BRITISH INVESTMENT OVERSEAS 1870-1913:
A MODERN PORTFOLIO THEORY APPROACH

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NBER Working Paper No. 11266
April 2005
JEL No. F0

ABSTRACT

Many scholars have asked whether British investors benefited from overseas investment investing

in the 19th century and whether this export of capital had negative effects. We re-visit the issue using

modern portfolio theory. We examine the set of investment opportunities available to British

investors, the developments in information transmission technology, and advances in financial and

investment theory at the time. We use mean-variance optimization techniques ot take into account

the risk and return characteristics of domestic and international investments available to a British

investor, and to quantify the beneifts from international diversification. Evidence suggests that

capital export was a consequence of both the opportunity and the understanding of diversification.

foreign assets offered higher rates of return, but equally important, they offered significant

diversification benefits. Even when--by setting expected return on each foreign asset class equal to

that of the corresponding UK asset class--we put foreign assets at a disadvantage, we find that it was

rational for a British investor to include foreign debts and equity in the portfolio.

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Introduction

The vast sums of capital invested by the British in overseas enterprises in the late 19th and early 20th centuries has been the focus of more than a century of economic discourse. Beginning with J. A. Hobson's theory of oversavings as the motivation for capital export and imperialism as its consequence, scholars have long disputed both the cause and the effects of the unprecedented flow of capital from a single nation into enterprises beyond its borders. While exact estimates of British overseas investment in the 19th century vary, there is general agreement that by 1914 Britain acquired a historically unprecedented position as a global creditor.[1] Between 1865 and 1914 as much British investment went to Africa, Asia, and Latin America as to the United Kingdom itself.[2] Between 4 to 8 percent of GNP was being sent out of the country by British investors in the years 1871—1913, a number significantly higher than that for other developed nations at the time.[3]

When a country sends a substantial amount of its financial capital abroad, a natural question arises whether these capital exports hurt the development of the industry at home.[4] For example, Kennedy argues based on certain assumptions, that a diversion of

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[1] Morgan and Thomas estimate that during one hundred year period, 1815—1914 the total British investment overseas amounted to £4,000 million, compared to British GDP of £2.5 billion in 1914. Morgan, E. Victor, and W. A. Thomas, 1962, *The Stock Exchange, Its History and Functions*, London: Elek Books, p. 79.

[2] Davis, L. E. and R. A. Huttenback, *Mammon and the pursuit of empire: the political economy of British imperialism, 1860—1912* (Cambridge, 1986), p. 46.

[3] Pollard, Sidney, 1985, "Capital Exports, 1870—1914: Harmful or Beneficial?" *Economic History Review* 38, 489—514.

[4] A general discussion of British industrial development and its relation to the British expansion overseas is contained in several works of Cain and Hopkins. Cain, P. J., and A. G. Hopkins, 1980, "The Political Economy of British Expansion Overseas, 1750—1914," *Economic History Review*, 33 pp. 463—490. Cain, P. J., and A. G. Hopkins, 1986, "Gentlemanly Capitalism and British Expansion Overseas I. The Old Colonial System, 1688—1850," *Economic History Review*, 39 pp. 501—525. Cain, P. J., and A. G. Hopkins, 1987, "Gentlemanly Capitalism and British Expansion Overseas II. New imperialism, 1850—1945," *Economic History Review*, 40 pp. 1—26. Cain, P. J., and A. G. Hopkins, 1994, *British Imperialism*, London: Longman.

capital from overseas to home purposes would have added 25—50 per cent to the British

national income. Crafts, on more restrictive assumptions, made it 25 per cent.[5] If this

indeed was the case, then Britain would have enjoyed a higher standard of living had

Victorian investors allocated a larger proportion of their portfolio to domestic issues. To

explain why investment abroad was so large if it was beneficial to invest at home some

scholars laid the blame on the City of London with its perceived propensity to channel

capital abroad. The proponents of this market failure hypothesis argue that London's

capital markets discriminated against domestic industry in favor of overseas

investments.[6] Ripley describes these views and responds to them eloquently:

> "British capital … was being used to develop foreign and colonial
> industries which were to prove serious competitors with the industries of
> Britain, competitive at first in particular areas and then throughout the
> world. … The flow of capital abroad might perhaps have been better
> directed, but a little reflection shows that nothing could have been gained
> in the long run by restricting capital investment to within the home
> country. The development of competing industries abroad would not have
> been prevented. Capital for that purpose would have been forthcoming
> from elsewhere; the trickle might have been slower and thinner, but the
> ultimate result would have been the same."[7]

Thus, in one view, overseas investment hurt Britain by creating a shortage of

capital for the domestic industry. Not being a supporter of any simplified opinion on the

matter of capital exports, Pollard writes:

> "An exactly opposite view is taken by neo-classical theory, which
> assumes, equally dogmatically, that capital exports must have been
> beneficial, since they would not have been undertaken had returns from

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[5] Kennedy, William, 1982, "Economic Growth and Structural Change in the United Kingdom, 1870--1914," *Journal of Economic History*, 42 pp. 87-118. Crafts, N. F. R., 1979, "Victorian Britain Did Fail," *Economic History Review*, 32.

[6] O'Rourke and Williamson, 1999, review and critique the capital market failure view of British overseas investment. O'Rourke and Williamson, 1999, *Globalization and History: The Evolution of a Nineteenth-Century Atlantic Economy*, Cambridge: MIT Press.

[7] Ripley, Percy, 1934, *A Short History of Investment*, London: Sir Isaac Pitman and Sons, pp. 161—163.

abroad not been higher than expected returns from home investment; thus they served to raise total British national income."[8]

There is a closely related literature on the profitability of investment in British empire. For example, Offer studies the question of whether the British empire was an asset or a liability.[9] The debate is focused on whether the empire produced economic returns higher than investments in Britain itself and whether these higher returns justified the cost of maintaining the empire, including the cost of defense. To measure returns, Offer cites the evidence presented by Edelstein and by Davis and Huttenback that overseas investment produced a higher risk-adjusted rate of return than British domestic securities. Offer discusses the costs of British defense at some length and concludes that these costs, contrary to the beliefs and conclusions of Davis and Huttenback, were not excessive and can be rationalized. Overall, he concludes that "overseas investment paid for its defense and left a substantial margin of profit." When discussing the benefits of the empire, Offer convincingly argues that the empire was a source of utility from items such as status goods, the privilege of management and control, and the opportunity for emigration.[10] Although focused on the strategic benefits of investment in the empire, Offer's arguments are directly related to consumption smoothing and risk-sharing: "Canadian wheat stood between Britain and starvation in 1917…"[11]

The debate on the costs and benefits of international investing is frequently focused on the rates of return of domestic and overseas assets. If returns on overseas investments are expected to be higher than on domestic issues, then a rational investor

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[8] Pollard, Sidney, 1985, "Capital Exports, 1870—1914: Harmful or Beneficial?" *Economic History Review* 38, 495.

[9] Offer, Avner, 1993, "The British Empire, 1870—1914: a waste of money?" *Economic History Review* 46, pp. 215—238

[10] Offer, 1993, pp. 232—233.

[11] Offer, 1993, p. 235.

would purchase foreign assets. To study this, Edelstein constructs a sample of 566 common and preferred stocks and bonds, domestic, colonial, and foreign, between 1870 and 1913 and computes realized rates of return. He concludes that on average, for the years 1870—1913, the United Kingdom's holdings of overseas portfolio investments realized a higher, price-deflated rate of return than their holdings of domestic portfolio investments.[12] Davis and Huttenback compute rates of return from company accounting records. These data are taken from the records of 482 British firms, operating either at home, in the empire, or in the rest of the world. Like Edelstein, they find that overall, from 1860 to 1912, British firms operating in the empire had higher returns than domestic enterprises, and also outperformed British companies operating overseas outside the empire.[13]

Edelstein argues that the risk of foreign and domestic assets is not the same and computes risk-adjusted returns. Using a form of the Capital Asset Pricing Model to adjust for the co-movement of international stocks with a domestic index, he finds that foreign equities returned a significant 1.58% per annum more than domestic equities over the period 1870-1913.[14]

An approach that is focused on rates of return, either raw or corrected for exposure to systematic risk via the CAPM does not use all the information contained in returns on domestic and foreign assets. Returns also contain information on the degree of correlation between different investments, and therefore, on the diversification benefits

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[12] Edelstein, M., Overseas investment in the age of high imperialism: the United Kingdom, 1850—1914 (New York, 1982). Data is described in Chapter 5.

[13] Davis and Huttenback, 1986, p. 107. One limitation of their study, is that it does not allow a true comparison between home and overseas investment, because it consists exclusively of British firms. It does not account for differences in performance between British and overseas management, especially when the overseas management managed on its home turf.

[14] Pollard, 1985, p. 496.

available to individual investors. In this paper we explore this important dimension of the data using Modern Portfolio Theory. Simply put, capital was invested abroad because many individual investors made a decision to invest in foreign assets. Our goal is to take into account expected returns, risks, *and diversification opportunities* simultaneously to we-revisit the question of whether these decisions were individually rational and if so, to what extent did the British investor benefited from international investing.[15]

The discussion of the benefits of overseas investment and of financial risk sharing can be enhanced and formalized by using mean-variance optimization techniques of the MPT. Modern portfolio theory assumes that investor preferences can be represented by a utility function defined over the expected return and variance of a portfolio return. Rational investors form portfolios that have the smallest variance for every level of expected return. In doing so, they take into account expected returns of assets in their investment opportunity set, as well as asset variances and *co-variances* between different investments.

In this study we use the data on returns on domestic and foreign assets compiled by Edelstein.[16] Our findings, therefore, can be compared to the results obtained by other researchers whose main focus is on the return characteristics of these data series. We argue that it is important to bring co-variance between asset classes into the picture. We document and quantify the benefits of international investments available to British investors in the late nineteenth century.

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[15] Several classic international asset pricing models are focused on the portfolio problem of domestic investors: Black (1974), Stulz (1981a, 1981b), Errunza and Losq (1985), and Eun and Janakiramanan (1986). For a corporate finance perspective see Errunza and Senbet (1981), Stulz (1999b), Stulz and Wasserfallen (1995), Errunza and Miller (2000).

[16] See the description of annual return series on various asset classes in Edelstein 1982, Chapter 5.

Our analysis suggests that diversification is an important explanation for British investors' overseas investments. Mean variance analysis shows that given expected returns, variances and co-variances among domestic and foreign assets, rational investors maximizing expected return for a given level of risk should have taken advantage of the diversification opportunities and include foreign asset classes in their portfolios. Estimates of British actual overseas investment, as a percentage of total investment range from 28 per cent by Hobson (1914) and Feis (1930) to 47.7 per cent by Edelstein (1982), with an average estimate of approximately 34 per cent.[17] Our results for the optimal portfolio weights from mean-variance analysis are surprisingly close to these. For example, when we consider eleven UK equity asset classes and four world-wide equity asset classes, the optimal portfolio given reasonable assumptions about investor risk aversion includes 38 per cent investment overseas.[18]

To highlight the role of diversification, we perform the following experiment. We maintain the correlation matrix and the standard deviations of all asset classes, but set the expected return on each foreign asset class equal to that of the corresponding UK asset class. Since returns on UK asset classes are lower during the time period of study, this effectively penalizes investment abroad. Even with this penalty, we find that it is still optimal to include foreign assets in the portfolio and take advantage of the diversification opportunities that investing overseas offers. A review of the financial literature of the period also suggests that British investors understood benefits of international diversification. Overall, evidence suggests that capital export was a consequence of opportunity and understanding of diversification.

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[17] Pollard, 1985, p. 491.
[18] The results are presented in Table 10 and discussed in a later section of the paper.

The British Securities Market

British Investment Overseas

The difficulty of obtaining precise measurements of overseas investment is well known. Estimates based on new issues made in London may be wrong, because foreign investors could, and often did, subscribe to issues made in London, and British investors could, and did, subscribe to issues made in overseas markets. Similar arguments apply to using nominal or market values of securities quoted in London. To obtain figures for overseas investment, economic historians supplement the information on securities issued and quoted in London with funds flow data, and with the estimates of the investment income derived from overseas. Whatever the method used, there is an agreement that a substantial amount of capital was sent by British investors to foreign countries during the period from 1870 to 1913.[19] Foreign investment, however, can be traced to earlier days of international trade and finance.

From the early days of finance, investors pursued international investments. The earliest known joint-stock company in Britain was the Russia Company. It was formed in 1553 by a group of London merchants to send an expedition to seek for a North-East passage to China and Indies.[20] The ships reached Archangel, and in 1555 the Company secured a charter giving it a monopoly of trade in Russia. Investors in the Company were

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[19] The challenges of obtaining the estimates of British overseas investment are also discussed in Platt, D.C., 1980, "British Portfolio Investment Overseas Before 1870: Some Doubts," *Economic History Review* 33, pp. 1—16.
[20] Ripley, Percy, 1934, *A Short History of Investment*, London: Sir Isaac Pitman and Sons.

not making an international investment in the strictest sense, because their capital was not all deployed abroad. Nonetheless, the risks that the Company faced were international in nature.

Another important early example of a chartered company was the East India Company, also an international trade enterprise. Joint-stock companies were formed for the colonization of Virginia (1606), Bermuda (1611), Guiana (1619), New England (1620), and Nova Scotia (1621).[21] By 1620 the East India Company had nearly a thousand shareholders and a subscribed stock of £1,629,000.[22] The first foreign government loan was floated in London in 1706 on behalf of the Emperor of Germany for £500,000, secured on the revenues of Silesia and bearing interest at 8 per cent.[23] More financial landmarks followed—The South Sea Company (1711), the establishment of the Sinking Fund in England (1717), The South Sea Bubble (1720), and The Bubble Act that made the formation of joint stock companies a difficult and costly matter. In 1802 a new Stock Exchange was opened in Capel Court.

