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Momentum in the UK Stock Market in the 19th and 20th Centuries

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Abstract

This paper studies the cross-section of stock returns for the United Kingdom stock market covering 61 years of independent data, spanning January 1870 to December 1930. The cross-section contains data on stock prices, returns, dividends, hand-collected shares outstanding, and market capitalization for 3,711 stocks. Results reveal a significant presence of the momentum pricing anomaly in the cross-section, with the best performing zero-cost portfolio earning on average 1.48% per month. Additionally, CAPM regressions reveal a significant alpha, signifying significant risk-adjusted returns. These results show strong out-of-sample robustness of the presence of the momentum factor.

Contents

1. Introduction

A well-known anomaly in the asset pricing literature is momentum. Such anomaly examines the past returns of a stock to predict the future trajectory of such returns. De Bondt and Thaler (1985) first identified that stocks that performed poorly in the past 3-5 years would later outperform stocks that had performed well, the reversal effect. Jegadeesh and Titman (1993, 2001) would later identify the tendency of past winners to outperform past losers, mainly momentum. Such discoveries undermine the weak-form market efficiency of the Efficient Market Hypothesis proposed by Fama (1965, 1970).

Since these initial studies, the methodology of Jegadeesh and Titman (1993) has been replicated in other studies for the same time period in Europe (Rouwenhorst, 1998), Spain (Forner and Marhuenda, 2003), Switzerland (Rey and Schmid, 2007), Sweden (Parmler and Gonzalez, 2007), Australia (Hurn and Pavlov, 2003), and the United Kingdom (Agyei-Ampomah, 2007; Hon and Tonks, 2003; Siganos, 2007). Although the results of such studies support the results of Jegadesh and Titman (1993), studying the same time period raises the issue of independence between studies. To solve this issue, momentum has also been researched in historical pre-World War II samples in the United States (Baltussen, Van Vliet, and Van Vliet, 2021; Geczy and Samonov, 2016), Imperial Russia (Goetzmann and Huang, 2018), and the UK ((Chabot, Ghysels, and Jagannathan, 2008).

To further expand the already existing literature about momentum strategies, this paper will investigate the existence of momentum for the UK stock market for a period that has not yet been extensively researched, the 19th and 20th century. More specifically, the period from 1870 to 1930. This period, as well as the period directly before, was eventful with technological advancements, armed conflicts, and financial downturns. Hence, such a time provides a rich historical sample to study the presence of momentum.

The main research question is: "Is the asset pricing anomaly of momentum present in the 19th and 20th centuries in the UK stock market?". In other words, this paper will investigate whether the findings of the existing literature into momentum coincide with a less researched period of time in the UK stock market.

To answer this question, we complement a database with market capitalization values to answer the research question with both equal- and value-weighting. In addition, we examine if the differences in returns from the momentum strategy are significantly different from zero. Moreover, what strategies for formation and holding periods are most profitable? How do these results change when forming portfolios based on only price momentum?

We will consider both different holding and formation periods as in Jegadeesh and Titman (1993) and evaluate the 25 different resulting strategies. The study will be conducted to study value weighted for total return and price momentum, as well as equally weighted portfolios. This gives rise to questions such as "Are there differences between strategies involving different holding periods?" and "Are there differences between strategies involving different periods of consideration momentum?."

The main contribution of this paper is the creation of a database covering 61 years including stocks listed in the London Stock Exchange during the period of January 1870 to December 1930. This database consists data on stock prices, total return, shares outstanding, and market capitalization. More importantly, data for shares outstanding was hand-collected. By weighting stocks with their market capitalization, we avoid small-stocks having greater importance than their true economic importance. This new dataset allows for a rigorous study for the presence of momentum in the U.K. stock market in the late 19th to early 20th centuries.

Based on previous literature and empirical research, the hypothesis of this study is that returns of the zero-cost portfolios based on price momentum will generate returns significantly different from zero.

This paper will be organized as follows. Section two presents a review of the existing literature related to the Efficient Market Hypothesis, the Capital Asset Pricing Model, and the momentum anomaly. Following, section three summarizes the history of the London Stock Exchange from the early 17th century to the early 20th century. Section four presents an analysis and detailed description of the cross-section. Section five explains the methodology used to conduct the research. Section six presents the results of the study, as well as a comparison of the results with that of existing literature. Finally, section seven provides a conclusion to the paper, discusses limitations, and suggestions for future research.

2. Literature Review

The Efficient Market Hypothesis, proposed by Fama (1965, 1970), states that stock prices reflect all available information, signifying that the expected return of a stock is equal to the actual return of the stock. In an efficient market, prices fully reflect available information and stocks trade at their fair value (Fama, 1970).

Fama describes three different forms of market efficiency: strong form, semi-strong form, and weak form. In strong form, efficient markets are those in which individual investors or groups do not have monopolistic access to relevant price information. For semi-strong markets, prices adjust to information that is publicly available such as earnings announcements. Finally, weak-form market efficiency assumes that in efficient markets, prices adjust efficiently to historical information. Although one cannot expect such an extreme assumption as the one concerning strong form efficiency to hold in the real world, weak-form market efficiency tests strongly support this form of market efficiency. Theoretically, deviations from market efficiency should be temporary and get arbitraged away.

Many studies have been conducted with the purpose of creating a model that explains cross-sectional differences in stock returns. William F. Sharpe (1964) was among the first to introduce a model to explain the returns of assets with the Capital Asset Pricing Model (CAPM). Sharpe (1964) proposed that investors expect to be compensated for the risk of an investment as well as the time value of money. The degree of systematic risk, measured by BETA, determines the return of an asset. After the introduction of the CAPM, researchers investigated deviations in expected stock returns based on firm characteristics. Fama and French (1992, 1993) identify two factors that the CAPM is unable to explain, size and value. Adding both pricing factors to the CAPM resulted in the three-factor model. Jegadeesh and Titman (1993, 2001) identify the tendency of past winners to outperform past losers, momentum. Carhart (1997) proposes a four-factor model, adding a momentum factor to the existing Fama-French three-factor model. Fama and French (2015) add a profitability and investment factor to the existing three-factor model, creating the Fama-French five-factor model. These findings propose that cross-sectional differences are not solely explained by differences in risk, as it should be in efficient markets. These discovered pricing anomalies, such as momentum, seem to persist over time.

Daniel, Hirshleifer, and Subrahmanyam (1998) attempt to explain momentum anomaly using human behaviour as a driver of momentum, mainly overconfidence and self-attribution bias. Overconfidence is seen in investors who overestimate how precise their private signals are, but do not overestimate public signals. Investors are overconfident in their private signals, causing an overreaction in the stock market. Self-attribution bias is the tendency of humans to attribute events that confirm their beliefs or actions to their own ability and attribute those that do not to bad luck. Subsequently, if public information supports the private signal, investors suffer from self-attribution bias, triggering further overreaction. Such overreaction drives momentum. Over time, as more information becomes available, the price reflects the true value more closely, causing a long-term reversal effect. Since human behaviour is consistent throughout time, such drivers of momentum result in the persistence of the anomaly.

De Bondt and Thaler (1985) were amongst the first to predict stock returns based on the past trajectory of their returns, implying a violation of weak-form market efficiency. Following the literature that documents that individuals tend to overreact to information, De Bondt and Thaler (1985) found evidence of a reversal effect, mainly that stocks that performed poorly in the past 3-5 years would later outperform stocks that performed better during the same period. Jegadeesh (1990) further continued research into the field of reversal, finding evidence of a short-term reversal effect, mainly a reversal effect in the past month. Such studies of reversal would form a basis of evidence for the hypothesis that individuals overreact to information.

Jegadeesh and Titman (1993) would later become pioneers in the field of momentum strategies. Their study investigates momentum strategies for NYSE and AMEX stocks between 1965 to 1989. Portfolios are formed based on momentum, the return of stocks for the past J-months, and skipping the last month to avoid the short-term reversal effect (Jegadeesh, 1990). The winners portfolio consists of the decile with the highest momentum and the losers portfolio of the decile with the lowest momentum. Zero-cost portfolios, winners minus losers, are formed for 3, 6, 9, and 12 holding and formation periods, totaling 16 strategies. Additionally, the analysis was repeated leaving a week between the end of the formation period and the beginning of the holding period, totaling 32 strategies. To increase the power of the study, the portfolios are formed with overlapping holding periods. The results found that all of the zero-cost portfolios had positive returns. With the exception of the 3-month formation and 3-month holding period that does not skip a week, all of the returns of the portfolios were significant.

The most successful zero-cost strategy was the 12-month holding and 3-month formation period. The study found that buying past winners and selling past losers earn a significant alpha over the period. Additionally, the results indicate that the profitability of the portfolios is not solely explained by their systematic risk, as the CAPM would suggest (Sharpe, 1964).

The presence of the momentum factor in stock cross-sections has been widely studied in many markets across different time periods. The US stock market is the most researched market for the pricing anomaly of momentum. Following Jegadeesh and Titman (1993), Jegadeesh and Titman (2001) reexamine the analysis of buying past winners and selling past losers for the time period subsequent to their last study, from 1990 to 1998. Using a sample of stocks traded in the NYSE, AMEX, and Nasdaq. The results of a six-month formation and six-month holding period confirm what Jegadeesh and Titman (1993) had discovered, as during the period of 1990 to 1998, past winners outperformed past losers. Further expanding their work, their study finds that both winners and losers contribute equally to momentum returns, as winners outperform, and losers underperform the benchmark. These results are consistent with that found by Chan, Jegadeesh and Lakonishok (1996), mainly that stocks with higher past 6-month returns earned higher returns in the subsequent six months following the formation date in the period of 1977 to 1993 in a study of stocks listed on the NYSE, AMEX, and Nasdaq equity markets. Most of the empirical research on momentum for the US stock market is conducted using the same database, raising concerns. Parmler and Gonzalez (2007) study the US stock market for momentum and find that data snooping can be very substantial.

Similar studies have been conducted following the same methodology for international markets. To test if the momentum results found in the US stock market come as a result of the market being "unusual", Rouwenhorst (1998) follows a similar strategy to that of Jegadeesh and Titman (1993) for 2,190 firms from 12 European countries spanning 1978 through 1995. The results are very close to those found in the US stock market, following a momentum strategy yields positive abnormal returns, as past winners outperform past losers by about 1 percent per month. The same is confirmed in the Spanish stock market for the 12-month momentum strategy between 1963 and 1997 (Forner and Marhuenda, 2003). Rey and Schmid (2007) report comparable results for the Swiss Market between 1994 and 2004. Parmler and Gonzalez (2007) find evidence of profitable momentum strategies for stocks in the Stockholm Stock Exchange. Such results can also be extended to markets outside of Europe, as Hurn and

Pavlov (2003) find statistically significant momentum profits in the Australian market between 1973 and 1998.

