Capital market development over the long run: the portfolios of UK life assurers over two centuries

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What shapes and drives capital market development over the long run? In this paper, using the asset portfolios of UK life assurers, we examine the role of regulation, historical contingency, and political reactions to events on the long-run development of the UK capital market. Government response to events such as war, hegemony-secured peace, and the wider macroeconomic environment was the ultimate determinant of major changes in asset allocation since 1800. Furthermore, when we compare the UK with the United States, we find that regulation played a limited role in shaping the asset portfolios of the UK life assurance industry.

1. Introduction

An important driver of economic growth is capital market development. Ultimately, investor demand and the supply of capital are critical factors in the development of capital markets (Albuquerque de Sousa et al. 2016). While previous studies have assessed long-run capital market development by examining changes in the overall size of markets, we examine one of the most important channels of supply of capital to markets over the long run—life assurance companies. Life assurance companies have a long history in the UK, stretching back more than 300 years. To perform their societally important function of pooling mortality risk, insurance companies have invested their premium income into capital markets. The assets under management (AUM) of British life assurance companies (which have been as high as 25 percent of the capital market) mean that they have always played a very important role in capital markets. Indeed, until the late 1970s, they were the largest grouping of institutional investors in the UK (Alborn 2002; Office of National Statistics 2020).1

In this paper, we analyse the portfolios of these important asset managers over the past two centuries. In particular, we explore the role of historical contingency and political reactions to events in shaping and driving changes in portfolio composition over time. We consider how the following affected portfolio composition: the supply of financial assets, regulation, the general economic environment, and firm-specific characteristics. To do this, we have

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1 By 1970, the assets of the insurance sector even exceeded the total assets of the UK banking system (Sheppard 1971, pp.116–7, 157–8; Ryan 1973).
compiled large amounts of asset composition data from insurance archives, government publications, and industry reports.

Our results reveal that there have been major changes to the composition of life assurance company assets over the past 200 years. One major change has been the switch away from government debt and relatively unmarketable assets, such as mortgages, towards financial assets traded in nascent capital markets. This switch had been largely completed by the 1920s. Notably, British government debt has at times been the largest asset class, but these occasions have coincided with abundant supplies of government debt having been issued to fight wars. Another major change has been the switch away from fixed-income securities towards equity, which started as far back as the 1890s, but accelerated rapidly after the 1920s.

What were the main drivers of changes in the asset portfolios of life assurance companies? The supply of different types of financial assets played a major role in the 19th century, with the development of the share, debenture, and foreign government debt markets. The availability of these new markets expanded the options for portfolio managers and a sharp switch away from government debt during the Pax Britannica period facilitated investment in these assets. In the 20th century, changes in the wider economic environment appear to have been the main determinant of the changes in portfolios of life assurance companies. The wartime finance needs of governments and the resulting inflation, allied to a healthy equity risk premium, resulted in a move away from government bonds and towards equity.

Actuaries also played a role in the evolution of asset portfolios. The seminal investment canons of the UK life assurance industry, which were articulated by the actuary (Bailey 1862), favoured low-risk fixed interest assets such as mortgages and debentures in the 19th century. However, in the interwar period, the changing macroeconomic climate led to a re-evaluation of these actuarial canons by Smith (1924), The Economist (1927), and Raynes (1928). This re-evaluation was accompanied by an increased investment in equities.

To explore the role played by regulation in the evolution of asset portfolios, we compare the trends in the UK after 1870 to what was happening in the United States. Although the general environment was somewhat similar in terms of wartime finance, inflation, and the equity premium, the regulatory regime in the United States was much stricter in restricting the types of assets that insurance companies could invest in. We suggest that the switch to equity occurred much later in the United States and US life assurers tended to have less property in their portfolios than their UK counterparts because of this more stringent regulatory regime.

It is possible that changing firm characteristics were the main drivers of change in the asset management practices of UK life assurers. Using panel regression analysis, we explore the relationship between firm-specific characteristics of life assurance companies and their asset portfolios. We find little evidence that changes in firm characteristics over time impacted on the composition of asset portfolios.

As well as contributing to our knowledge of what shaped British capital markets over the past 200 years, this paper contributes to the historiography of the asset management practices of UK life assurers. To date, this has consisted of studies of the practices of one company over short periods of time (Supple 1970; Treble 1980; Trebilcock 1985, 1998), an analysis of the sector at one point in time (Johnston and Murphy 1957), a study of the interwar period and the rise of the “cult of equity” (Scott 2002), and Baker and Collins (2003) decadal analysis of the portfolios of life assurance companies between 1900 and 1965. Our first contribution is to extend the period Baker and Collins (2003) studied by over 120 years. Our second contribution is to compare the long-term trends in the UK with those in the United States. The third is that we explore how firm-specific characteristics affected asset management practices of life assurers. Our final contribution is finding that the rise of the “cult of equity”
investment philosophy identified by Scott (2002) in the interwar period was preceded by an increasing propensity for assurance companies to invest in equity.

This paper also adds to the burgeoning literature on historical asset management practices (Rutterford and Hannah 2016; Morecroft 2017; Morecroft and Turnbull 2019). This literature includes studies of the asset management practices of life assurance companies in other countries such as Australia (Keneley 2006, 2012), Denmark, France, Germany, and the Netherlands (Bennet et al. 1984); research on the investment practices of banks (Baker et al. 2009); pension funds (Avrahampour 2015); investment trusts (Hutson 2005; Rutterford 2009; Chambers and Esteves 2014; Rutterford and Sotiropoulos 2016, 2017; Sotiropoulos et al. 2021); and research on the asset management style developed by influential figures such as John Maynard Keynes (Chambers and Dimson 2013; Chambers et al. 2015).

The rest of the paper proceeds as follows. Section 2 provides some background and outlines potential drivers of change in the asset management practices of life assurance companies. Section 3 describes our data sources. Section 4 examines the asset portfolios of UK life assurance companies from 1830 until 2016. Section 5 examines the role of regulation in shaping asset portfolios by comparing the UK life assurance industry to that of the United States. Section 6 analyses the relationship between firm-specific characteristics and asset portfolios. Section 7 is a brief conclusion.

2. Life assurance asset management

In life assurance a policyholder pays a series of premiums, so that when the policyholder dies, a beneficiary will receive a payment. The policy could last until the policyholder dies (a whole-life assurance), or the policy could be a more temporary arrangement. Life assurance companies are then responsible for managing the cash flows, so that when it comes to the point at which a policy must be paid out, which may be a long time after the policy was initiated, the company will be able to meet its obligations to the policyholder. Therefore, the way in which life assurance companies invested their assets is critical.

The first thing that affects the portfolio decisions of assurance companies will be the supply of financial assets. At the beginning of the 19th century, there was little to choose from apart from British government bonds. However, with the coming of the railways and liberalisation of incorporation law, there was an increase in the supply of company shares by the early 1860s, such that government debt securities only constituted circa 53 percent of the nominal value securities on the Stock Exchange Official List (Michie 1999, p. 88). The continued growth in company shares, the creation of corporate debentures, and increased number of foreign governments raising bond finance in London increased the supply as well as the variety of financial securities that assurance companies could invest in (Grossman 2002; Coyle and Turner 2013). By 1893, only 18 percent of the nominal value of securities in the Stock Exchange Official List was UK government debt or public bodies, 21 percent was the debt of foreign and colonial governments, and 61 percent was made up of the shares and bonds of companies (Michie 1999, p. 88). In other words, by the end of the 19th century, there was a wide choice of securities for assurance companies to invest in.

What assurance companies invested in over time will ultimately have been determined by their actuaries and the investment canons of the actuarial profession. The articulation of such canons by early actuaries such as Bailey (1862), a president of the Institute of Actuaries, had a long-lasting influence on the profession. Undoubtedly, the most important of his investment canons was the security of capital. However, changes in the general economic environment
could affect which assets were viewed as secure. As the Bailey canons were introduced at a
time of stable, low inflation, one would expect a focus on secure fixed-income assets, even if
more risky assets such as equities provided a higher return. Increases in inflation may have
resulted in assets such as equities being viewed as a more secure investment than fixed-income
instruments, although inflation fell until around 1900.

Theoretically speaking, regulation can have a major effect on the asset management
practices of life assurance companies. Up until 1870, the UK life assurance industry was
largely unregulated. However, the Life Assurance Companies Act of 1870, introduced after
the collapse of the Albert Life in 1869, mandated annual revenue accounts and balance sheets
to be provided to the Board of Trade. As a result of this new legislation, it became more difficult
for such companies to give a false impression of the security of their business to the public. In
addition, such disclosure meant that life assureds had to be seen to be investing policyholders’
 funds properly. This 1870 Act enshrined “freedom with publicity” as the cornerstone of
future regulation of the UK’s life assurance industry. In other words, there was no regulation
restricting what life assurance companies could invest in, which was in contrast with the
approach taken in the United States.