The significant flow of British investment overseas began in the years after the French wars. Three issues of the French "rentes" were placed by Barings in London between 1815 and 1818. In the early 1820's Rothschilds issued loans in London for Prussia and Russia. The republics of Central and South America also borrowed in London at that time. Between 1822 and 1825, Brazil and Peru each raised three loans; Mexico and Columbia, two; and Chile, the Argentine and Guatemala, one.[24] Greece also placed a 5 per cent government bond in London at this time. With the exception of Brazil,

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[21] Morgan, E. Victor, and W. A. Thomas, 1962, *The Stock Exchange, Its History and Functions*, London: Elek Books, pp. 12—13.
[22] Ripley, 1934, p. 25.
[23] Ripley, 1934, p. 50.
[24] Morgan and Thomas, 1962, p. 81.

all of the South American States soon defaulted. During the next fifteen years most foreign issues in London were from the United States. The amount of British investment in the United States around 1840 has been estimated between £22 million and £40 million.[25]

Table 1 lists different types of securities quoted on the London Stock Exchange in 1843 and their nominal values. Loans to foreign governments represent 11% of the securities. In addition, there are private companies that can be clearly identified as international enterprises. Among them, there is the East India Company, the South Sea Company, and twenty four foreign mining companies.

Morgan and Thomas estimate that by the mid eighteen-fifties British overseas investments were over £200 million, and during the next twenty years they increased more than five-fold.[26] Between 1860 and 1876 more then a hundred and fifty foreign government loans were issued in London and British investors are estimated to have provided £320 million in cash to these borrowers. This is more than two-and-a-half times the nominal amount of all foreign government debt in 1842. In addition, £160 million is estimated to have been invested in India and colonial governments and railways, and more than £230 million in companies operating abroad.[27] This was the time of large outflow of British capital to India. The amount of capital invested in Indian railways alone from 1858 to 1869 was £70.1 million. Indian securities were widely held. On January 1, 1868 there were 49,690 shareholders and bondholders, practically all of whom

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[25] Ripley, 1934, pp. 76—79.

[26] For comparison, the total value of UK government debt was £832 million in 1850 and £775 in 1875. With UK population in 1877 being equal to 33,444,419 UK government debt equaled 23 pounds 5 shillings per head. Foreign investment by the mid-1870's reached 29 pounds 18 shillings per person (the figures for UK population and UK debt are from *The Investors' Monthly Manual*).

[27] Morgan and Thomas, 1962, p. 88.

were residents of Great Britain.[28] Other rapidly growing colonies also raised funds in Britain. Fifty million pounds were loaned between 1860 and 1876 to the governments in Australasia, mainly for railway construction and other infrastructure projects. Twenty-five million more were loaned to the governments of Canada and smaller colonies.[29]

Investment overseas continued throughout the 1880's. The amount of capital raised in 1888 was £160 million and another £190 million followed in 1890. Much of this capital went into South American shares, and the shares of mining companies in North America and Africa. The sum subscribed for mining ventures in 1888 was £52.5 million, and in 1889 £41 million.[30] According to Ripley, estimated British capital abroad in 1885 stood at £1,302,000 and reached £1,600 million in 1895.[31] **Table 2** shows the nominal value of foreign securities quoted on the London Stock Exchange at the beginning of 1893. Of the total amount £1,368 million, foreign government securities represented 38% and colonial government securities represented 16%. These are the two largest asset classes. US Railways accounted for 8.8% and railways in India for another 4.75%. All railway securities accounted for 28.4% of the total investment overseas.

Another period of phenomenal growth in overseas investment was from 1905 to 1914. Overall, well over £2,000 million was invested abroad between 1880 and 1914.[32] At the end of 1913, a total of £3,715 million was invested in overseas securities. Researchers agree that measured in absolute value or relative to national product, savings,

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[28] Jenks, 1927, pp. 219—220.
[29] Jenks, 1927, p. 231. There are 157 foreign loans listed in the table of foreign government loan issues in London from 1860 to 1876 compiled by Jenks.
[30] Ripley, 1934, pp. 151—152. Total value of UK government debt was £746 million in 1884 and £665 in 1894.
[31] Ripley, 1934, p. 163.
[32] Morgan and Thomas, 1962, p. 94, who cite the following source: Cairncross, A. K., 1953, *Home and Foreign Investment*, 1870—1913, Cambridge, p. 180. These figures are based on balance of payments estimates and are significantly lower than estimates of the amount of foreign assets in British ownership derived from income tax returns.

or wealth, British capital exports moved to unprecedented levels in the late nineteenth and early twentieth centuries.[33]

Where was the money invested? **Table 3** displays the geographical distribution of foreign investment, as well as the distribution of investment among different asset classes and industries. At the end of 1913, just under half of foreign investment was in the dominions and colonies, approximately 20% in the United States, and another 20% in Latin America, and 15% in Europe. U.S. new issues were 21 per cent of total new overseas issues, 1886—1913. Argentina was another significant importer of capital from the United Kingdom over the same years. Between 1870 and 1913 Argentina issues accounted for approximately 8 per cent of total overseas issues placed in the UK. Between 1870 and 1913 Australian new issues absorbed by the United Kingdom amounted to £325 million, approximately 8 per cent of total new overseas issues in the UK. Britain's investment in new Canadian issues totaled 9.7 per cent of the total new issues taken up by the United Kingdom during 1870—1913.[34] Distribution across various industries is also interesting: 40% of foreign investment was in railway securities, 30% in loans to foreign governments and municipalities, 5% in public utilities, 10% in mines and plantations, and about 8% in banks and financial institutions.[35]

The Investment Opportunity Set

The overview of British overseas investment flows clearly indicates that the investors faced a rich set of foreign investment opportunities. By no means was this set

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[33] Edelstein, 1982, p. 25.
[34] Edelstein, 1982, pp. 102—104.
[35] Morgan and Thomas, 1962, p. 80. Similar percentages are reported in Segal, Harvey H., and Matthew Simon, 1961, "British Foreign Capital Issues, 1865—1894," *Journal of Economic History* 21, p. 575. See also Davis and Huttenback, 1986, Chapter 2.

static. It evolved with political changes around the world. Young Latin American states approached the British financial market early in their political development. Greece, too, borrowed in London when funds were needed to support the formation of a new political regime. Technological changes also affected the investment opportunity set. With the invention of the telegraph new companies were formed throughout the world laying telegraph cables and establishing the world-wide telecommunications network. Finally, infrastructure development placed large demands on the capital markets. British investors financed railroad construction throughout the world. Tracing the evolution of the investment opportunity set over several decades shows that foreign securities occupied an increasingly important role in the portfolio of a British investor, and illustrates that the investments also came from a wide range of industries and geographical regions, creating substantial diversification benefits.

The London Stock Exchange was both the world's largest before 1914, and the most international. In 1903, S. S. Pratt, an American, noted that "The bonds of every Government, the stocks of every country, are traded in London," and made a comparison with New York, where "Wall Street confines itself to the securities of the United States." Only the Paris Bourse came close to London as an international financial center. London's interest was worldwide, whereas Paris tended to trade in the securities of other European and Mediterranean countries.[36]

Integration between the London securities market and those abroad began in the eighteenth century when British securities were held extensively abroad, especially by the Dutch. At the beginning of the nineteenth century foreign holdings of British securities were reduced to small amounts and continued to decline. At the same time, British

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[36] Michie, 1987.

investors were beginning to hold foreign securities.[37] By 1843 a total of £1,118 million (nominal values) of securities was known in London, and of these, at least £128 million, or 11.4%, were foreign (**Table 1**). By 1853, when the paid-up capital of securities quoted on the London Stock Exchange was £1,215 million, a total of £101 million, or 8.3 per cent, was foreign, with 70% issued by foreign governments and 30% by foreign railroad companies (**Table 5**).

The second half of the nineteenth century there was a significant growth in internationally held government debt issued by non-European countries. **Table 4** lists government securities traded on the London Stock Exchange in 1869 and in 1890. There are 196 government bonds listed for 1869 and 250 for 1890. Canada, Brazil, Argentina and Australia raised funds to finance infrastructure development. In 1863, the nominal value foreign government securities quoted in London equaled £146.7 million, or 9 per cent of the total (which equaled £1,604 million). By 1883, the nominal value of foreign government securities quoted in London grew to £831.5, which equaled 22.8 per cent of the total of £3,641 million. Trading in the debt securities issued by countries such as Britain, France, Germany and the United States mostly took place on their own principal exchanges. However, it was not necessary for foreign debt to be exclusively held in Britain for it to be important from the point of view of a British investor. What was important was the fact that foreign debt could be purchased with relatively small transaction costs through a domestic securities exchange in London.

In addition to government issues, British investors had access to foreign corporate stocks and bonds (**Tables 2** and **5**). Securities issued by continental European railways and US railroad securities were two important asset classes. Depending on the source of

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[37] Morgan and Thomas, 1962, p. 80.

data, in 1893 US railways accounted for 8.8% to 11% of the total nominal value of securities quoted in London. New issues of railroad securities were made available to British investors throughout the years. When the Atchison, Topeka & Santa Fe railroad made a new issue of $88 million 4 per cent bonds in 1896 it allocated 22.7 per cent to Amsterdam, 29.5 per cent to London and the remainder to New York.[38]

In addition to US railroad securities, the issues of railway companies from numerous other countries were also an important part of the British investors' investment opportunity set. For example, 65 per cent of Canadian Pacific Railway shares were held in Britain. Of the £1.5 million loan placed by the Argentine North-Eastern Railway in 1888, investors in Britain accounted for 62.5 per cent.[39]

Industries other than railroads were also represented on the London Stock Exchange by foreign stocks and bonds. These, for example, included securities issued to finance the development of copper mining in Spain, United States, and the gold-mining boom in South Africa in the 1890s.[40] Other industries included banking, chemical industry, steel, manufacturing, telegraph (and later, telephone), gas and light, waterworks, and tramways—the latter five industries jointly often referred to as infrastructure securities.

The investment opportunity set continued to expand with the development of financial markets. **Table 3** provides a summary of foreign investment opportunities available to a British investor at the end of the period of our study, in 1913. By this time foreign stocks and shares quoted in London had a nominal value of nearly £6,800 million,

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[38] Michie, 1987, p. 53.
[39] Michie, 1987, pp. 54—55.
[40] Harvey, Charles and Peter Taylor, 1987, "Mineral wealth and economic development: foreign direct investment in Spain, 1851—1913," *Economic History Review* 40, pp. 185—207.

60% of the value of all quoted securities. Investors had access to securities issued within the empire, including Canadian, Indian, and Australasian securities. Investors could purchases stocks and bonds issued by North American and South American governments and corporations, as well as securities from all European states, the Middle East, Japan, and China. Overall, the investment opportunity set of a British investor at the end of 1913 is a list of companies that occupies ninety pages of *The Investor's Monthly Manual*, printed in a rather small font. The examination of this list shows that not only were the investors able to diversify their holding geographically, but they also could invest in different industries. Apart from government securities issued by colonial and foreign governments, there were stocks and bonds issued by foreign banks, breweries, canals and docks, mines, and railroads, as well numerous other industries. For example, the list contains 187 securities issued by American (US and Mexican) railway companies and 240 by foreign railways (this number does not include Canadian and Indian railways which are listed separately).

British investors could invest in individual issues of stocks and bonds floated by foreign governments and commercial enterprises. The investors could also invest in overseas assets through investment trusts that acted as financial intermediaries similarly to today's mutual funds. Investment trusts allowed smaller investors to hold diversified portfolios of foreign securities, thereby making investment abroad a more attractive proposition for British investors.

The concept of the investment trust company, or a mutual fund, received an increasing amount of attention and popularity during the last quarter of the nineteenth century. The Scottish American Investment Co., Ltd., founded in 1873 was an early

success story. Fifteen new investment trust companies were formed in 1888 with a capital of £9,500,000 and another nineteen in the following year, with the capital of £25 million. The total capital invested in investment trust companies at the end of 1889 was approximately £50 million.[41] As of the end of 1890, 119 investment trusts were listed in *The Investor's Monthly Manual*, with total capital of £60,076,805. Of this amount, the trusts with names suggesting overseas investments had a total capital of £6,366,426, or 10.6 percent.[42] There were trusts with the titles such as Colonial Securities, Ltd., Foreign, American, and General Investment Trust, Foreign and Colonial Government Trust, Ltd., South African Gold Trust and Agency, Ltd., and United States and South American Investment Trust, Ltd.

British investors had access to securities from many foreign issuers. Henry Lowenfeld, and English author, in his 1909 book *Investment, an Exact Science* lists forty countries with stock markets open to British investors.[43] These securities represented different regions of the world, as well as varied across industries. Investors had access to bonds, preferred stocks, and ordinary stocks. Investors were also able to invest overseas through an important group of intermediaries, investment trust companies. Overall, the ability to trade foreign securities in London was a crucial characteristic of the investment opportunity set in Britain.

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[41] Riple, 1934, pp. 123—124.
[42] The authors' calculations using the data from *The Investor's Monthly Manual*, 31 December 1890. Only the funds with distinctly sounding foreign titles were included in the calculation, and therefore the figure is biased downward.
[43] Great Britain, India, Canada, Australia, Tasmania, New Zealand, Straits Settlements (Singapore), Belgium, Denmark, Germany, Holland, Norway, Russia, Sweden, Switzerland, Austria, Bulgaria, France, Greece, Italy, Hungary, Portugal, Roumania, Spain, Serbia, Turkey, Japan (Tokyo and Yokohama), China (Shanghai and Hong Kong), Cape Colony, Natal, Transvaal, Egypt, New York, Mexico, Argentine, Brazil, Chile, Peru and Uruguay.