Several studies have been conducted in the UK Stock Market to analyse the presence of the momentum factor. Agyei-Ampomah (2007) employs the Jegadeesh Titman (1993) strategy for stocks in the London Stock Exchange between 1988 and 2003, finding evidence of momentum, especially for the 12-month formation and 1-month holding portfolio. The findings are supported by Siganos (2007), between 1975 and 2001, and Hon and Tonks (2003), between 1955 and 1996.

Although the original study of Jegadeesh and Titman (1993) has been replicated in different international markets, confirming their results, most of the empirical research uses data from the same post World War II period, and hence, the studies cannot be viewed as entirely independent from each other (Chabot, Ghysels, and Jagannathan, 2008). Additionally, momentum strategies have been found to be positively correlated with other momentum strategies globally (Asness, Moskowitz and Pedersen, 2013). Hence, although research was conducted across different international markets, an issue exists as to whether these results are truly independent from each other. As a result, investigating a sufficiently large and truly independent sample can address this issue (Baltussen et al., 2021).

Geczy and Samonov (2016) study momentum from 1801 to 1926 in the US stock market. However, their cross-section lacks data for shares outstanding and dividends. As a result, their study tests price momentum on equally weighted portfolios, negatively affecting their results with the historical abundance of small market capitalization stocks and dividends being a major source of return (Baltussen et al., 2021). Nonetheless, from 1801 to 1926, the top third of stocks outperform the bottom third. Merging their pre-1926 data to the 1927-2021 period, momentum generates an average of 0.4% per month for the 212-year period. Stronger evidence for the presence of momentum in the pre-1926 US stock market is brought forward by Baltussen et al. (2021). Value weighted portfolios are found to confirm momentum as a significant factor for the US stock market between 1866 and 1926, finding significant premiums and CAPM alphas for momentum. Such results are not influenced by an abundance of small market caps. Goetzmann and Huang (2018) confirm the existence of momentum in late 19th century and early 20th century Imperial Russia, between 1865 and 1914. Similarly, to Geczy and Samonov (2016), equal-weighted portfolios are used.

Chabot et. Al (2008) replicates the study design of Jegadeesh and Titman (1993) for data from the London Stock Exchange between 1866 and 1907 to study price momentum. Instead of using deciles, the study uses terciles. The data includes prices, dividends, and shares outstanding. The results show evidence of short-term reversal and the presence of price momentum, with the most profitable zero-cost strategy being the 13-month formation and 3-month holding. These studies attempt to indicate that momentum is not a result of data mining.

3. Brief History of the U.K. Stock Market

The first stock was traded in Amsterdam on 1602, where 1143 investors purchased 57 percent of the Dutch East India Company (Verenigde Oost-Indische Compagnie), with the option of transferring their shares (Petram, 2011). An informal market for securities existed in London long before the first stock was traded in Amsterdam. All types of commodities were traded in coffeehouses located in the Exchange Alley. Such market was unregulated. In the United Kingdom, there was a similar growth of joint-stock companies in the seventeenth century, similar to that of the Netherlands. The English East India Company issued its general stock in 1657 (Neal, 1982). At the end of the century, 140 joint-stock companies existed with total capital of £4.25 million being greatly concentrated among the top companies (Smith, 1929). However, the foundations that led to the eventual organization of the London Stock Exchange occurred in 1693 when the government borrowed money through the creation of transferrable debt (Michie, 2001). King William III issued debt to help fund the war against Catholic France. Under the tunnel act of 1694, the Bank of England was created (Neal, 1982). The owners of such debt now searched for a market to sell their securities. Securities continued to be sold in the Exchange Alley until 1773, when a group of stockbrokers attempted to organize a unified exchange in the Stock Exchange building. Although the building did unify the location of the transactions, it did little regarding controlling and regulating the exchange (Michie, 2001). As a result of the instability that ensued in France as a result of the French Revolution, London had an influx of talent and wealth. In 1799, the Committee for General Purposes of the Stock Exchange decided to charge a small fee to those who frequented the building to cover costs of increased disputes over the non-delivery of stocks or transaction details. (Michie, 2001). The proposed solution was to change the Stock Exchange to a Subscription Room, in January 1801.

Members would pay a subscription fee and would have to follow specific rules that dictated how business was to be conducted, being the foundation of the London Stock Exchange. More formally, in 1810, a specific set of rules and regulations was established which would later be officialized and printed in 1812 (Neal, 2006).

From 1760 to 1840, Great Britain experienced unprecedented economic growth as a result of the Industrial Revolution. The textiles, metallurgy, and chemical industries were some of the industries that experienced growth (Floud and McCloskey, 1994). Prior to the industrial revolution, the transport was mainly composed of maritime methods. New demand for improved transportation of goods and materials led to the creation of large railways such as the Liverpool and Manchester Railway. Such a railway not only provided improved transportation but also was a financial success, earning investors an average annual dividend of 9.5% (Hollow, 2019). Through capitalized railway companies, the London Stock Exchange contributed to economic growth. From 1834 to 1845, the market capitalization of stocks increased substantially. The burst of the Railway Mania bubble in late 1845 would generate a fall in the market capitalization to GDP. (Acheson, Hickson, and Turner, 2009). By 1853, the London Stock Exchange had grown to 906 members as opposed to 363 in 1802, making it the biggest and most important exchange in the world (Michie, 2001). Following the Crimean War, market capitalization began to quickly rise. By late 1860s, railways and banks were the two sectors with the largest market capitalizations (Acheson et al., 2009). At the start of the First World War, the London Stock Exchange listed one-third of all securities in the world (Neal, 2006).

World War I brought a shock to the London Stock Exchange, as a result of its international exposure. To avoid a crash, the exchange was closed until 1915, when it reopened under the condition of vetting any foreign investment. The war ultimately resulted in a decrease in the international significance of the London Stock Exchange (Michie, 2001). During World War I, insurance companies and other financial institutions directed their capital toward government debt, which resulted in such companies being increasingly relevant in the securities market by the early 1930s. In 1929, the Great Depression, a worldwide period of economic downturn affected many nations' economies. Great Britain slipped into depression in early 1930 (Pells and Romer, 2021).

The period under question for this study, 1870 to 1930, as well as the period leading up to it, was an eventful period including significant technological changes, armed conflicts, and financial crisis. As a result, such a time period provides a rich historical sample to study cross-sectional returns. Moreover, London was the financial center of the world at the moment, making it an important market in which to conduct analysis.

4. Data

The first important contribution of this study is the creation of a monthly stock price dataset for listed and delisted companies on the London Stock Exchange from January 1870 to December 1930. The inclusion of such delisted stocks ensures that the sample used in this paper is free of survivorship bias. Data has been compiled from different sources to create a reliable and extensive dataset.

Our deep historical sample contains 61 years of data on monthly stock prices, returns, shares outstanding, and market capitalization for listed and delisted stocks in the London Stock Exchange. The creation of the dataset allows for deeper research into earlier stages of the London Stock Exchange. To build the database required for the analysis, the sources used are the U.K. Equities dataset of Global Financial Data (GFD) and the Investors Monthly Manual (IMM), a record of the London Exchange, following Baltussen et al. (2021). The dataset is then combined with risk-free rates from *A History of Interest Rates* (Homer, 1996 pp. 193-194, 446-447).

The GFD U.K. Equities dataset covers historical stocks traded in the London Stock Exchange, including all delisted stocks. The GFD dataset contains data on prices and dividends for firms listed on the UK Stock Exchange between the 16th and 20th centuries. For the purpose of this research, only monthly prices and returns are relevant for the 19th and 20th centuries. However, GFD did not include data for the number of shares outstanding, which was hand collected from the IMM. The IMM dates to 1869, implying a start date of 1870 for our sample, since the value for shares outstanding used is the value at the end of the previous year. For example, data for the year 1870 includes the number of shares outstanding in December 1869.

Close attention to data quality was paid during the data collection process by both us and the data vendors. However, the quality of the data used in this study is less than the quality of the data used in more recent samples. This potential data quality issues stem from two reasons: the use of old data and the manual data collection process. Since digital archives were not used during the period of the historical sample, data was stored in manual writing which gives rise to potential concerns of misprints and manual errors. Secondly, the collection of shares outstanding data is done manually and leads to potential measurement errors.

Data for number of shares outstanding was hand-collected using the Investors Monthly Manual for December of each year, as in Chabot, Ghysels, and Jagannathan (2008) and Baltussen et al. (2021). Due to the time-consuming nature of the collection process, we work with yearly figures rather than monthly figures. The U.K. Equities GFD dataset contained data for 4,025 firms between 1870 and 1930, for which I collected data for shares outstanding. The IMM presents data for shares outstanding, par value, and prices for listed stocks. The manual is organized per sector in the order of: Railway, Banking, Finance, Insurance, Miscellaneous, and Mining Companies. The Miscellaneous Companies section is then further divided into categories such as Breweries & Distilleries, Canal Companies, Docks & Harbours, Gas & Lighting, Iron, Coal & Steel, Land & Mortgage, Spinning & Weaving, Steamships, Tea & Coffee, Telegraph, Tramway & Omnibus, Trusts, Wagon & Carriage, Waterworks, and Other Companies. Data for shares outstanding is presented in two different ways, as the total amount of raised capital or as shares outstanding. For the case of the former, the total amount of raised capital is divided by the par value of a stock to obtain the number of shares outstanding. When collecting the data, blocks of five years are created, mainly 1869, 1874, 1879, 1884, and so on, all the way to 1929. The data is filled out for those years. Then, if the number of shares outstanding did not change in the five-year period, we interpolated the years in between. Hence, if for a firm the number of shares outstanding was the same in 1869 and 1874, we filled in the data for the years in between. Interpolation was mostly done in the materials sector. For those firms that did change, data for more years was collected until interpolation was possible. Data for shares outstanding was found for 3,711 firms out of the 4,025. The firms for which data was not listed in the IMM were removed from the sample. An example of an issue of the IMM can be found in Appendix A.

Initially, GFD Database contained a list of data for 17,245 firms, spanning over 300 years. The list was shortened to 4,025 firms based on the years of interest. A large database of 10,9 million observations was created for the price, return, date, series id, and name. Then, this database was filtered to only include observations between the first day of January 1870 and the last day of December 1930, reducing the data to 4,5 million observations. As this study uses a holding strategy, monthly frequency is appropriate. Data was filtered to only include observations on the last day of the month, reducing the data to 869,003 for 4,025 firms. A 'zero price screen' was applied to the data, removing observations that had a price of zero, which reduced the data to 868,923 for 4,025 firms. The database was later merged with the database containing shares outstanding. As the IMM did not include data for all of the 4,025 firms, observations with shares outstanding of zero or a missing value were removed. To control for misprints as a result of using historical samples, the following data screen was applied to the cross-section. If the return is twice as large as that of the previous month, and the month thereafter is smaller than 50%, the average of the previous and following month is taken as the return. For the price momentum portfolios, the same data screen is applied to price. The final data included 776,073 monthly observations for 3,711 firms.

