a result, the national debt fell steadily over the period (see Figure 4). This period of relative peace meant that financial markets and institutions did not need to be repressed by the government, creating room for greater speculation. The major financial crises in this epoch were marked by excessive speculation,

³⁵ Shannon, 'The limited companies'; Campbell et al., 'Before the cult of equity'.

³⁶ Aldous and Coyle, 'Examining the role'.

³⁷ Forrester, 'Commodity exchanges'.

³⁸ Quinn and Turner, *Boom and Bust*, p.69.

³⁹ Quinn and Turner, *Boom and Bust*, pp.70-71, 110.

which was financed by banks and pseudo-banking institutions, which were deregulated from 1826 onwards.⁴⁰

Figure 3 reveals the major peaks during the second epoch. The ones in 1836 and 1845 are associated with the first and second British railway manias, when there were promotion booms of railway companies and major price reversals of railway shares.⁴¹ The higher peak in our speculation index for the first railway mania comes from the fact that there was a large joint-stock bank promotion boom happening concurrently. The high speculation in 1830 and 1831 coincides with the largest wave of social unrest in England over the past three centuries. This unrest was associated with the reform of the electoral franchise, creating a highly febrile country where to take any position on financial or commodity markets was to be a speculator. Notably, there are no major episodes in the historiography that do not register in our speculation index.

The third epoch (c.1891 until c.1967) is like the first in that speculation is very low, but unlike the first, there are no large spikes in speculation. Why is speculation so low for such a long period of time?

From 1891 until 1913 the low level of our speculation index is a puzzle. One possible explanation is that there was a different attitude to speculation following the Barings crisis and the losses incurred by British investors on speculative ventures in Australia, Argentina and South Africa. This retrenchment was accompanied by a major conservative turn in the lending practices of British banks which started in the 1880s and persisted into the 1890s and 1900s.⁴² British banks became much more liquid, became much more risk averse, and increased their holdings of debt. In addition, the types of securities being issued in large quantities on the stock market in the 1890s and 1900s were those which were not necessarily attractive to speculators

⁴⁰ Hotson, *Respectable Banking*, p.163.

⁴¹ Quinn and Turner, *Boom and Bust*, pp.58-76.

⁴² Capie and Collins, 'Industrial lending', 'Banks'; Collins, ' '; Collins and Baker, *Commercial Banks*.

– low-risk fixed-income securities issued by large companies, foreign governments, and local authorities.⁴³ In other words, after several decades of high speculation, British finance turned inwards and became more conservative. There is also a debate as to whether Britain experienced a climacteric, i.e., a marked slowdown in trend economic growth, in this epoch. A fall in speculation could well be explained by a slowdown in economic growth, but the evidence for a climacteric in this epoch is disputed.⁴⁴ Furthermore, inspired by populist and agrarian movements, there was increased hostility and legislative moves against speculation in commodity markets in the United States, Germany and Austria in the 1890s and 1900s.⁴⁵ These global movements likely pushed down the amount of speculation on the UK's commodity markets.

The only episodes not showing up in the index in this 1891-1913 period in the form of spikes are the bubbles in bicycle and brewing company shares in the mid-1890s.⁴⁶ One explanation as to why our index does not spike during these speculative booms is that they were confined to two minor industries on the stock market and did not spread to the rest of the market or affect the commodity market.

As can be seen from Figure 4, from 1914 until c.1967, the government debt/GDP ratio was very high. Unsurprisingly, the government's need to finance the huge debt to fight the two world wars meant that speculation was crowded out. Banks were under pressure from the Bank of England and government to help finance the government debt, with the result that large sums of their deposits were invested in government bonds.⁴⁷ This meant that they had reduced funds to lend to all borrowers and especially speculators. This financial repression became even more explicit after 1939 when Bank of England directives constrained and even forbade banks from

⁴³ Campbell et al., 'Before the Cult of Equity'; Coyle and Turner, 'Law'; Webster, 'Making'.

⁴⁴ On the climacteric debate, see Greasley, 'British economic growth' and Crafts et al., 'The climacteric'.

⁴⁵ Cowing, *Populists*, Cowing, 'The discussion'; Banner, *Speculation*, pp.105-37; Wurm, 'Strangling speculation'.

⁴⁶ Quinn, 'Squeezing the bears', 'Technological revolutions'; Acheson, 'Happy hour'.

⁴⁷ Turner, *Banking in Crisis*, p.180.

lending to any borrower who was speculating in shares, real estate and commodities.⁴⁸ Financial repression from 1939 also included capital and currency controls which restricted the flow of sterling and capital out of the UK. This greatly impeded the funds available for speculation. These capital controls lasted until 1979. Furthermore, 1939 also saw the introduction of the Capital Issues Committee, which was set up by the Treasury to approve the issuance of any securities or borrowing by a firm for a fixed-capital purpose.⁴⁹ This committee greatly restricted the flow of finance into anything speculative.

The final epoch is from c.1967 until 2019. Our speculation index rises steadily from the beginning of this epoch until it peaks in 2007, after which it begins a downward descent. The upward ascent of speculation is largely due to the deregulation and liberalisation of financial markets and institutions which started in the late 1960s with the dissolution of the Capital Issues Committee in 1967, the entrance of foreign banks into the UK, and the easing of financial repression in the early 1970s. The trigger for this deregulation was the fact that, as can be seen from Figure 4, the government debt/GDP ratio had fallen to a politically acceptable level of 100 per cent by 1967.⁵⁰

Capital controls were removed in 1979, and the deregulation of banking continued apace in the 1970s and 1980s. In 1986, building societies were deregulated, allowing them to become banks. Banks were granted significantly more freedom to lend to speculators in shares, commodities and real estate. After the Big Bang of 1986, which permitted banks to buy the City's stockbroking firms and merchant banks, they could even speculate on their own account. The Big Bang also increased marketability and liquidity of shares by introducing electronic trading. The stock market got another fillip with the privatisation of state-owned enterprises. Privatisations resulted in the proportion of UK citizens owning shares rising from 1 in 14

⁴⁸ Turner, *Banking in Crisis*, p.184.

⁴⁹ Plous, 'Control'.

⁵⁰ Turner, *Banking in Crisis*, p.184.

people to 1 in 4 people.⁵¹ The effects of deregulation were augmented by technological change that allowed trades to be executed much more quickly and frequently than at any previous point. In sum, it became much easier for speculators to trade shares and to access the finance needed to fund their speculation. Meanwhile, the number of potential speculators increased dramatically.

The Financial Services Act of 1986 deregulated other financial services and markets. In particular, it made speculative derivative contracts exempt from the Gaming Act of 1845, removing court oversight of the derivative market. Simultaneously, the Financial Services Act enabled banks and financial institutions to gain membership of commodity exchanges such as the London Metal Exchange. This change in membership resulted in the financialization of commodity markets and, as a result, greatly increased the amount of speculation on these markets.⁵² The creation of the London International Financial Futures and Options Exchange in 1982, which became the largest futures market in Europe by 1996, facilitated increased speculation in currencies, financial assets and commodities.

The culmination of this march upwards of speculation was the Global Financial Crisis which began in 2007. Interestingly, our speculation index peaks in early 2007, which is when the first signs appeared suggesting that not all was well in the financial system. Since then, the speculation index has trended downwards towards levels not seen since the 1960s. This could have happened for a variety of reasons. First, the size of the financial crisis and the subsequent malaise has dampened speculation. Second, regulation introduced after the financial crisis has restricted the freedom of banks to engage in or finance speculation. Third, the rescue of the banking system required a large increase in government debt (see Figure 4) and quantitative

⁵¹ Moore, 'British privatization'.

⁵² Seddon, 'Merchants'.

easing by the Bank of England. This new form of financial repression has dampened speculation.

During the fourth epoch, there are three spikes in speculation which correspond to the runup and collapse of the stock market in 1987, the dotcom boom of 1999–2000, and the global housing boom of 2005–07. However, in comparison with earlier epochs, the upward trend of speculation somewhat masks these spikes. Our index is designed to capture the breadth of coverage by capping each article at one point per speculative word, so that two separate articles are treated as more indicative of a speculative environment than one long, repetitive article. As shown in Figure A.3 (see Appendix), when this cap is removed and all mentions of speculative words are counted, the late twentieth-century peaks appear more pronounced.

<<INSERT FIGURE 5>>

To better understand what speculation referred to, our index is disaggregated into references to specific assets and commodities. Each year mentions of stocks, bonds, and real estate, cotton, gold, oil, and wheat are measured in the articles that contribute to the speculation index. Figure 5 shows that stocks and bonds dominate across the period, while real estate appears more prominent in the early nineteenth century (1785–1820s) and again in the late twentieth and early twenty-first centuries. Figure 6 highlights commodity-related speculation: cotton is prominent in the early nineteenth century, consistent with its central role in industrialisation and imperial trade; gold exhibits episodic surges—in 1819 with the resumption of the redemption of Bank of England notes for gold, in 1933–34 amid interwar monetary turmoil, and in 1968 with the collapse of the London Gold Pool; wheat features in episodes of food price volatility; and oil, absent from earlier decades, becomes a major speculative focus only in the late twentieth century.