The Information Environment

Successful development of a financial market requires access to information. If British investors were to place their capital at risk in remote parts of the world, it is only natural to expect that they would have had a strong demand for information about their investments. The emergence of London as the world financial center took place at a time of revolutionary improvement in information transmission. Britain was at the forefront of the technological change. Electric telegraph, based on scientific discoveries, technological innovations, and engineering talent, linked the City of London with most distant parts of the world.[44]

The first electric telegraph line established in Europe for the actual transmission of messages was between London and Birmingham, in 1838, by Sir Charles Wheatstone (1802—1875). In France the first line was constructed in 1844 between Paris and Rouen. The lines between Paris and Orleans, and Paris and Lille were constructed in the years 1847 and 1848. The first line constructed in the United States was put in operation in June, 1844, between Washington and Baltimore. The next year it was continued to New York and Boston, and in 1846 to Buffalo and Harrisburg.[45]

First telegraph lines used overhead copper wires. As technology improved, it became possible to lay telegraph lines under water. Prescott wrote in 1860: "The English

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[44] Kaukiainen argues that there was a substantial improvement in the speed of world-wide information transmission even before the introduction of the electric telegraph. He collects data from the *Lloyd's List* and argues that between 1820 and 1860, transmission times dropped substantially, in many cases to a third or even a fifth and in no case to less than about a half. The median interval in days between dispatch and receipt between London and St. Petersburg went from 25 days in 1820 to 7 in 1860. For other routes these numbers are: London and Gibraltar, 21 and 8 days; London and Constantinople, 38 and 10 days; London and Bombay, 145 and 26 days; London and New York, 32 and 13 days. Kaukiainen, Yrjo, 2001, "Shrinking the world: Improvements in the speed of information transmission, c. 1820—1870," *European Review of Economic History* 5, 1—28.

[45] Prescott, George B., 1866, *History, Theory, and Practice of the Electric Telegraph*, Boston: Ticknor and Fields.

were the first to lay submarine cables, and are now far in advance of the rest of the world in their manufacture, and in machinery for laying them."[46] By 1860, three lines were in existence between England and the Continent. Submarine cables connected England and Ireland, and Denmark and Sweden. Nearly one hundred submarine cables totaling more than 25,000 miles had been laid around the world, uniting about one-half million miles of land lines in America, Great Britain, Europe, India, Africa, Asia and Russia.[47] The Atlantic cable, connecting Ireland with Newfoundland and New York, and thus permitting Europe to communicate telegraphically with America, was laid 1858 and the first public dispatch – that of the Queen to the President of the United States – was received on August 17. Communications broke down, however, in September. The first fully successful Atlantic cable was completed in 1866.

The speed of information transmission through the telegraph system also improved continuously. In the 1860's, a telegraphic message could reach London from India in eight and a half hours.[48] "The actual celerity with which correspondence is transmitted between London and parts of Europe more or less remote, may be judged from the fact that the Queen's speech, delivered at the opening of the recent Parliamentary session, was delivered verbatim, and circulated in Paris and in Berlin, before her Majesty had left the House of Lords."[49] This was quite an improvement over the situation merely ten years before, when the fastest form of transport between London and Paris involved hours of travel, with the closing prices of the Paris Bourse not being

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[46] Prescott, 1866, p. 174.
[47] Shiers, George, 1977, *The Electric Telegraph: An Historical Anthology*, New York: Arno Press.
[48] Prescott, 1866, p. 478.
[49] Prescott, 1866, p. 217. Written in 1860.

received at the London Stock Exchange until 10 a.m. the following day.[50] Kaukiainen compares overseas dispatch times to London before and after the introduction of telegraph. The dispatch time between London and Bombay decreased from 145 days by post in 1820 to 3 days in 1870 by telegraph. These numbers were: London and Hong Kong 141 days in 1840 and 3 days in 1870; London and Sydney, 140 days (1820) and 4 days (1870).

The financial community quickly adopted the telegraph. By 1908, there were nine wires between the London and Paris stock exchanges. London was connected to all European financial centers, as well as more remote locations—New York (1866), Melbourne (1872), and Buenos Aires (1874). In 1871, the annual volume of telegrams between London and New York reached 42,000. Although the most rapid long-distance telegraph communications existed between the London Stock Exchange and New York, similar links were established throughout the world through a network of submarine and land lines.[51] Even with the invention of the telephone, in 1876, the telegraph remained an important channel of communications.[52] Telephone service was for a long time quite limited. And although the line between London and Paris operated since 1891, there was no transcontinental telephone until 1915.

These technological developments changed the informational environment of British investors. By 1870, with the development of the electric telegraph network, British investors could receive news concerning political events world-wide, economic

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[50] Michie, R.C., 1987, *The London and New York stock exchanges, 1850—1914*, London: Allen and Unwin.
[51] R. C. Michie, 1987, p. 47.
[52] Professor Bell and Colonel Raynolds demonstrated the possibilities of the telephone to Queen Victoria on 14th January, 1878.

and trade news, and even news regarding the weather and the storms affecting the crops in the colonies.

Investment Theories and Diversification

British investors understood the benefits of international diversification. Perhaps they were not employing the formal statistical tools and did not analyze the correlations between various investments. They have clearly understood, however, that they could achieve better risk and return opportunities by investing part of their portfolio in foreign securities. The quantitative analysis of international diversification dates at least to Henry Lowenfeld's (1909) study of equal-weighted, industry-neutral, international diversification strategies. In his book, he argues that superior investment performance can be obtained by spreading capital in equal proportion across a number of geographical areas and carefully re-balancing back to these proportions on a regular basis.[53] This geographical diversification strategy was apparently a popular one with British and other European investors during the last quarter of the nineteenth century.[54]

To support the recommendation for international diversification, Lowenfeld postulates that different factors affect securities from different countries. The dominant factor affecting security returns is the market factor (Market Influence in his terminology) for that country. In support of this argument, Lowenfeld displays a chart showing the price movements of twelve British stocks (actually fixed income securities) from the year 1893 to the end of 1906 to argue that there is a large degree of co-movement between

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[53] Lowenfeld, Henry, 1907, *Investment and Exact Science*, The Financial Review of Reviews, London.
[54] Goetzmann, William N., Andrey Ukhov, and Ning Zhu, 2001, *China and the World Financial Markets 1870-1930: Modern Lessons from Historical Globalization*, Yale International Center for Finance Working Paper No. 00-62.

them. Then the author points out that even if an investor holds a mixed assortment of British stocks he cannot expect the movements in the value of the investments to counterbalance each other, because all of them are subject to the influence from the home market-wide risk factor. This logic is similar to modern international asset pricing theories that show that returns on an asset are a function of the asset's exposure to the world market factor, and of the national market factor in the asset's domestic market.

To show that this logic applies to financial markets in other countries, Lowenfeld provides charts of price movements of the stocks of the following countries: Great Britain, France, Germany, Switzerland, Belgium, Canada, Japan, USA, and Argentina (the figure is reproduced in **Appendix A**). He concludes that the value of all securities that come from the same country is influenced by that country's market factor. At the same time he points out that securities from different countries do not have the same degree of co-movement as securities within one country. This observation allows Lowenfeld to put forward an investment principle which he calls "The Geographical Distribution of Capital." According to this principle, an investor spreads his wealth across securities from different countries, thereby diversifying away country-specific risks:

> "If an investor divides his capital equally among a number of stocks, every one of which is under a different trade influence, then each of these divisions of his capital will constitute a distinct investment risk, and a true system of averaging investment risks is thereby established."[55]

Lowenfeld also observes that when holding a diversified international portfolio an investor can achieve a higher level of return for the same level of risk compared to the case when only domestic securities are held in a portfolio:

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[55] Lowenfeld, 1907, p. 51.

"An investor who geographically distributes his capital can, with safety, afford to hold stocks which yield a larger income[56] than he can hope to receive from an Investment List which disregards the important point of Geographical Distribution."[57]

Lowenfeld's book shows that British investors, including the managers of banks, insurance, and finance companies, as well as large private investors, had a sophisticated way of thinking about investments. In many ways the views expressed in the book correspond to the ideas of the Modern Portfolio Theory, which was formally developed more than fifty years laterg. He advocates, for example, analyzing investments from a portfolio point of view and explains "the necessity of considering all investments held as **one harmonious whole**, of which all the component parts must properly balance each other."[58]

Lowenfeld also considers how an internationally diversified portfolio should be constructed for an investor who has limited wealth. He recommends that the first stock that an investor buys for his portfolio be of "a general international character."[59] In other words, the first stock should be a stock that represents a world market portfolio. The second stock should be a British stock. Consistent with the principle of diversification, the author recommends that the next sum should be invested "in a stock whose trade influence is most likely to be in diametrical contrast to that of Great Britain."[60] Once again, he expresses a view consistent with modern financial theory, namely with the formal statistical result that the lowest variance of a portfolio can be achieved when assets in the portfolio are negatively correlated.

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[56] That is, riskier stocks.
[57] Lowenfeld, 1907, pp. 53—54.
[58] Lowenfeld, 1907, pp. 72—73, emphasis as in the original text.
[59] Lowenfeld gives the following examples: Shipping Companies, Marine Insurance Companies, and Cable Companies.
[60] Lowenfeld, 1907, pp. 90.

In his discussion of The Geographical Distribution of Capital Lowenfeld takes into account both returns from foreign assets, as well as the risks. But how well did British investors understand the risks of foreign investment? The short answer is, "Very well." Investors in Britain had a sufficiently long history of active involvement in international financial market to accumulate negative experience and to learn the fact that placing capital in foreign lands can be risky. "By 1843, British citizens were believed to hold over £120 million of foreign bonds, including those of the American states, but at least £50 million were in default with dividends anything from five to twenty-five years overdue."[61]

Investors understood the risks, and were familiar with the difficulties that arose when foreign securities were in default. In 1875 the Government appointed a Select Committee to investigate the circumstances surrounding many foreign loans and the reasons for default on such loans. Loans raised by Honduras, San Domingo, Costa Rica, and Paraguay with the total nominal value of £10 million were subject of the inquiry. The Committee uncovered unsound lending practices on part of the syndicates that were formed to take portions of the loan at a price considerably below the issue price and re-sell the loan to the public. Honduras incurred a debt of £5,990,000 in the nominal principal value, and in return for the liability provided security in the form of an abandoned section of a railway line 53 miles in length for which the builder received £689,000. The Committee remarked of San Domingo that "it is clear that the Republic felt the improvidence of a bargain by which in return for a sum of £320,000 it was to repay in respect of interest and sinking fund annuities amounting to a total sum of £1,472,500, or in other words, more than 18 per cent per annum for twenty five years."

[61] Morgan and Thomas, 1962, pp. 86—87. Their work contains an extensive discussion on early defaults.

Overall, at the end of 1878, 54% of Britain's loans to foreign governments were in total or partial default.[62]

Another period of crisis, this time resulting from heavy borrowing by Argentina, were the years 1888 through 1893, and again in 1896. Argentina carried a heavy burden of external debt, the amount at the beginning of 1890 was approximately £22 million, experienced high inflation, and generally was in poor financial condition. In 1890 it became evident that the Argentine Government could not meet its obligations and guarantees on external railway and other loans and prices of Argentine securities fell dramatically in London.[63] The price of the Argentine Government Bond of 1886 fell by 17.5% from the end of 1889 to the end of 1890. The Buenos Ayres 1882 bond fell by 31.5% during the same period.[64] A series of renegotiations between a committee of English creditors chaired by Lord Rothschild and the Argentine Government took place in 1893 and 1896, and some of the losses of the bondholders were recovered.

The risks of foreign investments must be considered jointly with returns. And in many cases investments in foreign government loans gave a very reasonable rate of return. Writing in 1881, Nash lists approximately 130 foreign government securities with a total market capitalization of over £1,400 million, about half of which were believed to be in British ownership. For stocks that had been issued that long, he traces the dividend history back to 1870, finds remarkably few defaults, and reports an average dividend yield of 5.87%.[65] By 1870's, British investors understood the risks of foreign

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[62] Ripley, 1934, pp. 102—103.
[63] Ripley, 1934, pp. 152—153.
[64] End-of-the-year prices are from *The Investor's Monthly Manual*, December 31, 1890, p. 620.
[65] Morgan and Thomas, 1962, p. 91.

investments. They also understood the benefits that come from international diversification, and paid attention to both risk and return when placing capital abroad.

Benefits of Overseas Investment:

Evidence from the Modern Portfolio Theory

Theory

Let there be N risky assets available to the investors. The investment opportunity set is described by the vector of expected returns on the N assets, $\bar{\mathbf{z}}$, and by $\boldsymbol{\Sigma}$, the covariance matrix. Modern portfolio theory assumes that the investors' preferences can be represented by a utility function defined over mean (the expected return) and variance of a portfolio's return. The assumption is that investors favor higher means and smaller variances. Minimum-variance portfolios are portfolios that have the smallest variance for every level of expected returns. In the absence of a risk-less asset the minimum variance portfolio with expected return μ is the solution $\mathbf{w}(\mu)$ to

$$\text{Min}\,\frac{1}{2}\mathbf{w}'\boldsymbol{\Sigma}\mathbf{w}$$
$$\text{Subject to }\mathbf{1}'\mathbf{w} = 1, \quad\quad\quad\quad\quad\quad\textbf{(1)}$$
$$\bar{\mathbf{z}}'\mathbf{w} = \mu.$$

Vector $\mathbf{w}$ is the vector of weights of risky securities in the portfolio. When no positivity constraints of the form $w_i \geq 0$ are imposed, unrestricted short sales are permitted. With no short sale restrictions and no risk-free asset available, in mean-standard deviation space, with mean return on the *y*-axis and standard deviation on the *x*-axis, the set of

minimum variance portfolios is a hyperbola, as illustrated in **Figure 1**.[66] When a risk-less asset is available a Capital Allocation Line (CAL) obtains. It is a straight line which intersects the *y*-axis at the risk-free rate and is tangent to the minimum variance frontier constructed from risky assets. The Capital Asset Pricing Model identifies the tangency point as the market portfolio. Sharpe ratio, which equals the slope of the CAL, characterizes the risk-return trade-off of the market portfolio and is computed as

$$S_p = \frac{r_p - r_f}{\sigma_p},$$

where r_p is the expected return on the market portfolio, r is the risk-free interest rate, and σ_p is the standard deviation of the return on the market portfolio. Portfolios with higher Sharpe ratios offer more attractive risk-return trade-off.