Asset management practices may have differed across insurers because of different char-
acteristics and these characteristics may have differed across time. Perhaps the most obvious
difference was size. Some companies were large conglomerates who would have access to a
wide range of assets, whereas other companies were small provincial offices who were more
limited in their choice of assets. Another important difference between firms and over time
was that some life assureds were owned by the policyholders, e.g., mutuals, while others were
owned by shareholders. Another characteristic that differed across time and space was that
some companies only offered life assurance, while others offered other insurance products and
were known as composite insurance companies. There was also a difference in the nature of
the liability faced by owners in the event of failure. One would expect that the greater or more
immediate was this liability, the more conservative would have been the asset management
practices.

3. Data

In order to analyse the asset management practices of life assurance companies from 1830 to
2016, we construct a decadal time series of the share of broad asset classes in the portfolios
of life insurers. Table 1 shows the years included in our decadal analysis and the data sources
for each year.

Until the Companies Act 1844, there was no government or centrally produced summary
of life assurance company accounts. After 1844, the government-produced summary of
accounts only included life assurance companies registered under that Act and its successors.
Therefore, for 1830, 1840, 1851, and 1861, we used individual company accounts held by the
London Metropolitan Archives.2 For 1851 and 1861, these were augmented by reports produced
by the Government for those companies that were registered under the 1844 Act.3 From 1871
to 1960, data were collected from reports produced by the Board of Trade, which covered the
entire life assurance sector.

2 Thanks to Ian Webster for sharing these accounts with us.
3 The data prior to 1871 do not capture the assets held by the entire life assurance sector, but a comparison with
the 1871 data suggests that our data are representative.
The portfolios of UK life assurers over two centuries

Table 1. Data sources for insurance company asset portfolios, 1830–2016

| Year(s)         | Sources                                                                 |
|-----------------|-------------------------------------------------------------------------|
| 1830 and 1840   | Individual company accounts held at the London Metropolitan Archives (Rock Life, London Life, Equitable Life, Guardian, Mutual Life, Metropolitan Life, National Provident, Legal and General). |
| 1851           | *Assurance Companies: Abstract of Return to an Order of the Honourable House of Commons 1852*, and individual company accounts held at the London Metropolitan Archives (Rock Life, London Life, Equitable Life, Guardian, Mutual Life, Metropolitan Life, National Provident, Legal and General). |
| 1861           | *Assurance Companies: Abstract of Return to an Order of the Honourable House of Commons 1863*, and individual company accounts held at the London Metropolitan Archives (Rock Life, London Life, Equitable Life, Guardian, Mutual Life, Metropolitan Life, National Provident, Legal and General). |
| 1871, 1881, 1891, 1901, 1911, 1923, 1931, 1938, 1951, and 1960 | Board of Trade (1871–1918, 1923, 1931, 1938, 1951, 1960) |
| 1970 and 1981   | Life Offices Association (1971, 1982)                                    |
| 1991           | Association of British Insurers (1992)                                  |
| 2001, 2011, and 2016 | Association of British Insurers (2018)                              |

After 1960, the Board of Trade stopped publication of its reports on life assurance companies. As a result, the Life Offices Association, the industry’s own trade body, decided to collate and publish such data that had been previously been collated by the Board of Trade. Consequently, it is from the Life Offices Association and its successor body, the Association of British Insurers (ABI), that post-1960 data have been obtained.

While a decadal analysis enables us to identify long-run trends, one drawback of such an approach is that it does not capture year-on-year changes. However, we are constrained by our data sources in this regard because industry-level reports were not produced on an annual basis for most of our period, with annual reports only being produced from 1881 to 1915.

Our sources report the value of assets as they appear on each company’s balance sheet. In terms of the categorization of asset classes, we ultimately rely upon that used in our data sources. There are eight asset classes reported in our data sources, and their definitions are reported in table 2. Unfortunately, the asset classification used after 1960 does not map exactly to that used by the Board of Trade. The chief difference is that preference shares are included with debentures by the ABI and predecessor bodies, but were classified as stocks and shares by the Board of Trade. As we will see below, this definitional change had little effect on portfolio composition.

In order to compare the asset portfolios of American and British life assurance companies over the long run, we obtained data on US insurance companies from *The Historical Statistics of Life Insurance in the United States, 1759 to 1958* (Institute of Life Insurance 1960), and the American Council of Life Insurers *Life Insurers Fact Book* (American Council of Life Insurers 2017). Because these sources use a slightly different asset classification than in the

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4 London Metropolitan Archives, Life Offices Association, L. O. A. Circular 15/1970.
Table 2. *Asset class definitions*

| UK asset class                  | Definition                                                                 | US asset class |
|---------------------------------|---------------------------------------------------------------------------|----------------|
| Debentures                      | Holdings in corporate bonds.                                              | Bonds          |
| Stocks and shares               | Holdings in equities, be they ordinary or preference shares.              | Stocks         |
| British government securities   | Securities issued by HM government, gilt-edged.                           | Bonds          |
| Foreign government securities   | Securities issued by Indian, colonial, or foreign governments. From 1911, also included provincial and municipal securities. | Bonds          |
| Mortgages                       | Holdings in mortgages, a form of loan on property.                       | Mortgages      |
| Loans on policies               | Loans issued by life assurance companies to their policyholders, on their own policies, acting as a form of collateral. | Other          |
| Loans on rates                  | Loans issued by local authorities, on rates payments and other public works. | Other          |
| Property                        | Holdings in property, either as an investment or offices.                 | Real estate    |

Notes: Asset classes are taken from the *Board of Trade* reports (UK) and *Institute of Life Insurance* (1960). The *Board of Trade* data from 1871 to 1960 do not distinguish between domestic and foreign investment with the exception of government securities.

UK sources, we had to map the UK asset classes onto those used in the United States—see table 2.

4. *Asset portfolios, 1830–2016*

Table 3 shows the AUM of the UK life assurance companies from 1871 to 2016 and provides an estimate of the relative importance of the life assurance sector as a supplier of capital. While the AUM as a proportion of the UK’s capital market fluctuates over time, the weight of money held by life assurance companies throughout the period of investigation was significant, especially after the 1930s.

Figure 1 shows the average composition of the asset portfolios of UK life assurance companies from 1830 to 2016 and figure 2 shows annual data from 1881 to 1915. Figures 1 and 2 show that there have been marked changes in composition over the past 200 years. In order to understand the reasons for these changes, we will look at each asset class in turn.

Trebilcock (1985, p. 620) finds that nine major insurance companies in 1800 invested over 80 percent of their portfolios in government bonds. Figure 1 shows that government securities still constituted nearly 80 percent of the average portfolio in 1830. Notably, government debt issuance peaked following the Napoleonic Wars. Investment in government debt by life assurers fell sharply after 1830; by 1870, less than 10 percent of the average portfolio was in government bonds. This figure remained low throughout the remainder of the century as the government focused on paying down the national debt during the *Pax Britannica* period and life assurers rebalanced their portfolios, channelling capital into mortgages and nascent asset markets. Bailey (1862) did not think that the undated nature and fluctuation in value of consols was consistent with his principle of security of capital. He instead favoured mortgages and other secured loans as their capital value did not fluctuate (Keneley 2006). The availability of new corporate security markets also expanded the investment options for life
The portfolios of UK life assurance companies over two centuries

Table 3. Assets under management (AUM) of life assurance companies, 1871–2016

| Year | AUM (£bn) | AUM as a percentage of UK capital market |
|------|----------|-----------------------------------------|
| 1871 | 0.1      | 6.31%                                   |
| 1881 | 0.2      | 5.83%                                   |
| 1891 | 0.2      | 5.46%                                   |
| 1901 | 0.3      | 5.59%                                   |
| 1911 | 0.5      | 6.22%                                   |
| 1923 | 0.8      | 5.94%                                   |
| 1931 | 1.2      | 8.39%                                   |
| 1938 | 1.7      | 11.21%                                  |
| 1951 | 3.1      | 15.42%                                  |
| 1960 | 6.0      | 22.10%                                  |
| 1970 | 13.1     | 9.69%                                   |
| 1981 | 62.5     | 13.82%                                  |
| 1991 | 302.3    | 14.75%                                  |
| 2001 | 977.4    | 21.96%                                  |
| 2011 | 1,559.9  | 31.75%                                  |
| 2016 | 1,604.5  | 25.53%                                  |

Sources: AUM—See table 1. Capital Market: 1871–1960: Michie (1999, pp. 88, 175, 419), Equity and Corporate Debt: 1970–2001: London Stock Exchange (2011a, 2011b, 2016). British Government Securities, 1970–2016: Bank of England (2017).

Notes: AUM data are incomplete prior to 1871. Nominal values have been used for the size of the capital market from 1871 to 1960, with market values used for equities from 1970 onwards (corporate debt and British government securities use nominal values throughout). Before 1960, capital market estimates are only available at certain points in time, so the one closest to the AUM year has been chosen.

Low and falling yields around 1900 meant that British government debt remained a relatively unattractive investment (Morgan and Thomas 1969, pp. 278–9).

After 1911, we can see from figure 1 that British government securities once again became the dominant asset class, only being surpassed by stocks and shares in 1960. This rise in the importance of government debt is largely explained by the outbreak of the two world wars. As with other financial institutions, during World War I, life assurance firms were persuaded to take on large amounts of British government debt to help fund the war effort (Scott 2002). In doing so, they also had to sell off their other investments, particularly those based overseas (Morecroft 2017). The yield on government bonds remained high into the 1920s, but when yields declined below 3 percent in 1932, life assurance companies began to shift away from government bonds. However, during World War II, life assurance companies were once again required to do their bit to help the government finance the war effort. In addition, the nationalisation of certain British industries by the Attlee government from 1945 to 1951 led assurance companies, in some cases, to exchange private industry shares for government bonds (Chester 1975, pp. 240–312).