<<INSERT FIGURE 6>>

To strengthen our argument, we also construct a parallel speculation index for the *Financial Times* (Figure 7). This measure is necessarily less precise, as it is based on the newspaper’s commentary section, which is not confined to business or financial topics. Nonetheless, the results reinforce the representativeness of *The Times*: both indices show a decline in speculation from the inaugural issue of the *Financial Times* in 1888 through the mid-twentieth century, followed by a steady rise leading up to the Global Financial Crisis of 2008 and a decline thereafter. The broader scope of the commentary section does, however, produce additional spikes—most notably during World War I and World War II—when “speculation” is often used in political or wartime contexts.

<<INSERT FIGURE 7>>

IV. Speculation and the Economic Environment

Under what macroeconomic circumstances does speculation occur? In this section we explore the relationship between our index and four macroeconomic factors that have been linked to speculation in existing literature: prior economic growth, the level of government debt, prior stock market returns, and monetary conditions.

Economic growth may make investors more likely to speculate because it makes investor sentiment more optimistic, or it simply increases levels of disposable income. As discussed above, increased levels of government debt have been associated with lower levels of speculation because of financial repression (although this relationship is likely to be non-linear). Prior stock market returns have been hypothesised to increase speculation because high returns may attract new speculative investors or convince existing investors to pursue momentum-based strategies. The increased use of momentum-based strategies is thought to be a driver of speculative bubbles.⁵³ Monetary conditions can stimulate speculation for two

⁵³ Abreu and Brunnermeier, ‘Bubbles’; Quinn and Turner, *Boom and Bust*, pp.7-9.

reasons. First, a reduction in central bank discount rates can stimulate lending. As a result, speculators may have more access to leverage, allowing them to take larger speculative positions. Second, low interest rates imply a low return on safe assets, which can encourage reaching for yield in more speculative assets.⁵⁴

To examine these relationships, we combine our speculation index with data on economic and financial conditions from the Bank of England's *Millennium of Macroeconomic Data for the UK*. While money market and stock market data are available monthly, much of the economic data is only available at an annual frequency for most of the period under consideration. This includes gross domestic product (GDP) and public debt ratios. Specifically, we use the real headline UK GDP at market prices, which is a geographically consistent estimate based on post-1922 borders, from which we derived GDP growth rates over the preceding one-, five-, and ten-years. We use the calendar year-end nominal par value outstanding of UK public sector debt excluding public sector banks as a percentage of nominal GDP, from which we calculate its growth over the preceding five and ten years.

The data is summarised in Table 1. Panels D and E summarise data for years in the top and bottom quartiles of the speculation index. Table 1 shows that periods of high speculation are associated with higher GDP growth compared to periods of low speculation. This difference is most pronounced over longer time horizons: the average GDP growth in the 10 years preceding high-speculation years is 22.46%, markedly higher than the 16.91% observed in low-speculation years. In contrast, the differences in shorter time frames are less substantial, with a 0.41% difference in one-year GDP growth and 1.12% in five-year growth between high and low speculation periods.

<<INSERT TABLE 1>>

⁵⁴ Acharya and Naqvi, 'On reaching for yield'; Becker and Ivashina, 'Reaching for yield'; Quinn and Turner, 'Bubbles'; Jordá et al, 'Leveraged'; Allen and Gale, 'Bubbles'

Regarding public debt, Table 1 shows that in years of high speculation, public debt levels have been much lower. The average debt-to-GDP ratio during high speculation years is 77.25%, compared to 161.02% during low speculation periods. Furthermore, the five-year growth rate in the debt-to-GDP ratio is notably lower in high speculation years (0.62%) compared to low speculation years (2.99%). On average, over the ten years preceding a high speculation year, the debt-to-GDP ratio decreases by 3.73%, while it increases by 14.78% in low speculation years. This suggests that public debt levels are generally lower and experience less volatility in high speculation periods.

Together, these findings indicate that macroeconomic conditions may influence the level of speculation. The data suggests that speculation is not simply driven by short-term opportunities, but by broader economic conditions; sustained economic growth and conservative fiscal expenditure are associated with increased speculative activity.

While broader economic data is only available at an annual frequency, money market and stock market data are available on a monthly basis from prior to the creation of *The Times* in 1785 through to 2017 from the Bank of England's Millennium of Macroeconomic Data for the UK. Panels A–C of Table 1 provide a summary of the speculation data as well as money market and stock market conditions. We approximate money market conditions using the spliced series for the discount rate on prime short-term paper. This serves as a benchmark for short-term interest rates in financial markets and is mainly drawn from data on three-month banker and other eligible bills. Stock market conditions are measured using the spliced monthly share price index weighted by market capitalisation. To understand better the conditions that contribute to increased speculation, the previous one-month and 60-month changes in both variables are calculated.

Panels B and C summarise data for months in the top and bottom quartiles of the speculation index. This data suggests that stock market returns vary with levels of speculation.

As shown in Table 1, both past and future long-term returns are higher during periods of elevated speculation compared to periods of low speculation. The difference between past 60-month returns in high and low speculation months is particularly pronounced. The average high-speculation month had a preceding 60-month stock market return of 26.61%; the average low-speculation month had a preceding return of 7.73%. This suggests that investors may be reacting to strong historical performance when engaging in speculative behaviour.

The panels also suggest that months with high levels of speculation are typically preceded by loosening monetary conditions: for the top quartile of speculative months, the discount rate declined by an average 0.68 basis points over the prior month and 77.91 basis points over the prior 60 months. Conversely, during periods of low speculation, the cost of borrowing tends to be increasing, with the bottom quartile of speculation months averaging a 0.76 basis point increase in the discount rate over the previous month and 12.58 basis points over the previous 60 months. In the following section we attempt to model this relationship in more detail.

V. Speculation and Interest Rates

While speculation is often hypothesised to increase in response to a fall in the discount rate, measuring this relationship is econometrically challenging. The relationship is likely to be non-instantaneous and cumulative: a cut in the interest rate might have little or no effect on speculation within a given month, but a prolonged period of low interest rates can lead to the gradual development of a culture of more speculative investment. There is also likely to be substantial endogeneity: the discount rate might be increased in response to perceived high speculation, or in response to economic conditions that typically coincide with high levels of speculation.

In order to measure these cumulative effects, we use a distributed lag model of the form:

$$s_t = \alpha + \sum_{j=0}^{\infty} \beta_j d_{t-j} + decade_t + u_t$$

where s_t is the level of the speculation index at time t , d_{t-j} is the change in the discount rate at time $t - j$, and $decade_t$ is decade fixed effects. The cumulative relationship between the level of speculation today and the previous j changes in the discount rate is then given by the sum of the coefficients:

$$\sum_j^{t-j} \beta_j$$

The statistical significance of this relationship can then be tested using an F-test of the joint significance of these coefficients.

This model is notable for its omission of autoregressive terms. This is necessary for cumulative relationships to be observable: to observe how a change in the discount rate is related to speculation 60 months later, we cannot control for the level of speculation 59 months later.⁵⁵ However, the exclusion of autoregressive terms means that the aforementioned endogeneity is still strongly present. This analysis therefore contains the caveat that it is purely descriptive of the relationship between changes in the discount rate and speculation, and cannot make strong claims regarding causation.

To determine the appropriate number of lags in the model, we run the regression on identical samples with 12-month, 24-month... 120-month lags and calculate Akaike and Bayesian information criteria. As is typical, the Akaike criteria selected models with more lags than the Bayesian criteria, and a model that provided a reasonable compromise was 60 months of lags. The pattern of results described below does not notably change when using models of different lag lengths.

<<INSERT FIGURE 8>>

⁵⁵ Zanobetti et al., 'Generalized additive distributed lag models'.

The results are shown in Table 2 and illustrated graphically in Figure 9. We can see that the relationship between the level of the speculation index and discount rate changes in the preceding 13 months is positive, and this effect is statistically significant for changes that occurred 4 or 5 months previously. This is likely due to reverse causality: the speculation index autocorrelates, and authorities are more likely to increase the discount rate when speculation is perceived to be high (or in economic conditions that are conducive to high speculation).⁵⁶ For changes that occurred more than 24 months previously, the relationship is negative, i.e., a fall in the discount rate two or more years ago is associated with greater speculation today. The cumulative effect is statistically significant in this direction for changes that occurred more than 33 months previously.⁵⁷

This analysis suggests that lower discount rates lead to the gradual development of a more speculative investment culture. When interest rates fall, investors do not immediately transfer capital to more speculative assets or increase their leverage. Rather, after a period of low returns, more speculative assets and investment strategies gradually become more appealing. This suggests that the link between low interest rates and investor risk-taking is partly related to behavioural effects, such as reference dependence, herding, and personal experiences.⁵⁸ For example, investors may only begin to reach for yield after personally experiencing a period of what they perceive to be inadequate returns, or when speculative strategies become more salient.

VI. Speculation and Banking Instability

⁵⁶ This positive relationship between past speculation and the discount rate is confirmed by a distributed lag model where the current discount rate is regressed on lags of the speculation index. The results of this are presented in Appendix Table 1.

⁵⁷ We also repeated this analysis separately for each word in the index. The results for “speculation” were very similar to those for the overall index. For “mania” and “gamble”, the short-term positive relationship was more pronounced. Using “bubble” and “overtrading”, unsurprisingly, produced statistically insignificant results.

⁵⁸ Gao et al., ‘Do people feel less at risk?’; Grinblatt et al., ‘Momentum investment strategies; Kahneman and Miller, ‘Norm theory’; Lian et al., ‘Low interest rates’.