Investors frequently face short-sales constraints. The minimum variance frontier can still be constructed. When no risk-free asset is available, the optimization problem (1) is modified by adding short sales constraints $w_i \geq 0$ for all assets, $i = 1, \ldots, N$. In this case there is no simple analytical characterization of the frontier, and numerical optimization methods are required to compute the frontier portfolios. Generally, with positivity constraints the frontier is not a hyperbola.[67] If a risk-free asset is available, it is still possible to draw a straight line with the intercept equal to the risk-free rate tangent to the minimum variance frontier. The tangency point is the market portfolio in this case, and its Sharpe ratio (the slope of the line) characterizes the risk-return trade-off that the investors in the economy face.

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[66] Markowitz, Harry, 1952, "Portfolio Selection," *Journal of Finance* 7, pp. 77—91. Merton, Robert C., 1972, "An Analytical Derivation of the Efficient Portfolio Frontier," *Journal of Financial and Quantitative Analysis* 7, pp. 1851—72.

[67] Dybvig, Philip H., 1984, "Short Sales Restrictions and Kinks of the Mean Variance Frontier," *Journal of Finance* 39, pp. 239—44.

To evaluate the role of the foreign assets we first construct minimum variance portfolios with only domestic assets. We then include foreign assets in the investment opportunity set and construct minimum variance portfolios again. We follow this procedure to quantify the improvement in the risk-return trade-off due to the inclusion of foreign investments.

Evidence from Five Broadly Defined Asset Classes

We begin our minimum-variance analysis by using five broadly defined asset classes: UK Equity, UK Preferred, UK Debt, Foreign Equity, and Foreign Debt. The asset classes are defined by Edelstein. **Table 6** displays expected annual returns on the five asset classes, standard deviations, and correlations. Foreign equity has a higher return than domestic equity, 8.66% compared to 6.61%. Foreign debt has a higher return than domestic debt, 4.94% and 3.35%, respectively. At the same time, with a standard deviation of 9.36% foreign equity is riskier than domestic equity, which has a standard deviation of 7.38%. Foreign debt does not appear to be riskier than domestic debt. Foreign debt returns have a standard deviation of 2.37% compared to 2.36% for domestic debt. This, however, can be attributed to the fact that foreign debt asset class includes a much greater number of securities than the domestic debt asset class. By including a large number of government and industrial bonds from around the globe, foreign debt already takes advantage of diversification opportunities. Examination of the correlation matrix reveals a high correlation between domestic common and preferred shares (0.71). The correlation between domestic and foreign equity returns is lower at 0.39.

Data from **Table 6** is used to construct a mean-variance frontier with only British asset classes and a frontier that uses all five asset classes. The two frontiers are shown in **Figure 1**. No short sale restrictions are imposed. We refer to this case as "unconstrained." The figure illustrates a substantial improvement in the risk-return trade-off resulting from the inclusion of the foreign asset classes. The hyperbola constructed with foreign assets is located higher and to the left compared to the hyperbola that utilizes domestic assets only, indicating that any level of expected return μ can be attained with less risk σ when foreign assets are used. **Figure 2** is similar to **Figure 1**, except that no short sales are allowed—investments in all assets are constrained to be positive. Inclusion of foreign assets clearly improves risk-return characteristics of the frontier. The market (tangency) portfolio constructed with only UK assets has expected return of 5.21%, standard deviation of 3.89%, and a Sharpe ratio of 0.67. When foreign asset classes are included, the market portfolio has expected return of 5.02%, substantially less risk (2.40%), and a Sharpe ratio of 1.01.

Table 7 shows portfolio characteristics of the market portfolios created with different mixes of assets. Both the unconstrained and constrained cases are shown. Without short-sale constraints UK market portfolio has expected return of 7.51%, standard deviation of 6.99%, and Sharpe ratio of 0.70. When foreign stocks and bonds are included Sharpe ratio increases to 1.18. The market portfolio has expected return of 7.02% and substantially less risk (3.73%). The analysis suggests that given the risk and return characteristics of the five asset classes, rational investors maximizing expected return for a given level of risk should take advantage of the diversification opportunities and include foreign asset classes in their portfolios.

To highlight the role of diversification, we perform the following experiment. We maintain the correlation matrix and the standard deviations of all asset classes, but set expected return on each foreign asset class equal to that of the corresponding UK asset class. Since returns on UK asset classes are lower, this effectively penalizes investment abroad. Expected return on foreign equity is now set to 6.61%, down from 8.66%. All the benefits from investing abroad are now caused by diversification benefits, not by higher returns offered by foreign assets. The results are presented in **Table 8**. Without short-sale constraints, the market portfolio with penalized foreign assets has Sharpe ratio of 0.75, below the un-penalized value of 1.18, but still higher than the UK-only domestic portfolio with Sharpe ratio of 0.70. The results are stronger when short-sales are not allowed. In this case, the penalized market portfolio that includes foreign assets achieves a higher expected return than the UK-only portfolio (5.32% vs. 5.21%), and has a lower risk (3.86% vs. 3.89%). Foreign equity is riskier than domestic equity. Foreign debt is riskier than domestic debt. The returns on foreign and the corresponding domestic assets are set to be the same. Yet, it is still optimal to include foreign assets in the portfolio and take advantage of the diversification opportunities that investing overseas offers. The analysis also gives a benchmark level of investment abroad. Under the realistic assumption of no short sales and with foreign assets being penalized by setting their expected returns to the lower values of UK expected returns, the market portfolio still has 14% of wealth invested in foreign equity.

The benefit of equalizing the mean returns of domestic and foreign asset classes is that our analysis is robust to a range of assumptions about risk aversion. There is no implicit trade-off off between mean and variance in a situation in which the expected

returns are equal. The diversification result is thus driven solely by differences in variance and covariance between domestic and international asset classes.

Analysis of UK and Foreign Equity

The analysis can be refined in several ways. First, the number of asset classes can be increased. Instead of simply analyzing UK equity securities as one asset class, it is possible to include different industries in the study. We consider UK equity securities from 11 industries. We assume throughout this section that UK investors limited the number of assets in their portfolios. When investors face fixed transaction costs, such as brokerage commissions, and have limited funds available, they take transaction costs into account while forming portfolios. This results in investors not using all assets in the opportunity set, but only investing in a sub-set of assets. We assume that investors used seven assets in their portfolios. There are 330 different subsets of seven UK equity securities assets drawn from eleven. The three sub-sets that result in a market portfolio with the highest Sharpe ratios are listed in **Table 9**. In the constrained case the best combination of seven assets produces market portfolio with Sharpe ratio of 1.055, in the un-constrained case this number is 1.372.

Now include four world equity classes in the investment opportunity set. There are 6,435 different subsets of seven assets drawn from 15 equity asset classes. The three sub-sets that produce market portfolios with the highest Sharpe ratio are given in **Table 10**. Including foreign equity improves the best possible case. For the constrained case, Sharpe ratio of the market portfolio is now 1.149 and 1.50 for the un-constrained case. When foreign equity is included in the opportunity set the expected return on the market

portfolio increases when compared to the UK-only case from 8.79% to 9.28% (constrained case), and from 12.4% to 13.5% (unconstrained case). **Figure 3** shows the mean-variance frontier constructed with seven best UK-only equity asset classes and with seven best selected from 15 UK and world equity indices. The figure illustrates the improvement in the risk-return trade-off that results from the inclusion of the overseas investments.[68] It is important to point out that the positivity constraints used in this analysis are consistent with real limitations to shorting sector indices and individual securities on the London market. Although short-selling was certainly practiced through much of this period, it is unlikely that it would have been used by a long-term investor to maintain an optimal position in tern of risk and return of the portfolio.

Equity and Debt

We repeat the previous analysis but now include UK and foreign debt. The investment opportunity set now includes 19 asset classes: 5 UK Equity indices; 2 UK Preferred Share indices, 4 UK Debt indices, and 8 foreign asset classes (4 equity and 4 debt). Again, we assume that portfolios contain seven assets. There are 50,388 different subsets of seven asset classes drawn from nineteen. The sub-sets that produce market portfolios with the highest Sharpe ratio are given in **Table 11**. When short-sale constraints are imposed (Panel A) the best portfolio invests in three foreign asset classes and produces a Sharpe ratio of 1.278. This may be compared to the best sub-set of 7

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[68] The results hold not only for the very best group of 7 assets. In the un-constrained case when groups of 7 assets are ranked by the Sharpe ratio of their market portfolio, all top 200 groups contain at least one foreign equity asset class. The average optimal investment overseas across these 200 groups is 68%. In the case of short-sale constraints, when groups of 7 assets are ranked by the Sharpe ratio of their market portfolio, all top 1,000 groups contain at least one foreign asset class. The average optimal overseas allocation across these 1,000 groups equals 47%.

assets drawn form 11 UK-only asset classes that produces market portfolio with expected

return of 7.84%, standard deviation of 4.77%, and a lower Sharpe ratio of 1.099 (not

shown in the table).[69] Examination of recommended portfolio weights shows that the

constrained optimization procedure suggests that in the best cases, 48 to 52 percent of

wealth should be invested in world railway debt securities. This finding is particularly

remarkable in light of the fact that between 1865 and 1941, at least 41 percent of total

new overseas issues raised on British exchanges went solely for railway plant and

equipment.[70]

In the unconstrained case the best subset of 7 assets from 11 UK-only asset

classes produces market portfolio with Sharpe ratio of 1.46. When overseas asset classes

are available, the best subset of 7 from 19 includes 4 foreign asset classes and produces

market portfolio with a significantly higher Sharpe ratio of 1.95. **Figure 4** shows mean-

variance frontiers and capital allocation lines constructed with the best sub-sets of seven

asset classes. When foreign assets are included in the opportunity set the Capital

Allocation Line has a higher slope, indicating that a higher expected return can be

obtained for the same level of risk.

We now take our analysis one step further. For the 19 UK and overseas asset

classes we once again maintain the correlations and the standard deviations of all assets,

but set expected return on each foreign asset class equal to that of the corresponding UK

asset class. As before, this effectively penalizes investment abroad and highlights the role

of diversification. The results are presented in **Table 12**. In the constrained case (Panel

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[69] Benefits from using foreign asset classes are seen not only in the best 3 sub-sets, but also in the best one
thousand. In the case of short-sale constraints when groups of 7 assets are ranked by Sharpe ratio of their
market portfolio, all top 1,000 groups contain at least one foreign asset class. They all beat the UK-only
best case.
[70] Edelstein, 1982, p. 37.

A) the best market portfolio has a Sharpe ratio of 1.15, compared to the best UK-only market portfolio with Sharpe ratio of 1.099. The market portfolio that uses penalized overseas indices has both higher return (7.99% vs. 7.84%) and lower risk (4.69% vs. 4.77%) than the UK-only portfolio. Three out of seven asset classes in the top performing portfolios are foreign assets and the total fraction of wealth invested overseas is just above 20%. Similar results are obtained when short sales are allowed. The Sharpe ratio of the penalized foreign portfolio equals 1.700, higher than the Sharpe ratio of the UK-only portfolio of 1.46. Even when foreign assets are penalized with lower expected returns, they provide substantial improvement to the risk-return trade-off and should be included in the optimal portfolio.

Conclusion

Our findings indicate that diversification played an important role in the decision of British investors to allocate a significant fraction of their portfolio to overseas securities. Even when — by setting expected return on each foreign asset class equal to that of the corresponding UK asset class — we put foreign assets at a disadvantage, we find that it was rational for an investor to include a large proportion of foreign debt and equity in the portfolio. British investors had access to securities from all over the world. They also had access to news concerning political and economic events world-wide. Investors understood the notion of diversification, albeit in a slightly less formally developed at the time, and followed this principle by allocating a significant portion of their investments abroad. Our analysis shows that this behavior was consistent with the

recommendations obtained by applying Modern Portfolio Theory to the return series of securities available to the UK investors.

References

Black, F., 1974, "International Capital Market Equilibrium with Investment Barriers," *Journal of Financial Economics* 1, 337—352.

Cain, P. J., and A. G. Hopkins, 1980, "The Political Economy of British Expansion Overseas, 1750—1914," *Economic History Review*, 33 pp. 463—490

Cain, P. J., and A. G. Hopkins, 1986, "Gentlemanly Capitalism and British Expansion Overseas I. The Old Colonial System, 1688—1850," *Economic History Review*, 39 pp. 501—525

Cain, P. J., and A. G. Hopkins, 1987, "Gentlemanly Capitalism and British Expansion Overseas II. New imperialism, 1850—1945," *Economic History Review*, 40 pp. 1—26

Cain, P. J., and A. G. Hopkins, 1994, *British Imperialism*, London: Longman.

Cairncross, A. K., 1953, *Home and Foreign Investment, 1870—1913*, Cambridge

Crafts, N. F. R., 1979, "Victorian Britain Did Fail," *Economic History Review*, 32.

Davis, L. E. and R. A. Huttenback, *Mammon and the pursuit of empire: the political economy of British imperialism, 1860—1912* (Cambridge, 1986).

Dybvig, Philip H., 1984, "Short Sales Restrictions and Kinks of the Mean Variance Frontier," *Journal of Finance* 39, pp. 239—44.

Edelstein, M., *Overseas investment in the age of high imperialism: the United Kingdom, 1850—1914* (New York, 1982)

Errunza, V. and E. Losq, 1985, "International Asset Pricing under Mild Segmentation: Theory and Test," *Journal of Finance*, 40. 105—124.

