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EX-POST: THE INVESTMENT PERFORMANCE OF COLLECTIBLE STAMPS

By Elroy Dimson, Christophe Spaenjers

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EX POST:

THE INVESTMENT PERFORMANCE OF COLLECTIBLE STAMPS

Elroy Dimson[a]

London Business School

Christophe Spaenjers[b]

Tilburg University

Abstract

This paper investigates the returns on British collectible postage stamps over the very long run, based on stamp catalogue prices. Between 1900 and 2008, we find an annualized return on stamps of 6.7% in nominal terms, which is equivalent to an average real return of 2.7% per annum. Prices have increased much faster in the second half of the 1960s, the late 1970s, and the current decade. However, we also record prolonged periods of real depreciation, for example in the 1980s. As a financial investment, stamps have outperformed bonds, but underperformed stocks. After unsmoothing the returns on stamps, we find that the volatility of stamp prices approaches that of equities. There is mixed evidence that stamps are a good hedge against inflation. Once the problem of non-synchronous trading is taken into account, stamp returns seem impacted by movements in the equity market.

JEL classification: G1, Z11

Keywords: Alternative investments; Indexes; Long-term returns; Market model; Stamps

[a] London Business School, Regent's Park, London NW1 4SA, United Kingdom. Phone: +44 20 7000 7000. Fax +44 7000 7001. Email: edimson@london.edu.

[b] Department of Finance, CentER, Tilburg University, P.O. Box 90153, 5000 LE Tilburg, The Netherlands. Phone: +31 13 466 3025. Email: c.spaenjers@uvt.nl.

I. Introduction

Almost since the issuance of the Penny Black in 1840,[1] and at least until the middle of the twentieth century, the philatelic literature has suggested that "deliberately making money from one's hobby was a perversion of the proper reason to collect" (Gelber, 1992). However, others have countered that "it is impossible to get away from the necessity of regarding stamps as an investment" as early as 1902, when Edward Nankivell wrote his book, *Stamp Collecting as a Pastime.* Nankivell, a journalist and active stamp collector, further argued that "even the schoolboy cannot afford to put his shilling into stamps unless he can be fairly assured that he may get his money back at critical periods, which will crop up even in school life". Today, it is no longer taboo to think of stamps as an "emotional asset" (just like art, books, and wine) that may, or may not, contribute to a diversified investment portfolio (Campbell, Koedijk, and De Roon, 2009). Indeed, the individual, whose stamp collection is probably the finest in private hands, is a billionaire who applies top-down valuation techniques to his philatelic investment decisions.[2]

Globally, estimates of the number of stamp collectors range from 20 million to 200 million, dependent on the definition of collecting.[3] Many active philatelists specialize in vintage stamps from Great Britain. To serve these collectors' (or investors') need for a reliable price index, stamp dealer and catalogue publisher Stanley Gibbons launched the SG GB30 Rarities index in 2004. The SG GB30 aggregates the catalogue prices for thirty "scarce to rare" British stamps of high value.[4] The SG GB30 index is updated on a yearly basis. Price indexes are clearly a part of Stanley

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[1] The Penny Black was the world's first prepaid adhesive postage stamp. It was issued by the United Kingdom on 1 May 1840, and was valid from 6 May of the same year. Johnson (1920) reports that stamp collecting was an established pastime by 1841.

[2] The collector, Bill Gross, chief investment officer of PIMCO, sold his British rarities in June 2007. The collection, bought mostly in 2000, had cost USD 2.5 million and was sold for USD 9.1 million, a return that was "better than the stock market" (Bill Gross, quoted in The Economist, 2008).

[3] The number of stamp collectors in the United States is reported in collectors' publications as being up to 20 million individuals (Ericsson, 2006). The president of the All-China Philatelic Federation stated that "stamp-collecting in China has grown increasingly popular in recent years, with the number of collectors reaching 18 million" (People's Daily, 2000). Using a narrower definition, a survey by the Universal Postal Union reported that there were over 30 million collectors worldwide (excluding China) who annually spend over USD 10 billion on their hobby.

[4] All constituents of the SG GB30 had a catalogue price of at least GBP 10,000 in 2004. The composition of the index is publicly known. According to Stanley Gibbons CEO Michael Hall, "stamps included in the index represent examples of the type of classic material recommended by the Stanley Gibbons Investment Department to its clients. Such stamps are considered to be the most likely to show consistent returns over the medium to long term" (interview with Michael Hall). Rare by definition, each stamp in the SG GB30 is traded about 10 to 15 times in an average year.

Gibbons' marketing strategy. At the launch of another index, the SG100,[5] the press release noted: "The index will objectively demonstrate the stable growth performance which the stamp market enjoys. It should encourage more investors to choose stamps as an alternative means of achieving the returns they have failed to obtain from traditional investment routes in recent years" (Stanley Gibbons, 2002). Stanley Gibbons has also often referred to the good performance of the SG GB30 on its website and in its publications.

Two related problems with the SG GB30 come to the fore. First, if the market for stamps even slightly resembles the art market, it is not improbable that, since its launch in 2004, the SG GB30 has been measuring returns in a boom market, and that the price appreciation over the longer term has been much more modest. Second, while most of the company's publications focus on the performance of the SG GB30 since its creation, it has at times also back-tracked the values of the thirty stamps included in the index, and reported the annualized returns since the late 1990s (Gibbons Stamp Monthly, 2005) or even the 1970s (Gibbons Stamp Monthly, 2006a). Since the constituents of the index are those stamps with the highest values in 2004, the index suffers from a typical look-ahead bias (Dimson, Marsh, and Staunton, 2002). It is unclear how far the back-tracked price evolution of the constituents of the SG GB30 is representative of the overall price trend in the market for British collectible stamps.

It is not the first time that a firm dealing in collectibles creates its own price index. Consider, for example, the Sotheby's Art Index, which was run in the 1980s by the famous auction house. The index values were based upon the theoretical values of works of art, as estimated by Sotheby's experts.[6] With the impressive performance of the index in hand, Sotheby's could convince potential art buyers that it was "hard to make wrong investments in the art market" (Lacey, 1998). The index was discontinued very soon after the art market crash of 1991. Not only did

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[5] The SG100 was created in 2002, prior to the launch of the SG GB30. The SG100 is a monthly updated index based on the prices for 100 of the world's most frequently traded stamps. The composition of the SG100 is not revealed. Also the exact way in which the index is calculated is unclear, except that is "is weighted towards the most frequently traded and higher value stamps" and that the constituents are "carefully reassessed each year" (Stanley Gibbons, 2002).

[6] Robert Shiller (1993) commented on this aspect of the index as follows: "The year-to-year change in the index must reflect a lot of guess work. The Sotheby's index would appear to have even greater potential problems than the appraisal-based indices of commercial real estate."

Sotheby's feel that it could not be associated with a declining art market index; collectors were also becoming more aware of the possible conflicts of interest.[7]

In this paper, we look into the returns on British collectible postage stamps over the very long term, based on Stanley Gibbons catalogue prices. We construct buy-and-hold portfolios of stamps, and report returns on these portfolios since 1900. For the last few decades, we also compare our unbiased results to the returns reported by Stanley Gibbons itself. We then construct a periodically rebalanced stamp price index, report on the distribution of returns on stamps between 1900 and 2008, and compare these returns to those on a number of financial assets. We also investigate the relationship between stamp returns on the one hand and inflation and equity market movements in Great Britain on the other.