	Mean	Median	Standard Deviation	Maximum	Minimum
No. Of Firms	1,105.87	1,126	135.2896	1300	799
Market Capitalization (£)	4,765,201	180,000	24,060,198	463,118,900	7.5

Table 1. Descriptive statistics of the number of stocks per year and market capitalization in Great British Pounds (£).

Our cross-section starts in 1870 with 799 stocks and ends in 1930 with 1083 stocks. Analyzing the cross-section by months, in the month of August of 1914 there are only 15 firms in the sample. This number increases through December of that same year, to reach a normal level of 1081 firms in January of 1915. Such a drop comes as a result of the London Stock Exchange closing in the midst of World War I, as mentioned in the History section. The descriptive statistics for the data are shown in table 1. Firstly, the stocks were divided into six sectors: (1) Energy, (2) Materials, (3) Finance, (4), Transports, (5) Utilities and Telecommunications, and (6) Miscellaneous. These sectors were chosen to identify important industries during the time period, and Miscellaneous Companies include stocks that did not form part of such industries. Out of the 3,711 firms, 126 belong to the Energy sector, 990 to

Materials, 602 to Finance, 592 to Transports, 312 to Utilities and Telecommunications, and 1,089 to Miscellaneous.

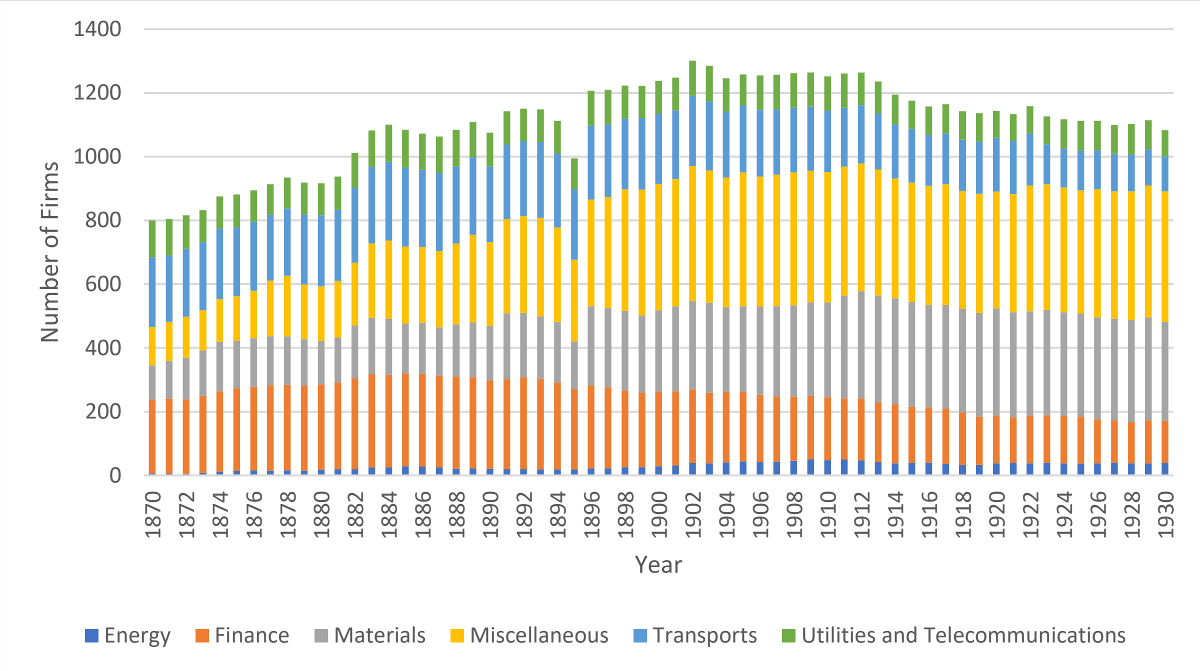

Figure 1. Number of firms in the London sample by sector between January 1870 and December 1930.

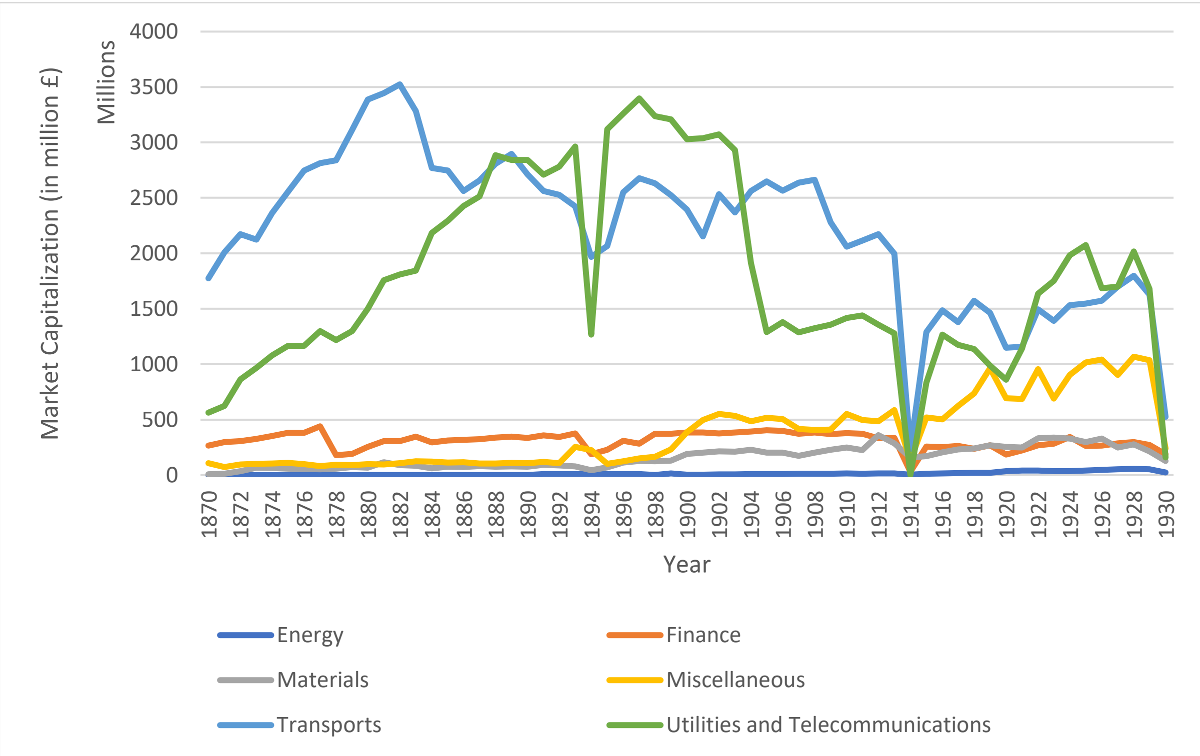

Figure 2. Total Market Capitalization in Great British Pounds in the sample by sector between January 1870 and December 1930.

When analysing figure 2, it can be noted that the average market capitalization drops in 1905, specifically for the Utilities and Telecommunications sector. After further inspection, it was evident that the largest companies disappeared from the sample after 1904. This was as a result of the foundation of the Metropolitan Water Board in 1903, which incorporated eight private companies under the same public body. These companies included East London Waterworks, Lambeth Waterworks, Chelsea Waterworks, West Middlesex Waterworks, among others (Kempton Steam Museum, 2021). The Metropolitan Water Board would start operating in 1904, marking the last year of these companies in the sample. Additionally, in the early 20th centuries there is a crash seen in the year 1915, when the exchange closed down as a result of the war. Market capitalization gradually increases after the war. Finally, another downturn is seen in the late 1920s, probably as a direct result of the Great Depression.

The energy sector, comprised mainly of oilfields and collieries, has an average market capitalization of £0,4 million throughout the 60-year period. The Materials sector, with a £0,7 million average market capitalization, mainly includes mining companies, however, chemicals and rubber companies also form a significant part of the firms. Finance companies, with an average market capitalization of £1,5 million are primarily banks, however, insurance companies are also included in this category. The Transports sector is mainly comprised of Railroads, with shipping companies also forming a significant part as well. The average market capitalization for this sector is £11,8 million. Gas and Water companies are the most represented in the Utilities and Telecommunications Sector, which had an average market capitalization of £19,3 million. Finally, the Miscellaneous sector includes a wide variety of firms, including health, communications, consumer staples, information technology, industrials, real estate, and consumer discretionary firms. Such firms have an average market capitalization of £1,3 million.

The risk-free rate used is the annual yield from British Consols in the 19th and 20th centuries. The data was hand-collected for each of the 60 years from *A History of Interest Rates* (Homer, 1996 pp. 193-194, 446-447).

Historical data provides an excellent opportunity to conduct out of sample tests of current literature. However, at the same time, using historical data comes with many challenges. Firstly, missing observations are far more common in historical data. Additionally, as digital archives did not exist, data was maintained in manual writing which allows for greater error as a result of misprints. Secondly, data for shares outstanding was hand collected, which allows for human error in the collection. These limitations can influence the results of the study by biasing the data towards the null hypothesis that a momentum factor does not exist or creating spurious results in the case that biases in the data correlate with the momentum factor.

5. Methodology

To test for momentum in the 19th and 20th centuries in the UK stock market, portfolios will be created using the J-month/K-month strategy (Jegadeesh and Titman, 1993). The portfolios are created for stocks based on returns from the past 1, 3, 6, 9, and 12 months. Also, different holding periods are considered for 1, 3, 6, 9, and 12 months, giving rise to a total of twenty-five different strategies. At the beginning of each month t, the momentum of each stock is calculated as in Jegadeesh and Titman (1993) the total return between months t – J and t-1:

$$R_{(t-J),(t-1)} = \frac{R_{(t-1)} - R_{(t-J)}}{R_{(t-J)}}$$

Momentum is calculated skipping the last month of the formation period, as Jegadeesh (1990) finds evidence supporting a short-term reversal effect. To investigate this effect, the 1-month formation portfolios are also constructed. Each month, momentum is calculated for each stock in the sample and stocks are ranked accordingly. The top decile is the stocks with the highest momentum and the bottom decile is the stocks with the lowest momentum. For each J-month/K-month strategy, two portfolios are created. P10 is a portfolio of the upper decile of momentum stocks, and P1 is a portfolio of the bottom decile of stocks. In other words, P10 is the “winners” portfolio and P1 is the “losers” portfolio. For each month, the return of the “losers” portfolio is subtracted from that of the “winners” portfolio, to yield the return of the long-short portfolio. The portfolios are value weighted using market capitalization. The process is repeated for each of the twenty-five different strategies, yielding 250 decile portfolios, used to create long-short portfolios. Following most of the existing literature, overlapping portfolios are used to increase the power of the statistical tests. Figure 3 depicts the construction of 3-month formation and 3-month holding periods. For each strategy, the first zero-cost portfolio is purchased in January 1870, and the last in December 1930.