As can be seen from figure 1, mortgages on land and property were a popular asset choice in the 19th century, overtaking British government securities as the most popular asset between 1851 and 1861. Although they remained the most popular asset until 1911, the share of mortgages declined steadily and substantially from their high in 1861 and never again regained their importance (figures 1 and 2). Supple (1970, p. 337) suggests that this fall was largely down to a decrease in the interest rates available from these mortgages, associated with the declining value of land and the agricultural depression of the late 19th century. Notably, when
Figure 1. Asset portfolios of UK life assurance sector, 1830–2016.
Sources: See table 1.
The portfolios of UK life assurance sector over two centuries

Figure 2. Asset portfolios of UK life assurance sector, 1881–1915.

Sources: See table 1.
life assurance companies moved away from mortgages in the 20th century, building societies stepped in to fill the void (Casu and Gall 2016).

Figures 1 and 2 show that investment by life assurers in debentures grew rapidly in the decades prior to 1911, coinciding with the initial growth phase of this new market. There were three reasons for this shift into debentures. First, the supply of debentures expanded rapidly from an almost non-existent base in the four decades after 1860 (Jefferys 1977, pp. 241–251; Coyle and Turner 2013). Second, debentures provided a higher rate of return than other fixed income assets (Supple 1970, p. 337; Coyle and Turner 2013). Third, the mild deflation of the era meant that the capital invested in debentures was secure. An inspection of individual company data contained within the Board of Trade reports attests to the popularity of investing in railway debentures rather than the debentures of other industries. Railways were by some distance the largest sector listed on the stock exchange in this era, and in addition to being widely available, railway debentures also paid handsome returns and were very safe (Coyle and Turner 2013). However, the popularity of debentures did not last. As can be seen from figure 1, between 1911 and 1923, the proportion of debentures in portfolios fell substantially. The Railway Act of 1921 reduced the volume of railway debentures available and high wartime inflation made debentures unattractive as an investment (Coyle and Turner 2013). Additionally, the obligation to hold more government bonds during the war may have facilitated the shift away from other fixed income assets, such as debentures. Notably, the Financial Times (1915) forewarned that life assurers would face serious depreciation in their assets because of the war and its associated inflation.

Figure 1 also shows that the proportion of portfolio investment in foreign government securities rose steadily after the 1860s, peaked at 15 percent in 1911, and then declined after 1931.5 Harding (1894), when looking at British colonies in Canada, Australia, and South Africa, believed that colonial mortgages and government securities could earn a higher return than their UK equivalents at the time. He therefore recommended such investments as an antidote to the falling interest rates in the UK. Given that these were British colonies, it could be argued that these were stable polities, and so Bailey’s main investment canons were kept intact by investing in these securities.

Figure 1 also shows that in the 50 years prior to 1911, the percentage of the average portfolio invested in company shares increased rather slowly from a very low base. Baker and Collins (2003) suggest that this reluctance to invest in equity was mostly attributable to the prevalence of family ownership. However, recent scholarship has revealed that far from being concentrated in family hands, company ownership was very diffuse even outside the largest public firms (Acheson et al. 2015; Foreman-Peck and Hannah 2012).

The reluctance at this stage to invest large proportions in equities could be explained by the adherence to Bailey’s investment principles. As well as the security of the capital being paramount, his second principle was that while “the highest practicable rate of interest be obtained,” this was subordinate to the first canon (Bailey 1862, p. 144). Nevertheless, investment in equities increased rapidly between 1891 and 1901. As can be seen in figure 2, there was a sharp increase in holdings of stocks and shares during the mid-1890s, increasing from 6.10 percent of total assets in 1893 to 11.51 percent of total assets in 1901.6 This

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5 There was a steep increase in foreign government securities and loans on rates between 1910 and 1911—see figure 2. This was due to a recategorization of assets by the Board of Trade, which expanded the foreign government securities to include municipal and provincial securities for the first time. They had previously been recorded as loans on rates.

6 In monetary terms, investment in stocks and shares increased from £13.6 m to £34.6 m in this period.
The portfolios of UK life assurers over two centuries

coincided with a collapse in yields on mortgages and bonds (Treble 1980), but also a substantial stock-market promotion boom (Acheson et al. 2016, Cheffins 2008, p. 176; Cottrell 1980, pp. 168–176, Quinn 2019). However, life assurers did not invest in these types of shares. Looking at individual assurance company data from 1901, it appears that most shares in portfolios were railway stocks, which were stable blue-chip companies. Their popularity with life assurance companies also stemmed from their three percent and above dividends (Alborn 1998, p. 239), while railway debentures yielded less than 3 percent in the 1890s (Klovland 1994).

As can be seen from figure 1, starting in the 1890s, stocks and shares had an inexorable rise in the portfolios of assurance companies, with a slight fall between 1911 and 1923. By 1960 it was the largest asset class and the exposure to equity was no longer in railway securities because the railways had been nationalised. By 1991 stocks and shares were by some distance the dominant asset class in the portfolios of assurance companies—the cult of equity had triumphed.

It is important to note that, up and until 1960, the stocks and shares asset class reported in our sources included investments in both ordinary and preference shares. However, from 1911 to 1960, we can obtain a split between ordinary and preference share investment from the Board of Trade summaries. This shows that the proportion invested in ordinary shares relative to preference shares increased over time: in 1911 it was 40 percent, 53 percent in 1923, 51 percent in 1938, 58 percent in 1951, and it had reached 77 percent by 1960. It is difficult to ascertain the split between ordinary and preference shares prior to 1911 because we are reliant on individual company accounts, which did not always differentiate between preference and ordinary shares. Based on the available data, the proportion of stocks and shares invested in ordinary shares was 3 percent in 1881, but it had reached 32 percent by 1901. Overall, the data suggests that the increased investment in stocks and shares by life assurance companies from the 1890s onwards was split evenly between preference and ordinary shares until the 1950s.

To understand the rise of the cult of equity after the 1920s, one must first consider the economic conditions of the interwar period. After the Great Depression, the government’s cheap money strategy led to falling bond yields. As such, assurance companies needed to move to an asset class that would provide a return in the presence of potentially high inflation rates. The American economist Edgar Lawrence Smith found that equities outperformed bonds in the period from 1866 to 1922 (Smith 1924). He suggested that rather than viewing investment in equities as a form of speculation, it should be viewed as a credible long-term investment as part of a diversified asset portfolio. Similarly, a 1927 Economist article, viewed investment in equities as a safeguard against inflation. Then, in 1928, in a re-evaluation of Bailey’s investment principles, the chief actuary of the Legal and General, H. E. Raynes, put forward the idea that investing in equities as part of the diversification of asset portfolios of life assurance companies would improve investment security (Raynes 1928).

After 1960, stocks and shares continued to dominate, representing over half of the asset portfolio by the early 1990s and 2000s. Moody (1964) provides some insights into this phenomenon, noting that the inflation in the preceding 20 years had pushed up share prices.

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7 This may be driven by the amalgamation of railways following the Railway Act of 1921. However, the individual investment level data for this period do not exist.

8 Detailed data are available for 80 percent of the total equity assets in 1881, but only around a third of the total equity assets in 1901.

9 *The Economist*, “Life Office Investments,” 28 October 1927.
Figure 3. Ten-year average annual returns on debentures and equities compared to their percentage holdings by life assurance companies, 1871 to 2011.

Sources: Stocks and Shares: 1871–1899: Grossman (2002), 1900–2009: Dimson et al. (2011) 2010: Barclays Capital (2011). Corporate Bonds: Coyle and Turner (2013).

and dividends. Indeed, in the view of Baker and Collins (2003), the fear of inflation was the decisive long-term factor driving the shift to equities in the post-war period.

Were life assurance companies simply moving into equities because they were providing a more substantial return? From figure 3, we can see a positive but weak correlation between the previous decade’s return on shares and their subsequent asset allocation, which suggests that changes in asset allocation were not just driven by previous returns. For example, the increased investment in equities that occurred in the 1960s and 1970s was despite relatively poor returns compared to previous decades, with some having little confidence in them and even viewing the cult of equity as being dead (Plender 1982, p. 38). Other factors beyond returns also help explain the sharp increase in equity investment from 1981 to 1991 (see figure 1). This sharp increase coincided with the privatization of various state-owned industries, which increased the supply of high-quality equities available to invest in. In addition, there was an increase in investment in equities by institutional investors after the lifting of exchange controls in 1979 and deregulation of London security markets in the early 1980s (Cheffins 2008, pp. 352–3).

As can be seen from figure 1, the 1960s and 1970s also saw the emergence of property as an important asset class for insurance companies. McIntosh and Sykes (1985, p. xv) note that institutional investors, such as life assurance companies, increased their investment in

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*Avrahampour (2015)* notes that after the Second World War, Ross Goobey, the chief actuary of Imperial Tobacco pension fund, changed the fund’s investments depending on what type of asset gave the highest return, and shifted into equities as a result.
properties ten-fold in the 25 years after 1960, and in their view, this was unique to the UK. Barras (1994) finds that while property outperformed equities in the 1970s, by the 1980s, the reverse was the case, which resulted in life assurance companies moving away from property, as seen in figure 1.