We find that the annualized nominal return on our earliest buy-and-hold portfolio is equal to 7.5% over the whole time frame. The returns on the different buy-and-hold portfolios are very similar to each other and, since the 1970s, also comparable to the returns reported by Stanley Gibbons for its SG GB30. Since 1900, our rebalanced stamp price index has shown an annualized nominal return of 6.7% per annum, which is equivalent to an average real return of 2.7% over the same 109 years. This is lower than the return on equities, but higher than that on bonds. There have been remarkably higher returns in some boom periods, for example in the second half of the 1970s and during the last few years. After unsmoothing the real stamp return series, we find that the volatility of these returns is much higher than that of bonds and only slightly below that of equities. The nominal returns on stamps show a relatively large positive correlation with inflation, but the correlation between real stamp returns and inflation is still significantly negative. Finally, we find evidence that stamp returns are positively correlated with movements in the equity market, once the problem of non-synchroneity in the returns is accounted for.

The remainder of this paper is structured as follows. Section II briefly reviews the existing literature on stamp investments. Section III describes our data collection and methodology, while Section IV reports the results of our research. Section V concludes and outlines future work.

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[7] Information based on an interview with an ex-Sotheby's employee.

II. Literature

Belk (1995) refers to collecting as an activity that involves passion, but which can clearly border on the obsessive. Satchell and Auld (2009) draw the distinction between the demand for stamps as an alternative financial asset, and demand driven by the intrinsic pleasures of ownership. While pecuniary benefits may not always be the primary motive for acquiring collectibles such as art, books, wine, coins, or stamps, "a substantial proportion of collectors also hope for financial gains" (Burton and Jacobsen, 1999).

Although there is a sizeable and still-expanding literature on art markets,[8] relatively few researchers have investigated the long-term *returns* on stamps. Nevertheless, two studies need be mentioned here, even though they both utilize US data. Taylor (1983) applies a signal extraction method on transaction prices of the five most frequently auctioned stamps in his sample period to estimate quality-adjusted returns. He finds an average yearly return of 12.2% between 1963 and 1976. Cardell, Kling, and Petry (1995) also start from auction prices, but cover a longer time frame, namely 1947-1988. They report an "upward and accelerating" trend until 1980, with a fivefold price increase between 1976 and 1980. Thereafter, prices decline and level off.

The same authors have also studied whether stamps can function as a *hedge* against inflation.[9] While Taylor (1983) cannot draw solid conclusions from his results due to the large standard errors of his coefficients, Cardell, Kling, and Petry (1995) find that "stamp returns are highly positively related to expected inflation". Thiel and Petry (1995) confirm this positive relationship for US stamp auction data from the 1920s and 1930s.

Veld and Veld-Merkoulova (2007) suggest that there might be portfolio *diversification benefits* from investing in stamps. When applying a capital asset pricing model to the SG100 index, the authors find positive alphas, and betas that are not significantly different from zero. However, the results do not lead to an implementable strategy, since the composition of the SG100 is private information. Also, the study is based on not more than four years of data. Nevertheless, the results seem to confirm previous findings by Cardell, Kling, and Petry (1995) that stamps may act

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[8] See Ashenfelter and Graddy (2006) and Ginsburgh, Mei, and Moses (2006) for reviews of the literature on auctions, art prices, and art price indexes. Renneboog and Spaenjers (2009) undertake a novel empirical analysis on auction data since the 1920s.

[9] Wagenheim (1976) dubbed stamps "paper gold" because of their supposed ability to serve as hedges against inflation.

as hedge against movements in the large financial markets. Similarly, Taylor (1983) observed that "most of the risk in the stamp portfolio was found to be unsystematic relative to the NYSE index".

III. Data and methodology

To look into the long-term returns on British stamps, we need a history of prices. Therefore, we turn to the Stanley Gibbons price catalogues.[10] We consult all Stanley Gibbons stamp price catalogues (for stamps of Great Britain[11]) that have been published since the end of 1899.[12] We assign every catalogue to the end-of-year that is closest to the publication date.[13] The first catalogue considered for this research is the 13th edition (year end 1899); the last one is the 111th edition that was published last year (year end 2008). No stamp price catalogues were published around year ends 1900, 1905, 1909, 1916, 1918, 1921, 1923, 1942, 1945, 1947, and 1950.[14]

We identify the fifty most valuable British stamps in every catalogue, and track the prices from that point forward. When necessary, we take into account changes in classification numbers. In order to replace stamps in our indexes, we also make sure we have a 'reserve list' for every year. We include both unused and used stamps, but do not consider 'special

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[10] In 1865, only nine years after he started selling stamps in his father's shop, Edward Stanley Gibbons published a 'Descriptive Price List and Catalogue of British, Colonial and Foreign Postage stamps' (Gibbons Stamp Monthly, 2006b). The 16-page list was to be the forerunner of a long series of price catalogues. Since the first editions were hardly complete and did not include catalogue numbers, we start our data collection at the end of the nineteenth century. By that time the Stanley Gibbons catalogues had become the main source of reference of collectors of British stamps.

[11] Throughout the decades, the names of the relevant catalogues have changed. For the first few decades, 'Stamps of the British Empire' was the first part of Stanley Gibbons' three-volume set with stamps from all over the world. Later, this first part was renamed 'British Commonwealth' and split in two volumes (with stamps from Great Britain always included in the first volume).

[12] The catalogues were requested and consulted at the British Library. A small number of missing editions were ordered through online booksellers.

[13] For each catalogue, we infer the month of publication from three different sources of information: (i) the date it entered into the collection of the British Museum or British Library (as evidenced by an ink stamp); (ii) the timing mentioned in the introduction of the catalogue or at the beginning of a section entitled 'new announcements'; (iii) the publication date listed on Amazon.co.uk (for catalogues published since 1970). Of the 99 catalogues considered in this research, 89 appear to have been published in the second half of the calendar year. At the same time, in most cases, the next year's date is mentioned on the cover. This validates our procedure.

[14] In our empirical part, we interpolate the values of the indexes in those years.

varieties',[15] different 'plates',[16] or issues of 'postage due stamps', 'control letters', 'postal fiscals', 'official stamps', and the like. We also track the prices of the constituents of the SG GB30 when possible. In this case, we do not exclude any variety or plate number, but stick to the composition of the SG GB30.

According to Stanley Gibbons, their catalogue prices reflect "(i) average third party auction realisations; (ii) average competitor dealer prices; (iii) prices in third party specialised country catalogues; (iv) our own experience in supply / demand; (v) prices realised on own postal, online and public auctions" (interview with Michael Hall). Prices are always for examples in "fine condition". They represent the estimated selling prices of Stanley Gibbons at the time of publication of the catalogue and seem to be reliable estimates of prices. Two potential problems with using catalogue prices as the basis for the calculation of returns is that they may lag real transaction prices and may not always reflect bear markets as accurately as auction prices (due to the managed price level). However, this should be less of a problem over the very long term we are considering here. Also, although Taylor (1983) makes an argument for the use of real transaction prices, his index based on catalogue prices is very similar to his benchmark auction price index.

In the next section, we construct buy-and-hold portfolios starting at different points in time. Moreover, we build a price index that measures returns from collectible postage stamps since 1900. These returns are then compared to those from traditional financial assets.

IV. Empirical results

A. Buy-and-hold portfolios

We start by constructing buy-and-hold portfolios every nine years, starting at year end 1899. We denote the portfolios BH1899, BH1908, BH1917, etc. Our last buy-and-hold portfolio is

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[15] Special varieties are not attributed a main Stanley Gibbons classification number (such as *15* or *23a*) and often have different colors or printing errors. Until 1917, these varieties were not even included in the general list of stamps in the catalogues. An exception on the rule that we exclude these varieties is made for two stamps that were already included in our database as regular types.