Thus far, we have considered some of the institutional and macroeconomic factors that influence speculation. In this section, we consider whether speculation can in turn have a destabilising influence on the banking system. Speculation can affect banking stability in several ways. First, if banks have extended large amounts of credit to speculators, then when the boom ends, there will be speculators who are unable to repay loans. Second, even though banks may not lend directly to speculators, the collapse of a speculative boom may affect the value of collateral backing loans, which in turn can affect the likelihood that banks get repaid. Third, there may be wider macroeconomic repercussions from the bursting of the speculative boom which causes a recession and has spillover effects on banking stability.

To see if periods of high speculation are followed (temporally but necessarily causally) by banking instability, we need a measure of banking instability. In extant literature there are three different approaches that have been used. The first is the narrative approach whereby scholars use the historical narrative to determine whether a banking crisis had occurred.⁵⁹ The downside of this approach is that it does not differentiate between the severity of crises or account for subjectivity in what constitutes a banking crisis. The second approach is to use the bank failure rate.⁶⁰ The weakness of this approach is that it only is of use for the era before banks were rescued by the central bank and government. The third approach is to use bank share prices.⁶¹ This approach overcomes the weaknesses of the narrative approach and can be employed in an era where governments rescue banks. However, it can only be used in eras when bank shares were traded.

To account for the weaknesses of each of these approaches, we conduct our analysis using all three measures of banking stability. For the narrative approach, we use existing

⁵⁹ Reinhart and Rogoff, *This Time is Different*; Grossman, *Unsettled Account*; Schularick and Taylor, 'Credit booms gone bust'.

⁶⁰ Kenny et al., 'The macroeconomic effects'.

⁶¹ Campbell et al, 'This time is different'; Baron et al, 'Banking crises'.

narratives created by Kenny et al and Turner.⁶² According to these narratives, there were UK banking crises in 1772, 1815-16, 1820-21, 1825-26, 1836-37, 1840-41, 1847, 1857-58, 1866, 1878-79, 1974, and 2007-08. For the bank failure approach, we use the capital-weighted bank failure series created by Kenny et al. for 1750 to 1938. The useful feature of this series is that it takes account of bank size when it comes to calculating the ratio of the banking population that failed each year. For bank share prices, we use the absolute returns series of Campbell et al, which stretches back to the appearance of the first joint-stock banks in 1825.⁶³ Absolute returns are an accurate non-parametric measure of volatility in time series data and are more robust than other volatility measures in the presence of large price movements.⁶⁴

<<INSERT FIGURE 9>>

Figure 9 shows diagrammatically the relationship between speculation and banking crises. Several things are worthy of comment. First, the cluster of banking crises between 1825 and 1866 all occurred during a period of high speculation. Indeed, we know from the rich historiography that each of these crises was preceded by a speculative boom on financial markets.⁶⁵ Second, it is notable that during the period of very low speculation from c.1890 until the 1960s, there are no banking crises. This was the era of financial repression, which had the effect of suppressing speculation so that funds would flow to financing the government debt. The tools of financial repression, however, also placed constraints on banks which made them hold lots of government debt and make very prudent lending decisions.⁶⁶ Conversely, the ending of financial repression in the late 1960s coincides with an increase in speculation, which culminated in the secondary banking crisis in 1974. Third, the 2007-08 banking crisis, arguably

⁶² Kenny et al., 'The macroeconomic effects'; Turner, *Banking in Crisis*.

⁶³ Campbell et al, 'This time is different'.

⁶⁴ Granger and Sin, 'Modelling absolute returns'; Forsberg and Ghysels, 'Absolute returns'.

⁶⁵ Evans, *The History; The Commercial Crisis*; Cottrell, 'London's first big bang'; Campbell, 'Government policy'; Turner, *Banking in Crisis*, pp. 66-101; Quinn and Turner, *Boom and Bust*, pp.39-57; 58-76; Neal, 'The financial crisis'.

⁶⁶ Turner, *Banking in Crisis*, pp.1881-86.

the most severe one the UK ever experienced, came at the end of a four-decade upward march of speculation.

<<INSERT TABLE 3>>

From Panel B of Table 3, we see that the speculation index is markedly higher in crisis years than non-crisis years. However, the change in speculation ($\Delta Speculation$) actually declines in the year of the crisis, which is to be expected because the crisis usually comes after the end of the speculative boom. Notably, the change in speculation over the previous five years is much larger for crisis than non-crisis years, suggesting that speculation in this year may take several years to come home to roost in the form of banking instability.

Panel A of Table 3 reveals that the speculation index is much higher in the top quartile of bank failure years than the bottom quartile. In addition, the one-year change in speculation in the top quartile of failure years is negative, which is consistent with what we found for the narrative measure. Meanwhile, the five-year change in speculation is much larger in the top quartile than in the bottom quartile. The results in Panel C of Table 3 suggests that the same findings hold for the absolute returns measure: the speculation index is high when bank stocks exhibit high volatility, and the one-year and five-year changes in speculation mirror what we find for the bank failure measure.

<<INSERT TABLE 4>>

In Table 4, we report the results of a regression where we regress the lag of the change in speculation over the previous 1, 2, 3, 4 and 5 years on the bank failure rate measure. We take lags because, as our summary statistics have suggested, speculation falls in years of high bank failures. The results in Table 4 reveal that the change in speculation is economically and statistically significant from at least five years before the instability. Only the lagged one-year change variable falls outside the 10 per cent level of statistical significance. These results

suggest that it can take up to two years after the speculative episode burns out before the damage is manifest in the banking system.

<<INSERT TABLE 5>>

In Table 5, we report the results of a regression where we regress the lag of the change in speculation over the previous 1, 2, 3, 4 and 5 years on the bank stock volatility measure. We take lags because our summary statistics show that speculation falls in years of high bank stock volatility. Similar to the results with the bank failure measure, the coefficients on the 60-month change in speculation suggest that it is the speculation over the previous five years that affects bank stock volatility in the present.

In summary, with each of the three measures, our results suggest that speculation is high and increasing in the years before episodes of banking instability. Although this analysis is not sufficient to claim that high speculation causes banking instability, a rich and developing historiography of crisis episodes suggests that it is at least a contributing factor.

VII. Conclusions

This paper uses the text of articles from *The Times* newspaper to generate a long-run measure of speculation levels in the UK economy. Our measure reveals that the UK economy has experienced four epochs of speculation. Years in which speculation was higher coincide with higher preceding economic growth, lower levels of public debt, and higher preceding stock returns. Statistically modelling the relationship between speculation and interest rates shows that a rise (fall) in interest rates leads to a gradual decrease (increase) in speculation over a period of two to five years.

Speculation has at times been seen by economists as an ephemeral concept, too intangible to be the subject of serious analysis. Others have seen it as an expression of “animal

spirits”, a psychological or cyclical phenomenon that may never be fully understood. By developing a quantitative index, we are able to show the extent to which economy-wide speculation has varied over time. Investigating the causes of these fluctuations demonstrates that speculation, rather than being a purely behavioural phenomenon, can have deep political, macroeconomic, and monetary roots. Our evidence also suggests that it can contribute to financial instability and thereby have a profound macroeconomic impact. From a policy perspective, our findings suggest that monetary authorities and regulators should attempt to measure and monitor the level of speculation in an economy so that they can act more promptly and deftly on maintaining financial stability.

While our evidence points to the destabilising effects of speculation, it has also been argued that speculation can have stabilising effects, leading to greater price discovery and more efficient allocation of capital.⁶⁷ The optimal level of speculation in the economy is thus unlikely to be zero. Future research should focus on the circumstances that determine whether speculation is stabilising or destabilising. Is it the entrance of amateur speculators that makes speculation destabilising, is it the increased leverage used by professionals that exposes systemically important financial institutions, or is it a combination of both?

⁶⁷ Iorgulescu and Pütz, ‘Does speculation’; Irwin, ‘The nature’.

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Figure 1. Frequently occurring words in speculation articles in 1800, 1850, 1890, 1900, 1929, 1950, 1986, 2000.

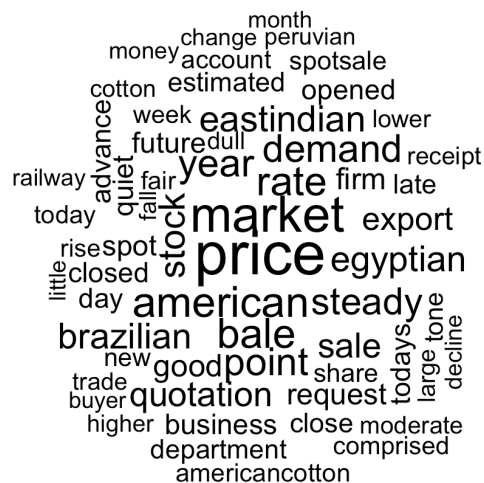
1800



1850



1890



1900



1929



1950



Figure 2. Annual references to individual speculation-related terms, scaled as articles per 10,000 words, 1785–2019