Figures 1 and 2 reveal that loans on rates, which were loans to local authorities to finance infrastructure investment and secured on their rates, were a popular asset class from the 1870s until circa 1900. This period corresponds to a rapid expansion of public infrastructure investment by local authorities. It also corresponds to the period when larger local authorities began to issue their own debt securities on financial markets, which undoubtedly reduced their need to borrow from assurance companies. The disappearance of loans on rates after the 1950s is principally due to the centralisation of government in the UK and the removal of borrowing powers from local government.

The final category of assets in figures 1 and 2 is loans on policies. These loans were made to policyholders on the security of their life assurance policy. These rarely constituted more than five percent of the average portfolio and they had effectively disappeared as an asset class by the 1950s. Notably, there was competition for insurance companies in this sphere as banks also lent against the security of life assurance policies (Collins and Baker 2003, pp. 184–6).

The final aspect to consider in this section is whether life assurance companies invested in an optimal manner during their emergence as an important institutional investor. Using data from 1870 to 1913, Goetzmann and Ukhov (2006) define an optimal portfolio for investment in British listed securities. Due to data constraints, we can only compare this optimal portfolio with life assurance portfolios in terms of the proportion of the portfolio in debt and equity. The Goetzmann and Ukhov (2006) optimal portfolio is invested 55.7 percent in debt and 44.3 percent in equity. However, life assurance company portfolios from 1881 to 1913, where we have continuous annual data, invested nine and a half times more in debt than equity, on average. This means that life assurance portfolios were likely to be closer to the minimum variance portfolio on the efficient frontier.

Why was this the case? As regulation at the time placed no restrictions on what life assurance companies could invest in, the answer lies in the adherence to the Bailey canons. While the optimal portfolio is concerned with obtaining the highest rate of return for a given level of risk, the Bailey canons stated that the security of capital took precedence over obtaining the highest return. Therefore, it is no surprise that life assurance companies invested much less in equities than suggested by the optimal portfolio of Goetzmann and Ukhov (2006).

This section has shown that asset portfolios of UK life assureds over two centuries have changed substantially over the past 200 years. The evidence thus far suggests that historical contingency and political reaction to events shaped this change in portfolios. However, it is possible that changes in portfolios were principally driven by regulation of the life assurance industry or by changing firm characteristics. We explore these alternative drivers of change in the next two sections.

5. Regulation and asset portfolios

As mentioned above, the UK life assurance industry was largely unregulated until the passage of the Life Assurance Companies Act of 1870. This Act shaped the philosophy of all future regulation of the UK life assurance sector, which was that assurers had to disclose on an annual basis the status and security of their business, but they were not subject to any regulation with respect to the assets that they could invest in. While a life assurance company’s related liabilities had to be kept separate from other insurance liabilities,
there was no restriction on the type of liabilities that a life assurance company could have, and there was no requirement for assets to be ringfenced on the balance sheet for life assurance liabilities. This would suggest that regulation was not a key driver of the change in asset portfolios over the long run. An interesting contrast can be made with another common law country—the United States—to show that regulation potentially can have a major effect on asset portfolios. Unlike the UK, the United States have had much more stringent regulations on what insurance companies could invest in. This contrast between the UK and United States is all the more helpful because the life assurance sectors in the two jurisdictions have had broadly similar environments over the past 150 years or so in terms of the supply of financial assets, the performance of financial assets and the wider macroeconomy.

Figure 4 compares the asset allocation of the US life insurance sector from 1871 to 2016 with that of the UK life assurance sector. Perhaps the most striking difference in figure 4 is that while the UK life assurance sector saw the emergence of equity as the dominant asset class after World War II, this did not happen in the United States until much later. This difference is largely because the investments of life assurance companies in the United States were regulated more stringently than their UK counterparts. Regulation of insurance companies in the United States depends on the state an insurance company is licensed in. New York State is the largest state with regard to life insurance, licensing the majority of US life insurance assets. In addition, the Appleton rule, a 1900 New York State ruling codified in 1939, states that insurers who do business in New York State must abide by the New
York Insurance Code in respect of all of their business. This applied even if the business was carried out outside that state, meaning that the impact of New York State regulation was much wider than on the state itself (Pottier and Sommer 1998). Historically, New York State has had some of the most stringent regulation of any state (Cummins and Sommer 1996). For example, New York State restricted the proportions of assets that could be held in equities, property, and bonds not of investment-grade quality (Kamen and Toppeta 1989). Rutterford and Hannah (2016, p. 250) note that in New York, insurance companies were banned from holding equities in their general accounts until 1951, and the then 20 percent restriction was only lifted in 1990. Only after the deregulation of the insurance market, and the removal of such restrictions, did the percentage holdings in equities substantially rise. The restriction on investment in property by US life insurance companies also meant that they, unlike their UK equivalents, were unable to take advantage of buoyant property markets in the 1970s and 1980s.

The fact that US insurance companies were constrained in their ability to invest in equity, meant that by default they had to invest a greater proportion in mortgages and bonds. Indeed, Snowden (1995, p. 210) notes that insurance companies came to dominate the US mortgage market by developing monitoring structures to assess such mortgages. He also noted that their dominance of the US mortgage market after 1940 was maintained by being involved in mortgage programs provided by the federal government. However, there was a decline in investments in mortgages for US life assurance companies after 1970. Wright (1992) suggests that, due to higher returns available on shares in the 1960s and 1970s, the life insurance sector moved away from offering mortgage loans to individual homeowners.

This comparison with the United States reveals that the US regulatory environment shaped the investment portfolios of its insurance companies by delaying the shift into equity. Ultimately, the comparison reveals that regulation can shape capital market development and the supply of funds to different sectors in the economy.

6. Firm characteristics and asset portfolios

In this section we examine whether changes in the characteristics of life assurance companies were a major driver of the changes in their asset management practices over the long run. To do so, we use multivariate panel regressions to analyse 10 observable company-specific explanatory variables that might have influenced the asset allocation of assurance companies over time.

First, firm size (FirmSize) may have affected portfolios. For example, larger firms may have invested differently from their smaller peers, or may have been able to take more risk or invest more in illiquid assets. Second, we create a binary variable (LifeFire) that distinguishes between companies offering life assurance and those offering fire insurance in addition to life assurance. The latter may have had to invest differently because of the different risk profile of fire insurance as opposed to life assurance. Our third explanatory variable is London, which is a binary variable that takes the value one if a firm’s headquarters were in London, and zero otherwise. Firms based in London may have experienced a local or regional effect in that they may have had more choice on what assets they could invest in due to their proximity to the London Stock Exchange. They could have also attracted a different and perhaps more sophisticated type of policyholder by being based in London.
The fourth explanatory variable we include is a binary variable (Mutual) that indicates whether an assurance company is mutually owned versus shareholder owned. Mutual companies, owned as they were by policyholders, may have taken less risk with their asset portfolios than a shareholder owned company, as there was no need to provide a return to shareholders. Our fifth explanatory variable is Unlimited, which is a binary variable that equals one if an assurance company had unlimited liability, and zero otherwise. A company with unlimited liability may have had a more cautious investment strategy because its shareholders were fully liable for losses. The sixth explanatory variable is CalledCapitalRatio, which reflects the proportion of the company’s subscribed capital that has been called up. The rationale of this variable is similar to the Unlimited one in that a company with a greater degree of uncalled capital may have had a more cautious strategy due to having more capital to be called up in the event of a company failure.

The seventh explanatory variable is Politicians, which is a binary variable that equals one if the board of directors contains one or more Members of Parliament and zero otherwise. The rationale for including this variable is that studies have shown that companies in Victorian Britain that had politicians on their boards behaved differently than their peers (Braggion and Moore 2013; Campbell and Turner 2011). In the case of life assurance companies, having a politician on the board may mean, for example, that the company invests more in government bonds.

Our final explanatory variables are PremiumsRatio, ClaimsRatio, and FundsRatio. While each of these variables relate to the cash flows associated with the policies of the life assurance company, each one looks at a different aspect of life assurance company cash flows. In a given year, every life assurance company will receive premiums from their policyholders to maintain their policy, and also pay out claims to policyholders, should a life assurance policy fall due. PremiumsRatio and ClaimsRatio capture the ratio of premiums and claims in a given year relative to the company’s assets, respectively. In contrast, the FundsRatio variable looks at the liabilities relating to life assurance and annuity policies that the life assurance company will have to meet, when such policies fall due in the future, as opposed to the current year’s claims that were paid out. This variable is the ratio of the company’s life and annuity funds relative to the company’s assets. These three variables are included as they may have influenced the composition of the asset portfolios in terms of asset risk and liquidity.