[16] The catalogue sometimes mentions prices for separate plate numbers below the prices for the main type.

constructed in 1998. Each time, we pick the fifty highest priced[17] stamps from the Stanley Gibbons catalogues and track the sum of their prices over time. We thus create a price-weighted index. In total, 130 different stamps are (at least in one year) included in our twelve buy-and-hold portfolios. A complete overview of the composition of our portfolios is provided in Table 1.

[Table 1 about here]

Table 1 shows that two stamps have been in each top-50 of most valuable stamps since the beginning of our time frame: the unused stamps with classification numbers *5* (1840, 2d., blue) and *121* (1880, 2s., brown), see Figure 1. Six more stamps, all dating from between 1867 and 1888, have been in every constructed portfolio since 1908. No stamps from after 1935 are included in our portfolios.

[Figure 1 about here]

If a stamp (type) is deleted from the catalogue, we replace it by the first (i.e. most valuable) item on our reserve list of the year of construction, and recalculate our index at the beginning of the year. Especially in the early years, it sometimes happens that a stamp is not deleted from the catalogue but that no price is quoted, for example because Stanley Gibbons did not have the item in stock. We then geometrically interpolate a price estimate from the two nearest price observations. In two cases, we do not have price observations for the last few years. We then estimate price trends since the last available price quotation from the evolution in value of the unused stamp with the same classification number.[18]

The annualized (i.e. geometric mean) nominal returns of these buy-and-hold portfolios are reported in Table 2. The table reports the returns per time frame of nine years until 1998 and for the ten-year period 1999-2008. It also includes the overall returns since the construction of each portfolio.

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[17] If several stamps have the same catalogue price, then we choose the one with the earliest year of issuance, since collectors are often more concerned with older stamps. The other(s) will then end up on our reserve list.

[18] To check the robustness of our results, we also use some other data-infilling procedures for missing stamp prices. This does not materially affect our results. For example, instead of using the two nearest price observations, we can also assume that in any given year the price movement of stamps with missing prices is identical to the one of a price-weighted portfolio of the stamps for which prices are availabe. This leads to returns that are very similar to the ones reported in this chapter. This is attributable to the small number of missing prices and the relatively narrow dispersion in price trends across stamps.

[Table 2 about here]

Table 2 suggests that there was a steady, but slow growth in stamp prices during the first half of the twentieth century. Later, there were booms in stamp prices during the 1960s, 1970s, and 2000s. In particular, the average price increase between 1972 and 1980 is spectacular: more than 33% per year on all portfolios. However, the nominal price level of all portfolios declined slightly after 1980. The realized return on the buy-and-hold portfolios between 1981 and 1989 is -0.5%. Between 1990 and 1998 the returns are positive, but far from spectacular. As mentioned before, prices have since risen sharply.

The annualized return on the buy-and-hold portfolio created at the start of the twentieth century (BH1899) amounts to 7.5%.[19] The returns on this portfolio are not always in line with those on the other portfolios, due to the relatively large difference in composition between BH1899 and the later buy-and-hold portfolios. This is due to the fact that, for many portfolio constituents, price data only became available during the first decade of the twentieth century.

We now compare the returns on our buy-and-hold portfolios with the returns on the (back-tracked, buy-and-hold) SG GB30. The period we examine runs from the end of 1973 (the first year for which prices for all constituents are available) to the beginning of 2004 (the year of creation of the SG GB 30 index). If the SG GB30 suffers from a look-ahead bias, we would expect the index returns between to overestimate the true returns on stamps. Therefore, Table 3 reports the returns on our buy-and-hold portfolios and the SG GB30 for two time frames before the launch of the SG GB30 (1974-2003 and 1990-2003), and since the same launch (2004-2008).

[Table 3 about here]

Table 3 shows that the returns on the back-tracked SG GB30 are in line with those on the buy-and-hold portfolios constructed in this study. In contrast to back-fitted equity indices (see Dimson, Marsh and Staunton, 2002), the returns on BH1971, the last constructed buy-and-hold

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[19] We also did an analysis in which each stamp receives an equal weight. This is analogous to investing the same amount of money (e.g. 1 British Pound) in each of the fifty stamps included in the portfolio at the beginning of the time frame. This procedure gave rise to very similar results. The annualized return on the portfolio created at year end 1899 was also equal to 7.5%. The arithmetic averages over all portfolios were (per time frame): 4.2% (1900-1908), 2.2% (1909-1917), 3.8% (1918-1926), 4.6% (1927-1935), 4.8% (1936-1944), 5.9% (1945-1953), 3.6% (1954-1962), 11.6% (1963-1971), 36.6% (1972-1980), -0.5% (1981-1989), 2.0% (1990-1998), and 12.5% (1999-2008).

portfolio before the start of the relevant time frame in 1974, are equal to the back-tracked returns on the SG GB30. This implies that the SG GB30, although ad hoc in its design and clearly launched at the start of a stamp price boom, still gives a good idea of the average stamp price evolution since the beginning of the 1970s. However, if we want to get a long-term view on the returns from collectible stamps, and compare these returns to those on a number of financial assets, the SG GB30 will not suffice. Therefore, we now turn to the construction of a (periodically rebalanced) price index for British stamps since 1900.

B. An index for postage stamps

Instead of considering a buy-and-hold portfolio, we construct an index which allows for changes in the constituents every nine years. As before, we start with the 50 most valuable stamps in 1899, we work with reserve lists, and aggregate the values of all stamps included. We adapt the composition of our index at year ends 1908, 1917, etc. (and rebalance our index at those points), to make sure we are continuously tracking the price evolutions of the most important stamps. We treat missing prices in the way outlined in the previous section, but a stamp which does not have a price observation at the moment of rebalancing is replaced. Doing this results in the index values reported in Table 4. For missing years, the index values are geometrically interpolated. The same table also shows the implied nominal returns.

[Table 4 about here]

Table 4 again illustrates the strong increases in stamp prices in the second half of the 1960s, throughout the 1970s and since 2000. In four years, we record a nominal return of more than 35%: 1969 (61.3%), 1976 (81.6%), 1979 (84.7%), and, most recently, 2008 (38.8%). Decreases in the nominal price level occur rarely, and in only three years do we see depreciations of more than one percent in the average catalogue prices, 1981 (-2.2%), 1982 (-10.4%), and 1992 (-1.1%). However, our index sometimes remains remarkably stable over relatively long time periods; consider 1983-1994 for a recent example. Over the whole 109 year time frame, the annualized return on the rebalanced portfolio is 6.7%.

Table 5 repeats the analysis, but shows the deflated index, using inflation data from Dimson, Marsh, and Staunton (2009). In real terms, it is clear that there have been several prolonged periods of price depreciation, for example from the beginning of 1906 until the end of 1920

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(except in 1913), in the 1950s, and between year ends 1980 and 1994 (except in 1987). In contrast, we record the strongest price appreciations in the second half of the 1970s, when prices increased more than threefold in real terms, and, somewhat less pronounced, since the start of 2003, just before Stanley Gibbons created its SG GB30 index.

[Table 5 about here]

It is probably no coincidence that the largest increases in real stamp prices in the last 109 years took place in the inflationary (late) 1970s.[20] At that time, real assets became very attractive as hedges: investments in stamps were only one particular way "to lick inflation" (The Times, 1974). In the United States, oil, gold, coins, silver, diamonds, farmland, old master paintings, and real estate also showed very high returns between 1970 and 1980 (Ibbotson and Brinson, 1993). When the inflationary pressure subsided in the early 1980s, stamps lost their hedge appeal, and for some households became an "investment that turned sour" (The Times, 1984).