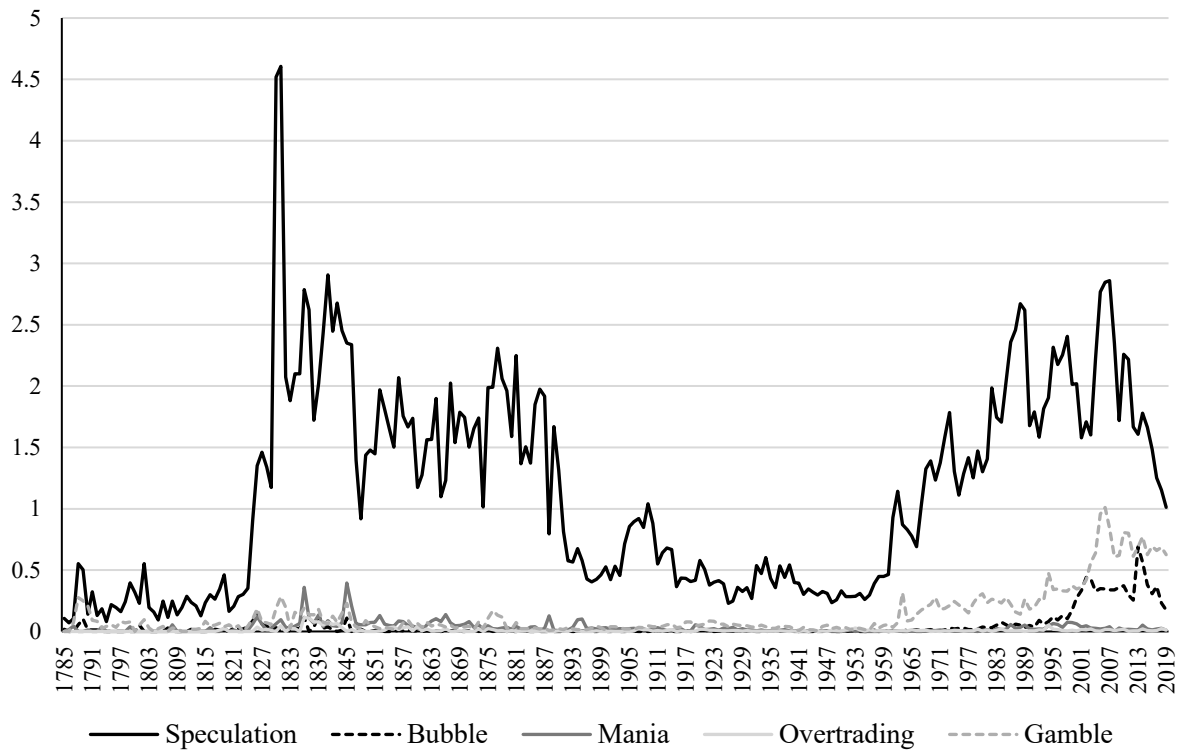
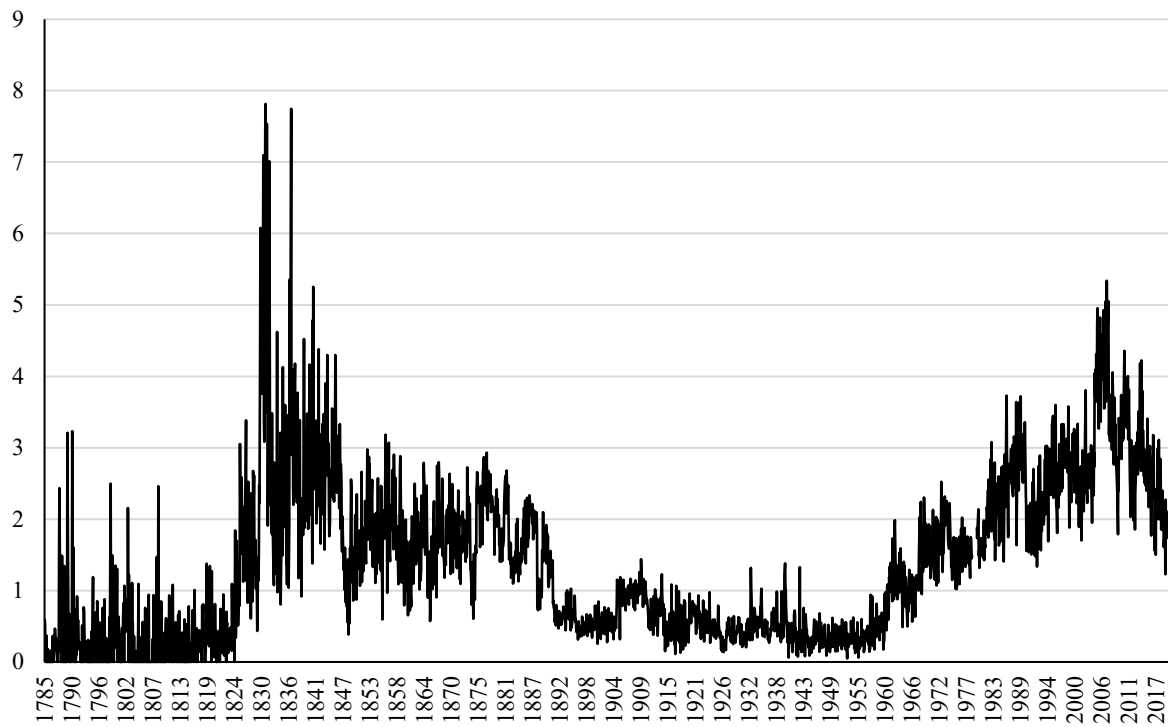
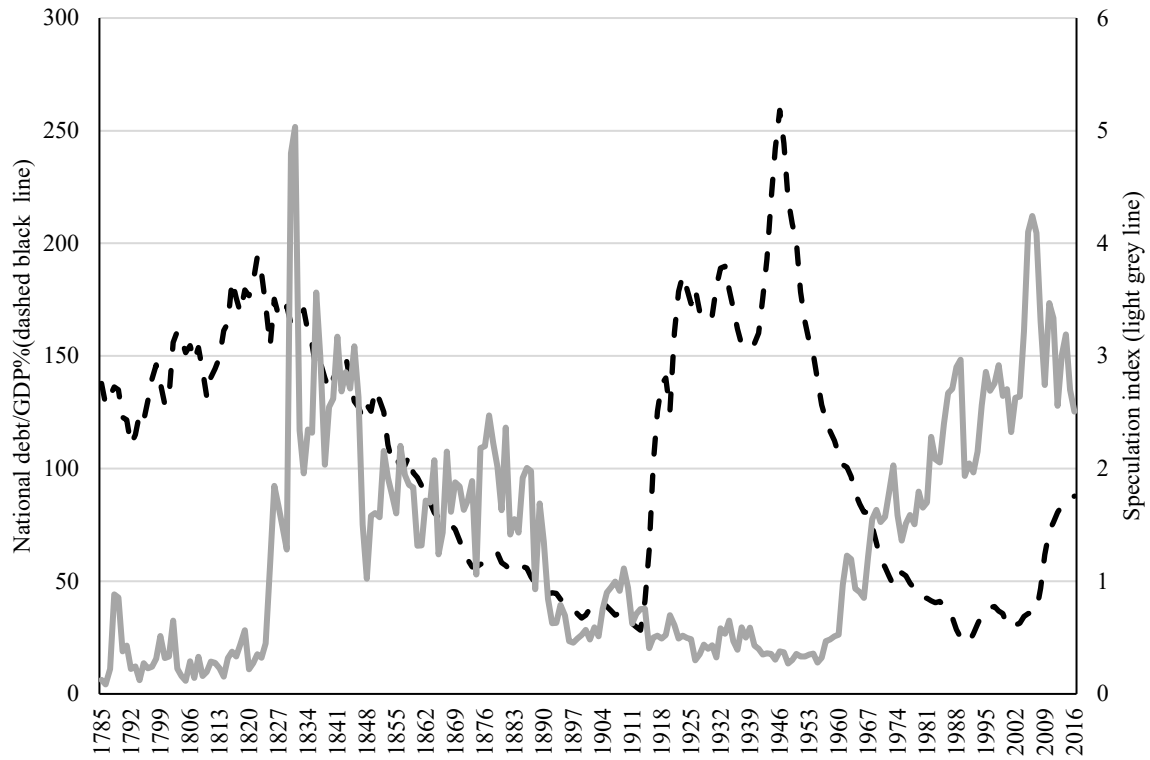


Figure 3. Monthly speculation index (composite of all terms), scaled as articles per 10,000 words, 1785–2019



Note: The index in Figure 3 is constructed from the same set of terms shown individually in Figure 2.

Figure 4. Annual speculation vs National debt/GDP (%), 1786-2017



Sources: consolidated UK debt as a % of GDP at nominal prices is from Thomas and Dimsdale, 'A millennium of UK data'.