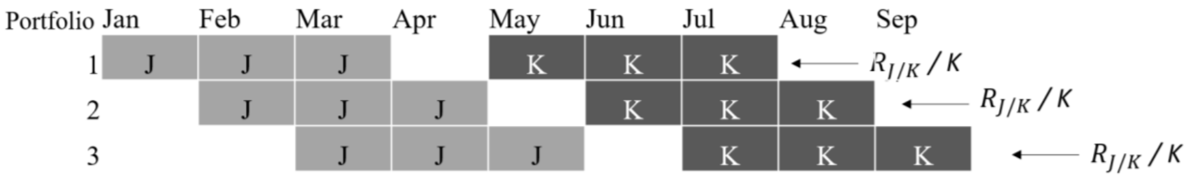

Figure 3. Visual representation of the construction of 3-month formation and 3-month holding periods, skipping a month between the formation and the holding period.

The mean monthly return is calculated using the arithmetic mean as in Jegadeesh and Titman (1993).

$$Longshort\ monthly\ R_{J/K} = \frac{Longshort\ R_{J/K}}{K}$$

To evaluate the significance of each long-short portfolio's monthly returns, a one sample t-test is carried out for each of the twenty-five strategies. If the corresponding p-value is lower than the significance level of 5%, the null hypothesis is rejected, signifying a difference in the mean monthly returns of the same strategy portfolios, only differing in the momentum decile category of the stocks. With this methodology, we will be able to determine if the difference in the returns of long-short momentum portfolios are significantly different from zero.

When back-testing zero-investment strategies, abnormal returns represent an unbiased estimate of the economic profitability of the strategy (Alexander, 2000). To test if the momentum strategy of buying winners and selling losers generates significant risk-adjusted returns, a CAPM market model regression will be used.

In the CAPM, Sharpe (1964) proposed that investors expect to be compensated for the risk of an investment as well as the time value of money. The degree of systematic risk, measured by BETA, determines the return of an asset. The expected return of an asset can be modeled as:

$$E(R_i) = R_f + \alpha_i + \beta_i(E(R_m) - R_f)$$

Where $E(R_i)$ is the expected return of the portfolio, R_m is the return of the market, R_f is the risk-free rate, the beta, β_i, represents the systematic risk of the portfolio, and α_i is the excess return over the expected return of the CAPM, represented as:

$$\alpha_i = E(R_i) - R_f - \beta_i(E(R_m) - R_f)$$

After regressing the return of each of the twenty-five long-short different strategies by the market risk premium, the market return minus the risk-free rate, if α_i significant, the null hypothesis is rejected. Acheson, Hickson, and Turner (2009) find that the majority of return in the UK stock market between 1825 to 1870 came from dividends, rather than capital appreciation. Hence, use of total return is most appropriate for this study. Nonetheless, for the purpose of comparison, the Jegadeesh and Titman (1993) strategy will be replicated by excluding dividends to test for price momentum.

The purpose of this research is to conduct a thorough analysis of momentum in the UK stock market. To obtain more robust results, data for shares outstanding is collected and portfolios are value weighted. The advantage of using equal-weighted returns is that they will not be overly affected by movements in larger firms. However, equal-weighted returns give equal importance to stocks that have different economic importance (Acheson et al, 2009). As several empirical studies have been conducted into historical cross-sections using equal-weighing, the results for equal-weighted portfolios will also be included for the purpose of comparison.

6. Results

In this section, the results for the zero-cost portfolios are shown in tables 1, 2, 3, and 4. Each of the twenty-five strategies will be referred to with numbers in parentheses where the first number is the formation period and the second number is the holding period. For instance, the 12-month formation and 3-month holding period is the (12,3) portfolio. Table 1 shows the average monthly returns for each of the twenty-five strategies.

J	K =	1	3	6	9	12
1	Winners	0.23	**0.15***	**0.43*****	**0.41*****	**0.57*****
	Losers	**1.51*****	**0.68*****	**0.37*****	**0.29*****	**0.23*****
	W-L	**-1.27*****	**-0.54*****	0.05	0.12	**0.34*****
3	Winners	**0.82*****	**0.62*****	**0.71*****	**0.68*****	**0.76*****
	Losers	**0.99*****	**0.33*****	**0.14***	**0.18*****	**0.10***
	W-L	-0.17	**0.29****	**0.56*****	**0.50*****	**0.65*****
6	Winners	**1.35*****	**1.08*****	**0.96*****	**1.08*****	**1.00*****
	Losers	**1.09*****	**0.21***	0.13	-0.04	-0.01
	W-L	0.26	**0.87*****	**0.84*****	**1.13*****	**1.01*****
9	Winners	**1.30*****	**1.07*****	**1.15*****	**1.13*****	**1.11*****
	Losers	**0.87*****	0.14	-0.08	-0.10	-0.07
	W-L	0.43	**0.92*****	**1.23*****	**1.22*****	**1.18*****
12	Winners	**1.81*****	**1.46*****	**1.21*****	**1.20*****	**1.10*****
	Losers	**0.92*****	-0.02	-0.10	-0.11	-0.05
	W-L	**0.89*****	**1.48*****	**1.31*****	**1.31*****	**1.14*****

*Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 1. Average monthly returns as a percentage of each strategy between 1870 and 1930 for value weighted portfolios. The winners portfolio consists of the top decile of stocks based on total return momentum. The losers portfolio consists of the bottom decile of stocks based on total return momentum. W-L is the difference between the monthly returns of the winners portfolio and the losers portfolio.

Decile Rank	Average monthly return (%)
P1	-0.02
P2	0.12
P3	**0.12****
P4	**0.30*****

P5	**0.41*** **
P6	**0.52*** **
P7	**0.63*** **
P8	**0.70*** **
P9	**0.85*** **
P10	**1.46*** **
P10 - P1	**1.48*** **

*Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 2. Average monthly returns as a percentage for the 12-month formation and 3-month holding portfolio between January 1870 and December 1930. Stocks are grouped in deciles based on total return momentum. P10 consists of the top decile of stocks based on total return momentum and P1 of the bottom decile. Portfolios are value-weighted.

Firstly, it can be noted that there is a significant presence of momentum in the UK stock market in the late 19 century and early 20th centuries. Excluding the (3,1), (6,1), (9,1), (1,6), and (1,9) portfolios, all the zero-cost portfolios earn returns that are significantly different from zero. Jegadeesh and Titman (1993) find that the best performing portfolio is the (12,3) with a monthly return of 1.31%. The most profitable strategy in this study is the (12,3) as well, with a slightly higher monthly return of 1.48%. As for the worst-performing portfolio, both Jegadeesh and Titman (1993) and this paper find that the worst portfolio is the (3,3) earning monthly returns of 0.32% and 0.29% respectively. These results are consistent with the studies of momentum in the UK stock market for the same period, which find significant momentum (Agyei-Ampomah, 2007; Hon and Tonks, 2003; Siganos, 2007). Chabot et. Al (2008) find significant momentum in the UK stock market for 1866 to 1907, a slightly shorter period than this study. The best performing portfolio, (13,3) earns a monthly return of 0.5% which is lower than the return of our (12,3) portfolio. However, their study ranks stocks based on terciles rather than deciles. In a study of European markets, spanning 1978 through 1995, Rouwenhorst (1998) finds a monthly return of 1.16% for the (6,6) portfolio, which compares to our monthly return of 0.84%.

Further analyzing the most successful portfolio, (12,3) table 2 presents a breakdown of average monthly return for each decile. It can be noted that the lowest deciles present returns that do not significantly differ from zero. As the decile increases, the return increases and significantly differs from zero.

Secondly, the presence of short-term reversal in the UK stock market is found, which is in line with Jegadeesh (1990). Their study finds a significant first-order serial correlation in returns. The (1,1) zero-cost portfolio earns a significant monthly return of –1.27%, and a significant alpha of -1.09% per month. The reversal effect is also significant for the (1,3) portfolio, however, such an effect dissipates as the holding period increases and becomes insignificant.

Thirdly, there is not a clear trend in returns based on holding periods. De Bondt and Thaler (1985) suggest that there is mean reversion in the long term, meaning that the momentum effect would dissipate as the holding period increases. However, in this study monthly returns for the zero-cost portfolios do not appear to decrease with holding periods.

Panel A – CAPM Alpha						
J	K =	1	3	6	9	12
1		**-1.09*** **	**-0.50*** **	0.08	**0.13* **	**0.34*** **
		(-4.96)	(-4.34)	(1.00)	(1.91)	(5.45)
3		0.02	**0.31** **	**0.60*** **	**0.51*** **	**0.66*** **
		(0.10)	(2.48)	(6.38)	(6.74)	(9.33)
6		**0.51* **	**0.92*** **	**0.91*** **	**1.15*** **	**1.03*** **
		(1.88)	(6.35)	(8.95)	(13.32)	(13.51)
9		**0.65** **	**0.98*** **	**1.30*** **	**1.24*** **	**1.16*** **
		(2.32)	(6.72)	(12.11)	(13.34)	(13.59)
12		**1.10*** **	**1.51*** **	**1.34*** **	**1.30*** **	**1.11*** **
		(3.70)	(9.61)	(12.34)	(14.09)	(13.76)
Panel B – CAPM Beta						
J	K =	1	3	6	9	12
1		**-0.60*** **	**-0.22* **	-0.17	-0.08	-0.01
		(-3.29)	(-1.66)	(-1.51)	(-0.70)	(-0.10)
3		**-0.64*** **	-0.12	-0.21	-0.04	-0.07
		(-3.21)	(-0.81)	(-1.57)	(-0.35)	(-0.53)
6		**-0.83*** **	**-0.29* **	**-0.43*** **	-0.17	-0.15

	(-3.69)	(-1.71)	(-2.96)	(-1.23)	(-1.14)
9	**-0.74*** **	**-0.29***	**-0.41*** **	-0.08	0.10
	(-3.20)	(-1.74)	(-2.66)	(-0.55)	(0.69)
12	**-0.70*** **	-0.19	-0.19	0.05	**0.29** **
	(-2.83)	(-1.04)	(-1.22)	(0.32)	(2.05)

*Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 3. The monthly returns of the twenty-five strategies are regressed against the market premium to test the robustness. Panel A shows the CAPM alpha and Panel B shows the CAPM beta for the equation: $R_i = \alpha_i + \beta_i(R_m - R_f) + \epsilon_i$. Numbers in parentheses indicate t values. Momentum signals are calculated based on total return and stocks are value weighted. The sample runs from January 1870 to December 1930 at monthly frequency.