We have constructed panel data for UK life assurance companies for 1881, 1891, 1901, 1911, 1923, 1931, 1938, 1951, and 1960 to enable a panel regression analysis. We are constrained by data availability because several key variables are not available before 1881 and company-level asset portfolio data are not available after 1960. However, 1881 to 1960 is the period when most changes occurred to insurance company asset portfolios. The asset classes analysed are as in table 2 with the exception of property, but we also examine two combined asset classes—corporate securities (debentures plus stocks and shares) and government securities (British government securities plus foreign government securities). We also carry out a Shapley decomposition, which shows what proportion of the variance in the regression is explained by different categories of variables used in the analysis. We decompose the variance in the regressions into that explained by our explanatory variables, time fixed effect variables, and company fixed effect variables.

The definitions of and data sources for our explanatory variables are in table 4 and table 5 shows the summary statistics for our dependent and explanatory variables. Not every life
Table 4. Definitions of explanatory variables

| Variable name   | Definition                                                                 | Data source                                                   |
|-----------------|---------------------------------------------------------------------------|---------------------------------------------------------------|
| FirmSize        | Natural log of the life assurance company’s assets.                       | Board of Trade reports.                                      |
| LifeFire        | Dummy variable, set to 1 if the company also offered fire insurance, 0 otherwise. | Board of Trade reports and The Stock Exchange Yearbook. |
| London          | Dummy variable, set to 1 if the company had its head office in London, 0 otherwise. | Board of Trade reports and The Stock Exchange Yearbook. |
| Unlimited       | Dummy variable, set to 1 if the company had unlimited liability, 0 otherwise. | December Investor’s Monthly Manuals and The Stock Exchange Yearbook. |
| Mutual          | Dummy variable, set to 1 if the company was a mutual, 0 otherwise.        | The Stock Exchange Yearbook.                                 |
| CalledCapitalRatio | Ratio of called up capital to total capital.                         | December Investor’s Monthly Manuals and The Stock Exchange Yearbook. |
| Politicians     | Dummy variable, set to 1 if the company had MPs, 0 otherwise.            | The Stock Exchange Yearbook.                                 |
| PremiumsRatio   | Ratio of premiums to company assets.                                     | Board of Trade reports.                                      |
| ClaimsRatio     | Ratio of claims to company assets.                                       | Board of Trade reports.                                      |
| FundsRatio      | Ratio of life and annuity funds to company assets.                       | Board of Trade reports.                                      |

assurance company in our sample had information on all of the explanatory variables at each observation point. We have 153 unique companies and 691 firm-years in our sample.

Table 5 shows wide variation in both the PremiumsRatio and ClaimsRatio variables, having high maximum values. This also occurs, to a much lesser extent, within the categories of assets that we are investigating. While this shows that the investments of life assurance companies were highly varied, this also raises the question of outliers, and the potential for such outliers to affect the results. To address this issue, all variables that are not of a binary or logarithmic nature have been winsorised, at a tolerance of 1 percent in each direction.

With the caveat that this is a dataset across time, it is worth noting from Table 5 that the majority of companies in our sample was based in London and had Members of Parliament (MPs) on their board. The majority of companies did not offer fire insurance in addition to life assurance, and the proportion of companies with unlimited liability was less than 10 percent.

Tables 6 and 7 show regression results of percentage holdings in each asset against firm characteristics and Shapley decompositions of the regression results. At least four things are worthy of comment from the regression results. First, larger assurance firms invested marginally more in mortgages and loans on policies, but FirmSize overall is not significant for most asset classes.

11 Where a life assurance company did not have all the information required for a given year, it has been dropped as a data entry for that year.
12 This made little difference to our results.
Table 5. Summary statistics

|                          | Minimum | Maximum | Average | Std. dev. | Number of observations |
|--------------------------|---------|---------|---------|-----------|------------------------|
| Debentures               | 0.00%   | 60.43%  | 12.43%  | 10.38%    | 691                    |
| Stocks and shares        | 0.00%   | 58.18%  | 12.33%  | 11.23%    | 691                    |
| British government securities | 0.00% | 90.24%  | 12.92%  | 14.87%    | 691                    |
| Foreign government securities | 0.00% | 72.14%  | 10.20%  | 8.88%     | 691                    |
| Mortgages                | 0.00%   | 88.20%  | 22.07%  | 19.67%    | 691                    |
| Loans on policies        | 0.00%   | 36.14%  | 3.94%   | 4.09%     | 691                    |
| Loans on rates           | 0.00%   | 81.35%  | 6.36%   | 9.76%     | 691                    |
| Corporate securities     | 0.00%   | 81.95%  | 24.77%  | 16.88%    | 691                    |
| Government securities    | 0.00%   | 92.34%  | 23.12%  | 17.39%    | 691                    |
| Total assets (£m)        | 0       | 1,035   | 21      | 61        | 691                    |
| FirmSize                 | 6.88    | 20.76   | 15.14   | 2.01      | 691                    |
| LifeFire                 | 0.00    | 1.00    | 0.41    | 0.49      | 691                    |
| London                   | 0.00    | 1.00    | 0.63    | 0.48      | 691                    |
| Unlimited                | 0.00    | 1.00    | 0.08    | 0.27      | 691                    |
| Mutual                   | 0.00    | 1.00    | 0.27    | 0.44      | 691                    |
| CalledCapitalRatio       | 0.00    | 1.00    | 0.34    | 0.37      | 691                    |
| Politicians              | 0.00    | 1.00    | 0.56    | 0.50      | 691                    |
| PremiumsRatio            | 0.02%   | 220.03% | 13.65%  | 24.57%    | 691                    |
| ClaimsRatio              | 0.00%   | 137.28% | 7.17%   | 10.42%    | 691                    |
| FundsRatio               | 0.00%   | 99.84%  | 73.50%  | 27.92%    | 691                    |

Sources: Statements and Abstracts of Reports Deposited With the Board of Trade, under the Life Assurance Companies Act 1870/Assurance Companies Act 1909, Stock Exchange Yearbooks, 1881, 1891, 1901, 1911, 1923, 1931, 1938, 1951, and 1960, and Investors Monthly Manuals, December 1871, December 1881, December 1891, December 1901, and December 1911.

Second, mutual companies invested in a different way to their non-mutual peers. Table 6 shows that mutual companies invested significantly more in debentures and stocks and shares than non-mutual companies, investing 13.5 percent and 12.4 percent more than non-mutual companies, respectively. However, they invested substantially less in mortgages and loans on policies than non-mutual companies. At first glance, it seems surprising that it was mutual companies that invested more in stocks and shares. However, Morecroft and Turnbull (2019) point out that a more sophisticated investment strategy originated in the mutual companies in the 1920s. Notably, in a 1922 speech, J. M. Keynes wanted the mutual life assurance company to lead the way in improving investment principles.13 The nature of the with-profits life assurance policy that was associated with the mutual life assurance company may explain why they invested more in shares. Because profits were distributed to the policyholders rather than going to shareholders, there was a greater benefit to members from investing in higher yielding assets such as equities.14 However, the proportion of life assurance companies that

13 Report to the Annual Meeting of the National Mutual, 18 January 1922.
14 The collapse of the Equitable Life was an example of a mutual company wanting to provide high bonuses to its policyholders to remain competitive. They offered Guaranteed Annuity Rates (GAR) to some of their policyholders, and when in the 1990s, the market rate for annuities fell below their GAR, a discretionary final bonus had to be added to the policy to meet the contract. This was a cost that the Equitable Life ultimately could not meet.
Table 6. **Panel regression on life assurance asset portfolios, excluding called capital**