C. Stamps versus financial assets

Now that we have established a 109 history of the returns on British collectible postage stamps, we can compare these returns with those on UK bills, bonds, and equities. The return data for these financial asset classes are from Dimson, Marsh, and Staunton (2009). The nominal price evolutions since year end 1899 are shown in Figure 2, while Figure 3 plots the real price trends.

[Figure 2 and Figure 3 about here]

Figures 2 and 3 show that equities have outperformed all other asset categories, including stamps, over the time frame 1900-2008. Equities have realized a yearly average nominal return of 9.2% (equivalent to a real return of 5.1%), while our stamp price index has grown by an annualized 6.7% in nominal terms (2.7% in real terms). However, over the very long term, stamps have proved a better investment than bonds or bills, which record average real returns of less than 1.5%.[21] Even before the stamp price boom in the 1970s, our stamp indexes have higher values than the indexes of bonds and bills. The successive negative real returns in the 1980s show, however, that stamps can also significantly underperform financial assets. A full overview of the

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[20] Cardell, Kling, and Petry (1995) find strong appreciations in value over the same period.

[21] Recent research suggests that, over the very long term, works of art have also appreciated at a rate that is between the returns on stocks and bonds (Renneboog and Spaenjers, 2009).

distribution of the nominal and real returns on stamps and the financial assets can be found in Table 6.

[Table 6 about here]

Table 6 again shows that the mean returns on stamps are between those on bonds and equities. A problem with comparing the returns on collectibles with those on financial securities lies in the difference in transaction costs. The transaction costs associated with buying and selling stamps can amount to more than 20% on a round-trip,[22] which is significantly more than on an average trade of financial securities. However, if one takes into account the long average holding periods of stamp collections on the one hand, and the high turnover in many financial portfolios on the other, the transaction cost drag associated with an average stamp collection may actually be lower than that of many financial portfolios.[23] Of course, the low turnover in collectibles may in part be endogenous: there can be little doubt that high round-trip costs curtail turnover.[24]

At first sight, the standard deviation of the stamp returns seems higher than that of bonds in nominal terms, but lower in real terms. We are, however, underestimating the true standard deviation of stamp returns, for two different reasons. First, the return series probably suffer from "appraisal smoothing" (Geltner, 1991; Geltner, 1993): appraisers' estimates of the market value of an infrequently traded item typically depend on previous price observations, and are only partially adjusted in any period.[25] This will lead to autocorrelation in the return series and understated standard deviations. Second, in eleven different years, we use geometrically interpolated index values, which again smooths the stamp return series.

A remedy to the first above-mentioned problem is to "unsmooth" our return series, a technique originated in the real estate literature by Geltner (1993), and applied to hedge funds (Kat and

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[22] One can buy stamps at catalogue prices through Stanley Gibbons, but the company only buys back at about 75% of the catalogue price. When trading through auction, one has to take into account the buyer's premiums and seller's commissions, which can also add up to more than 20% of the underlying item's value.

[23] There is evidence that investors trade too much in financial markets: see, for example, Barber and Odean (2000). Therefore, our argument might be flawed to the extent that we are comparing stamp investments with suboptimal behavior in financial markets.

[24] There is also the issue of custody costs such as storage and insurance, but while custody may be more costly for stamps than for stocks, they are lower for stamps than for most other collectibles such as artworks.

[25] A related concept is the "Working effect" (Working, 1960; Schwert, 1990): since the catalogue prices are partially based on past average prices, the first differences in these catalogue prices (i.e. the returns) will follow a moving average process.

Brooks, 2002) and art index returns (Campbell, 2008) afterwards. If we assume that all items are reappraised at the end of each period, the observed (or smoothed) return in period t, R^*_t, can be expressed as a weighted average of the true (underlying, unsmoothed) return in period t, R_t, and the smoothed return in the previous period, R^*_{t-1}:

$$R^*_t = (1-\alpha) R_t + \alpha R^*_{t-1} \tag{1}.$$

Relation (1) can be inverted to recover the true, unsmoothed return series from the observed returns:

$$R_t = (R^*_t - \alpha R^*_{t-1})/(1-\alpha) \tag{2}.$$

Assuming that the smoothed series follows an AR(1) process,[26] one can set the coefficient α equal to the autocorrelation coefficient at lag 1. This newly constructed series will then have a first-order autocorrelation that is very close to zero (by construction), and the standard deviation of this unsmoothed return series is a better estimate of the true riskiness of stamp investments.

The first-order autocorrelation coefficients and the standard deviations of the smoothed and unsmoothed real returns are compared in Table 7. The same table also outlines the standard deviations of financial asset real returns.[27] We see that the unsmoothed stamp return series has a standard deviation that is equal to 17.6%, which is almost 5% higher than the standard deviation of the original series, and also higher than that of the returns on bonds. To accommodate concerns about our interpolation of returns (and thus smoothing the index) in the first half century of our time frame, Table 7 also repeats the analysis for the real return series after 1951, which is the last year with an interpolated return. The unsmoothed real stamp returns now have a standard deviation of 19.7%, which again is significantly higher than that of bonds, and just below the standard deviation of stock returns. It is thus clear that the real riskiness of stamp investments is probably not so much different from that of investments in equity markets.

[Table 7 about here]

The previous observation that stamps seem to thrive in inflationary environments is somewhat corroborated by the return correlation matrix in Table 8, which shows a positive correlation of 0.29 between the nominal returns on stamps and inflation. Only bills have a larger correlation

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[26] Inspection of the (partial) autocorrelogram suggests that the original real stamp return series indeed follows an AR(1) process. This was confirmed by an analysis of the residuals using Portmanteau statistics.

[27] Since we lose the first-year observation when unsmoothing the stamp data, we also exclude the first return when calculating standard deviations of the original stamp returns or the returns on financial assets in Table 7. Therefore, the standard deviations in this table can in some cases deviate from those in Table 6.

coefficient (0.40). When considering real returns on stamps, however, we see a negative correlation with inflation of -0.25.[28] This is comparable to the correlation coefficient between equities and inflation. In general, it is thus not the case that the real returns on stamps increase when inflation is higher. It might be that investors only prefer real assets such as stamps when inflation rates rise above a certain level, such as in the 1970s.

[Table 8 about here]

Table 8 reports a correlation between stamp and equity returns that is very close to zero.[29] However, this might be due to the non-synchronous nature of the two types of returns. This non-synchroneity problem stems from three different sources. First, stamp prices probably adjust slowly to changes in financial markets. Second, catalogue prices partially reflect the pricing history, as mentioned before. Third, in order to calculate yearly stamp returns, we assigned all published catalogues to the closest year end. There is a possibility that this has created a small discrepancy in timing between the reported price trends of stamps and the timing of the equity returns.

Therefore, to gain more insight in the true equity market sensitivity of stamps, we estimate the market model beta using the aggregated coefficients methodology of Dimson (1979), which accounts for non-synchroneity in the returns. Dimson (1979) sums the slope coefficients in a regression on lagged, matching and leading market returns to get an unbiased estimate of the beta of an asset. The results for our series of real stamp and equity returns are shown in Table 9.

[Table 9 about here]

Although the traditional beta (estimated in Model 1) is very close to zero, we get a significantly positive beta of 0.232 when also including one lag and one lead in the analysis (Model 2). This beta grows to 0.340 with two lags and one lead (Model 3). This shows that there is non-negligible positive correlation between equity returns and stamp returns, as also indicated by the R-squares.