Figure 5: Asset classes references per 1,000 words of Speculation Articles in *The Times*, 1785-2019

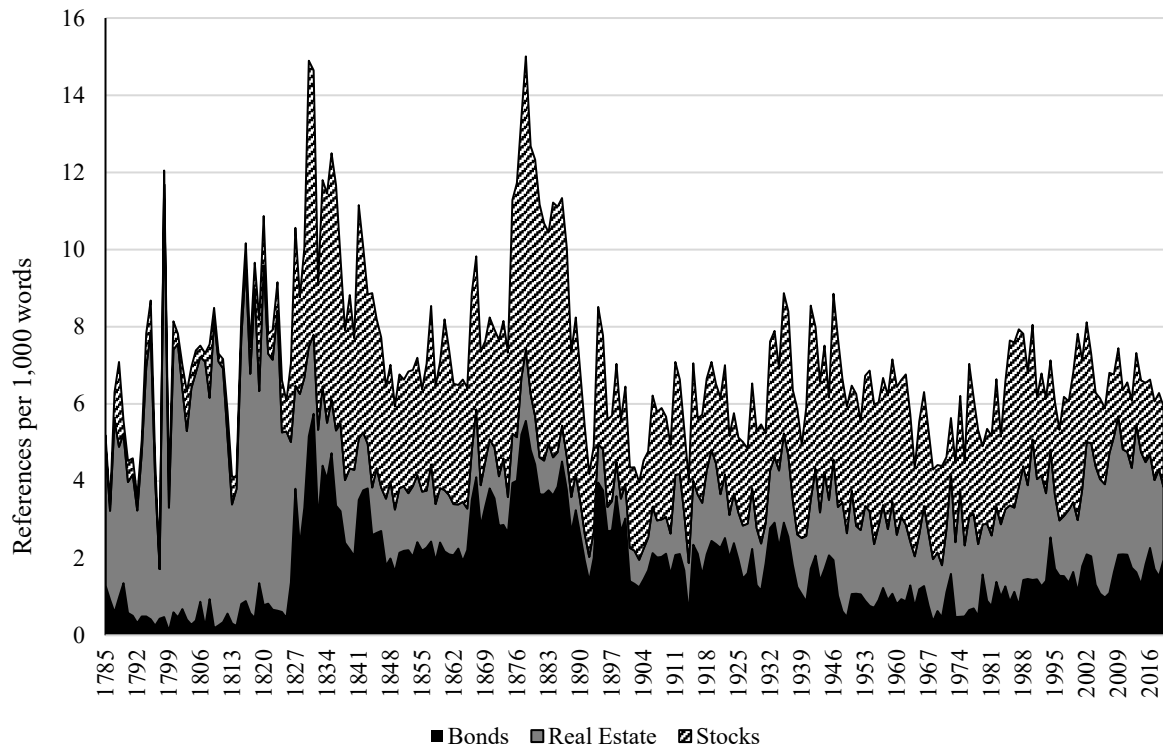


Figure 6: Commodities references per 1,000 words of Speculation Articles in *The Times*, 1785-2019

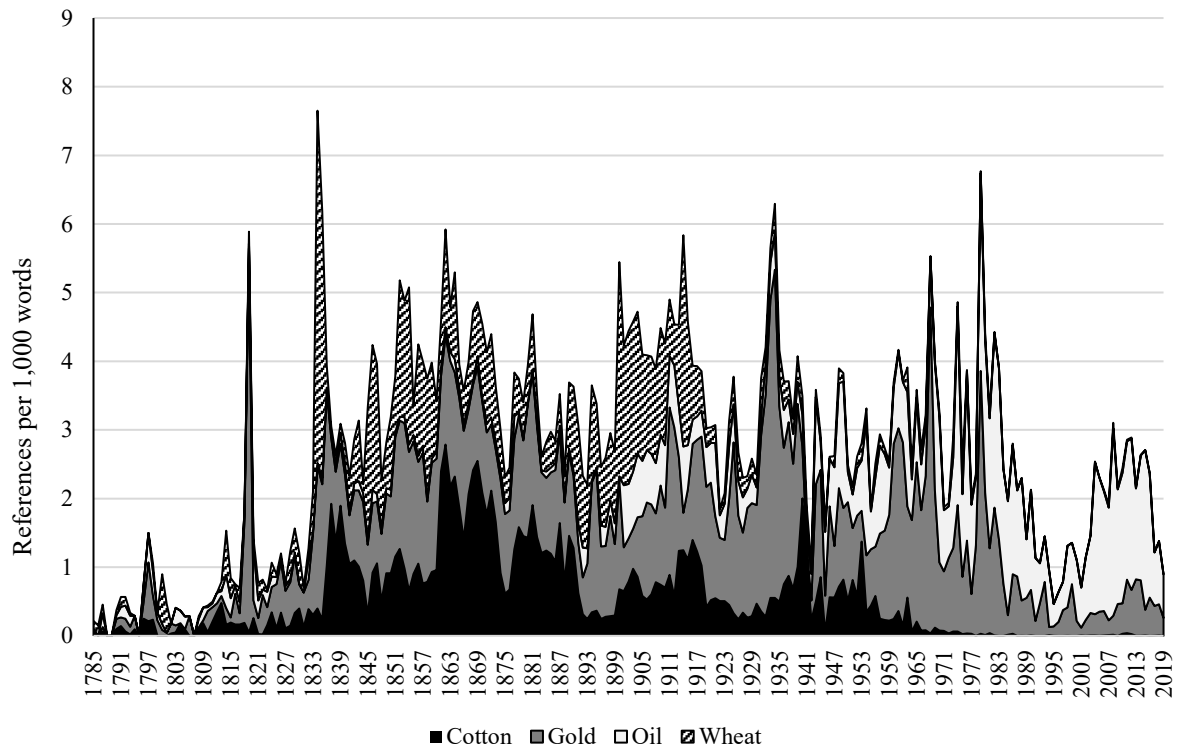


Figure 7: Comparison of Speculation Indices in *The Times* and *Financial Times*, 1888–2019

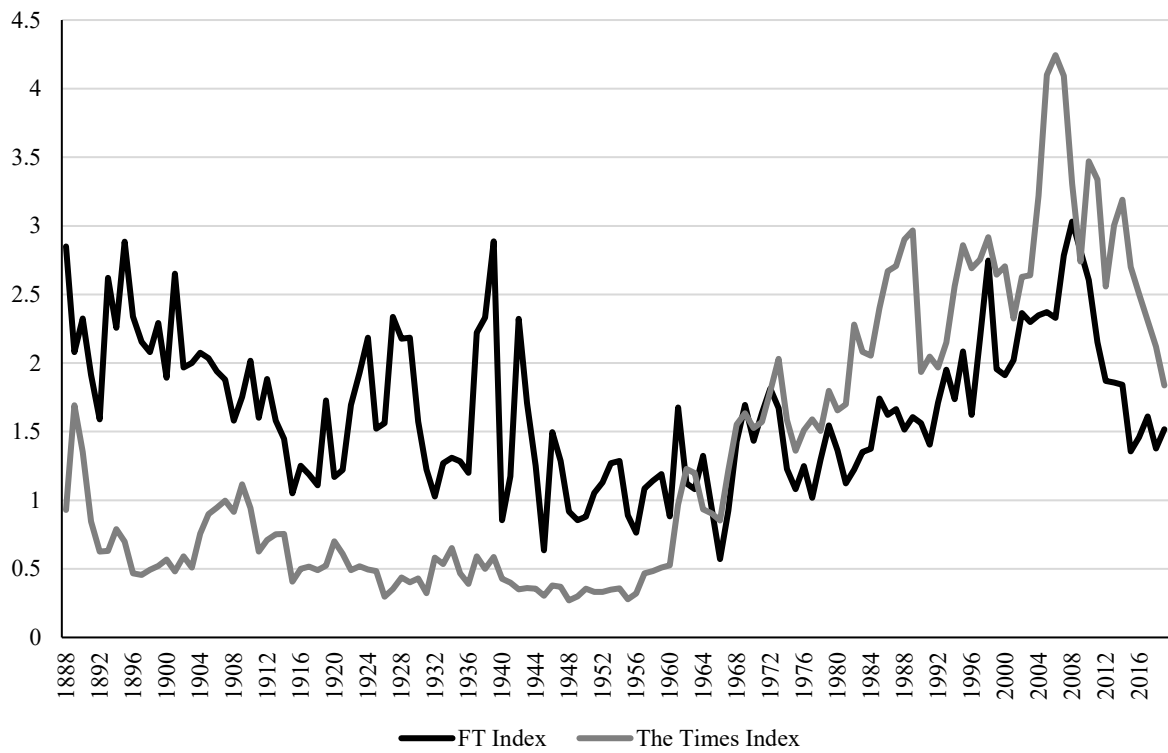


Figure 8. Cumulative relationship between past discount rate changes and speculation