Fourthly, Geczy and Samonov (2016) mention that before researching momentum in historical samples, there had only been two occurrences of decades in which momentum strategies yielded negative returns. Their study of the US stock market between 1801 and 1926 found 7 negative decade long periods. The returns of the (12,3) portfolio divided by decade are shown in table 4. It can be noted that this study does not find negative returns for such strategy, however, one decade earned an average monthly return that does not significantly differ from zero, whilst another three decades earned an average monthly return that exceeded 2% per month, signifying variation in returns per decade.

Finally, excluding the (1,6) and (3,1), all the portfolios exhibit a significant alpha coefficient. In other words, the momentum portfolios generate significant risk-adjusted returns. Such results are in line with (Baltussen et al., 2021), which finds significant CAPM alphas for momentum. The (12,3) earns a monthly alpha of 1.51%, significant at the 1% level. On the other hand, as seen in Panel B of table 3, most of the zero-cost portfolios have insignificant betas, meaning that the returns of the zero-cost portfolios are not explained by systematic risk.

Decade	Average monthly Return (%)	CAPM alpha (%)	CAPM Beta
1870 – 1879	**2.10*** **	**2.90*** **	**-0.76*** **
1880 – 1889	0.21	0.28	-0.19
1890 – 1899	**0.68***	**0.94** **	**-0.46** **

1900 – 1909	**1.16*** **	**1.15*** **	0.08
1910 – 1919	**2.12*** **	**2.12*** **	-0.00
1920 – 1930	**2.48*** **	**2.42*** **	0.09
1870 – 1930	**1.48*** **	**1.51*** **	-0.19

*Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 4. Average monthly returns as a percentage for the 12-month formation and 3-month holding portfolio per decade between January 1870 and December 1930. Momentum signals are calculated based on total return and stocks are value weighted. CAPM alpha and Panel B shows the CAPM beta for the equation: $R_i = \alpha_i + \beta_i(R_m - R_f) + \epsilon_i$. The sample runs from January 1870 to December 1930 at monthly frequency. Since the sample includes 61 years, the last decade includes an extra year, running from January 1920 to December 1930.

For the purpose of comparison, the methodology was also conducted for momentum excluding dividends, mainly price momentum, and also for equally weighted portfolios. The results are presented in Appendices B, C, and D.

For the equally weighted momentum portfolio, significant CAPM alphas were found. Also, significant CAPM betas were found, indicating that some, but not all, of returns are explained by systematic risk. The most successful portfolio is the (12,9), earning an average monthly return of 0.89%. When dividing the returns of the (12,9) in decades, there is evidence of one significantly negative decade of returns, in 1870 – 1879.

As for price momentum, the value weighted portfolios found significant alphas and significant betas. The most successful portfolio, (12,3), earned an average monthly return of 0.92% and displayed no negative decades, although two decades had returns that did not differ significantly from zero.

Finally, the equally weighted price momentum portfolio displayed significant alphas for most strategies and significant betas for almost every strategy. The most successful strategy is the (9,9), earning 0.36% monthly return, on average. One statistically significant negative decade was present in 1870 – 1879. It is worth noting that every strategy, excluding the 12-month holding period, for the one-month formation period earned significantly negative returns, signifying a longer short-term reversal.

7. Conclusion

For this study, a database is constructed of UK stock prices, returns, and market capitalizations for 3,711 firms between 1870 and 1930. This data extends the existing recent data for the UK stock market with 61 years of independent data. Such data allows for a robust analysis of momentum in the cross-sectional returns of the UK stock market. Using this data, this paper attempts to answer the question: “Is the asset pricing anomaly of momentum present in the 19^{th} and 20^{th} centuries in the UK stock market?”.

This paper tested twenty-five different strategies for the formation and holding periods of 1, 3, 6, 9, and 12 months, following Jegadeesh and Titman (1993). Results reveal a significant presence of the momentum pricing anomaly in the cross-section, with the best performing zero-cost portfolio earning on average 1.48% per month. Additionally, CAPM regressions reveal a significant alpha, signifying significant risk-adjusted returns. These results show strong out-of-sample robustness of the presence of the momentum factor. Such findings contradict the existing literature on market efficiency proposed by Fama (1965, 1970) and the Capital Asset Pricing Model (CAPM) proposed by Sharpe (1964). The results of this study are in line with previous empirical research conducted on momentum in recent samples, as well as in historical cross-sections.

There are several limitations to this paper that need to be addressed. This study does not take into account transaction costs, which are fundamental in evaluating profitability. Secondly, although historical data provides an opportunity to conduct out-of-sample test studies, it comes with limitations. Missing observations are common in historical data. As momentum strategy relies on observing the lags of returns in the cross-section, such missing observations limit the robustness of our tests. Secondly, as data for shares outstanding is hand-collected, there is potential for human error that might affect results.

Suggestions for future research would be to investigate how other stock characteristics influence the pricing anomaly of momentum. First, investigating how momentum differs by industry, following Moskowitz and Grinblatt (1999). Secondly the interaction effect between the momentum and size effect could be investigated, following Alhenawi (2015). Finally, studying the profitability of the (12,3) strategy when taking into account transaction costs would provide a better outlook on the realistic returns that investors could earn employing this strategy.

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9. Appendix A

BRITISH, COLONIAL, AND FOREIGN RAILWAYS.—Continued.