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[28] We also recalculated the correlations using the unsmoothed stamp returns, but the results were very similar.

[29] The negative correlation coefficient is due to the opposite returns in 2008. When excluding 2008, the correlation becomes positive (but still very close to zero).

V. Conclusions and discussion

When the economic environment is uncertain, inflation runs high, or investors are looking for diversification, collectibles are promoted as an attractive and relatively safe haven for one's money. Therefore, in this paper, we have looked into the returns on British collectible stamps over the very long run. Since 1900, our price index of classic stamps has appreciated at a yearly average rate of 6.7% in nominal terms, which is equivalent to a real return of 2.7%. This is lower than the return on equities, but higher than that on bonds and bills. There have been some booms in the stamp market (in nominal and real terms), most notably in the second half of the 1970s, and in the current decade. However, during most of the 1980s, and well into the 1990s, our index has shown negative real returns. After unsmoothing the stamp return series, we find that the standard deviation of the real returns is higher than that of bonds, and relatively close to that of equities. There is mixed evidence that stamps are a good hedge against inflation: although the highest real returns were reported in the late 1970s (when there was a lot of inflation), there is still a significantly negative correlation between real stamp returns and inflation when considering the whole time frame. After accounting for non-synchroneity in the returns of stamps and equities, we conclude that there is a positive correlation between real equity and stamp returns.

As an alternative asset class, stamps have characteristics that are clearly different from those of stocks or other financial securities. Just like other collectibles, stamps do not give rise to future cash flows, on which the valuation of traditional assets is based. As in the art market framework of Mandel (2009), the demand for stamps stems from the demand for saving and a utility dividend, which captures non-pecuniary benefits. These can include the aesthetic enjoyment of a collection of stamps, or the pride in having secured a rare issuance. Supply-side considerations, in contrast, may play a more important role in the stamp market than in the art market, since the scarcest stamps are generally the most valuable ones.

It is still unclear what drives the returns on collectibles. This paper has hinted at the existence of a 'wealth creation effect' (in the sense that there seems to be a positive correlation between the returns on equities and on stamps),[30] and the use of collectibles as a hedge in inflationary environments. Nevertheless, we do not know how the price performance of collectibles is determined. We hope that the length and consistency of construction of our index series will facilitate further research in this area.

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[30] Again, there are similarities with the art market. Goetzmann (1993) is one of the studies to present evidence of a causal relationship from stock prices to art prices.

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Table 1: Composition buy-and-hold portfolios

Year	Description	SG No.	Type	1899	1908	1917	1926	1935	1944	1953	1962	1971	1980	1989	1998
1840	1d., intense black	1	Unus.	x									x	x	x
1840	1d., black	2	Unus.											x	x
1840	1d., grey-black	3	Unus.		x		x		x					x	*
1840	2d., deep full blue	4	Unus.	x		x	x	x	x	x	x	x	x	x	x
1840	2d., blue	5	Unus.	x	x	x	x	x	x	x	x	x	x	x	x
1840	2d., pale blue	6	Unus.			x	x	x	x	x	x	x	x	x	x
1841	1d., red-brown	7	Unus.		x				x						
1841	1d., red-brown	12a	Used							x	x	x	x	x	x
1841	2d., violet-blue	15aa	Unus.								*	*	x	x	x
1848	1d., red-brown	16/a	Unus.	x	x		x	x	x	x	x	x		x	x
1841	1d., red-brown	16a/b/c/16	Unus.				x		x	x	x	x			
1841	1d., red-brown	16c	Used						x		x		x	x	x
1841	1d., red-brown	16d	Unus.							x	x	x	x	x	x
1854	2d., deep blue	19	Unus.	x	x	x									
1854-57	2d., pale blue	20	Unus.				x								
1855	2d., pale blue	20a	Unus.					x	x	x	x	x	x		
1855	1d., red-brown	22	Unus.	x	x										
1855	2d., blue	23	Unus.				x	x	x	x	x				
1855	2d., blue	23a	Unus.						x	x	x				
1854-57	1d., orange-brown	25	Unus.	x											
1855	1d., red-brown	26	Unus.		x	x	*								
1855	2d., blue	27	Unus.				x	x	x	x	x	x			
1855	2d., blue	34	Unus.	x											
1857	1d., rose-red	36	Unus.		x										
1858	2d., blue	36a/b/a	Unus.			x	x	x	x	x	x	x		x	x
1870	1d., rose-red	44b	Unus.				x	x		x	x				
1870	1d., rose-red	44b	Used					x	x	x	x				
1870	1.5d., rose-red	53	Unus.			x	x	x	x	x	x	x	x	x	x
1870	1.5d., rose-red	53	Used		x	*									
1847	1s., pale green	54	Unus.			x	x	x	x					x	x
1847-54	1s., green	55	Unus.	x	x	x	x	x						*	x
1847-54	1s., deep green	56	Unus.			x	x	x	x	*	x	x	x	x	x
1848	10d., brown	57	Unus.	x	x	x									
1854	6d., mauve	58	Unus.		x	x	x								
1847-54	6d., dull lilac	59	Unus.	x	x	x	x								
1847-54	6d., purple	60	Unus.	x	x	x	x	x	x						
1847-54	6d., violet	61	Unus.	x	x	x	x	x				x	x	x	x
1855	4d., deep carmine	62/62	Unus.			x	x	x	x	x	*	*	x		
1856	4d., pale carmine	63/62	Unus.			x	x	x	x	x					
1856	4d., deep carmine	64/63	Unus.				x	x	x	x	x	*	x	x	
1856	4d., pale carmine	65/63	Unus.			x			x	x	x				
1856	4d., rose carmine	65a/62(b)	Unus.						x	x	x	x	x	x	x
1856	4d., pale rose-carmine	66/64	Unus.			x	x	x							
1857	4d., rose-carmine	67/66	Unus.			x									
1857	4d., rose	68/66(a)	Unus.	x											
1857	4d., rose-carmine	68a/b/66(b)	Unus.						x	*					
1856	6d., deep lilac	69	Unus.	x											
1855-57	6d., pale lilac	70	Unus.	x											
1856	1s., deep green	71	Unus.			x	x	x	*						
1855-57	1s., green	72	Unus.	x	x										
1855-57	1s., pale green	73	Unus.	x	*										
1862	3d., deep carmine-rose	75	Unus.		*										
1862	3d., rose	78	Used				x	x	x	x	x	x	x		
1864	6d., lilac	85	Unus.	x											
1862	9d., straw	87	Unus.	x											
1862	9d., bistre	88	Unus.						x	x	x	x	x	x	x
1862	9d., bistre	88	Used				x	x	x	x	x	x	x		
1862	1s., green	90	Unus.	x											
1862-64	1s., deep green	91	Unus.							x	x	x	x	x	x
1865	9d., straw	98	Unus.	x	x	x									
1867	10d., red-brown	99	Used						x	x	x	x	x	x	x
1867-69	6d., purple	106	Unus.	x											
1868	6d., bright violet	107	Unus.	x											
1867	10d., red-brown	112	Unus.	x											
1867-69	10d., pale red-brown	113	Unus.	x											