|                | Debitures | Stocks | Brit. gov. | Foreign gov. | Mortgages | Loans on policies | Loans on rates | Corporate | Government |
|----------------|-----------|--------|------------|--------------|-----------|------------------|---------------|-----------|------------|
| **FirmSize**   | -0.004    | -0.009 | -0.022     | 0.001        | 0.038**   | 0.009***         | -0.012        | -0.014    | -0.021     |
|                | (0.008)   | (0.010)| (0.015)    | (0.007)      | (0.018)   | (0.002)          | (0.011)       | (0.009)   | (0.015)    |
| **LifeFire**   | 0.020     | 0.017  | 0.027      | -0.025       | -0.008    | -0.006           | 0.007         | 0.037     | 0.002      |
|                | (0.016)   | (0.016)| (0.019)    | (0.017)      | (0.033)   | (0.006)          | (0.021)       | (0.023)   | (0.021)    |
| **London**     | -0.012    | 0.057**| -0.001     | -0.027       | 0.047     | -0.016*          | -0.086*       | 0.045     | -0.026     |
|                | (0.022)   | (0.028)| (0.032)    | (0.044)      | (0.035)   | (0.009)          | (0.046)       | (0.046)   | (0.050)    |
| **Unlimited**  | -0.037    | -0.001 | 0.005      | 0.011        | -0.005    | 0.000            | -0.030        | -0.037    | 0.017      |
|                | (0.033)   | (0.022)| (0.021)    | (0.019)      | (0.036)   | (0.005)          | (0.029)       | (0.050)   | (0.028)    |
| **Mutual**     | 0.135***  | 0.124***| -0.063*    | 0.011        | -0.185*** | -0.038***        | 0.062*        | 0.259*** | -0.054*    |
|                | (0.028)   | (0.017)| (0.034)    | (0.012)      | (0.017)   | (0.006)          | (0.033)       | (0.029)   | (0.030)    |
| **Politicians**| -0.013    | 0.011  | -0.009     | 0.011        | 0.011     | -0.004*          | -0.004        | -0.001    | 0.002      |
|                | (0.009)   | (0.012)| (0.013)    | (0.008)      | (0.019)   | (0.003)          | (0.010)       | (0.014)   | (0.014)    |
| **PremiumsRatio** | 0.041     | 0.128**| -0.097     | -0.025       | -0.220    | 0.032            | -0.205**      | 0.177**   | -0.123     |
|                | (0.050)   | (0.063)| (0.073)    | (0.044)      | (0.163)   | (0.021)          | (0.097)       | (0.082)   | (0.096)    |
| **ClaimsRatio** | -0.268*   | -0.517**| -0.151     | -0.005       | 0.708     | -0.122*          | 0.550**       | -0.813*** | -0.157     |
|                | (0.144)   | (0.212)| (0.240)    | (0.135)      | (0.474)   | (0.066)          | (0.252)       | (0.253)   | (0.302)    |
| **FundsRatio** | 0.039     | 0.038  | 0.005      | -0.009       | 0.107*    | 0.047***         | 0.091**       | 0.080     | 0.001      |
|                | (0.030)   | (0.038)| (0.035)    | (0.044)      | (0.061)   | (0.011)          | (0.044)       | (0.053)   | (0.051)    |
| **Constant**   | 0.076     | 0.090  | 0.375*     | 0.087        | -0.194    | -0.084***        | 0.238         | 0.175     | 0.462**    |
|                | (0.113)   | (0.128)| (0.209)    | (0.087)      | (0.218)   | (0.025)          | (0.153)       | (0.112)   | (0.221)    |
| **Comp fixed effects** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Time fixed effects** | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes | Yes |
| **Obs**        | 691       | 691    | 691        | 691          | 691       | 691              | 691           | 691       | 691        |
| **R² (within)**| 0.380     | 0.510  | 0.668      | 0.249        | 0.488     | 0.380            | 0.213         | 0.534     | 0.660      |

Shapley decomposition of explained variance

| Explanatory variables | 9.8% | 15.8% | 14.2% | 4.8% | 12.6% | 22.0% | 16.9% | 15.4% | 11.6% |
| Time fixed effects    | 22.6%| 34.0% | 54.2% | 18.4%| 23.9% | 23.5% | 12.8% | 27.6% | 48.4% |
| Company fixed effects | 64.6%| 50.2% | 31.6% | 76.8%| 63.5% | 54.5% | 70.3% | 57.0% | 40.0% |

*significant at a 10% level, **significant at a 5% level, ***significant at a 1% level.

Notes: This table shows the results of various panel OLS regressions with fixed effects and robust standard errors. The years included in the analysis are 1881, 1891, 1901, 1911, 1923, 1931, 1938, 1951, and 1960. The dependent variables are shown across the top row of the table and are percentage holdings in the respective asset class. Please see Table 2 for more information. The explanatory variables used are in the first column of the table and are defined in Table 4. Mutual companies do not have uncalled capital and so the CalledCapitalRatio variable has been excluded. A Hausman test was conducted, and it was determined that company and time fixed effects should be used.
Table 7. Panel regression on life assurance asset portfolios, excluding mutual companies

|                      | Debentures | Stocks | Brit. gov | Foreign gov | Mortgages | Loans on policies | Loans on rates | Corporate | Government |
|----------------------|------------|--------|-----------|-------------|-----------|-------------------|---------------|-----------|------------|
| FirmSize             | −0.004     | −0.002 | −0.020    | −0.007      | 0.045**   | 0.007***          | −0.020**      | −0.006    | −0.027     |
|                      | (0.011)    | (0.013)| (0.018)   | (0.008)     | (0.021)   | (0.002)           | (0.009)       | (0.010)   | (0.020)    |
| LifeFire             | 0.026      | 0.029  | 0.025     | −0.036*     | −0.039    | −0.005            | 0.029         | 0.055*    | −0.011     |
|                      | (0.020)    | (0.019)| (0.019)   | (0.020)     | (0.037)   | (0.006)           | (0.022)       | (0.028)   | (0.024)    |
| London               | −0.020     | 0.053  | 0.017     | −0.065      | 0.040     | −0.006            | −0.028        | 0.034     | −0.047     |
|                      | (0.024)    | (0.034)| (0.029)   | (0.046)     | (0.044)   | (0.006)           | (0.035)       | (0.049)   | (0.053)    |
| Unlimited            | −0.037     | −0.002 | 0.002     | −0.021      | 0.003     | −0.005            | −0.038        | 0.006     |            |
|                      | (0.040)    | (0.024)| (0.026)   | (0.021)     | (0.041)   | (0.005)           | (0.025)       | (0.057)   | (0.032)    |
| CalledCapitalRatio   | −0.004     | −0.001 | 0.062**   | 0.039       | −0.114*** | 0.003             | 0.001         | 0.003     | 0.100***   |
|                      | (0.026)    | (0.025)| (0.030)   | (0.025)     | (0.043)   | (0.006)           | (0.029)       | (0.035)   | (0.037)    |
| Politicians          | −0.012     | 0.020  | 0.002     | 0.003       | 0.005     | −0.006**          | −0.001        | 0.008     | 0.005      |
|                      | (0.013)    | (0.014)| (0.015)   | (0.010)     | (0.022)   | (0.009)           | (0.016)       | (0.016)   |            |
| PremiumsRatio        | 0.076      | 0.159**| −0.038    | −0.066      | −0.278*   | 0.032*            | −0.299***     | 0.246**   | −0.103     |
|                      | (0.050)    | (0.078)| (0.095)   | (0.061)     | (0.147)   | (0.016)           | (0.085)       | (0.097)   | (0.128)    |
| ClaimsRatio          | −0.342**   | −0.590**| −0.276    | 0.072       | 0.838*    | 0.101*           | 0.754***       | −0.967*** | −0.266     |
|                      | (0.154)    | (0.272)| (0.301)   | (0.175)     | (0.472)   | (0.055)           | (0.274)       | (0.312)   | (0.379)    |
| FundsRatio           | 0.069**    | 0.060  | 0.003     | −0.018      | 0.114     | 0.049***          | 0.063         | 0.133**   | −0.010     |
|                      | (0.035)    | (0.041)| (0.040)   | (0.055)     | (0.069)   | (0.012)           | (0.040)       | (0.053)   | (0.062)    |
| Constant             | 0.088      | 0.008  | 0.308     | 0.235**     | −0.296    | −0.084***         | 0.311**       | 0.106     | 0.544*     |
|                      | (0.149)    | (0.165)| (0.255)   | (0.116)     | (0.251)   | (0.027)           | (0.125)       | (0.128)   | (0.293)    |
| Comp fixed effects   | Yes        | Yes    | Yes       | Yes         | Yes       | Yes               | Yes           | Yes       | Yes        |
| Time fixed effects   | Yes        | Yes    | Yes       | Yes         | Yes       | Yes               | Yes           | Yes       | Yes        |
| Obs                  | 505        | 505    | 505       | 505         | 505       | 505               | 505           | 505       | 505        |
| $R^2$ (within)       | 0.344      | 0.443  | 0.627     | 0.236       | 0.430     | 0.425             | 0.230         | 0.464     | 0.637      |

Shapley decomposition of explained variance

|                          | Explanatory variables | Time fixed effects | Company fixed effects |
|--------------------------|-----------------------|--------------------|-----------------------|
|                          | 11.1%                 | 14.8%              | 15.5%                 |
|                          | 15.4%                 | 37.0%              | 36.1%                 |
|                          | 3.7%                  | 13.5%              | 80.4%                 |
|                          | 18.8%                 | 18.4%              | 69.1%                 |
|                          | 15.5%                 | 53.1%              | 66.0%                 |
|                          | 13.1%                 | 42.8%              | 44.1%                 |

**significant at a 1% level, ***significant at a 5% level, *significant at a 10% level.

Notes: This table shows the results of various panel OLS regressions with fixed effects and robust standard errors. The years included in the analysis are 1881, 1891, 1901, 1911, 1923, 1931, 1938, 1951, and 1960. The explanatory variables are shown across the top row of the table and are percentage holdings in the respective asset class. Please see Table 4 for more information. The explanatory variables used are in the first column of the table and are defined in Table 4. Mutual companies do not have uncalled capital and so mutual companies have been excluded. A Hausman test was conducted, and it was determined that company and time fixed effects should be used.
were mutual did not change much over time, ranging from 25 percent in 1881 to 33 percent in 1960. Therefore, changes in the proportion of mutual companies over time cannot explain changes in overall asset allocation in the life assurance industry.

Third, the results in tables 6 and 7 indicate that unlimited liability and the amount of uncalled capital had little bearing on the asset portfolios of insurance companies. In other words, the downside risk faced by shareholders did not affect how companies invested their funds. This, however, is not to say that these features did not affect the riskiness of a life assurance company’s business model.