RAILWAYS.	Capital. Subscribed. £	Capital. Amt. of Share.	Par.	Prices of the Month. Highest	Prices of the Month. Lowest	Prices of the Month. Latest	Last Business Done.	Dividends. Last Four. Rate Per Cent. Per Annum.				Dividends. Payable.
Lancashire & Yorksh. Barnsley (gur. 5 7/12 % in perp.)	260,050	...	100	...	...	115	115	103/10	103/10	103/10	103/10	Feb. & Sept.
Do Blackburn 4½ per cent. perpetual	538,048	...	100	102½	100	102¼	102	4½	4½	4½	4½	Feb. & Sept.
Do East Lancashire 6 per cent., & surplus profits	287,794	...	100	...	...	129	138	6½	6½	6¾	6¾	Feb. & Sept.
Do — 5 — perpetual	297,490	...	100	111½	110½	111	111	5	5	5	5	Feb. & Sept.
Do E. Lanc. 4½ p. c. perp. propor. of add. profits	90,780	...	100	...	...	133	135	6½	6½	6¾	6¾	Feb. & Sept.
Do East Lancashire 5 per cent. perpetual	53,230	...	100	111½	110	111	111¼	5	5	5	5	Feb. & Sept.
Do 4½ per cent. perpetual	1,233,000	...	100	101½	100	101	101	4½	4½	4½	4½	Feb. & Sept.
Do 1865, 4½ per cent. till 1870, then 5 per cent	607,750	...	100	111	109½	110½	110	4½	4½	4½	4½	Feb. & Sept.
Do debenture stock 4 per cent.	552,903	...	100	101	98	100	99	4	4	4	4	Jan. & July.
Lausanne and Fribourg, 6 per cent. obligations	300,000	...	100	...	...	...	99½	6	6	6	6	April & Oct.
Lemberg-Czernowitz-Jassy, guaranteed 7 %	3,960,000	20	20	16¾	15¾	16⅞	16¾	7	7	7	7	May & Nov.
Leven-East of Fife	...	10	10	...	...	7⅞	7⅞	3¾	3	3	3	May & Nov.
Leven	...	10	10	...	...	14½	14½	10	7½	7½	7½	May & Nov.
Do preference 4½ per cent	...	10	10	...	...	9⅝	9⅝	4½	4½	4½	4½	May & Nov.
Limerick and Ennis	84,750	25	25	...	...	...	6¾	nil.	nil.	nil.	nil.	- ... -
Limerick and Foynes	101,513	25	25	...	...	...	...	nil.	nil.	nil.	nil.	...
Llynvi and Ogmore Valley (Llynvi)	112,180	...	100	...	...	...	...	5	nil.	1¼	1¼	Feb. & Aug.
Do (Ogmore) deferred ordinary	153,020	...	100	...	...	...	...	nil.	nil.	nil.	nil.	Feb. & Aug.
Do pref. 5 per cent. ...	130,920	...	100	...	...	...	...	5	5	5	5	Feb. & Aug.
London & Blackwall (leased at 4½ p c to Gt Eastrn)	1,459,050	...	100	96	94	95	95¼	4½	4½	4	4½&1bs	Feb. & Aug.
Do 4½ per cent. perpetual	250,055	...	100	...	...	95	95	4½	4½	4½	4½	Feb. & Aug.
L. and Green. perp. lease at 45,000l p. ann. to S. E.	861,540	...	100	64	62	63	64	2l 14/2	2l 14/2	2l 13/6	2l 14/2	Jan. & July.
Do 5 per cent. preference perpetual	222,720	...	100	...	...	...	108	5	5	5	5	April & Oct.
London & North-Wstrn (capital raised 53,163,066l.)	29,944,197	...	100	123⅝	120½	123¼	123¼	6¾	5¼	6¾	5½	Feb. & Aug.
Do Stour Valley (guaranteed ⅔ L. & N. W. divd)	393,088	...	100	78	75½	77⅞	73½	4½	3½	4½	3⅜	Mar. & Sept.
Do 5 per cent. preference perpetual	2,887,768	...	100	112½	110	111¾	111¾	5	5	5	5	Feb. & Aug.
Do 4½ %	...	...	...	...	...	100	99	4½	4½	4½	4½	Feb. & Aug.
Do Cvntry & Nun 5 pr ct. perp. & ½ (C.&N.) surp.	270,000	...	100	113	110	112	111½	5	5	5	5	Feb. & Aug.
Do Bedford and Cambridge	240,000	...	100	91	88	90	89½	4	4	4	4	Feb & Aug.
Do debenture stock 4 per cent.	2,835,757	...	100	101	99	100½	101	4	4	4	4	Jan & July.
Do debenture stock 3½ per cent.	310,830	...	100	...	...	...	88½	3½	3½	3½	3½	Jan. & July
Do St Helen's Railway & Canal, Class A	334,000	...	100	112½	111	112	112	5	5	5	5	Feb. & Aug.
Do do 5 per cent perpetual, B	144,000	...	100	112½	111	112	112¼	5	5	5	5	Feb. & Aug.
Do do 6 per cent perpetual, C	158,400	...	100	133	127½	132½	133	6	6	6	6	Feb. & Aug.
Do do 4½ pr cnt, red at par, at option of Compy D	102,830	...	100	100	97	99½	100	4½	4½	4½	4½	Feb. & Aug.
Do do 4½ per cent, redeemable as above, E.	72,280	...	100	100	96	99	95	4½	4½	4½	4½	Feb. & Aug.
Do do 5 per cent., redeemable at 5 premium, G...	100,000	...	100	107	104	106	104	5	5	5	5	Feb. & Aug.
Do Shrewsbury and Welchpool 4 per cent.	300,000	...	100	91	88	90	90	4	4	4	4	Mar. & Sept
Do Whitehaven Junction, leased at 10 per cent...	120,840	20	20	45	43	44	42½	10	10	10	10	Mar. & Sept.
Do Lancaster and Carlisle (guar. minimum 8 %)	2,420,300	...	100	223	216	222	222	11½	9¾	11½	10	Feb. & Aug.
Do 4½ % preference perpetual	456,000	...	100	...	...	102	102	4½	4½	4½	4½	Feb. & Aug.
Do Merthyr, Tredegar, & Aber., gua. 5% in perpet...	220,000	...	100	...	...	111	111	5	5	5	5	Feb. & Aug.
Do Buckinghamshire guar. 4 pr ct parpet & ½ surp.	1,245,000	...	100	94	92	93	94	4	4	4	4	Feb. & Aug.
Do Cannock Mineral, guar. perpet. 3½ per cent. ...	160,000	10	10	...	...	7¼	...	3½	3½	3½	3½	Feb. & Aug.
Do Chester & Holyhead gua. perpet. 2½ per cent...	2,100,000	...	100	56	54	55	55½	2½	2½	2½	2½	Feb. & Aug.
Do do 5½ per cent. perpetual	630,000	...	100	...	...	122	122	5½	5½	5½	5½	Feb. & Aug.
Do do 5 per cent. perpetual	725,000	...	100	113	111	112	112½	5	5	5	5	Feb. & Aug.
Do Kendal & Windermere guar. 1/16 earnings of Lanc. and Carlise (a min. 3 % g. by L. & N. W.)	111,700	25	25	...	...	16¾	16½	3	3	3	3	Jan. & July.
Do Shropshire Union (guar. ½ L. & N.-Wn. div. and surplus to 6 p. ct, ½ srplus above 6)	1,300,000	...	100	61½	59½	61½	59¼	3⅜	2⅝	3⅜	2¾	Mar. & Sept.
Do South Staffordshire, A (lea 99 ys, 4½ per cent. until Aug 1871, then 4 per cent.)	1,269,330	...	100	90½	88½	90	89	4½	4½	4½	4½	Mar. & Sept.
Do do B, 5 per cent. until August 1871	127,000	10	1	...	...	...	par	5	5	5	5	Mar. & Sept.
London & Sth.-Western, capital raised 16,826,035l	7,772,886	...	100	95	91	93	93½	5¼	4	5¼	4	Feb. & Aug.
Do 7 per cent. perpetual	171,277	...	100	149	144	147½	145	7	7	7	7	Feb. & Aug.
Do Portsmth anns, 2s 6d each, 144,000 in number	...	...	...	...	...	...	2⅛	paid.	paid	paid.	paid.	Jan. & July.
Do 4½ per cent. perpetual	2,929,230	...	100	97	95	96	95½	4½	4½	4½	4½	Feb. & Aug
Do 5 % perpetual, 1866	1,408,791	...	100	...	...	...	101	5	5	5	5	Feb. & Aug.
Do debenture stock, 4 per cent.	1,048,739	...	100	100	98	99	99	4	4	4	4	Jan. & July.
Do debenture stock, 4½ per cent.	729,146	...	100	...	...	...	...	4½	4½	4½	4½	...
London, Brighton, and South Coast ......stock	6,839,882	...	100	48⅜	44	47¼	47⅜	nil.	nil.	1¼	nil.	Feb. & Aug.
Do 7 per cent. perpetual	220,000	...	100	...	...	...	130	14	7	7	7	...
Do 6 — No. 1, perp, and any div above 6.	393,395	...	100	...	...	...	119½	12	6	6	6	Feb. & Aug.
Do 6 per cent., No. 2, perpetual only	17,783	...	100	...	...	...	115	12	6	6	6	Feb. & Aug.
Do 5 — 1, —	398,268	...	100	102½	100	101½	101	10	5	5	5	Feb. & Aug.
Do 5 — 2, —	161,013	...	100	101	99	100	100	10	5	5	5	Feb. & Aug.
Do 5 — 3, —	82,000	...	100	...	...	...	...	10	5	5	5	Feb. & Aug.
Do 5 — 4, —	251,919	...	100	101	98	99	98	10	5	5	5	Feb. & Aug.
Do 5 — 1865, No. 5, perpetual only	830,970	...	100	...	...	88	87½	nil.	5	5	5	Feb. & Aug.
Do 5 — 1866, No. 6	1,661,335	...	100	86	83	...	85	nil.	2½	7½	5	Feb. & Aug.
Do 5 — 1866, No. 7	318,368	...	100	...	...	...	85	nil.	nil.	10	5	Feb. & Aug.
Do 4½ — 1858, perpetual only	650,000	...	100	84	81½	83	81¾	9	4½	4½	4½	Feb. & Aug.
Do 4½ — 1859, —	94,717	...	100	...	...	...	...	9	4½	4½	4½	Feb. & Aug.
Do 4½ — 1861, —	716,005	...	100	83	81½	82½	81¾	9	4½	4½	4½	Feb. & Aug.
Do 4 pr ct. perpet., but deferred until after 1864.	220,000	...	100	...	...	...	75	8	4	4	4	Feb. & Aug.
Do 4 per cent. 1860 perpetual	133,900	...	100	...	...	...	74	8	4	4	4	Feb. & Aug.
Do 4½ — 1863 —	943,000	...	100	82½	81	82	82¼	9	4½	4½	4½	Feb. & Aug.
Do debenture stock 4 per cent. perpetual	1,306,199	...	100	90	89	89⅝	89¼	4	4	4	4	Jan. & July.
Do — 4½ — — (iss. at 95)	599,516	...	100	100	98	99	99¾	...	4½	4½	4½	Jan. & July.
London, Chatham, and Dover ......stock	3,000,000	...	100	16¼	14¾	15¼	15¼	nil.	nil.	nil.	nil.	...
Do 5 pr ct. 1st pref. perpet. arrears accumulative.	670,000	...	100	46	42	45	40	...	...	...	...	...
Do 6 p c. 2nd pf. perpet. arrears not accumulative	800,000	...	100	26	24	25	25	nil.	nil.	nil.	nil.	...
Do 6 per cent. Metropolitan Extension A	2,425,000	...	100	13	10	12	11	nil.	nil.	nil.	nil.	...
Do 6 per cent. Metropolitan Extension B	825,000	...	100	41	39	40	40	...	...	...	...	...
Do 6 per cent. Metrop Exten C arrears not accum	1,050,000	...	100	25	24	24½	24½	nil.	nil.	nil.	nil.	...
Do 4½ per cent. Western Extensions, perpet. rent	622,727	...	100	...	...	...	60	...	...	...	...	...
Do common fund stock 5%	750,000	...	100	...	...	...	55	...	...	...	...	Jan. & July.
Londonderry and Coleraine	176,250	25	25	...	...	...	...	nil.	nil.	nil.	nil.	...
Do 5 per cent. ½ shares	149,525	12½	12	...	...	...	...	nil.	nil.	nil.	nil.	...
Londonderry and Enniskillen (leased by I. N. W.)	129,200	...	100	10½	10	10¼	10⅜	nil.	nil.	nil.	nil.	...

Figure 4. Investors Monthly Manual for January 1870.

INSURANCE COMPANIES.