Errunza, V. and D. Miller, 2000, "Market Segmentation and the Cost of Capital in International Equity Markets," *Journal of Financial and Quantitative Analysis* 25.

Errunza, V. and L. Senbet, 1981, "The effects of International Operations on the Market Value of the Firm: Theory and Evidence, " *Journal of Finance*, 36, 401—417.

Eun, C. and S. Janakiramanan, 1986, "A Model of International Asset Pricing with a Cobstraint in Foreign Equity Ownership," *Journal of Finance*, 41, 897—914.

Goetzmann, William N., Andrey Ukhov, and Ning Zhu, 2001, *China and the World Financial Markets 1870-1930: Modern Lessons from Historical Globalization*, Yale International Center for Finance Working Paper No. 00-62.

Harvey, Charles and Peter Taylor, 1987, "Mineral wealth and economic development: foreign direct investment in Spain, 1851—1913," *Economic History Review* 40, pp. 185—207.

Hobson, John H, 1902, *Imperialism: A Study*. London, Nisbet.

Jenks, L. H., 1927, *The Migration of British Capital to 1875*, London and New York: Alfred Knopf.

Kaukiainen, Yrjo, 2001, "Shrinking the world: Improvements in the speed of information transmission, c. 1820—1870," *European Review of Economic History* 5, 1—28.

Kennedy, William, 1982, "Economic Growth and Structural Change in the United Kingdom, 1870--1914," *Journal of Economic History*, 42 pp. 87-118.

Lowenfeld, Henry, 1907, *Investment and Exact Science*, The Financial Review of Reviews, London.

Markowitz, Harry, 1952, "Portfolio Selection," *Journal of Finance* 7, pp. 77—91.

Merton, Robert C., 1972, "An Analytical Derivation of the Efficient Portfolio Frontier," *Journal of Financial and Quantitative Analysis* 7, pp. 1851—72.

Michie, R.C., 1985, "The London Stock Exchange and the British Securities Market, 1850—1914," *Economic History Review* 38, pp. 61—82.

Michie, R.C., 1987, *The London and New York stock exchanges, 1850—1914*, London: Allen and Unwin.

Morgan, E. Victor, and W. A. Thomas, 1962, *The Stock Exchange, Its History and Functions*, London: Elek Books.

Offer, Avner, 1993, "The British Empire, 1870—1914: a waste of money?" *Economic History Review* 46, pp. 215—238

O'Rourke and Williamson, 1999, *Globalization and History: The Evolution of a Nineteenth-Century Atlantic Economy*, Cambridge: MIT Press.

Platt, D.C., 1980, "British Portfolio Investment Overseas Before 1870: Some Doubts," *Economic History Review* 33, pp. 1—16

Pollard, Sidney, 1985, "Capital Exports, 1870—1914: Harmful or Beneficial?" *Economic History Review* 38, 489—514

Prescott, George B., 1866, *History, Theory, and Practice of the Electric Telegraph*, Boston: Ticknor and Fields.

Ripley, Percy, 1934, *A Short History of Investment*, London: Sir Isaac Pitman and Sons.

Segal, Harvey H., and Matthew Simon, 1961, "British Foreign Capital Issues, 1865—1894," *Journal of Economic History* 21, p. 575.

Stulz, R. M., 1981a, "A Model of International Asset Pricing," *Journal of Financial Economics*, 9, 383—403.

Stulz, R. M., 1981b, "On the Effects of Barriers to International Investment," *Journal of Finance*, 36, 923—934.

Stulz, R. M., 1999b, "Globalization and the Cost of Equity Capital," Working paper, The New York Stock Exchange (NYSE Working Paper 99-02).

Stulz, R. M. and W. Wasserfallen, 1995, "Foreign Equity Investment Restrictions, Capital Flight, and Shareholder Wealth Maximization: Theory and Evidence," *The Review of Financial Studies*, 8, 1019—1057.

Shiers, George, 1977, *The Electric Telegraph: An Historical Anthology*, New York: Arno Press.

Spackman, W. F., 1842, *Statistical Tables of the agriculture, shipping, colonies, manufactures, commerce and population of the United Kingdom of Great Britain and its dependencies*, London.

Table 1
Nominal value of Securities Quoted on the London Stock Exchange in 1843

No.	Type	£
	British and Irish Funded Debt	773,000,000
	Loans to Foreign Governments (including the United States)	121,500,000
	Total Government Bonds	894,500,000
70	Railway Companies	57,448,000
	Banking and Interest Companies	46,450,000
59	Canal Companies	17,862,000
8	Dock Companies	12,177,000
	Turnpike Trusts	8,775,000
	East India Company	6,000,000
	South Sea Company	3,663,000
24	Foreign Mining Companies	6,465,000
81	British Mining Companies	4,500,000
107	Assurance Companies	26,000,000
27	Gas, Light and Coke Companies	4,327,000
11	Water Companies	2,536,000
5	Bridge Companies	2,124,000
4	Literary Institutions	1,003,000
196	Shipping, Land, Asphalt, Loan, etc. Companies	25,000,000
		224,330,000

Source: Percy Ripley (1934), p. 80, who does not provide the source for his figures. This table matches a table in Jenks (1927), p. 373, who gives W.F. Spackman (1843) as a source.

Table 2
Par Value of Overseas Securities Quoted on the London Stock Exchange in January, 1893

Type	£
Colonial Government Securities	225,000,000
Foreign Government Securities	525,000,000
Colonial and Foreign Corporation Stocks	20,000,000
Railways in British Possessions	75,000,000
Railways in India	65,000,000
Railways in United States	120,500,000
Railways in Other Foreign Countries	127,500,000
Banks operating abroad	50,000,000
Foreign Breweries	3,500,000
Gas Companies operating abroad	6,500,000
Iron Companies operating abroad	500,000
Land and Mortgage Companies	100,000,000
Tea Companies	2,500,000
Telegraph Companies	10,000,000
Waterworks Companies operating abroad	3,000,000
Tramway Companies operating abroad	4,000,000
Miscellaneous Companies—Colonial and Foreign	30,000,000
	1,368,000,000

Source: Ripley (1934), p. 154, who does not provide the source for his figures.

Table 3
Capital Publicly Invested by Great Britain Overseas
December 1913

Geographical Distribution		Asset Classes and Industries	
Description	**£, in '000**	**Description**	**£, in '000**
Canada and Newfoundland	514,870	Colonial Governments	675,464
Australia	332,112	Foreign Governments	284,059
New Zealand	84,334	Total Government Loans	959,523
Africa—South	370,192		
Africa—West	37,305	Municipal	147,547
India and Ceylon	378,776		
Straits Settlements	27,293	Colonial Railways	306,460
Hong Kong	3,104	Indian Railways	140,796
British North Borneo	5,820	American Railways	616,581
Other Asiatic Colonies	26,189	Foreign Railways	457,177
Total India and Colonies	1,779,995	Total Railways	1,521,014
United States	754,617	Banks	72,909
Cuba	33,075	Breweries	17,980
Philippines	8,217	Canals and Docks	7,111
Argentina	319,565	Commercial and Industrial	145,332
Brazil	147,967	Electric Lighting and Power	27,310
Mexico	99,019	Financial, Land and Investment	244,187
Chili	61,143	Gas and Water	29,216
Uruguay	36,124	Insurance	246
Peru	34,173	Iron, Coal, and Steel	30,535
Miscellaneous American	25,538	Mines	272,789
Russia	66,627	Motor Traction, etc.	1,059
Egypt	44,912	Nitrate	11,623
Spain	19,057	Oil	40,579
Turkey	18,696	Rubber	40,982
Italy	12,440	Shipping	794
Portugal	8,136	Tea and Coffee	22,443
France	8,020	Telegraphs and Telephones	43,692
Germany	6,364	Tramways	77,790
Miscellaneous European	54,580		
Japan	62,816		
China	43,883		
Miscellaneous Foreign other than European or American	69,697		
Total Foreign	1,934,666	Total Industrial, etc.	1,086,577
Grand Total	3,714,661	Grand Total	3,714,661

Source: Ripley, 1934, p. 175. Ripley states that the figures were computed by Sir George Paish.

Table 4
London Stock Exchange: Government Securities (British, Colonial and Foreign Stocks)

	1869	1890		1869	1890
American			Hungarian	-	3
United States	7	2	Indian	12	4
Virginia	2	3	Italian	4	3
Massachusetts	1	5	Jamaica	-	3
Antigua	1	-	Japanese	-	1
Argentine	4	24	Mauritius	4	4
Austrian	3	3	Mexican	3	2
Australian	12	26	Montevidean	1	-
Belgian	2	1	Moorish	1	-
Brazilian	5	8	New Granada	4	-
British	16	12	Natal	2	5
British Colombian	4	-	New Brunswick	1	-
British Guiana	-	1	New Zealand	7	10
Canadian	7	22	Nicaragua	-	1
Cape of Good Hope	6	10	Norwegian	-	3
Ceylon	3	3	Nova Scotia	2	-
Chilean	5	4	Orange F. State	-	1
Chinese	-	4	Paraguay	-	2
Columbian	1	1	Peruvian	2	2
Costa Rica	-	2	Portuguese	2	1
Cuba	5	-	Prussian	-	1
Danish	7	2	Queensland	2	5
Danubian Principalities	2	1	Russian	10	17
Dutch	4	2	San Domingo	-	1
Ecuador	2	1	Sardinian	1	1
Egyptian	9	5	Spanish	4	3
Fijian	-	1	Straits Settlements	-	1
French	2	3	Swedish	3	3
Greek	2	5	Trinidad	-	2
Guatemala	1	1	Tasmanian	2	4
Hawaii	-	1	Turkish	10	9
Honduras	1	2	Uruguay	-	2
			Venezuela	5	1

The table shows the number of different issues for each government. The figures for 1869 are from *The Investor's Monthly Manual* published on January 30, 1869. The figures for 1890 are from *The Investor's Monthly Manual* published on January 31, 1890.

Table 5
Nominal Value of Securities Quoted on the Stock Exchange (£ million)

	Jan. 1 1853	Jan. 1 1863	Jan. 1 1873	Jan. 1 1883	Dec. 28 1893	Dec. 31 1903	Dec. 13 1913	Dec. 31 1920
British Funds, etc.								
British Government								
Guaranteed & Nationalisation Stocks	853.6	901.9	858.9	871.6	810.2	936.2	1,013.0	5,418.2
Corporation, County Stocks, Public								
Boards, etc. Gt. Britain & N. Ireland	-	-	-	50.0	91.4	166.0	277.1	335.0
Corporation Stocks, Indian, Colonial								
And Foreign	-	-	35.3	13.0	43.9	48.1	156.5	159.5
Dominion Provincial & Colonial,								
Government Securities	-	24.7	47.3	130.6	264.9	334.6	455.7	540.5
Foreign Stocks, Bonds, etc.	69.7	146.7	403.9	831.5	2,384.6	2,884.3	3,133.9	2,394.2
Railways:-								
Gt. Britain & Northern Ireland	193.7	245.2	374.0	658.1	854.8	1,104.6	1,217.3	1,259.5
Indian (and Native Loan)	Inc. in Foreign	68.7	102.0	80.0	105.5	134.0	151.4	159.9
Dominion & Colonial				51.6	119.0	154.5	313.4	323.3
American	-	-	82.7	307.6	743.7	1,107.5	1,729.6	2,534.7
Foreign	31.3	132.0	168.6	378.0	596.1	581.9	736.1	870.9
Banks and Discount Companies	6.5	17.7	103.7	55.8	62.6	200.2	294.4	392.0
Breweries and Distilleries	-	-	-	-	52.1	118.4	103.8	120.8
Canals and Docks	16.6	15.3	9.8	33.2	41.7	41.4	19.9	14.8
Commercial, Industrial, etc.	21.9	26.7	19.7	18.9	93.3	256.5	438.6	669.2
Electric Lighting & Power	-	-	-	-	34.9	70.2	75.3	105.8
Gas	5.7	7.3	12.8	21.8			74.2	70.6
Financial Trust, Land, Investment & Property	-	-	7.3	33.5	124.6	176.5	248.7	255.8
Insurance	6.6	8.5	2.2	12.8	12.4	63.8	66.4	67.2
Investment & Unit Trusts	-	-	-	-	-	-	-	-
Iron, Coal, Steel & Copper	-	-	5.8	13.4	15.4	287.2	329.8	413.1
Mines	7.4	5.2	7.6	20.8	32.9	41.1	60.2	11.4
Nitrate	-	-	-	-	-	-	7.6	6.5
Oil	-	-	-	-	-	-	23.6	79.6
Rubber	-	-	-	-	-	-	24.9	32.3
Tea and Coffee	-	-	1.1	1.6	1.6	9.7		
Shipping	-	-	7.1	10.8	11.8	28.7	45.3	66.8
Telegraphs & Telephones	-	-	12.2	29.6	34.9	41.8	141.1	146.0
Tramways and Omnibus	-	-	1.7	6.4	11.9	24.4	117.5	119.7
Waterworks	2.1	4.5	6.1	10.8	16.9	22.2	7.2	8.8
TOTAL	1,215.1	1,604.4	2,270.0	3,641.4	6,561.1	8,833.8	11,262.5	16,576.1

Source: Morgan and Thomas, 1962, pp. 282—283. They cite Burdett's Official Intelligence, Stock Exchange Official Intelligence, and Stock Exchange Official Year Book.

Table 6

Mean, Standard Deviation, and Correlations

	UKEQ	UKPREF	UKDEB	FOREQ	FORDEB
UKEQ	1.0000				
UKPREF	0.7136	1.0000			
UKDEB	0.5764	0.6859	1.0000		
FOREQ	0.3938	0.3115	0.3064	1.0000	
FORDEB	0.5086	0.5462	0.6622	0.6145	1.0000
Standard Deviation (%)	7.3780	3.6847	2.3653	9.3567	2.3732
Mean (%)	6.6082	5.0102	3.3464	8.6632	4.9445

The table shows average returns, standard deviation of returns, and correlations for five asset classes: UK Equity (UKEQ), UK Preferred (UKPREF), UK Debt (UKDEB), Foreign Equity (FOREQ), and Foreign Debt (FORDEB). The data corresponds to Edelstein, 1982, Table 5.5, p. 126.