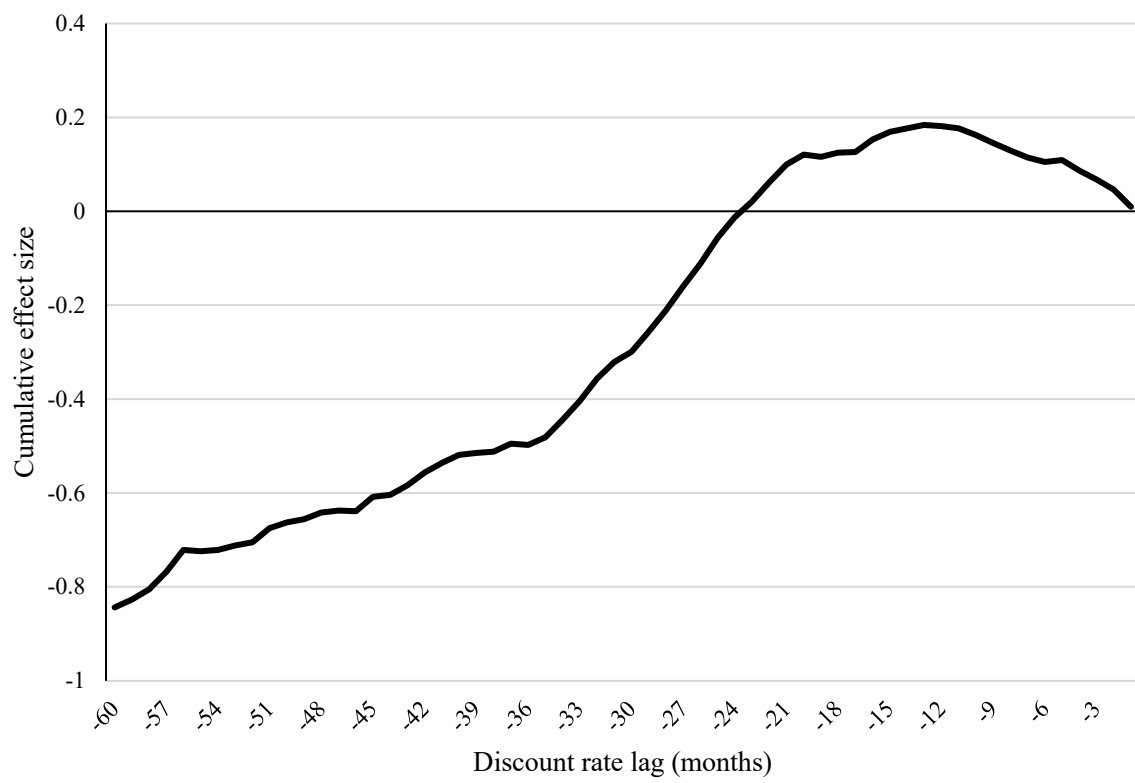
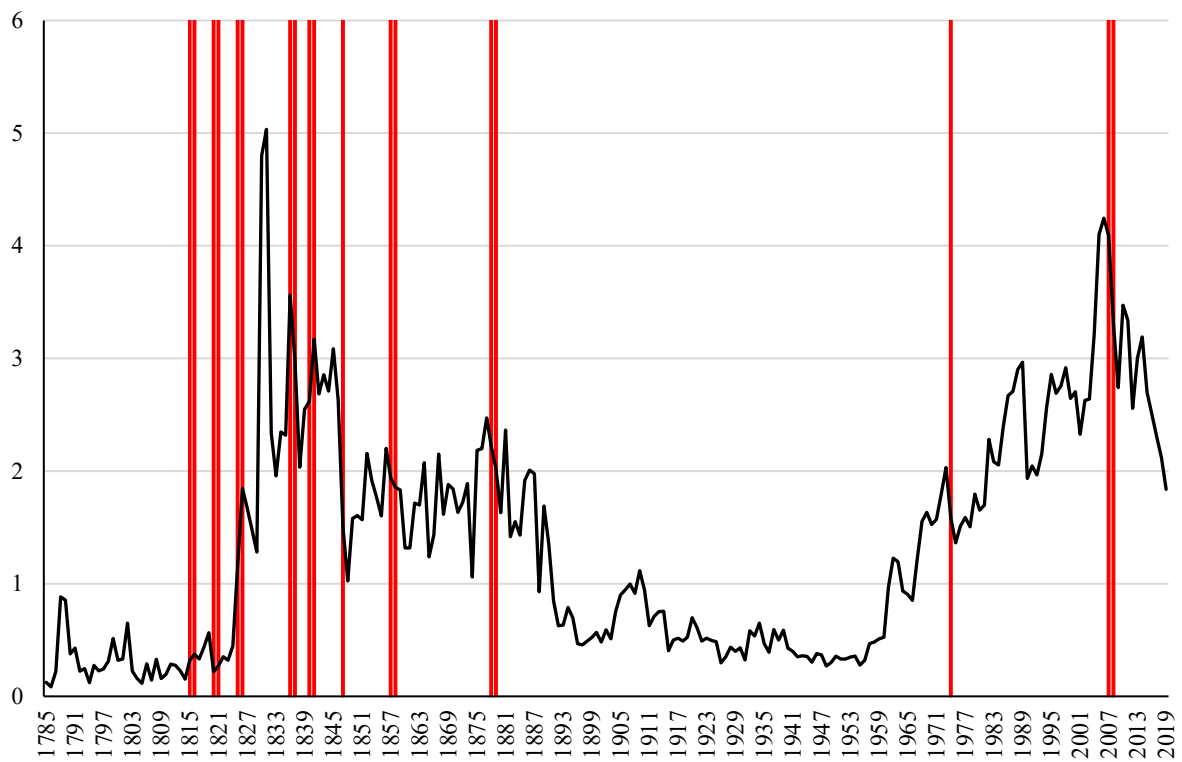


Figure 9. Speculation index and UK banking crises, 1785-2019



Notes: The red lines are the banking crisis years identified by Kenny (2001) and Turner (2014).

Table 1: Speculation and the Macroeconomic Environment

	Panel A: All Months (2,724 observations)				
	Mean	Median	St.Dev	Min	Max
Speculation Index	1.31	1.03	1.10	0.00	7.81
Discount Rate (basis points)	429.76	386.83	283.36	31.30	1770.00
Discount Rate Change	-0.15	0.00	57.26	-431.00	450.00
Discount Rate 60-Month Change	-3.56	7.85	223.65	-879.00	985.80
Next Month Log Return (per cent)	0.26	0.29	3.09	-26.31	36.86
Next 60-Month Log Return	15.58	12.74	27.93	-77.96	129.26
Last Month Log Return	0.26	0.29	3.09	-26.31	36.86
Last 60-Month Log Return	15.63	13.04	27.84	-77.96	129.26
	Panel B: Top Quartile Speculation Months (681 observations)				
Speculation Index	2.85	2.64	0.84	2.01	7.81
Discount Rate (basis points)	504.08	450.00	314.91	48.00	1770.00
Discount Rate Change	-0.68	0.00	63.12	-431.00	450.00
Discount Rate 60-Month Change	-77.91	-59.00	283.22	-877.00	985.80
Next Month Log Return (per cent)	0.47	0.44	3.15	-26.31	10.45
Next 60-Month Log Return	21.59	21.25	27.66	-44.99	129.26
Last Month Log Return	0.38	0.38	3.21	-26.31	10.87
Last 60-Month Log Return	26.61	27.18	32.50	-44.99	129.26
	Panel C: Bottom Quartile Speculation Months (681 observations)				
Speculation Index	0.20	0.24	0.15	0.00	0.43
Discount Rate (basis points)	361.63	396.67	198.44	50.00	1422.00
Discount Rate Change	0.76	0.00	30.09	-209.40	233.00
Discount Rate 60-Month Change	12.58	17.00	140.20	-523.40	465.60
Next Month Return (per cent)	0.18	0.28	2.90	-14.24	12.48
Next 60-Month Return	8.51	7.60	25.30	-58.41	78.77
Last Month Return	0.10	0.24	2.63	-15.36	12.48
Last 60-Month Return	7.73	7.38	24.08	-58.41	115.92
	Panel D: Top Quartile Speculation Years (57 observations)				
Speculation Index	2.79	2.67	0.65	2.05	5.03
GDP Growth (per cent)	2.37	2.55	2.08	-4.33	7.39
GDP Growth 5-Year	10.80	11.81	5.10	-0.22	21.07
GDP Growth 10-Year	22.46	23.19	5.56	11.32	30.88
Public Debt/GDP (per cent)	77.25	58.99	47.83	23.22	166.77
Public Debt/GDP 5-Year Growth	0.62	-1.30	15.95	-29.52	43.83
Public Debt/GDP 10-Year Growth	-3.73	-11.60	23.35	-37.17	52.18
	Panel E: Bottom Quartile Speculation Years (58 observations)				
Speculation Index	0.30	0.31	0.09	0.08	0.44
GDP Growth (per cent)	1.96	1.73	4.08	-5.24	10.86
GDP Growth 5-Year	9.68	9.82	7.81	-10.99	27.31
GDP Growth 10-Year	16.91	15.75	10.22	-8.53	46.71
Public Debt/GDP (per cent)	161.02	158.83	34.82	63.71	259.03
Public Debt/GDP 5-Year Growth	2.99	0.13	35.36	-80.52	98.96
Public Debt/GDP 10-Year Growth	14.78	15.40	39.56	-130.70	97.00

Notes: Monthly: Market Return based on arithmetic return of spliced monthly share price index weighted by market capitalisation. Discount rate is the spliced series for discount rate on prime short-term paper. Data with the exception of the Speculation Index is from Thomas and Dimsdale, 'A millennium of UK data'.