NAME.	Capital: No. of Shares or Amt. of Stk. Quoted.	Share or Stock.	Paid.	December Prices: Opening.	Highest.	Lowest.	Latest.	Last years divs. yield at Latest Price %: £	s	d	Prices of 1929: Highst.	Lowest.	Recent Dividends. Rate per Cent. per Annum, including Bonus, except where marked %. * Interim. (a Tax free.)			
Alliance Assurance Co., Limited, ord	250,000	20	2l 4/	18	18 3/16	17½	17¾	5	1	6	22½	17½	17/ for 26	18/ for 27	18/ for 28	8/* Jan 30
Do New, ord	450,000	1	1	19	19½	18 1/16	18¾	4	16	0	23	18 1/16	17/ for 26	18/ for 27	18/ for 28	8/* Jan 30
Associated Re-insurers, ord.	250,000	1	10/	1 3/16	1 3/16	1⅛	1⅛x	..			1 13/16	1⅛	..	..	9d June 29	6d* Jan 30
Atlas Assurance Co., Limited, ord.	440,000	5	1¼	13	13	12½	12¾	3	2	9	15½	12½			8/a for 29	3/6a*Ot29
Caledonian, ord.	129,000	5	1	19	19	18¼	18¼	4	14	0	27½	18¼	43¾%My28	43¾%Nv28	43¾%My29	43¾%Nv 29
Commercial Union Assurance Co., ord. ...	1,416,000	2½	2½	24½	24½	23½	23¾	4	4	6	29 1/16	23½	16/6a fr 26	16/6a fr 27	20/6 for 28	10/3*Nv29
Do Palatine 4% deb. red. Dec. 31, 1929 .	£213,299	Stock	100	99	99	99	99x	4	0	9†	97	94½	Half-	yearly,	Jne &	Dec
Do Union 4% deb. red. Jan. 1, 1947	£470,434	,,	100	86	86	84	84x	5	1	0	86	83	Half-	yearly,	Jan &	July
Do "Ocean" 4% deb. red. Jan. 1, 1930 .	£719,644	,,	100	99	99	99	99x	4	0	9†	99	95	Half-	yearly,	Jan &	July
Do West of Scot. 5% deb. red. Jan.1,1954	£433,548	,,	100	96	96	94	94x	5	8	9	101¼	94	Half-	yearly,	Jan &	July
Do 5% "British Gen" deb. red Apr.1,1957	£1,382,643	,,	100	97	97	96½	97	5	4	0	102	96	Half-	yearly,	Mar &	Sep
Eagle, Star, & British Dominions Insc., ord.	224,912	3	3	11½	11½	11 1/16	11½	5	6	9	13½	10¾	5%* Jan30	5% Apl 29	5%*July29	5%* Oct 29
Do	52,246	3	1	3¾	3¾	3¾	3¾	5	18	6	3¾	3 1/16	5%* Jan30	5% Apl 29	5%*July29	5%* Oct 29
Do	60,000	3	15/	2⅝	2⅝	2⅝	2⅝	5	14	3	3 5/16	2 1/16	5%* Jan30	5% Apl 29	5%*July29	5%* Oct 29
Do	62,092	3	10/	1⅝	1⅝	1⅝	1⅝	6	3	0	2	1 9/16	5%* Jan30	5% Apl 29	5%*July29	5%* Oct 29
Do preferred ord.	559,558	3	6/	13/16	13/16	¾	¾x	8	0	0	7/8	¾	10% for 25	10% for 26	10% for 27	10% for 28
Do 6% cum. pref.	40,667	3	3	3¼	3¼	3	3x	6	0	0	3 5/16	3	Half-	yearly,	Jan &	July
Employers' Liability Assurance Corp., L., ord.	1,539,090	1	5/	3⅛	3⅜	3 3/16	3 3/16	5	12	3a	4⅛	3⅜	4/a for 25	4/a for 26	4/a for 27	4/a for 28
Equity & Law Life Assurance Society, ord.	50,000	20	24/	10⅞	10⅞	10⅞	10⅞	3	9	0a	12	10⅞	15/6a	July 27	15/6a	July 28
Federated Employers' Insurance, ord.	145,980	1	10/	2 13/16	2 13/16	2 13/16	2 13/16	3	11	0a	3½	2 13/16	15%a for 26	15%a for 27	20%a for 28	7½%a*Jy29
General Accident Fire and Life, ord.	331,000	5	1¼	14½	14½	13¾	14	4	5	9	17	12¾	32½% for 26	40% for 27	48% for 28	22½%*Nv 29
Do 5% cum. pref.	250,000	1	1	15/16	15/16	15/16	15/16	5	6	9	1	15/16	Half-	yearly,	May &	Nov
Gresham Fire and Accident, ord.	200,000	1	10/	¾	¾	¾	¾	5	12	0	7/8	¾	7% for 25	7% for 26	7% for 27	7% for 28
Gresham Life Assurance Society, L., ord...	18,264	5	15/	17	17	17	17x	..			17	16½	2½%* Ja29	2½%a*July	29 2½%a*	Jan 30
Guardian Assurance, Limited, ord.	413,608	4	½	10x	10	9½	9¾	4	2	0	11¾	9½	8/ for 26	8/ for 27	8/ for 28	4/* Dec 29
Do 5% non.-cum. pref.	200,000	1	4	3½x	3⅝	3 5/16	3⅝	5	10	3	3 11/16	3 3/16	Half-	yearly.	Jne &	Dec
Law Union & Rock 4% deb. red. Dec. 31, 1942	£215,861	Stock	100	79x	79	79	79	6	11	3	80½	78	Half-	yearly,	May &	Nov
Legal & Gen. Life Assurance Society, ord...	200,000	5	1	15	15	14½	14½x	2	8	3	16	13⅝	9/a for 26c	6/ for 27	7/a for 28	3/*aJan30
Licenses and General Insurance, ord.	140,420	1	10/	2¼	2¼	2¼	2¼	4	9	9	4⅛	2¼	19% for 26	20% for 27	20% for 28	6%* Oct 29
Life Association of Scotland, ord.	10,000	40	8¾	41	41	38	38	4	6	9	44	38	15/* May	1928	16/3 My29	16/3 Nv29
Liverpool & London & Globe 4% perp. deb.	£584,877	Stock	100	77½	77½	75½	75½	5	6	0	80⅞	75½	Half-	yearly,	Jan &	July
4% "Thames & Mersey" deb. red., Dec 31,'61	£384,002	,,	100	76½	77½	76½	76½	5	14	3	78½	76½	Half-	yearly,	Jne &	Dec
London and Lancashire Insurance, L., ord.	727,862	5	1	27¼	27¼	26¼	26¼	3	11	9	33½	25⅝	15/ for 26	17/ for 27	19/ for 28	9/* Nov29
Do 5% "Marine" deb. red., Aug 1, 1937	£660,761	Stock	100	97	97¼	96½	97	5	11	0	101	96½	Half-	yearly,	1 Feb &	1 Aug
Lon. Assoc. Reinsurance 7% cum. ptg. pref.	1,000,000	1	·4	9/32	9/32	9/32	9/32	4	8	0	⅜	9/32	7% for 25	7% for 26	8½% for 27	8½% for 28
London Assurance Corporation, ord.	498,620	2½	1¼	10¼	10¼	9 13/16	9⅞	5	14	0	12¼	9 13/16	45% for 25	45% for 26	45% for 27	45% for 28
Do 6% cum. pref. (repayable 1943–53)..	250,000	1	1	1 3/32	1 3/32	1 1/16	1 1/16x	5	13	0	1 3/16	1 1/16	Half-	yearly,	Jan &	July
Motor Union Insurance 5½% cum. pref. ..	174,543	1	1	15/16	15/16	7/8	7/8x	6	5	9	15/16	7/8	Half-	yearly,	Jan &	July
North British and Mercantile, ord.	550,000	5	1¼	33	33	31½	32	3	2	6	39½	31½	18/ for 26	18/6 for 27	20/ for 28	10/6*Nv29
Do 4% non.-cum. pref.	£1,750,000	Stock	100	79	79	77	77x	5	4	0	81	77	Half-	yearly,	Jan &	July
Northern Assurance, ord.	401,619	10	1	16	16	15 15/16	15½	5	9	9	18½	15	85% for 26	85% for 27	85% for 28	40%*Nv29
Do participating pref.	67,000	7½	7½	15	15	14 7/16	14½x	5	10	3	17	14 7/16	,4/6	Jan 29 11/	7·97 Jy29	4/6 Jan 30
Do 5% deb. stock red. Dec. 31, 1970 ...	£891,364	Stock	100	98	98	97	97x	5	5	0	100⅜	97	Half-	yearly,	Jan &	July
Norwich Union 4% Nor., &c., deb. red. ...	£443,873	,,	100	77½	77½	76½	76½x	5	4	6	81	76½	Half-	yearly,	Jan &	July
Pearl Assurance ord.	500,500	1	1	12¼	12½	12⅛	12½	4	0	0a	13⅛	12⅛	..	5/	a Mar 29	5/a Sep 29
do. do. ord.	699,500	1	13/	11¾	12	11¾	12	..			12 3/16	11⅜	1/4 306(a)	Mar.19, 29	2/11·589a	Sep. 1929
6% (a) Cum. Pref.	300,000	1	1	1 3/32	1 1/16	1 3/32	1 1/16x	4	11	6a	1 13/32	1 3/32	Half-	yearly,	Jan &	July (a)
Phœnix Assurance, Limited, ord.	309,755	10	1	13¼x	13¼	12¾	12¾	5	4	9	15 15/16	12¾	70% for 27	35% May	29 35%	Nov 29
Do Pelican shares	695,245	1	1	14x	14¼	13⅝	13⅝	5	2	9	16¼	13⅝	70% for 27	35% May	29 35%	Nov 29
Do 4% Law Life deb. red.	£1,000,000	Stock	100	78½	78½	77½	77½x	5	3	3	81	77½	Half-	yearly,	May &	Nov
Do 4% deb. (1911) red.	£277,950	,,	100	78½	78½	77½	77½x	5	3	3	81	75	Half-	yearly,	May &	Nov
Do 5% reg. deb.	£938,347	,,	100	96½	96½	94½	94½x	5	6	9	99	94½	Half-	yearly,	May &	Nov
Prudential Assurance "A"	1,000,000	1	1	26¼	26¼	21¼	21¼x	3	16	0	28¼	21¼	85%a for 25	87½%a fr 26	90%a for 27	94½a%for28
Do do "B"	1,000,000	1	4/	1 15/16	1 31/32	1⅞	1 15/16	2	11	6a	2 11/32	1⅞	..	..	..	25%a for 28
Re-Insurance Corporation, ord.	305,000	1	10/	27/32	27/32	27/32	27/32	5	18	6	1 1/16	27/32	10% for 25	10% for 26	10% for 27	10% for 28
Royal Exchange Assurance Corporation, ord.	£946,978	Stock	100b	6¼	6¼	5 15/16	6⅛	4	1	9	7 3/32	5 15/16	27% for 26	27% for 27	27% for 28	10%*Oct29
Royal Insurance Co., Limited, ord.	5,599,430	1	10/	8	8	7 11/16	7⅞	3	16	0	9 5/16	7⅝	29/ for 27	on old cap	60% for 28	30%*Nv 29
Do 4% deb. stock red. 1939	£630,614	Stock	100	89	89	87	87x	5	13	6	90½	87	Half-	yearly,	Jan &	July
Scottish Life Assurance, Limited, ord.	50,000	5	1	5 23/32	5 23/32	5 23/32	5 23/32	3	2	9	6 1/16	5 3/16	15% for 24	18% for 25	18% for 26	18% for 27
Scottish Union and National, A	275,685	20	1	16¼x	16¼	16¼	16¼	4	0	0	19½	16½	10/ for 25	10/ for 26	12/ for 27	13/ for 28
Do do do B	6,484	10	3¾	60½x	60½	60½	60½	3	16	0	70½	60½	37/6 for 25	37/6 for 26	45/ for 27	48/9 for 28
Sea Insurance, Limited, ord.	500,000	1	1	3 13/16	3 13/16	3 13/16	3 13/16	4	5	0	4 5/16	3 21/32	15% for 25	15% for 26	15% for 27	16½% for 28
Standard Life Assurance 5% Perpetual ...	£850,000	Stock	100	95	95½	95	95½	5	4	9	99	95	..	..	..	..
Sun Insurance Office, ord.	240,000	10	2	37¾x	37¾	35½	35½	1	8	3	45	35½	21/ for 26	23/ for 27	25/ for 28	12/*Jan30
Sun Life Assurance Society, ord.	48,000	10	10	52	52	50½	50½x	3	3	9a	60	50½	16/a Jly 28	16/a Jan29	16/a Jly29	16/a Jan30
Tariff Reinsurances, ord.	307,831	14/	9/	9/32	9/32	9/32	9/32	Nil			7/16	9/32	..	..	..	..
Trade Indemnity Co., ord.	25,000	10	10	12½	12⅝	12½	12½	4	16	0	15½	12¼	5% for 25	5% for 26	6% for 27	6% for 28
United British Insurance 7% cum. pref. ..	400,000	1	1	1	1	15/16	1x	7	0	0	1 1/32	15/16	Half-	yearly,	Jan &	July
Victory Insurance, ord.	500,000	16/	6/	5/16	5/16	5/16	5/16	4	16	0	⅜	9/32	..	..	4% for 27	5% for 28
World Auxiliary Insurance Corporation, ord.	600,000	1	10/	1 3/32	1 3/32	1 3/32	1 3/32	2	17	0a	1 15/32	1 3/32	5%a for 25	5%a for26	6½%a for 27	6½%a for28
Yorkshire Insurance, Limited, ord.	348,736	2½	½	6¼	6¼	6 1/16	6⅛	..			7 5/16	6 1/16	9/6a for 28	} Paid	before	1/9a*Oc29
Do do do ord.	109,133	1	1	13	13	12¾	13	..			16	12¼	19/a for 28	} subdiv	ision	3/6a*Oc29

b Quotation is per £1 of stock. † Without allowance for redemption.

CANALS, DOCKS, AND HARBOURS.