Fourth, the coefficients on the ratio variables relating to premiums paid in, claims paid out, and life and annuity liabilities held by life assurance companies reveal some interesting findings. The regression results show that companies with a higher proportion of premiums to assets (PremiumsRatio) invested more in equities and corporate securities. Firms with a higher proportion of life and annuity liabilities relative to assets (FundsRatio) invested significantly more in debentures. Conversely, companies that had a higher proportion of claims relative to assets (ClaimsRatio) invested in relatively fewer equities and debentures.

However, as with the findings for the Mutual variable, these correlations cannot explain the overall changes in asset allocation of the industry over time. For example, figure 1 shows that the proportion of portfolios invested in equities increased over time, yet the average ratio of premiums to assets (PremiumsRatio) decreased over the period we analyse in the panel regressions. The increase in investment in equities is most pronounced between 1923 and 1960, but the average ClaimsRatio barely changes over this period. Similarly, the rise in debentures is most pronounced between 1881 and 1911, but that coincided with a decrease in the average ratio of life and annuity liabilities to assets (FundsRatio). Therefore, the changes in industry asset allocations over time do not occur in a way that is consistent with the results implied by changes in these variables alone.

Overall, the regression results suggest that while these firm-specific characteristics can explain some of the variation in asset allocation within life assurance firms, they cannot explain the observed shifts in the industry's asset allocation over time. This is supported by Shapley decompositions of our regressions. The Shapley decompositions in tables 6 and 7 show that the firm-specific explanatory variables together can only explain a minority of the variation in the regressions. For example, table 6 shows that our firm-specific variables can explain between 4.8 percent and 22 percent of the variation in portfolio asset allocation.

Company fixed effects explain far more of the variation in these regressions, ranging from 31 to 80 percent depending on the asset class. Company fixed effects control for company characteristics that we cannot measure or observe, but that do not vary over time or change at a constant rate over time. Some examples of this would be the asset management style of the company, their adherence to investment canons, and their actuarial expertise.

Time fixed effects explain anywhere from 18 to 54 percent of the variation in these regressions. Time fixed effects control for factors that change over time but do not vary across firms. Notably, the Shapley decomposition for the amount invested in government bonds suggests that time fixed effects are the main explanatory factor. This aligns with our earlier observation that the supply of government bonds varied greatly across the two centuries of our sample due to government war needs. Other examples of time fixed effects could include changes in economic and demographic factors such as inflation, the equity risk premium, and the proportion of pensioners in the population. As we can observe these three potentially important factors, we run further regressions including them. However, as our panel data are decadal, these results must be viewed with the caveat that there are just nine observations for each of these variables and we cannot include time fixed effects in these regressions because
of multicollinearity with these three variables. The results in Tables A1 and A2 show, for example, that the equity risk premium and the proportion of the population over 65 have a significant and positive relationship with investment in equities, and that inflation has a negative and significant relationship with debenture investment.

Overall, the findings in this section are consistent with the explanations put forward in section 4 for the changes in life assurance company asset portfolios over time, in that it is a reaction to the underlying macroeconomic and societal conditions, rather than any change in the companies themselves. The Shapley decompositions of our regression results reveal that company and time fixed effects appear to be the most important determinants of the asset allocations by life assurance companies. In other words, the drivers of changes in asset portfolio over time were events in the wider economy and how insurance companies adapted to those changes through industry-wide changes in investment canons and asset management practices.

7. Conclusion

In this paper we explored the development of the UK’s capital market over the past two centuries through the lens of the most important institutional investor and asset manager—the life assurance industry. Our findings suggest that there have been four epochs in the development of the asset portfolios of UK life assurance companies and therefore in the development of capital markets. The first epoch from c.1800 to c.1850 was where government securities dominated portfolios. This was an era where government debt was in plentiful supply thanks to the Napoleonic Wars. The second epoch from c.1850 to c.1913 was one where mortgages were, by some distance, the principal asset in the portfolios of life assurance companies and where corporate securities, particularly debentures, were becoming increasingly important. Increased availability, as well as the sharp switch of capital away from government debt, enabled investment in these burgeoning asset markets. The third epoch from c.1913 to c.1950 was marked by the reemergence of government debt, the fall in other fixed-income assets such as mortgages and debentures, and the rise of the cult of equity. Government debt was issued in abundance to fund the effort of two world wars and moral suasion was used by the treasury to encourage insurance companies to do their bit to support the war efforts. Inflation during World War I contributed to the diminution of investment in other fixed-income assets and made investment in equities much more attractive because they acted as a hedge against inflation. The fourth and final epoch from c.1950 to the present day was marked by the ascent of equity as the dominant asset class. High inflation in the 1970s contributed to this ascent, as did lifting of exchange controls, privatization, and deregulation of security markets in the 1980s. Fixed-income assets such as company debentures only returned to favour once inflation had been tamed.

Our findings do not imply that deep-seated historical factors that persist over time played no role in the evolution of UK capital markets. Indeed, legal origin, historical religion, or historical decisions about the nature of government may not only have had persistent effects on UK capital markets in and of themselves, but they may also have shaped how political systems responded to historical contingency.

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The portfolios of UK life assurers over two centuries

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## APPENDIX

Table A1. Panel regression on life assurance asset portfolios, excluding called capital

|                | Debentures | Stocks | Brit. Gov. | Foreign Gov. | Mortgages | Loans on Policies | Loans on Rates | Corporate | Government |
|----------------|------------|--------|------------|--------------|-----------|-------------------|----------------|-----------|------------|
| FirmSize       | 0.018***   | -0.005 | 0.000      | 0.018***     | -0.014    | 0.007***          | -0.018**       | 0.012     | 0.018      |
|                | (0.007)    | (0.008)| (0.012)    | (0.005)      | (0.017)   | (0.002)           | (0.009)        | (0.010)   | (0.012)    |
| LifeFire       | -0.003     | 0.008  | 0.037*     | -0.027       | 0.015     | -0.003            | 0.012          | 0.006     | 0.009      |
|                | (0.017)    | (0.016)| (0.021)    | (0.018)      | (0.034)   | (0.006)           | (0.021)        | (0.025)   | (0.024)    |
| London         | -0.003     | 0.058**| -0.003     | -0.023       | 0.038     | -0.016*           | -0.089*        | 0.055     | -0.024     |
|                | (0.022)    | (0.027)| (0.025)    | (0.042)      | (0.039)   | (0.008)           | (0.046)        | (0.044)   | (0.041)    |
| Unlimited      | -0.056     | -0.005 | 0.001      | 0.002        | 0.026     | 0.000             | -0.024         | -0.061    | 0.005      |
|                | (0.036)    | (0.023)| (0.027)    | (0.020)      | (0.026)   | (0.005)           | (0.027)        | (0.053)   | (0.037)    |
| Mutual         | 0.109**    | 0.116***| -0.064    | 0.004        | -0.148*** | -0.033***         | 0.067*         | 0.224***  | -0.061     |
|                | (0.043)    | (0.019)| (0.045)    | (0.010)      | (0.037)   | (0.004)           | (0.039)        | (0.052)   | (0.048)    |
| Politicians    | 0.000      | 0.015  | -0.007     | 0.017**      | -0.011    | -0.005*           | -0.008         | 0.016     | 0.010      |
|                | (0.011)    | (0.012)| (0.013)    | (0.009)      | (0.022)   | (0.003)           | (0.011)        | (0.017)   | (0.015)    |
| PremiumsRatio  | 0.101*     | 0.121* | -0.023     | 0.027        | -0.369**  | 0.027             | -0.216**       | 0.230**   | 0.005      |
|                | (0.053)    | (0.068)| (0.083)    | (0.046)      | (0.159)   | (0.023)           | (0.093)        | (0.089)   | (0.108)    |
| ClaimsRatio    | -0.385**   | -0.498**| -0.228    | -0.079       | 0.920*    | -0.115            | 0.562**        | -0.896*** | -0.315     |
|                | (0.174)    | (0.233)| (0.258)    | (0.147)      | (0.479)   | (0.070)           | (0.248)        | (0.303)   | (0.339)    |
| FundsRatio     | 0.033      | 0.044  | -0.062     | -0.035       | 0.175***  | 0.054***          | 0.092*         | 0.080     | -0.093     |
|                | (0.026)    | (0.040)| (0.038)    | (0.045)      | (0.064)   | (0.010)           | (0.042)        | (0.055)   | (0.066)    |
| ERP            | -0.070     | 0.308***| -0.868*** | -0.529***    | 0.878***  | -0.219***         | 0.266***       | 0.246**   | -1.403***  |
|                | (0.066)    | (0.072)| (0.093)    | (0.058)      | (0.119)   | (0.032)           | (0.066)        | (0.098)   | (0.102)    |
| Inflation      | -0.635***  | -0.440***| 2.490***  | 0.279***     | -1.246*** | -0.093***         | -0.479***      | -1.077*** | 2.759***   |
|                | (0.092)    | (0.128)| (0.187)    | (0.091)      | (0.138)   | (0.040)           | (0.085)        | (0.161)   | (0.182)    |
| Prop65         | -0.327     | 2.417***| 1.884***   | -0.666***    | -2.255*** | -0.304***         | -0.044         | 2.112***  | 1.238***   |
|                | (0.349)    | (0.314)| (0.435)    | (0.228)      | (0.047)   | (0.103)           | (0.309)        | (0.438)   | (0.505)    |
| Constant       | -0.143*    | -0.068 | 0.081      | -0.057       | 0.433**   | -0.044**          | 0.299***       | -0.206    | 0.023      |
|                | (0.084)    | (0.098)| (0.164)    | (0.067)      | (0.199)   | (0.018)           | (0.114)        | (0.125)   | (0.174)    |
| Comp Fixed Effects | Yes    | Yes   | Yes        | Yes          | Yes       | Yes               | Yes            | Yes       | Yes        |
| Time Fixed Effects | No     | No    | No         | No           | No        | No                | No             | No        | No         |