Table 7

Optimal Portfolio Characteristics

	Market Expected Return (%)	Market St. Dev. (%)	Sharpe Ratio	Market Portfolio Weights				
				UKEQ	UKPREF	UKDEB	FOREQ	FORDEB
UK Assets Only								
Unconstrained	7.51	6.99	0.70	0.285	1.945	-1.230		
Constrained	5.21	3.89	0.67	**0.126**	**0.874**	**0.000**		
UK Assets & Foreign Equity								
Unconstrained	9.37	7.95	0.85	0.046	1.830	-1.408	0.532	
Constrained	6.03	4.22	0.81	**0.000**	**0.721**	**0.000**	**0.279**	
UK Assets & Foreign Debentures								
Unconstrained	7.11	3.82	1.183	0.0058	0.533	-1.330		1.790
Constrained	4.95	2.33	1.009	**0.000**	**0.105**	**0.000**		**0.895**
All Five Asset Classes								
Unconstrained	7.02	3.73	1.184	0.013	0.517	-1.323	-0.025	1.817
Constrained	5.02	2.40	1.011	**0.000**	**0.109**	**0.000**	**0.019**	**0.872**

Table 8
Optimal Portfolio Characteristics
When Expected Returns are set to be Equal

| | *Market Expected Return (%)* | *Market St. Dev. (%)* | *Sharpe Ratio* | *Market Portfolio Weights* | | | | |
				UKEQ	UKPREF	UKDEB	FOREQ	FORDEB
UK Assets Only								
Unconstrained	7.51	6.99	0.70	0.285	1.945	-1.230		
Constrained	5.21	3.89	0.67	**0.126**	**0.874**	**0.000**		
UK Assets & Foreign Equity								
Unconstrained	7.90	7.15	0.74	0.163	1.886	-1.321	0.272	
Constrained	5.32	3.86	0.71	**0.056**	**0.803**	**0.000**	**0.141**	
UK Assets & Foreign Debentures								
Unconstrained	7.31	6.70	0.70	0.268	1.856	-1.237		0.114
Constrained	5.21	3.89	0.67	**0.125**	**0.875**	**0.000**		**0.000**
All Five Asset Classes								
Unconstrained	10.79	10.87	0.75	0.246	2.894	-1.342	0.560	-1.358
Constrained	5.32	3.86	0.71	**0.056**	**0.803**	**0.000**	**0.141**	**0.000**

The rate of return on foreign equity is set equal to the rate of return on UK equity, and the rates of return on UK and Foreign debt are set equal to each other.

Table 9
UK Equity: Selecting 7 out of 11 Asset Classes

Panel A: Constrained Optimization

				Top 3 Portfolios			Worst 3 Portfolios		
				# 1	**# 2**	**# 3**	**# 328**	**# 329**	**# 330**
Market: Sharpe				1.055	1.053	1.053	0.739	0.730	0.696
Market: Mean, %				8.79	8.75	8.75	7.37	7.98	7.90
Market: St.Dev, %				5.87	5.84	5.84	6.45	7.37	7.61

				Portfolio Weights					
Asset No.	**Asset Class**	**Mean (%)**	**St.Dev. (%)**	**# 1**	**# 2**	**# 3**	**# 328**	**# 329**	**# 330**
1	UKRAIL	4.66	8.77				0.000	0.000	0.000
2	UKFIN	7.48	6.31	0.400	0.404	0.404			
3	UKTXTL	7.69	9.32	0.194	0.208	0.208	0.350		0.477
4	UKFD	13.73	15.77	0.129	0.124	0.124			
5	UKIRN	9.68	17.74	0.020			0.106	0.226	0.098
6	UKIND	9.50	9.99	0.149	0.162	0.162			
7	UKUTIL	6.51	9.52		0.000		0.188	0.196	0.317
8	UKCD	2.69	7.81			0.000	0.000	0.000	0.002
9	UKSHIP	5.75	11.81				0.006	0.000	0.005
10	UKTT	6.83	9.03	0.069	0.064	0.064	0.350	0.463	
11	UKTO	11.77	27.83	0.039	0.038	0.038		0.114	0.101

Panel B: No Short-Sale Constraints

				Top 3 Portfolios			Worst 3 Portfolios		
				# 1	**# 2**	**# 3**	**# 328**	**# 329**	**# 330**
Market: Sharpe				1.372	1.370	1.351	0.849	0.813	0.794
Market: Mean, %				12.38	13.60	12.94	10.27	8.73	12.79
Market: St.Dev, %				7.13	8.03	7.65	9.03	7.54	12.84

				Portfolio Weights					
Asset No.	**Asset Class**	**Mean (%)**	**St.Dev. (%)**	**# 1**	**# 2**	**# 3**	**# 328**	**# 329**	**# 330**
1	UKRAIL	4.66	8.77	-0.786	-0.675	-0.718	-0.018	-0.255	0.066
2	UKFIN	7.48	6.31	0.856	0.869	0.945			
3	UKTXTL	7.69	9.32	0.415	0.439	0.460	0.543	0.384	0.787
4	UKFD	13.73	15.77	0.165	0.179	0.215			
5	UKIRN	9.68	17.74				0.067	0.183	0.149
6	UKIND	9.50	9.99	0.536	0.470	0.478			
7	UKUTIL	6.51	9.52	-0.244		-0.207	0.479	0.221	0.814
8	UKCD	2.69	7.81		-0.359	-0.172	-0.717		-1.011
9	UKSHIP	5.75	11.81				0.065	-0.061	-0.019
10	UKTT	6.83	9.03				0.581	0.426	
11	UKTO	11.77	27.83	0.057	0.078			0.101	0.214

Asset Classes: (1) UKRAIL – UK. Railways; **(2) UKFIN** – UK Finance: Banks and Insurance; **(3) UKTXTL** – UK Textiles; **(4) UKFD** – UK Food and Drink; **(5) UKIRN** – UK Iron, Steel, Coal and Heavy Industry; **(6) UKIND** – UK Industrial, including Mechanical Equipment, Electrical Equipment, Building and Construction Materials, and Chemicals; **(7) UKUTIL** – UK Utilities; **(8) UKCD** – UK Canals and Docks; **(9) UKSHIP** – UK Shipping; **(10) UKTT** – UK Telegraph and Telephone; **(11) UKTO** – UK Tramway and Omnibuses.

Table 10
UK Equity (11) and World-Wide Equity (4): Selecting 7 out of 15 Asset Classes

Panel A: Constrained Optimization

				Top 3 Portfolios			Worst 3 Portfolios		
				# 1	# 2	# 3	#6433	#6434	#6435
Market: Sharpe				1.149	1.147	1.147	0.679	0.678	0.669
Market: Mean, %				9.28	9.35	9.35	7.50	8.70	9.13
Market: St.Dev, %				5.81	5.88	5.88	7.21	9.00	9.76

				Portfolio Weights					
Asset No.	Asset Class	Mean (%)	St.Dev. (%)	# 1	# 2	# 3	#6433	#6434	#6435
1	UKRAIL	4.66	8.77				0.000	0.000	0.000
2	UKFIN	7.48	6.31	0.140	0.160	0.160			
3	UKTXTL	7.69	9.32	0.222	0.229	0.229	0.341		0.503
4	UKFD	13.73	15.77	0.144	0.149	0.149			
5	UKIRN	9.68	17.74		0.000		0.059	0.246	0.209
6	UKIND	9.50	9.99	0.050	0.049	0.049			
7	UKUTIL	6.51	9.52			0.000	0.292	0.403	
8	UKCD	2.69	7.81				0.009	0.000	0.000
9	UKSHIP	5.75	11.81				0.168	0.035	0.000
10	UKTT	6.83	9.03	0.039					
11	UKTO	11.77	27.83	0.028	0.028	0.028		0.079	0.130
Foreign Equity									
12	WRAIL	6.85	7.46						
13	WBANK	9.21	8.12	0.377	0.385	0.385			
14	WINFR	8.32	8.32						
15	WTEA	8.28	18.45				0.130	0.236	0.158

Table 10 (Continued)
UK Equity (11) and World-Wide Equity (4): Selecting 7 out of 15 Asset Classes

				Panel B: No Short-Sale Constraints					
				Top 3 Portfolios			**Worst 3 Portfolios**		
				# 1	**# 2**	**# 3**	**#6433**	**#6434**	**#6435**
Market: Sharpe				1.50	1.50	1.50	0.761	0.742	0.699
Market: Mean, %				13.49	13.77	12.88	9.80	14.21	13.65
Market: St.Dev, %				7.24	7.43	6.85	9.47	15.65	15.82
				Portfolio Weights					
Asset No.	**Asset Class**	**Mean (%)**	**St.Dev. (%)**	**# 1**	**# 2**	**# 3**	**#6433**	**#6434**	**#6435**
1	UKRAIL	4.66	8.77	-0.912	-0.738	-0.811	-0.506	-0.222	0.183
2	UKFIN	7.48	6.31	0.377	0.419	0.456			
3	UKTXTL	7.69	9.32	0.492	0.473	0.449	0.435		0.928
4	UKFD	13.73	15.77	0.179	0.213	0.195			
5	UKIRN	9.68	17.74				0.190	0.431	0.350
6	UKIND	9.50	9.99	0.401	0.298	0.368			
7	UKUTIL	6.51	9.52			-0.171	0.531	1.041	
8	UKCD	2.69	7.81		-0.246			-0.815	-0.733
9	UKSHIP	5.75	11.81				0.067	-0.031	-0.201
10	UKTT	6.83	9.03						
11	UKTO	11.77	27.83				0.073	0.221	0.297
Foreign Equity									
12	WRAIL	6.85	7.46	-0.259					
13	WBANK	9.21	8.12	0.721	0.580	0.513			
14	WINFR	8.32	8.32						
15	WTEA	8.28	18.45				0.211	0.376	0.176

Asset Classes: (12) WRAIL – World Rail Equity; (13) WBANK – World Banking Equity; (14) WINFR – World Infrastructure Equity; (15) WTEA – World Tea and Coffee Equity.

Table 11
Debt and Equity: Selecting 7 out of 19 Asset Classes

Panel A: Constrained Optimization

				Top 3 Portfolios			Worst 3 Portfolios		
				# 1	# 2	# 3	# 3	# 2	# 1
Market: Sharpe				1.278	1.277	1.276	0.612	0.597	0.588
Market: Mean, %				6.52	6.49	6.34	4.88	5.32	3.96
Market: St.Dev, %				3.07	3.04	2.94	3.73	4.56	2.31

				Portfolio Weights					
No.	Asset Class	Mean (%)	St.Dev. (%)	# 1	# 2	# 3	# 3	# 2	# 1
UK Equity									
1	UKRAIL	4.66	8.77				0.000	0.000	0.000
2	UKFIN	7.48	6.31	0.062	0.076				
3	UKLIND	10.64	8.84	0.174	0.174	0.157			
4	UKHVIND	9.56	9.95						
5	UKINFRA	6.74	8.07				0.266		
UK Preferred									
6	UKRAILP	4.56	3.96				0.432	0.745	0.237
7	UKINDP	5.70	4.75	0.054		0.079			
UK Debt									
8	UKMUNIDB	3.71	2.37				0.301	0.083	0.303
9	UKRAILDB	3.79	3.32				0.001	0.000	0.066
10	UKINDDB	3.83	3.35	0.114	0.118	0.118			0.368
11	UKINFRDB	3.55	3.25				0.000	0.022	0.027
Foreign Equity									
12	WRAIL	6.85	7.46						
13	WBANK	9.21	8.12	0.049	0.041	0.062			
14	WINFR	8.32	8.32						
15	WTEA	10.83	18.45	0.024	0.024	0.024		0.143	
Foreign Debt									
16	CLGVDB	4.15	2.24						
17	CLMUNIDB	5.25	3.22		0.068	0.080			
18	WRAILDB	5.25	2.89	0.521	0.499	0.479			
19	WINFRDB	-1.68	27.14				0.000	0.007	0.000

Table 11 (Continued)
Debt and Equity: Selecting 7 out of 19 Asset Classes
Panel B: No Short-Sale Constraints

				Top 3 Portfolios			Worst 3 Portfolios		
				# 1	# 2	# 3	# 3	# 2	# 1
Market: Sharpe				1.945	1.930	1.920	0.731	0.727	0.720
Market: Mean, %				11.86	13.30	13.75	5.01	4.32	4.17
Market: St.Dev, %				4.76	5.55	5.81	3.29	2.37	2.17

				Portfolio Weights					
No.	Asset Class	Mean (%)	St.Dev. (%)	# 1	# 2	# 3	# 3	# 2	# 1
UK Equity									
1	UKRAIL	4.66	8.77	-0.460	-0.295	-0.312	-0.309		-0.096
2	UKFIN	7.48	6.31	0.391	0.616	0.733			
3	UKLIND	10.64	8.84	0.535	0.668	0.755			
4	UKHVIND	9.56	9.95						
5	UKINFRA	6.74	8.07						
UK Preferred									
6	UKRAILP	4.56	3.96				1.030	0.287	0.525
7	UKINDP	5.70	4.75						
UK Debt									
8	UKMUNIDB	3.71	2.37				0.654	1.012	0.962
9	UKRAILDB	3.79	3.32		-1.719	-1.259	-0.424	-0.605	-0.635
10	UKINDDB	3.83	3.35					0.331	0.327
11	UKINFRDB	3.55	3.25	-1.341		-0.853	-0.070	-0.047	-0.064
Foreign Equity									
12	WRAIL	6.85	7.46	-0.536	-0.584	-0.412			
13	WBANK	9.21	8.12		0.338				
14	WINFR	8.32	8.32	0.381					
15	WTEA	10.83	18.45				0.110	0.039	
Foreign Debt									
16	CLGVDB	4.15	2.24						
17	CLMUNIDB	5.25	3.22						
18	WRAILDB	5.25	2.89	2.030	1.976	2.349			
19	WINFRDB	-1.68	27.14				0.008	-0.017	-0.019