Year	Description	SG No.	Type												
1867	10d., deep red-brown	114	Unus.	x											
1867	1s., deep green	115	Unus.	x											
1867	2s., dull blue	118	Unus.	x	x										
1867-69	2s., deep blue	119	Unus.		x										
1867-69	2s., pale blue	120	Unus.	x	x										
1867-69	2s., cobalt	120a	Unus.									x	x	x	x
1867-69	2s., milky blue	120b	Unus.						x	*			x	x	x
1880	2s., brown	121	Unus.	x	x	x	x	x	x	x	x	x	x	x	x
1880	2s., brown	121	Used	x	x	x	x								
1872	6d., deep chestnut	122	Unus.	x											
1872	6d., chestnut	123/122a	Unus.	*											
1872	6d., pale chestnut	124/123	Unus.	x											
1867	5s., rose	126	Unus.	x											
1867-82	5s., pale rose	127	Unus.	x	x								x		x
1878	10s., grey-green	128	Unus.		x	x	x	x	x	x	x	x	x	x	x
1878	10s., grey-green	128	Used	x											
1878	£1, brown-lilac	129	Unus.		x	x	x	x	x	x	x	x	x	x	x
1878	£1, brown-lilac	129	Used	x	*	x									
1882	5s., rose	130	Unus.		x	x	x	x	x	x	x	x	x	x	x
1883	10s., grey-green	131	Unus.		x	x	x	x	x	x	x	x	x	x	x
1883	10s., grey-green	131	Used	x		x	x								
1882	£1, brown-lilac	132	Unus.		x	x	x	x	x	x	x	x	x	x	x
1882	£1, brown-lilac	132	Used	x	x	x	x	x	*		x	x			
1882	£5, orange	133	Unus.		x	x	x	x	x	x	x	x	x	x	x
1882	£5, orange	133	Used	x	x	x	x	x	x	x	x		x	x	x
1867-82	5s., rose	134	Unus.		x	x	x	x	x	x	x	x	x	x	x
1867-82	5s., rose	134	Used	x											
1867-82	10s., greenish grey	135	Unus.			x	x	x	x	x	x	x	x	x	x
1867-82	10s., greenish grey	135	Used			x	x								
1867-82	£1, brown-lilac	136	Unus.			x	x	x	x	x	x	x	x	x	x
1867-82	£1, brown-lilac	136	Used		x		x	x	x	x	x				
1867-82	£5, orange	137	Unus.	x	x	x	x	x	*	x	x	x	x	x	x
1867-82	£5, orange	137	Used	x		x	x								
1873-80	2.5d., rosy mauve	140	Unus.							x	x	x	x	x	x
1873	6d., pale buff	145	Used				x	x	x	x	x	x	x	x	x
1880	1s., orange-brown	151	Unus.	x											
1876	4d., vermillion	152	Unus.	x											
1876	8d., brown-lilac	156a	Unus.		x	x							x	x	x
1881	1d., purple	174a	Unus.		x	x									
1883	2s.6d., lilac	175	Unus.	x	x	x									
1884	5s., rose	176	Unus.				x	x	x	x	x	x	x	x	x
1884	10s., ultramarine	177	Unus.				x	x	x	x	x	x	x	x	x
1884	10s., ultramarine	177	Used	x	x	x	x								x
1884	10s., cobalt	177a	Unus.				x	x	x	x	x	x	x	x	x
1884	10s., cobalt	177a	Used						*		x	x	x	x	x
1883-84	10s., cobalt	182	Unus.			x	x	x	x	x	x	x	x	x	x
1883-84	10s., cobalt	182	Used								x	x	x	x	x
1883-84	£1, brown-purple	184	Unus.	x	x										
1884	£1, brown-lilac	185	Unus.			x	x	x	x	x	x	x	x	x	x
1888	£1, brown-lilac	186	Unus.		x	x	x	x	x	x	x	x	x	x	x
1888	£1, brown-lilac	186	Used			x									
1891	3d., deep brown on or.	204	Unus.		x										
1891	£1, green	212	Unus.	x									x		
1910	2d., Tyrian plum	266a	Unus.								x	x	x	x	x
1911	3d., grey/lemon	277a	Unus.								x	x			
1911	3d., grey-purple on lemon	285a	Unus.						x	x	x	x	x	x	
1911	3d., grey-purple on lemon	285a	Used							x	x				
1911-12	6d., brigh magenta	296	Unus.						x	x	x	x	x		
1913	£1, green	403	Unus.										x		
1913	£1, dull blue-green	404	Unus.										x		
1915	10s., deep blue	411	Unus.										x		
1915	10s., blue	412	Unus.										x		
1915	10s., pale blue	413	Unus.										*		
1935	2.5d., prussian blue	456a	Unus.						x	x	x	x	x	x	x
1935	2.5d., prussian blue	456a	Used						x	x	x			x	x

Notes. Table 1 shows the composition of our buy-and-hold portfolios. The exact catalogue description sometimes changes over time. The column 'SG No.' reports the classification number, while the Type is either Unused or Used. The symbol *x* indicates that a stamp is included in the buy-and-hold portfolio as from the year end in the column heading, while * indicates that the stamp is on the reserve list at the beginning of the time period but gets into the portfolio at some point.

Table 2: Annualized returns buy-and-hold portfolios

	1900-1908	1909-1917	1917-1926	1927-1935	1936-1944	1945-1953	1954-1962	1963-1971	1972-1980	1981-1989	1990-1998	1999-2008	Total
BH1899	4.5%	2.0%	3.7%	3.4%	5.7%	7.5%	4.1%	10.9%	38.2%	-0.4%	2.4%	11.8%	7.5%
BH1908	-	1.3%	2.8%	5.6%	3.8%	4.4%	3.7%	13.4%	38.7%	-0.9%	2.3%	12.6%	7.6%
BH1917	-	-	3.1%	5.7%	3.6%	4.4%	3.5%	12.9%	37.6%	-0.8%	2.2%	12.8%	8.1%
BH1926	-	-	-	5.2%	3.6%	4.3%	3.2%	13.2%	37.3%	-0.7%	2.1%	13.3%	8.6%
BH1935	-	-	-	-	3.2%	3.8%	3.3%	12.9%	35.8%	-0.5%	1.8%	13.5%	8.8%
BH1944	-	-	-	-	-	3.9%	3.1%	12.8%	35.4%	-0.4%	1.6%	13.3%	9.5%
BH1953	-	-	-	-	-	-	3.1%	12.0%	35.0%	-0.4%	1.6%	13.2%	10.2%
BH1962	-	-	-	-	-	-	-	11.8%	33.5%	-0.2%	1.7%	13.4%	11.5%
BH1971	-	-	-	-	-	-	-	-	33.5%	-0.2%	1.6%	13.3%	11.4%
BH1980	-	-	-	-	-	-	-	-	-	-0.6%	1.5%	13.2%	4.8%
BH1989	-	-	-	-	-	-	-	-	-	-	1.6%	13.3%	7.6%
BH1998	-	-	-	-	-	-	-	-	-	-	-	13.3%	13.3%
Average	**4.5%**	**1.6%**	**3.2%**	**5.0%**	**4.0%**	**4.7%**	**3.4%**	**12.5%**	**36.1%**	**-0.5%**	**1.9%**	**13.1%**	

Notes. Table 2 reports the annualized (geometric mean) returns on the buy-and-hold portfolios per time frame of nine years (until 1998), and between 1999 and 2008. The composition of each portfolio can be found in Table 1. The last column ('Total') shows the annualized return of each portfolio between its creation and the end of 2008. The last row ('Average') reports the arithmetic average of the calculated returns for each time frame.