(Continued)
Table A1. Continued

|                | Debentures | Stocks | Brit. Gov. | Foreign Gov. | Mortgages | Loans on Policies | Loans on Rates | Corporate | Government |
|----------------|------------|--------|------------|--------------|-----------|------------------|----------------|-----------|------------|
| Obs            | 691        | 691    | 691        | 691          | 691       | 691              | 691            | 691       | 691        |
| \(R^2\) (within) | 0.151      | 0.469  | 0.511      | 0.157        | 0.352     | 0.272            | 0.193          | 0.369     | 0.454      |

Shapley decomposition of explained variance

|                | Company | Explanatory Variables | ERP, Inflation and Prop65 | Company Fixed Effects |
|----------------|---------|-----------------------|---------------------------|-----------------------|
|                | 14.0%   | 16.4%                 | 16.6%                     | 80.3%                 |
|                | 6.6%    | 45.9%                 | 10.5%                     | 52.3%                 |
|                | 13.1%   | 17.4%                 | 17.4%                     | 37.5%                 |
|                | 24.3%   | 15.1%                 | 10.0%                     | 82.9%                 |
|                | 18.1%   | 17.0%                 | 17.0%                     | 69.5%                 |
|                | 18.5%   |                       | 37.2%                     | 60.5%                 |
|                | 14.5%   |                       |                           | 71.9%                 |
|                |         |                       |                           | 64.5%                 |
|                |         |                       |                           | 48.3%                 |

***—significant at a 1% level, **—significant at a 5% level, *—significant at a 10% level

Notes: This table shows the results of various panel OLS regressions with fixed effects and robust standard errors. The years included in the analysis are 1881, 1891, 1901, 1911, 1923, 1931, 1938, 1951 and 1960. The dependent variables are shown across the top row of the table and are percentage holdings in the respective asset class. Please see Table 2 for more information. The explanatory variables used are in the first column of the table and are defined in Table 4. Mutual companies do not have uncalled capital and so the CalledCapitalRatio variable has been excluded. Time fixed effect variables are not included because of collinearity with ERP, Inflation and Prop 65. Sources of these three variables are as follows: ERP: See Figure 3. Inflation: Bank of England: A millennium of macroeconomic data, A47. Wages and Prices. Prop 65: Mitchell (1988, pp. 15–17). The ERP variable is defined as the average difference in return between equities and gilts, over the prior 10 years. The Inflation variable is defined as the annualised 10 year inflation rate over the prior 10 years. The Prop65 variable is the proportion of the Great Britain population aged 65 and over, derived using the most recent census data as set out in Mitchell (1988), or via linear interpolation of these figures.
Table A2. *Panel regression on life assurance asset portfolios, excluding mutual companies*

|                       | Debentures | Stocks | Brit. Gov. | Foreign Gov. | Mortgages | Loans on Policies | Loans on Rates | Corporate | Government |
|-----------------------|------------|--------|------------|--------------|-----------|-------------------|---------------|-----------|------------|
| FirmSize              | 0.016**    | -0.004 | -0.004     | 0.011*       | 0.000     | 0.006***          | -0.023**      | 0.012     | 0.007      |
| (0.008)               | (0.009)    | (0.014) | (0.006)    | (0.020)      | (0.002)   | (0.008)           | (0.011)       | (0.016)   |
| LifeFire              | 0.001      | 0.018  | 0.047*     | -0.030       | -0.023    | -0.002            | 0.030         | 0.019     | 0.017      |
| (0.020)               | (0.020)    | (0.026) | (0.021)    | (0.039)      | (0.006)   | (0.021)           | (0.031)       | (0.029)   |
| London                | -0.011     | 0.052  | 0.004      | 0.043        | -0.006    | -0.033            | 0.041         | -0.058    |
| (0.027)               | (0.033)    | (0.026) | (0.042)    | (0.053)      | (0.007)   | (0.037)           | (0.050)       | (0.044)   |
| Unlimited             | -0.070*    | -0.010 | 0.015      | 0.018        | 0.003     | -0.002            | -0.080        | 0.012     |
| (0.040)               | (0.025)    | (0.031) | (0.024)    | (0.031)      | (0.006)   | (0.022)           | (0.057)       | (0.043)   |
| Called Capital Ratio  | -0.008     | -0.001 | 0.065**    | 0.034        | -0.105**  | 0.005             | 0.007         | -0.008    | 0.098**    |
| (0.028)               | (0.027)    | (0.032) | (0.029)    | (0.049)      | (0.006)   | (0.028)           | (0.040)       | (0.045)   |
| Politicians           | 0.005      | 0.021  | 0.004      | -0.023       | -0.006**  | -0.004            | 0.026         | 0.016     |
| (0.014)               | (0.014)    | (0.014) | (0.011)    | (0.026)      | (0.003)   | (0.010)           | (0.020)       | (0.017)   |
| PremiumsRatio         | 0.076      | 0.112  | 0.034      | -0.345**     | 0.035*    | -0.288***         | 0.198*        | 0.030     |
| (0.060)               | (0.081)    | (0.100) | (0.058)    | (0.153)      | (0.020)   | (0.085)           | (0.109)       | (0.131)   |
| ClaimsRatio           | -0.314     | -0.488*| -0.366     | -0.011       | 0.884*    | -0.111*           | 0.713**       | -0.836**  |
| (0.196)               | (0.281)    | (0.305) | (0.178)    | (0.491)      | (0.063)   | (0.275)           | (0.363)       | (0.392)   |
| FundsRatio            | 0.063**    | 0.068  | -0.036     | -0.040       | 0.160**   | 0.052***          | 0.061         | 0.135**   |
| (0.031)               | (0.046)    | (0.045) | (0.058)    | (0.073)      | (0.012)   | (0.040)           | (0.061)       | (0.082)   |
| ERP                   | 0.015      | 0.341***| -0.936***  | -0.592***    | 0.832***  | -0.223***         | 0.248***       | 0.368***  |
| (0.084)               | (0.092)    | (0.109) | (0.080)    | (0.127)      | (0.030)   | (0.059)           | (0.120)       | (0.133)   |
| Inflation             | -0.679***  | -0.392***| 2.343***   | 0.359***     | -1.152*** | -0.107***         | -0.366***      | -1.074*** |
| (0.126)               | (0.165)    | (0.226) | (0.123)    | (0.160)      | (0.037)   | (0.071)           | (0.198)       | (0.230)   |
| Prop65                | -0.546     | 1.892***| 1.761***   | -0.465       | -1.852*** | -0.163            | 0.270         | 1.371***  |
| (0.504)               | (0.309)    | (0.542) | (0.296)    | (0.695)      | (0.118)   | (0.276)           | (0.493)       | (0.630)   |
| Constant              | -0.092     | -0.050 | 0.076      | 0.060        | 0.234     | -0.067***         | 0.319***       | -0.137    |
| (0.097)               | (0.118)    | (0.199) | (0.082)    | (0.221)      | (0.020)   | (0.098)           | (0.148)       | (0.223)   |
| Comp Fixed Effects    | Yes        | Yes    | Yes        | Yes          | Yes       | Yes               | Yes           | Yes       |

(Continued)
Table A2. Continued

| Time Fixed Effects | Debentures | Stocks Shares | Brit. Gov. | Foreign Gov. | Mortgages | Loans on Policies | Loans on Rates | Corporate | Government |
|-------------------|------------|---------------|------------|--------------|-----------|-------------------|---------------|-----------|------------|
| Obs               | No         | No            | No         | No           | No        | No                | No            | No        | No         |
| R² (within)       | 0.143      | 0.396         | 0.490      | 0.146        | 0.305     | 0.309             | 0.200         | 0.300     | 0.456      |

Shapley decomposition of explained variance

| Company Explanatory Variables | ERP, Inflation and Prop65 | Company Fixed Effects |
|-------------------------------|---------------------------|----------------------|
| 15.6%                         | 15.4%                     | 79.5%                |
| 17.7%                         | 4.6%                      | 56.7%                |
| 13.6%                         | 21.3%                     | 41.6%                |
| 19.6%                         | 19.1%                     | 86.0%                |
| 15.6%                         | 15.6%                     | 73.9%                |
| 79.5%                         | 56.7%                     | 51.0%                |
| 4.9%                          | 27.9%                     | 41.6%                |
| 40.7%                         | 9.4%                      | 86.0%                |
| 12.5%                         | 18.9%                     | 73.9%                |
| 8.5%                          | 13.0%                     | 59.8%                |
| 33.4%                         | 33.4%                     | 71.9%                |
| 13.0%                         | 13.0%                     | 67.9%                |
| 79.5%                         | 79.5%                     | 51.0%                |