Asset Classes: (1) UKRAIL – UK Railways; (2) UKFIN – UK Banks and Insurance; (3) UKLIND – UK Light Industry and Commerce: (a) Textiles, (b) Oldham cotton spinners; (c) Food, (d) Drink, (e) Retail stores; (4) UKHVIND – UK Heavy Industry: (a) Iron, coal, steel, and heavy fabrication, (b) Mechanical equipment, (c) Electrical equipment, (d) Building and Construction materials, (e) Chemicals; (5) UKINFRA – UK Infrastructure (Social overhead): (a) Electricity, (b) Gas, (c) Water, (d) Canals and Docs, (e) Shipping, (f) Telephone and Telegraph, (g) Tramways and Omnibuses; (6) UKRAILP – UK Railways, Preferred Shares; (7) UKINDP – UK Manufacturing and Commerce preferred shares; (8) UKMUNIDB – UK Municipals; (9) UKRAILDB – UK Railways; (10) UKINDDB – Manufacturing and Commerce debt; (11) UKINFRDB – UK Infrastructure (Social overhead) debt; (12) WRAIL – World railways: (a) Indian, (b) Western European, (c) Eastern European, (d) U.S. Railways, (e) Latin American Railways; (13) WBANK – World Banks equity: (a) Asia and Australasia, (b) South Africa, (c) Canada, (d) Eastern Mediterranean, (e) Latin America; (14) WINFR – World Infrastructure (Social Overhead): (a) India and China, (b) Western Europe, (c) North America, (d) Latin America; (15) WTEA – World Tea and Coffee; (16) CLGVDB – Debt of Colonial and Provisional Governments: (a) Australia, (b) Canada, (c) India, (d) Jamaica, (e) New Zealand, (f) South Africa; (17) CLMUNIDB – Debt of Colonial municipals; (18) WRAILDB – Debt of World Railways: (a) Indian railways, (b) Canadian Railways, (c) W. European railways, (d) E. European railways, (e) U.S. railways, (f) Latin American Railways; (19) WINFRDB – Debt, World infrastructure (Social Overhead).

Table 12
Debt and Equity: Selecting 7 out of 19 Asset Classes
Expected Return on Foreign Asset Classes Equal Corresponding UK Return

Panel A: Constrained Optimization

				Top 3 Portfolios			Worst 3 Portfolios		
				# 1	**# 2**	**# 3**	**# 50,386**	**# 50,387**	**# 50388**
Market: Sharpe				1.149	1.147	1.147	0.456	0.445	0.425
Market: Mean, %				7.99	7.92	7.99	3.75	3.79	3.84
Market: St.Dev, %				4.69	4.64	4.70	2.53	2.67	2.92

				Portfolio Weights					
No.	**Asset Class**	**Mean (%)**	**St.Dev. (%)**	**# 1**	**# 2**	**# 3**	**# 50,386**	**# 50,387**	**# 50388**
UK Equity									
1	UKRAIL	4.66	8.77				0.000	0.003	0.000
2	UKFIN	7.48	6.31	0.242	0.237	0.254			
3	UKLIND	10.64	8.84	0.340	0.350	0.360			
4	UKHVIND	9.56	9.95	0.041					
5	UKINFRA	6.74	8.07			0.000			
UK Preferred									
6	UKRAILP	4.56	3.96						
7	UKINDP	5.70	4.75		0.032				
UK Debt									
8	UKMUNIDB	3.71	2.37						
9	UKRAILDB	3.79	3.32				0.231	0.350	0.456
10	UKINDDB	3.83	3.35	0.162	0.156	0.160			
11	UKINFRDB	3.55	3.25				0.000	0.000	0.015
Foreign Equity									
12	WRAIL	**4.66** (6.85)	7.46	0.123			0.000	0.000	0.104
13	WBANK	**7.48** (9.21)	8.12		0.136	0.136			
14	WINFR	**6.74** (8.32)	8.32						
15	WTEA	**10.64** (10.83)	18.45	0.044	0.043	0.044			
Foreign Debt									
16	CLGVDB	**2.06** (4.15)	2.24				0.017	0.000	0.000
17	CLMUNIDB	**3.71** (5.25)	3.22				0.227		0.416
18	WRAILDB	**3.79** (5.25)	2.89				0.525	0.634	
19	WINFRDB	**6.74** (-1.68)	27.14	0.049	0.045	0.046		0.012	0.008

Table 12 (Continued)
Debt and Equity: Selecting 7 out of 19 Asset Classes
Expected Return on Foreign Asset Classes Equal Corresponding UK Return
Panel B: No Short-Sale Constraints

				Top 7 Portfolios						
				# 1	# 2	# 3	# 4	# 5	# 6	# 7
Market: Sharpe				1.700	1.622	1.620	1.615	1.611	1.610	1.605
Market: Mean, %				50.86	18.02	15.69	46.72	50.94	86.20	44.36
Market: St.Dev, %				28.40	9.50	8.08	27.31	29.99	51.92	26.03

				Portfolio Weights						
No.	Asset Class	Mean (%)	St. Dev. (%)	# 1	# 2	# 3	# 4	# 5	# 6	# 7
UK Equity										
1	UKRAIL	4.66	8.77	-1.445		-0.46	-1.12	-1.49	-2.40	
2	UKFIN	7.48	6.31		1.00	1.05				3.65
3	UKLIND	10.64	8.84		1.23	1.04				3.46
4	UKHVIND	9.56	9.95	2.609			2.07	2.41	4.09	
5	UKINFRA	6.74	8.07					1.02		
UK Preferred										
6	UKRAILP	4.56	3.96							
7	UKINDP	5.70	4.75				1.55			
UK Debt										
8	UKMUNIDB	3.71	2.37	13.843			11.20	12.53	27.31	
9	UKRAILDB	3.79	3.32		-2.99	-2.16				-8.58
10	UKINDDB	3.83	3.35	2.818			2.31	3.10	5.38	
11	UKINFRDB	3.55	3.25							
Foreign Equity										
12	WRAIL	**4.66** (6.85)	7.46	-2.227	-1.37	-0.94				-3.04
13	WBANK	**7.48** (9.21)	8.12	3.859	0.91	0.57	2.45	2.61	4.84	1.57
14	WINFR	**6.74** (8.32)	8.32							
15	WTEA	**10.64** (10.83)	18.45							
Foreign Debt										
16	CLGVDB	**2.06** (4.15)	2.24	-18.46			-17.5	-19.16	-37.7	
17	CLMUNIDB	**3.71** (5.25)	3.22							-3.41
18	WRAILDB	**3.79** (5.25)	2.89		2.07	1.89				7.34
19	WINFRDB	**6.74** (-1.68)	27.14		0.15				-0.54	

Expected returns in **boldface** are the returns on UK investments that are used in the calculations; the numbers in parenthesis are the true returns on the overseas investments.

Asset Classes: Identical to **Table 11**.

Figure 1
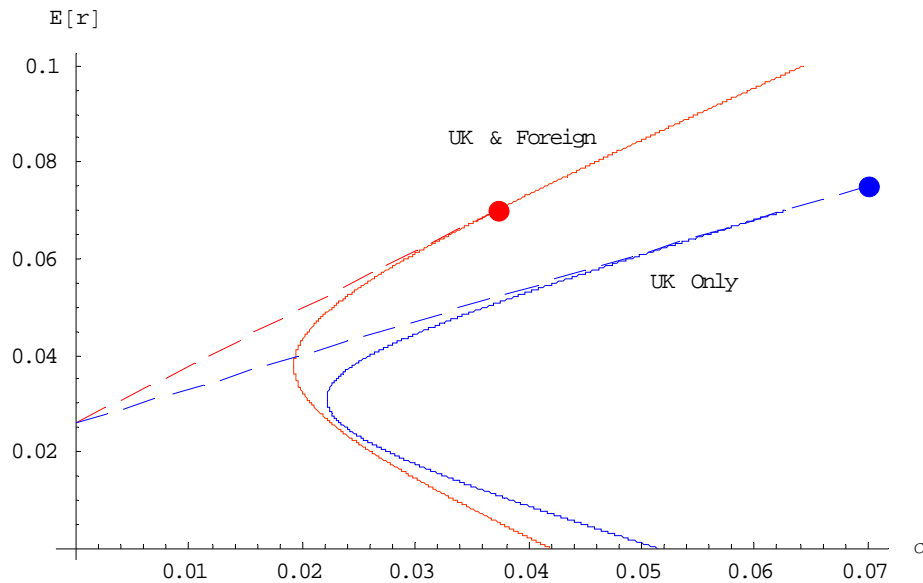
Mean-Variance frontier constructed with UK Assets only (blue) and with UK and Foreign Assets (red). UK-Only frontier is constructed using three asset classes: UK Equity, UK Preferred, and UK Debt. UK and Foreign frontier contains three UK asset classes and adds Foreign Equity and Foreign Debt. Data is from Edelstein, 1982. Returns on the asset classes are given in Edelstein, Table 5.5, p. 126.

Figure 2
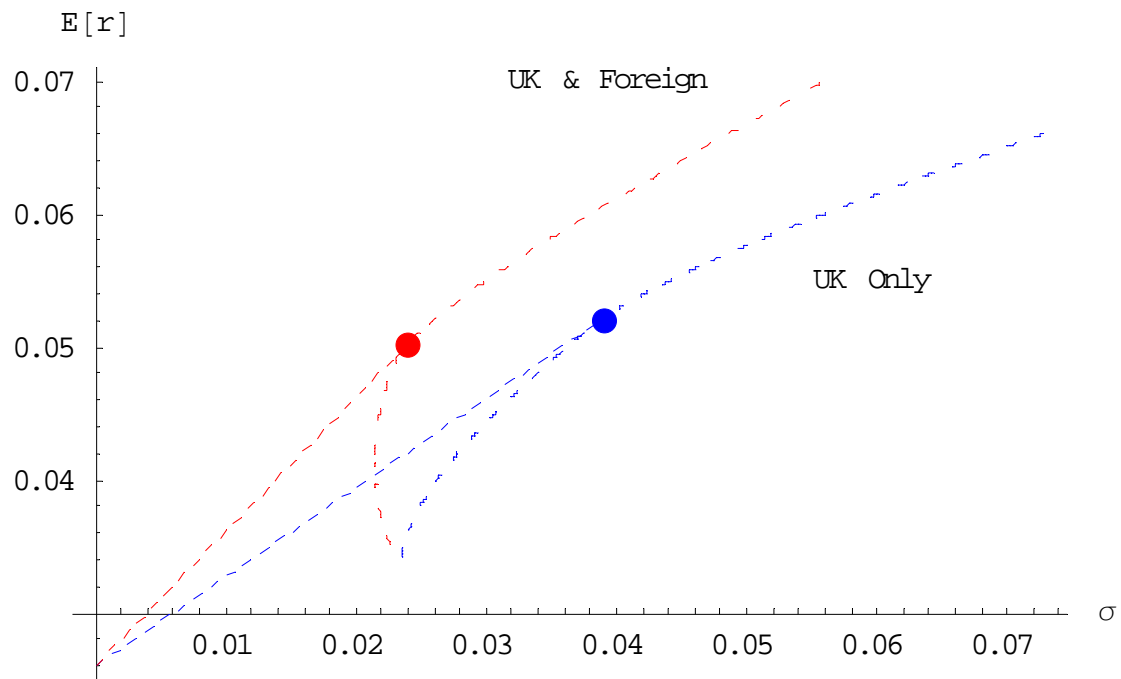
Constrained optimization: investments in all assets are constrained to be positive (no short sales allowed).

Figure 3
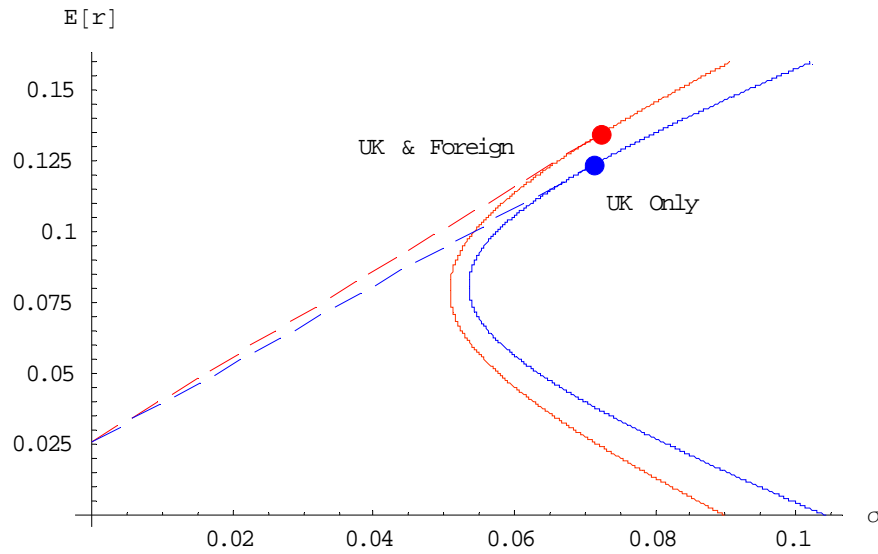
Unconstrained optimization: minimum-variance frontier constructed with the best sub-set of seven asset classes selected from eleven UK Equity asset classes and the frontier constructed with the best seven assets selected from eleven UK Equity asset classes and four foreign equity asset classes. The best subsets are found by selecting the sub-set of 7 out of 11 assets (and 7 out of 15 assets) that results in the highest Sharpe ratio for the market portfolio.