Table 3: Comparison of buy-and-hold portfolios with SG GB30

	1974-2003	1990-2003	2004-2008
BH1899	11.5%	4.5%	15.3%
BH1908	11.5%	4.7%	16.3%
BH1917	11.5%	4.7%	16.2%
BH1926	11.4%	4.7%	17.1%
BH1935	11.0%	4.4%	17.8%
BH1944	10.8%	4.3%	17.6%
BH1953	10.7%	4.2%	17.6%
BH1962	10.5%	4.3%	17.8%
BH1971	**10.4%**	**4.3%**	**17.6%**
BH1980	-	4.1%	17.7%
BH1989	-	4.1%	17.9%
BH1998	-	-	17.1%
SG GB30	**10.4%**	**4.3%**	**17.6%**

Notes. Table 3 reports the annualized (geometric mean) returns on the buy-and-hold portfolios until the launch of the SG GB30 and since the same launch in 2004. The composition of the buy-and-hold portfolios can be found in Table 1. Table 3 also includes the returns of the SG GB30 over the same time frames.

Table 4: Stamp price index values and nominal returns 1899-2008

Year end	Index	Return	Year end	Index	Return	Year end	Index	Return
1899	100.0	-	1936	348.7	1.4%	1973	2,815.6	18.1%
1900	109.4	9.4%	1937	355.0	1.8%	1974	3,336.3	18.5%
1901	119.7	9.4%	1938	357.2	0.6%	1975	4,429.4	32.8%
1902	130.7	9.2%	1939	362.1	1.4%	1976	8,043.4	81.6%
1903	139.8	7.0%	1940	362.3	0.0%	1977	10,796.8	34.2%
1904	144.8	3.6%	1941	369.4	2.0%	1978	13,711.6	27.0%
1905	145.8	0.6%	1942	396.4	7.3%	1979	25,331.6	84.7%
1906	146.7	0.6%	1943	425.3	7.3%	1980	31,279.5	23.5%
1907	146.3	-0.3%	1944	458.3	7.8%	1981	30,588.6	-2.2%
1908	148.0	1.2%	1945	500.7	9.2%	1982	27,415.1	-10.4%
1909	148.2	0.1%	1946	547.0	9.2%	1983	27,358.2	-0.2%
1910	148.3	0.1%	1947	587.9	7.5%	1984	27,373.3	0.1%
1911	149.3	0.7%	1948	631.9	7.5%	1985	27,422.7	0.2%
1912	149.9	0.4%	1949	639.6	1.2%	1986	27,559.4	0.5%
1913	150.3	0.3%	1950	640.1	0.1%	1987	28,853.8	4.7%
1914	164.1	9.2%	1951	640.6	0.1%	1988	29,153.7	1.0%
1915	164.4	0.2%	1952	646.0	0.9%	1989	29,647.2	1.7%
1916	165.1	0.4%	1953	646.0	0.0%	1990	29,721.3	0.2%
1917	165.7	0.4%	1954	644.7	-0.2%	1991	29,813.8	0.3%
1918	169.2	2.1%	1955	644.7	0.0%	1992	29,480.5	-1.1%
1919	172.7	2.1%	1956	648.8	0.6%	1993	29,499.0	0.1%
1920	189.0	9.4%	1957	650.3	0.2%	1994	29,628.7	0.4%
1921	198.1	4.8%	1958	660.5	1.6%	1995	31,221.2	5.4%
1922	207.6	4.8%	1959	687.1	4.0%	1996	32,147.1	3.0%
1923	212.0	2.1%	1960	769.0	11.9%	1997	32,147.1	0.0%
1924	216.4	2.1%	1961	806.0	4.8%	1998	34,061.9	6.0%
1925	216.8	0.2%	1962	853.1	5.8%	1999	35,853.6	5.3%
1926	217.7	0.4%	1963	853.1	0.0%	2000	40,443.6	12.8%
1927	242.9	11.6%	1964	866.1	1.5%	2001	41,865.6	3.5%
1928	260.2	7.1%	1965	1,113.4	28.6%	2002	45,762.2	9.3%
1929	285.1	9.6%	1966	1,200.5	7.8%	2003	52,085.2	13.8%
1930	296.5	4.0%	1967	1,256.4	4.7%	2004	63,165.6	21.3%
1931	298.5	0.7%	1968	1,290.8	2.7%	2005	70,052.6	10.9%
1932	301.8	1.1%	1969	2,082.3	61.3%	2006	77,955.2	11.3%
1933	306.8	1.7%	1970	2,286.8	9.8%	2007	85,492.2	9.7%
1934	341.9	11.4%	1971	2,321.6	1.5%	2008	118,653.1	38.8%
1935	343.7	0.6%	1972	2,383.5	2.7%			

Notes. Table 4 reports the index values of our rebalanced stamp price index from 1899 until 2008. It also shows yearly nominal returns.

Table 5: Stamp price index values and real returns 1899-2008

Year end	Index	Return	Year end	Index	Return	Year end	Index	Return
1899	100.0	-	1936	198.7	-1.2%	1973	351.6	6.8%
1900	107.2	7.2%	1937	190.9	-3.9%	1974	349.8	-0.5%
1901	116.1	8.4%	1938	197.0	3.2%	1975	371.8	6.3%
1902	125.5	8.1%	1939	180.1	-8.6%	1976	586.7	57.8%
1903	132.9	6.0%	1940	159.8	-11.2%	1977	702.3	19.7%
1904	137.7	3.6%	1941	158.1	-1.0%	1978	822.9	17.2%
1905	139.2	1.1%	1942	170.5	7.8%	1979	1,296.7	57.6%
1906	138.0	-0.9%	1943	183.9	7.9%	1980	1,390.9	7.3%
1907	133.8	-3.1%	1944	196.2	6.7%	1981	1,213.9	-12.7%
1908	133.4	-0.3%	1945	212.2	8.1%	1982	1,032.1	-15.0%
1909	132.9	-0.4%	1946	230.7	8.7%	1983	978.0	-5.2%
1910	131.7	-0.9%	1947	240.3	4.1%	1984	935.7	-4.3%
1911	129.6	-1.6%	1948	246.2	2.5%	1985	886.9	-5.2%
1912	127.8	-1.4%	1949	240.7	-2.2%	1986	859.4	-3.1%
1913	128.7	0.7%	1950	233.4	-3.0%	1987	867.7	1.0%
1914	128.3	-0.3%	1951	208.5	-10.7%	1988	821.1	-5.4%
1915	104.8	-18.4%	1952	197.7	-5.2%	1989	775.2	-5.6%
1916	86.1	-17.9%	1953	195.7	-1.0%	1990	710.7	-8.3%
1917	77.0	-10.5%	1954	187.8	-4.0%	1991	682.5	-4.0%
1918	66.1	-14.2%	1955	177.4	-5.5%	1992	657.9	-3.6%
1919	66.0	-0.2%	1956	173.3	-2.3%	1993	645.8	-1.8%
1920	60.4	-8.4%	1957	166.0	-4.2%	1994	630.4	-2.4%
1921	85.6	41.6%	1958	165.5	-0.3%	1995	643.6	2.1%
1922	99.2	15.9%	1959	172.2	4.0%	1996	646.8	0.5%
1923	103.0	3.8%	1960	189.3	9.9%	1997	624.1	-3.5%
1924	102.9	-0.1%	1961	190.1	0.4%	1998	643.6	3.1%
1925	105.4	2.4%	1962	196.0	3.1%	1999	665.7	3.4%
1926	104.6	-0.7%	1963	192.4	-1.8%	2000	729.6	9.6%
1927	123.6	18.1%	1964	186.4	-3.1%	2001	750.0	2.8%
1928	133.2	7.8%	1965	229.3	23.0%	2002	796.3	6.2%
1929	146.9	10.2%	1966	238.5	4.0%	2003	881.7	10.7%
1930	164.5	12.0%	1967	243.7	2.2%	2004	1,033.2	17.2%
1931	173.5	5.5%	1968	236.3	-3.0%	2005	1,121.1	8.5%
1932	181.6	4.6%	1969	364.2	54.1%	2006	1,194.6	6.6%
1933	184.6	1.7%	1970	370.7	1.8%	2007	1,259.2	5.4%
1934	204.2	10.6%	1971	345.2	-6.9%	2008	1,731.2	37.5%
1935	201.1	-1.5%	1972	329.2	-4.6%			

Notes. Table 5 reports the deflated index values of our rebalanced stamp price index from 1899 until 2008. It also shows yearly real returns.