Table 2: Cumulative relationship between past discount rate changes and speculation

Discount rate lag	Lag coefficient	Cumulative effect size	p-value
1	0.010	0.010	0.632
2	0.037	0.047	0.101
3	0.021	0.068	0.06
4	0.019	0.087	0.046**
5	0.022	0.109	0.029**
6	-0.004	0.105	0.061
7	0.010	0.115	0.075
8	0.015	0.129	0.061
9	0.016	0.145	0.056
10	0.017	0.162	0.048**
11	0.014	0.176	0.041**
12	0.005	0.182	0.044**
13	0.002	0.184	0.051
14	-0.007	0.177	0.075
15	-0.008	0.169	0.104
16	-0.016	0.153	0.163
17	-0.026	0.126	0.271
18	-0.002	0.125	0.299
19	-0.008	0.116	0.358
20	0.005	0.121	0.357
21	-0.021	0.099	0.465
22	-0.038	0.061	0.668
23	-0.041	0.020	0.891
24	-0.033	-0.013	0.933
25	-0.043	-0.056	0.728
26	-0.055	-0.112	0.504
27	-0.049	-0.160	0.354
28	-0.051	-0.211	0.237
29	-0.046	-0.257	0.164
30	-0.042	-0.300	0.116
31	-0.022	-0.321	0.102
32	-0.035	-0.356	0.079
33	-0.048	-0.404	0.053
34	-0.041	-0.444	0.039**
35	-0.037	-0.482	0.030**
36	-0.016	-0.497	0.029**
37	0.003	-0.495	0.034**
38	-0.017	-0.512	0.032**
39	-0.003	-0.515	0.035**
40	-0.004	-0.519	0.038**
41	-0.016	-0.535	0.035**
42	-0.021	-0.556	0.031**
43	-0.027	-0.584	0.027**
44	-0.021	-0.604	0.025**
45	-0.004	-0.608	0.027**
46	-0.031	-0.639	0.022**
47	0.001	-0.638	0.025**
48	-0.004	-0.641	0.027**
49	-0.014	-0.656	0.026**
50	-0.007	-0.662	0.026**
51	-0.013	-0.675	0.026**
52	-0.030	-0.705	0.022**
53	-0.007	-0.712	0.023**
54	-0.009	-0.721	0.024**
55	-0.003	-0.724	0.025**
56	0.002	-0.721	0.028**
57	-0.046	-0.767	0.021**
58	-0.038	-0.805	0.016**
59	-0.022	-0.827	0.015**
60	-0.017	-0.844	0.014**

Notes: Results of a regression of the speculation index on past changes in the discount rate with decade fixed effects and heteroskedasticity-robust standard errors. The speculation index measures the relative frequency of five key speculation terms in *The Times* business section each month, normalised by total monthly word count and scaled x10,000. The discount rate is the spliced series for the discount rate on prime short-term paper taken from the Bank of England's Millenium of Macroeconomic Data for the UK. p-values are derived from F-tests of the joint significance of all discount rate changes between t-1 and t-k, where k is the current lag. ** indicates statistical significance at the 5 per cent level.

Table 3: Summary statistics for speculation and banking instability measures

	Mean	Median	St. Dev	Min	Max
Panel A.1: Bottom quartile bank failure years (37 obs.)					
Speculation Index	0.95	0.76	0.61	0.12	2.07
Δ Speculation (1-year)	-0.01	0.04	0.33	-1.05	0.76
Δ Speculation (5-year)	-0.07	-0.13	0.35	-0.82	0.46
Panel A.2: Top quartile bank failure years (37 obs.)					
Speculation Index	1.22	0.53	1.16	0.15	5.03
Δ Speculation (1-year)	-0.06	0.02	0.57	-2.69	0.72
Δ Speculation (5-year)	0.21	0.079	0.70	-1.18	3.19
Panel B.1: Years without banking crises (207 obs.)					
Speculation Index	1.31	1.00	1.01	0.12	5.03
Δ Speculation (1-year)	0.01	0.01	0.04	-2.69	3.52
Δ Speculation (5-year)	0.04	0.001	0.65	-2.48	3.64
Panel B.2: Years with banking crises (19 obs.)					
Speculation Index	1.92	1.86	1.16	0.22	4.09
Δ Speculation (1-year)	-0.03	-0.09	0.56	-1.13	1.24
Δ Speculation (5-year)	0.19	0.12	0.77	-1.47	1.57
Panel C.1: Bottom quartile bank stock absolute returns (557 obs.)					
Speculation Index	1.38	1.15	1.00	0.08	7.54
Δ Speculation (12-month)	-0.01	-0.01	0.74	-5.18	4.29
Δ Speculation (60-month)	-0.02	-0.05	0.91	-4.48	5.76
Panel C.2: Top quartile bank stock absolute returns (556 obs.)					
Speculation Index	1.83	1.77	1.10	0.00	7.75
Δ Speculation (12-month)	0.05	0.02	0.81	-4.96	6.38
Δ Speculation (60-month)	0.20	0.23	0.96	-5.50	4.65

Notes: Bank failure data is annual and based on Kenny et al. (2021). Years with banking crises are based on Kenny et al. (2021) and Turner (2014). Absolute bank returns from Campbell et al. (2016).

Table 4: Regression results for speculation and bank failure rates

	(1)	(2)	(3)	(4)	(5)
	Coeff. (R.S.E.)	Coeff. (R.S.E.)	Coeff. (R.S.E.)	Coeff. (R.S.E.)	Coeff. (R.S.E.)
L1 Δ Speculation (1-year)	0.130 (0.081)				
L1 Δ Speculation (2-year)		0.117* (0.059)			
L1 Δ Speculation (3-year)			0.115** (0.055)		
L1 Δ Speculation (4-year)				0.141** (0.058)	
L1 Δ Speculation (5-year)					0.149** (0.064)

Notes: Results of a regression of annual bank failure rates (i.e., the capital-weighted percentage of banks that failed) on past changes in the speculation index with heteroskedasticity-robust standard errors. Bank failure data is from Kenny et al. (2021). The speculation index measures the relative frequency of five key speculation terms in *The Times* business section each month, normalised by total monthly word count and scaled x10,000. Based on 147 annual observations. * indicates statistical significance at the 10 per cent level. ** indicates statistical significance at the 5 per cent level.

Table 5: Regression results for speculation and absolute bank stock returns

	(1)	(2)	(3)	(4)	(5)
	Coeff. (R.S.E.)	Coeff. (R.S.E.)	Coeff. (R.S.E.)	Coeff. (R.S.E.)	Coeff. (R.S.E.)
L1 Δ Speculation (12-month)	0.034* (0.019)				
L1 Δ Speculation (24-month)		0.004 (0.026)			
L1 Δ Speculation (36-month)			-0.001 (0.024)		
L1 Δ Speculation (48-month)				0.044* (0.025)	
L1 Δ Speculation (60-month)					0.078*** (0.024)

Notes: Results of a regression of bank stock absolute returns on past changes in the speculation index with heteroskedasticity-robust standard errors. Absolute bank stock returns are from Campbell et al. (2016) and are based on the portfolio of British bank stocks each month. The speculation index measures the relative frequency of five key speculation terms in *The Times* business section each month, normalised by total monthly word count and scaled x10,000. Based on 2,220 monthly observations. * indicates statistical significance at the 10 per cent level. *** indicates statistical significance at the 1 per cent level.

Appendix

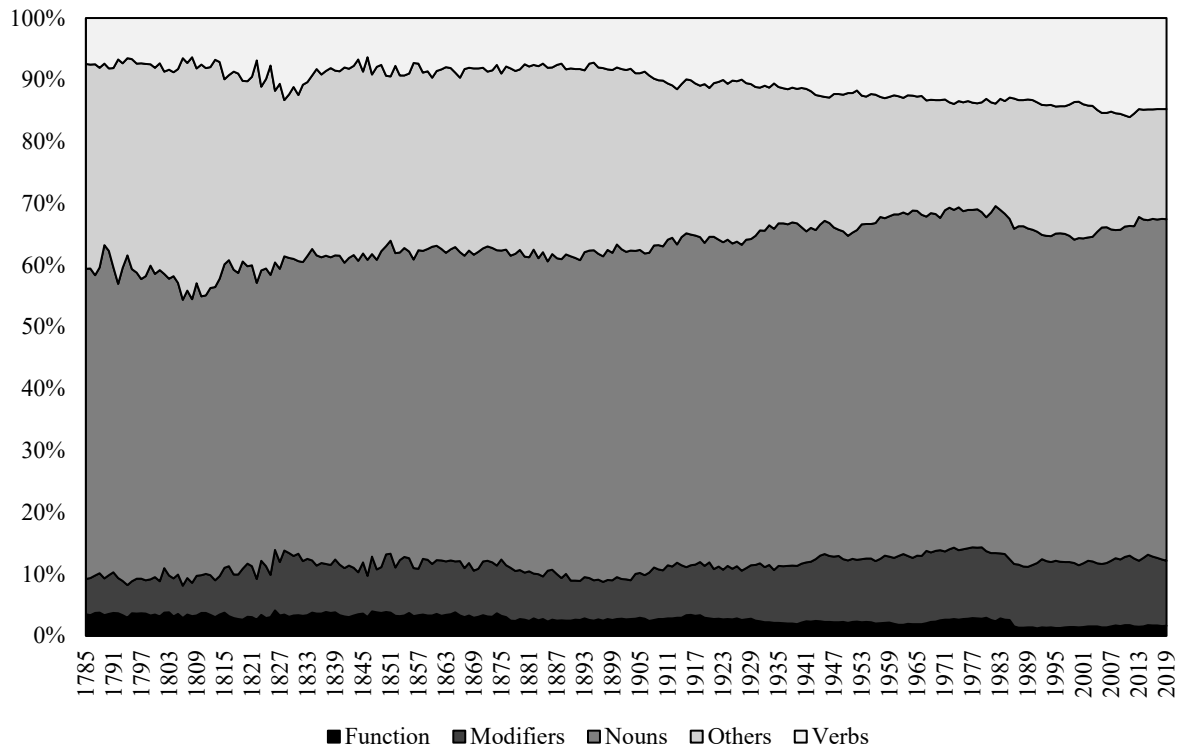


Fig. A.1: Word Use in the Business Section of *The Times*, 1785-2019.