Figure 4
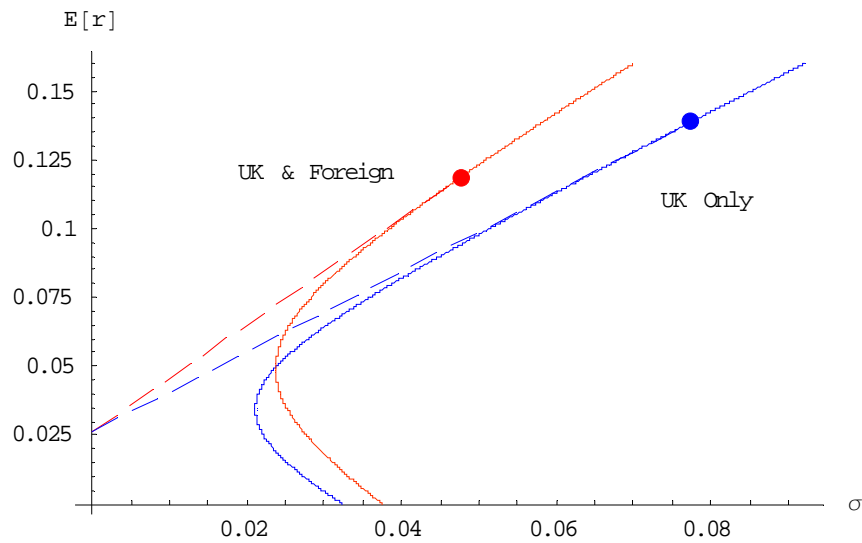
Unconstrained optimization: minimum-variance frontier constructed with the best sub-set of seven asset classes selected from eleven UK asset classes (UK Equity, UK Preferred, UK Debt) and the frontier constructed with the best seven assets selected from nineteen UK and Foreign asset classes. The best subsets are found by selecting the sub-set of 7 out of 11 assets for the UK-only case (and 7 out of 19 assets for the UK and Foreign case) that results in the highest Sharpe ratio for the market portfolio. There are 50,388 possible ways of selecting 7 different asset classes from 19.

Appendix A
Charts of Security Prices from Lowenfeld (1907)

I.—GREAT BRITAIN (General Investments).

Class of Stock.	VALUE OF STOCK	Price Movement During
① ELECTRIC RLY	140	1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906
② INDUSTRIAL	130	
③ BREWERY	120	
④ GAS	110	
⑤ INSURANCE	100	
⑥ RAILWAY	90	
⑦ CANAL	80	
⑧ BANK	70	
	60	
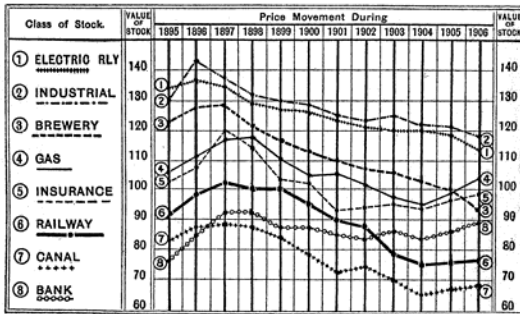
NAMES OF STOCKS.—(1) Liverpool Overhead Railway 4% Deb.; (2) J. & P. Coats 6% Cum. Pref.; (3) Bass, Ratcliff & Gretton 5% Cum. Pref ; (4) Brentford Gas Consolidated Stock; (5) Guardian Assurance Company; (6) London & North Western Railway Company Consolidated Stock; (7) Grand Junction Canal Original Shares; (8) Parr's Bank Shares.

FRANCE.

Class of Stock.	VALUE OF STOCK	Price Movement During
① STEEL	580	1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906
② ELECTRICITY	570	
③ DOCKS	560	
④ TRAMS	550	
⑤ RAILWAY	540	
⑥ MUNICIPAL	530	
⑦ GAS & WATER	520	
⑧ INDUSTRIAL	510	
	500	
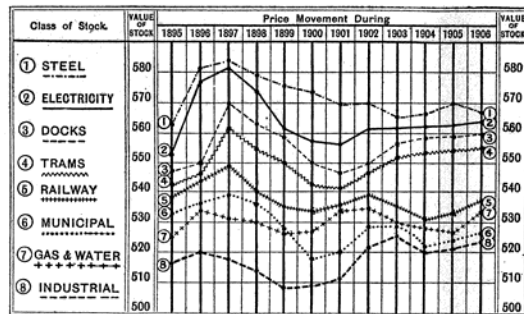
NAMES OF STOCKS.—(1) Acieries de France; (2) Thomson Houston (procédés); (3) Docks du Havre; (4) Lyon Omnibus & Tramway Company; (5) Lyon 5%; (6) Ville de Besançon; (7) Gaz et Eaux; (8) Soc. Lyonn. de Teinture Apprêt et Gaufrage.

II.—GREAT BRITAIN (Trustee Stocks).

Geographical Position.	VALUE OF STOCK	Price Movement During
① ENGLAND	160	1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906
② INDIA	150	
③ ENGLAND	140	
④ INDIA.	130	
⑤ GT. BRITAIN	120	
⑥ NATAL	110	
⑦ NEW ZEALAND	100	
⑧ CANADA	90	
	80	NOTE.—This Chart is copied from "The Investment of Trust Funds" by the same author.
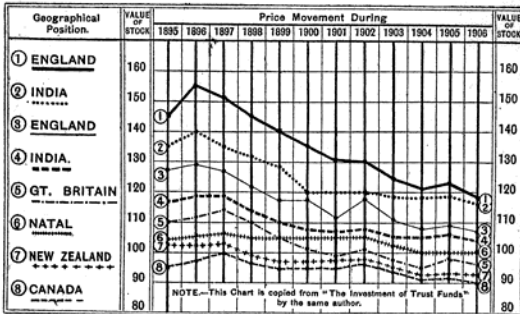
NAMES OF STOCKS.—(1) London & North Western Railway 4% Preference; (2) Southern Mahratta 4% Debenture; (3) Birmingham Corporation 3½%; (4) India 3½%; (5) British Local Loans 3%; (6) Natal 3½%; (7) New Zealand 3½%; (8) Canada 3%.

CANADA.

Class of Stock.	VALUE OF STOCK	Price Movement During
① BANK	160	1895 1896 1897 1898 1899 1900 1901 1902 1903 1904 1905 1906
② BANK	150	NOTE.— The 1895 and 1896 prices are not in the author's possession.
③ ELECTRICITY	140	
④ BANK.	130	
⑤ FINANCIAL	120	
⑥ BANK	110	
⑦ RAILWAY	100	
⑧ TRUST	90	
	80	
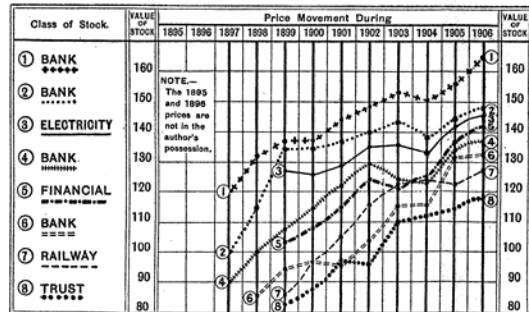
NAMES OF STOCKS.—The 1895 and 1896 prices were not obtainable.—(1) Canadian Bank of Commerce; (2) The Ontario Bank; (3) Toronto Electric Light Company; (4) The Standard Bank of Canada; (5) Toronto Mortgage Company; (6) The Traders' Bank of Canada; (7) Grand Trunk 1st Pref.; (8) Real Estate Loan Company.

GERMANY.

Price Movement During

Class of Stock	VALUE OF STOCK	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	VALUE OF STOCK
① BANK	150													150
② GAS	135													135
③ RAILWAY	120													120
④ BANK	105													105
⑤ MINE	90													90
⑥ BANK	75													75
⑦ INDUSTRIAL	60													60
⑧ BUILDING	45													45
	30													30

NAMES OF STOCKS.—(1) Frankfort Mortgage Bank Shares; (2) General Gas Company of Magdeburg; (3) Lübeck-Büchen-Hamburg Railway; (4) Deutsche Bank; (5) Gelsenkirchen Mine; (6) Schaafhausen Bankverein; (7) Westphalia Wireworks; (8) Passage Building Society of Berlin.

SWITZERLAND.

Price Movement During

Class of Stock	VALUE OF STOCK	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	VALUE OF STOCK
① INSURANCE	1090													1090
② RAILWAY	1060													1060
③ BANK	1030													1030
④ RAILWAY	1000													1000
⑤ MUNICIPAL	970													970
⑥ GOVERNMENT	940													940
⑦ ELECTRICITY	910													910
	880													880
	850													850

NAMES OF STOCKS.—(1) La Genevoise Assurance Company; (2) Jura Simplon; (3) Banque du Commerce; (4) Central Swiss Debenture, 1894; (5) Ville de Genève; (6) 3% Rentes; (7) Industrie Électrique de Genève Debentures.

BELGIUM.

Price Movement During

Class of Stock	VALUE OF STOCK	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	VALUE OF STOCK
① BANK	160													160
② STEEL	145													145
③ COMMERCIAL	130													130
④ GAS	115													115
⑤ CHEMICAL	100													100
⑥ INDUSTRIAL	85													85
⑦ GLASS	70													70
	65													65
	40													40

NAMES OF STOCKS.—(1) Banque d'Anvers; (2) Athus; (3) Société Immobilière de Belgique; (4) Société d'Éclairage du Bassin Houiller de Mons; (5) Produits Chimiques de Droogenbosch; (6) Frayon; (7) Glaces de Charleroi.

JAPAN.

Price Movement During

Class of Stock	VALUE OF STOCK	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	VALUE OF STOCK
① RAILWAY	200													200
② BANK	180													180
③ BANK	160													160
④ COLLIERY	140													140
⑤ RAILWAY	120													120
⑥ SHIPPING	100													100
⑦ RAILWAY	80													80
	60													60
	40													40

NAMES OF STOCKS.—(1) Sanyō Railway; (2) Bank of Japan; (3) Japan Railway; (4) Hokkaido Colliery; (5) Yokohama Specie Bank; (6) Japan Steamship Company; (7) Kwansai Railway.

UNITED STATES OF AMERICA.

Price Movement During

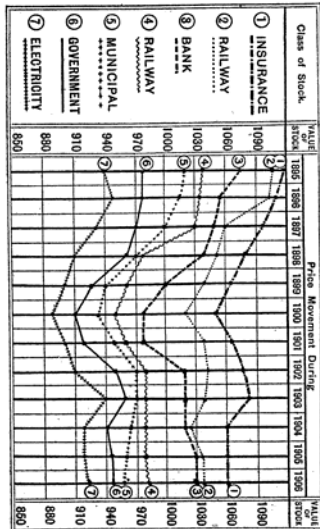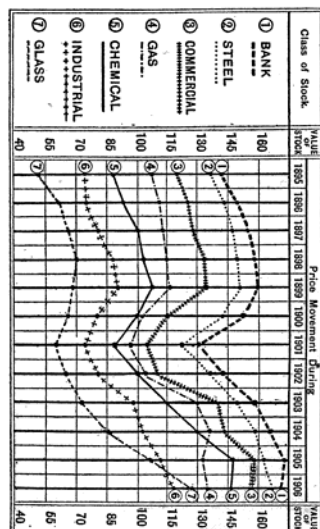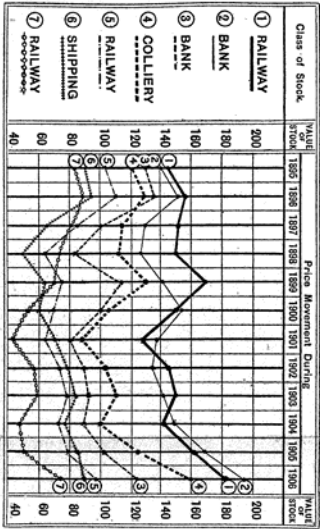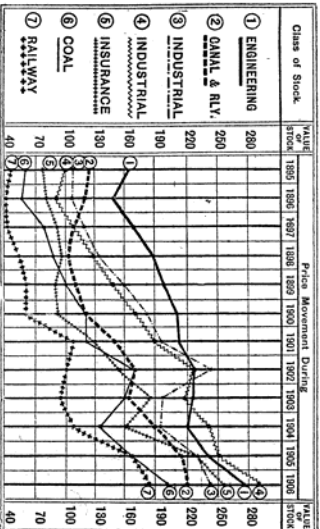| Class of Stock	VALUE OF STOCK	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	VALUE OF STOCK
① ENGINEERING	280													280
② CANAL & RLY.	250													250
③ INDUSTRIAL	220													220
④ INDUSTRIAL	190													190
⑤ INSURANCE	160													160
⑥ COAL	130													130
⑦ RAILWAY	100													100
	70													70
	40													40

NAMES OF STOCKS.—(1) The Pullman Company; (2) Delaware & Hudson Company; (3) American Express Company; (4) Wells, Fargo & Company; (5) Home Fire Assurance Company; (6) Consolidation Coal Company; (7) New York, Chicago & St. Louis Railroad Company.

ARGENTINE REPUBLIC.

Price Movement During

Class of Stock	VALUE OF STOCK	1895	1896	1897	1898	1899	1900	1901	1902	1903	1904	1905	1906	VALUE OF STOCK
① RAILWAY	100													100
② WATERWORKS	90													90
③ GOVERNMENT	80													80
④ FINANCIAL TRUST	70													70
⑤ TRAMWAY	60													60
⑥ RAILWAY	40													40
	20													20

NAMES OF STOCKS.—(1) Buenos Ayres Western Railway Ord.; (2) Buenos Ayres 5% Water Works Loan; (3) 4½% Sterling Loan 1888; (4) River Plate Trust Loan & Agency Company; (5) Anglo-Argentine Trams; (6) Argentine North Eastern Railway Ord.