Table 6: Distribution of returns on stamps and financial assets 1900-2008

		Mean returns p.a.		Dispersion of annual returns				
		Geometric	Arithmetic	S.D.	Lowest		Highest	
Nominal	**Stamps**	**6.7%**	**7.4%**	**14.1%**	**-10.4%**	**1982**	**84.7%**	**1979**
returns	Equities	9.2%	11.2%	21.8%	-48.8%	1974	145.6%	1975
	Bonds	5.4%	6.0%	11.9%	-17.4%	1974	53.1%	1982
	Bills	5.0%	5.1%	3.8%	0.5%	1946	17.2%	1980
	Inflation	4.0%	4.2%	6.6%	-26.0%	1921	24.9%	1975
Real	**Stamps**	**2.7%**	**3.3%**	**12.8%**	**-18.4%**	**1915**	**57.8%**	**1976**
returns	Equities	5.1%	7.0%	20.0%	-57.1%	1974	96.7%	1975
	Bonds	1.4%	2.3%	13.7%	-30.7%	1974	58.9%	1921
	Bills	1.1%	1.2%	6.3%	-15.4%	1915	42.3%	1921

Notes. Table 6 reports the distribution of nominal and real returns for stamps and different UK financial asset classes. For each asset category, it shows the geometric and arithmetic average yearly return, the standard deviation, and the lowest and highest recorded return. The stamp return data are shown in Tables 4 and 5. The return data for equities, bonds, bills, and inflation come from Dimson, Marsh, and Staunton (2009).

Table 7: Autocorrelations and standard deviations of real returns on stamps

		Since 1900		Since 1952	
		Original	Unsmoothed	Original	Unsmoothed
First-order AC of real stamp returns		**0.31**	**0.00**	**0.26**	**0.01**
S.D. of real returns	**Stamps**	**12.8%**	**17.6%**	**15.2%**	**19.7%**
	Equities	20.1%		23.7%	
	Bonds	13.8%		12.8%	
	Bills	6.4%		3.4%	

Notes. Table 7 reports the first-order autocorrelation coefficients for the periods 1900-2008 and 1952-2008, and standard deviations of both the original and the unsmoothed real stamp return series for the periods 1901-2008 and 1953-2008. For equities, bonds, and bills, it also shows the standard deviation of the real return series for the periods 1901-2008 and 1953-2008. The original stamp return data are shown in Tables 4 and 5. The return data for equities, bonds, and bills come from Dimson, Marsh, and Staunton (2009).

Table 8: Correlation matrix of returns on stamps and financial assets 1900-2008

	Stamps	Equities	Bonds	Bills	Inflation
Stamps	-	**-0.02**	**0.07**	**0.32**	**0.29**
Equities	*-0.02*	-	0.51	0.18	0.13
Bonds	*0.23*	*0.53*	-	0.29	-0.06
Bills	*0.35*	*0.26*	*0.65*	-	0.40
Inflation	*-0.25*	*-0.22*	*-0.55*	*-0.82*	-

Notes. Table 8 reports the correlations of the nominal and real returns of stamps and different UK financial asset classes. It also includes the correlations with inflation. The correlation coefficients in italics are calculated based on real asset returns, while the others are based on nominal return data. The stamp return data are shown in Tables 4 and 5. The return data for equities, bonds, bills, and inflation come from Dimson, Marsh, and Staunton (2009).

Table 9: Market model regressions

	$\beta(-2)$	$\beta(-1)$	$\beta(0)$	$\beta(+1)$	β	R2
Model 1	-	-	-0.013	-	**-0.013**	0.000
Model 2	-	0.161	0.031	0.041	**0.232**	0.068
Model 3	0.081	0.169	0.041	0.049	**0.340**	0.086

Notes. Table 8 reports the results of a regression of real stamp returns on real UK equity market returns. $\beta(-2)$, $\beta(-1)$, $\beta(0)$, and $\beta(+1)$ are the slope coefficients on lagged (-2 and -1), matching (0), and leading (+1) returns on equities. β aggregates the individual slope coefficients into an unbiased estimate of the market model beta, using Dimson (1979). R2 is the R-squared, or the multiple correlation coefficient. The stamp return data is shown in Table 5. The return data for equities come from Dimson, Marsh, and Staunton (2009).
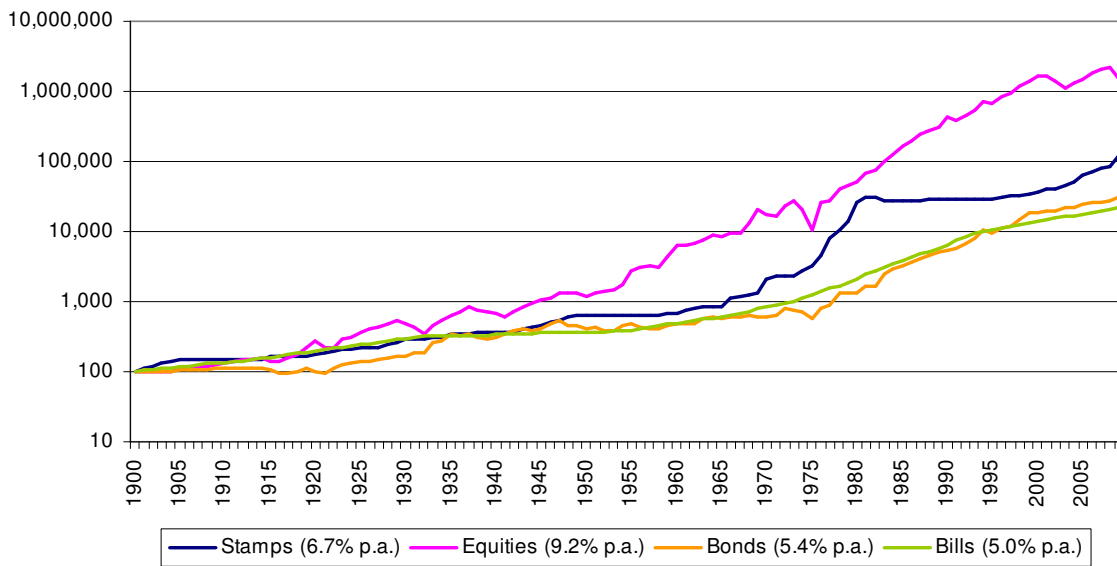
Figure 1: The two stamps that have consistently been among the top-50 from 1900 to 2008

SG classification no. *5*, 1840, 2d., blue (unused)   SG classification no. *121*, 1880, 2s., brown (unused)

Figure 2: Cumulative returns on stamps and financial assets in nominal terms 1900-2008

Figure 3: Cumulative returns on stamps and financial assets in real terms 1900-2008