Notes: Function words (prepositions, determiners, pronouns, conjunctions), Modifiers (adjectives, adverbs), Nouns (nouns, proper nouns, numerals), Verbs (main verbs, auxiliaries, particles), and Others (interjections, punctuation, symbols, spaces, and miscellaneous).

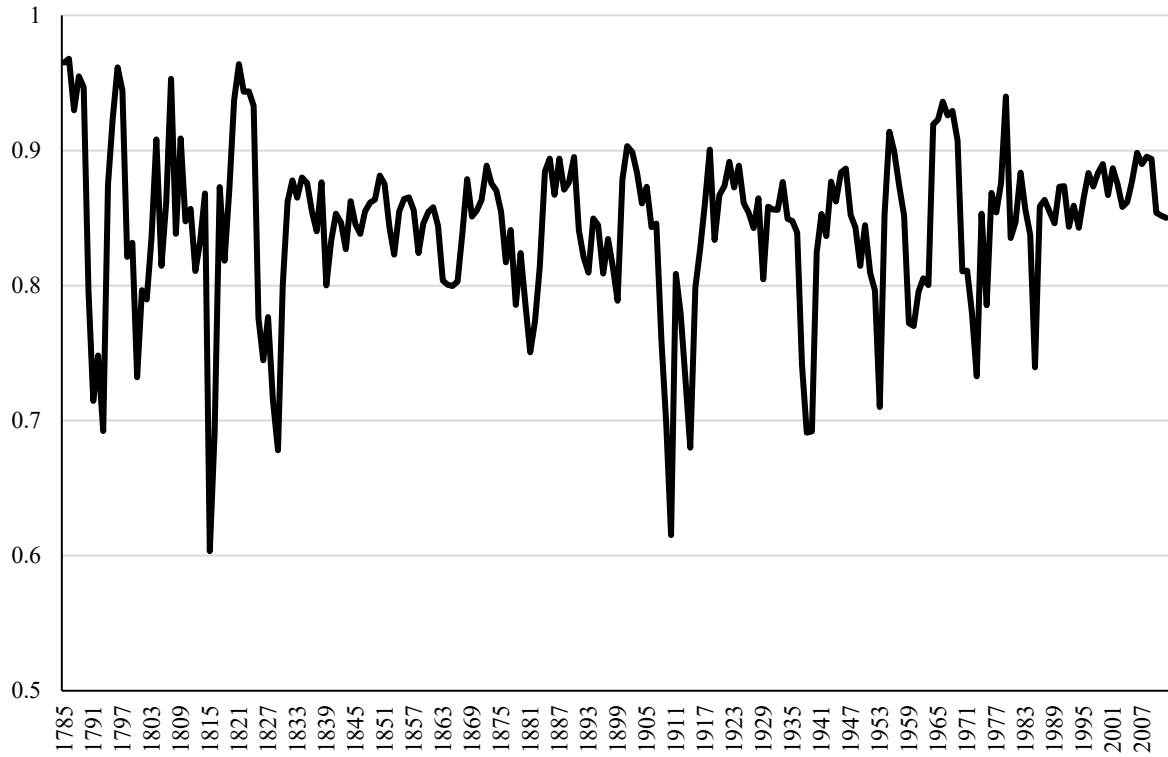


Fig. A.2: Speculation Articles 10-Year Rolling Jaccard Test Results *The Times*, 1785-2019
 Notes: The Jaccard test measures the percentage of vocabulary used in one 10-year period that is also used in the subsequent 10-year period.

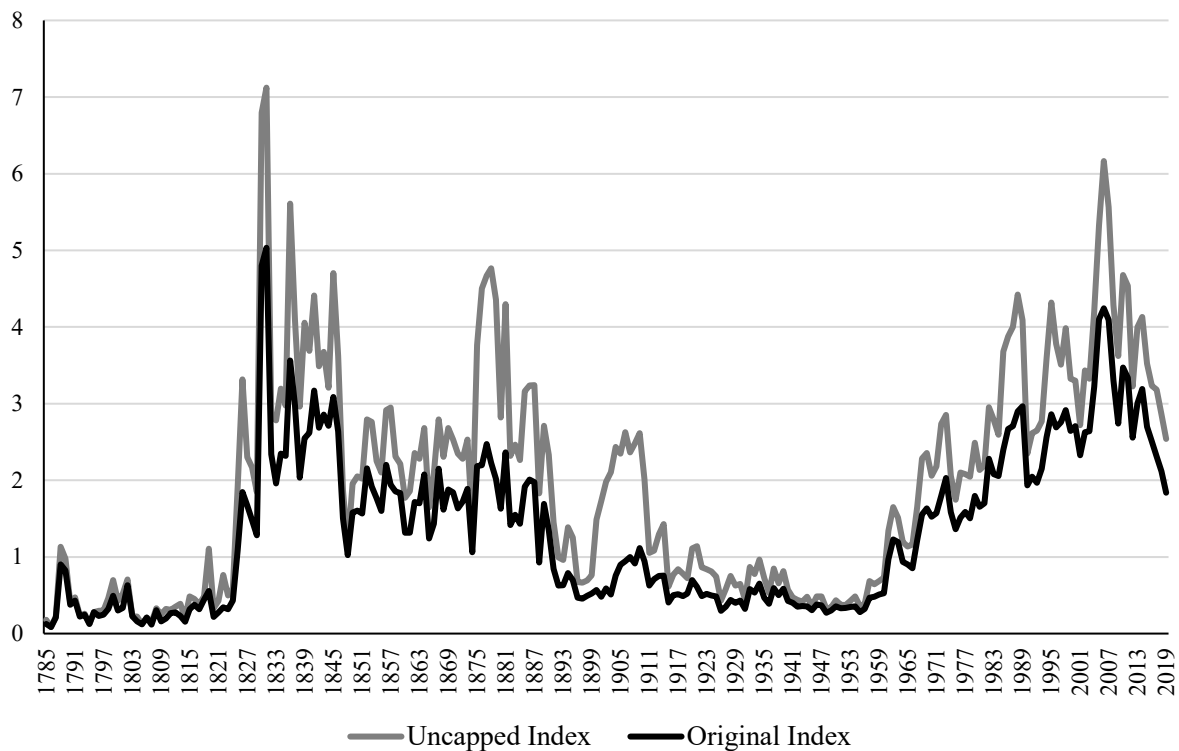


Fig. A.3: Original and Uncapped Speculation Indices for *The Times*, 1785-2019

Note: The original speculation index scores each article from 0 to 5 based on mentions of the target words (*speculat*, *bubble*, *mania*, *overtrad*, *gambl*), with a maximum of 1 point per distinct word. Repeated mentions of the same word within an article do not increase the score (e.g., “bubble” appearing four times still counts as 1). This article-level cap emphasises breadth of coverage rather than article length, so two separate articles referencing speculation are treated as more indicative of a speculative environment than one long, repetitive article. For comparison, we also construct an uncapped version of the index that counts all mentions of the target words.

Appendix Table 1: Cumulative Relationship between Past Speculation and the Discount Rate

Lag	Coefficient	Cumulative	p-value
1	-0.009	-0.009	0.793
2	-0.002	-0.011	0.789
3	-0.008	-0.019	0.684
4	0.018	-0.001	0.986
5	0.020	0.019	0.723
6	0.004	0.023	0.669
7	0.006	0.028	0.588
8	-0.009	0.020	0.709
9	0.000	0.020	0.705
10	0.019	0.039	0.461
11	0.027	0.066	0.210
12	0.007	0.073	0.182
13	0.029	0.102	0.064
14	0.004	0.106	0.046
15	-0.014	0.091	0.087
16	-0.008	0.083	0.120
17	-0.017	0.066	0.231
18	-0.012	0.054	0.328
19	-0.003	0.051	0.364
20	0.027	0.078	0.170
21	0.020	0.098	0.090
22	0.001	0.099	0.092
23	0.022	0.121	0.041
24	0.043	0.163	0.005
25	0.034	0.197	0.001**
26	0.014	0.211	0.000**
27	0.004	0.215	0.000**
28	-0.016	0.199	0.001**
29	-0.014	0.184	0.003**
30	-0.008	0.177	0.005**
31	0.006	0.183	0.003**
32	-0.013	0.170	0.008**
33	-0.023	0.146	0.025
34	0.000	0.147	0.027
35	-0.008	0.138	0.040*
36	-0.013	0.125	0.068
37	0.012	0.138	0.048*
38	0.022	0.160	0.024*
39	0.030	0.190	0.009**
40	0.025	0.215	0.004**
41	0.025	0.240	0.002**
42	0.016	0.256	0.001**
43	-0.020	0.235	0.001**
44	0.009	0.244	0.001**
45	-0.010	0.235	0.001**
46	-0.009	0.226	0.001**
47	0.008	0.234	0.001**
48	-0.003	0.231	0.002**
49	0.028	0.259	0.001**
50	0.014	0.273	0.000**
51	0.009	0.282	0.000**
52	-0.003	0.279	0.001**
53	-0.012	0.267	0.001**
54	-0.020	0.246	0.003**
55	-0.012	0.235	0.005**
56	0.004	0.238	0.005**
57	0.007	0.246	0.004**
58	0.019	0.264	0.002**
59	0.024	0.288	0.001**
60	0.047	0.334	0.000**

Notes: Results of a regression of changes in the discount rate on past levels of the speculation index with decade fixed effects and heteroskedasticity-robust standard errors. * and ** denote statistical significance at the 5% and 1% level respectively.