NAME.	Capital: No. of Shares or Amt of Stk Quoted.	Share or Stock.	Paid.	December Prices: Opening.	Highest.	Lowest.	Latest.	Last years divs. yield at Latest Price %: £	s	d	Prices of 1929: Hghst.	Lowst.	Recent Dividends. Rate per Cent. per Annum, inc. Bonus, except where marked %. * Interim.				Reserve and Balance aftr Last Report.
Birm. Canal Navigations cons. ..	£2,439,575	Stock	100	71½	71¾	71½	71½	5	11	3	78½	71½	2% Feb 28	2% Aug 28	2% Feb 29	2% Aug 29	} £
Do 4% perpetual deb.	£797,400	,,	100	72	72	72	72	5	11	6	78	72	Half-	yearly,	Jan &	July	} ..
Buenos Ayres Sthn. Dock 6% debs.	£1,000,000	100	100	106½	106½	106 15/16	106½	5	12	6	106½	104¾	Half-	yearly,	Feb. &	Aug.	
Grand Canal Co., ord.	33,295	10	10	4 21/32	4 21/32	3¾	3¾	6	13	3	4 15/16	3¼	1% *Sep26	1% Mar 27	1%* Sep 27	1½%a Mr28	}
Do 3% pref.	33,295	10	10	3⅝	3¾	3⅝	3¾	8	0	0	4	3⅝	Half-	yearly,	Mar &	Sep	} ..
Grand Junction Canal Co., ord. ..	11,300	100	100	57½	57½	55	56½x	5	14	6	74	55	2½% Jne 28	1¾%* Dc28	2½% Jne 29	1%* Dec29	
Grand Union Canal, cap. stk. ...	£2,159,542	Stock	100	35½	35½	30	30½	..			54½	30	..	..	1½% Dec 28	⅝%*Sep.29	} 54,208
Do 3% perp. deb.	£730 634	,,	100	55½	55½	55½	55½	5	8	9	57½	54½	Half-	yearly,	Jan &	July	} 22,900
Do 5½% perp. deb.	£111,650	,,	100	98½	98½	98½	98½	5	12	9	105½	97½	Half-	yearly,	Jan &	July	}
Leeds and Liverpool Canal Co., ord	£1,225,000	,,	100	15	15	15	15	6	13	9	15½	15	½% for 25	½% for 26	1% for 27	1% for 28	}
Do 3½% perp. deb.	£378,910	,,	100	60½	61	59½	59½x	5	17	9	61	57	Half-	yearly,	Jan &	July	} ..

(a) Free of tax. (c) This 9s per sh. includes a special bonus at the rate of 6s per sh. (as a result of the quinquennial investigation).

Figure 5. Investors Monthly Manual for December 1929.

10. Appendix B

Equally Weighted Total Return Momentum Results

J	K =	1	3	6	9	12
1	Winners	**0.42*** **	**0.43*** **	**0.67*** **	**0.67*** **	**0.86*** **
	Losers	**1.87*** **	**1.32*** **	**0.89*** **	**0.72*** **	**0.65*** **
	W-L	**-1.44*** **	**-0.89*** **	**-0.22*** **	-0.05	**0.21*** **
3	Winners	**0.47*** **	**0.74*** **	**0.88*** **	**0.90*** **	**1.08*** **
	Losers	**1.50*** **	**1.11*** **	**0.78*** **	**0.72*** **	**0.58*** **
	W-L	**-1.02*** **	**-0.37*** **	0.11	**0.18*** **	**0.49*** **
6	Winners	**1.04*** **	**1.19*** **	**1.19*** **	**1.37*** **	**1.38*** **
	Losers	**1.42*** **	**1.14*** **	**0.90*** **	**0.70*** **	**0.67*** **
	W-L	**-0.38** **	0.05	**0.30*** **	**0.67*** **	**0.71*** **
9	Winners	**1.12*** **	**1.28*** **	**1.49*** **	**1.49*** **	**1.50*** **
	Losers	**1.42*** **	**1.15*** **	**0.80*** **	**0.70*** **	**0.66*** **
	W-L	**-0.31* **	0.12	**0.69*** **	**0.79*** **	**0.84*** **
12	Winners	**1.65*** **	**1.69*** **	**1.61*** **	**1.60*** **	**1.56*** **
	Losers	**1.19*** **	**0.99*** **	**0.78*** **	**0.70*** **	**0.74*** **
	W-L	**0.46*** **	**0.71*** **	**0.83*** **	**0.89*** **	**0.83*** **

Table 5. Average monthly returns as a percentage of each strategy between 1870 and 1930. The winners' portfolio consists of the top decile of stocks based on total return momentum. The losers' portfolio consists of the bottom decile of stocks based on total return momentum. W-L is the difference between the monthly returns of the winners' portfolio and the losers' portfolio. Portfolios are equally weighted.

Decile Rank	Average monthly return (%)
P1	**0.70*** **
P2	**0.17*** **
P3	**0.29*** **

P4	**0.44*** **
P5	**0.54*** **
P6	**0.65*** **
P7	**0.72*** **
P8	**0.85*** **
P9	**0.99*** **
P10	**1.60*** **
P10 - P1	**0.89*** **

Table 6. Average monthly returns as a percentage for the 12-month formation and 9-month holding equal weighted portfolio between January 1870 and December 1930. Stocks are grouped in deciles based on total return momentum. P10 consists of the top decile of stocks based on total return momentum and P1 of the bottom decile.

Panel A – CAPM Alpha (%)						
J	K =	1	3	6	9	12
1		**-1.26*** **	**-0.77*** **	**-0.12* **	0.08	**0.28*** **
		(-9.56)	(-8.19)	(-1.88)	(1.47)	(5.05)
3		**-0.84*** **	**-0.27** **	**0.30*** **	**0.32*** **	**0.54*** **
		(-5.30)	(-2.26)	(3.94)	(4.66)	(7.32)
6		-0.09	**0.26** **	**0.52*** **	**0.81*** **	**0.84*** **
		(-0.58)	(2.22)	(6.12)	(9.15)	(8.46)
9		-0.00	**0.39*** **	**0.97*** **	**1.00*** **	**0.88*** **
		(-0.01)	(3.19)	(9.54)	(9.93)	(8.89)
12		**0.80*** **	**1.01*** **	**1.15*** **	**1.07*** **	**0.92*** **
		(4.61)	(7.09)	(9.66)	(9.65)	(7.80)
Panel B – CAPM Beta						
J	K =	1	3	6	9	12
1		**-0.44*** **	**-0.29*** **	**-0.24*** **	**-0.35*** **	**-0.17*** **
		(-5.42)	(-4.01)	(-4.09)	(-6.05)	(-2.79)
3		**-0.43*** **	**-0.27*** **	**-0.49*** **	**-0.36*** **	-0.12
		(-4.43)	(-3.39)	(-7.12)	(-5.11)	(-1.51)
6		**-0.66*** **	**-0.52*** **	**-0.58*** **	**-0.36*** **	**-0.34*** **
		(-6.72)	(-5.76)	(-7.45)	(-3.95)	(-3.13)

9	**-0.71*** **	**-0.62*** **	**-0.72*** **	**-0.56*** **	-0.11
	(-7.38)	(-6.71)	(-7.77)	(-5.42)	(-1.03)
12	**-0.81*** **	**-0.71*** **	**-0.82*** **	**-0.47*** **	**-0.23***
	(-7.59)	(-6.51)	(-7.59)	(-4.14)	(-1.81)

*Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 7. The results of the twenty-five strategies are regressed against the market premium to test the robustness. Panel A shows the CAPM alpha, and Panel B shows the CAPM beta for the equation: $R_i = \alpha_i + \beta_i(R_m - R_f) + \epsilon_i$. Momentum signals are calculated based on total return and stocks are equally weighted. Numbers in parentheses indicate t values. The sample runs from January 1870 to December 1930 at monthly frequency.

Decade	Average monthly Return (%)	CAPM alpha (%)	CAPM Beta
1870 – 1879	**-0.86** **	**1.25*** **	**-3.11*** **
1880 – 1889	**0.35*** **	**0.59*** **	**-1.07*** **
1890 – 1899	-0.02	0.29	**-0.90*** **
1900 – 1909	**1.26*** **	**1.30*** **	-0.24
1910 – 1919	**2.16*** **	**1.90*** **	0.44
1920 - 1930	**2.32*** **	**2.03*** **	**1.00*** **
1870 – 1930	**0.89*** **	**1.07*** **	**-0.47*** **

*Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 8. Average monthly returns as a percentage for the 12-month formation and 9-month holding portfolio per decade between January 1870 and December 1930. CAPM alpha and Panel B shows the CAPM beta for the equation: $R_i = \alpha_i + \beta_i(R_m - R_f) + \epsilon_i$. Momentum signals are calculated based on total return and stocks are equally weighted. The sample runs from January 1870 to December 1930 at monthly frequency. The sample runs from January 1870 to December 1930 at monthly frequency. Since the sample includes 61 years, the last decade includes an extra year, running from January 1920 to December 1930.

11. Appendix C

Value weighted Price Momentum Results

J	K =	1	3	6	9	12
1	Winners	0.17	-0.04	0.02	0.05	**0.09****
	Losers	**1.15*****	**0.37*****	0.05	-0.02	**-0.11****
	W-L	**-0.99*****	**-0.42*****	-0.03	0.07	**0.20*****
3	Winners	**0.44****	**0.25*****	**0.18*****	**0.16*****	**0.18*****
	Losers	**0.72*****	-0.04	**-0.17****	**-0.19*****	**-0.24*****
	W-L	-0.29	**0.29****	**0.35*****	**0.34*****	**0.43*****
6	Winners	**0.69*****	**0.44*****	**0.40*****	**0.43*****	**0.36*****
	Losers	**0.86*****	-0.01	**-0.15***	**-0.30*****	**-0.28*****
	W-L	-0.17	**0.44*****	**0.55*****	**0.74*****	**0.64*****
9	Winners	**0.83*****	**0.58*****	**0.55*****	**0.47*****	**0.42*****
	Losers	**0.67*****	-0.06	**-0.31*****	**-0.35*****	**-0.30*****
	W-L	0.16	**0.65*****	**0.86*****	**0.82*****	**0.72*****
12	Winners	**1.04*****	**0.74*****	**0.54*****	**0.49*****	**0.39*****
	Losers	**0.80*****	-0.19	**-0.31*****	**-0.29*****	**-0.25*****
	W-L	0.24	**0.92*****	**0.85*****	**0.79*****	**0.64*****

Table 9. Average monthly returns as a percentage of each equally weighted strategy between 1870 and 1930. The winners' portfolio consists of the top decile of stocks based on price momentum. The losers' portfolio consists of the bottom decile of stocks based on price momentum. W-L is the difference between the monthly returns of the winners' portfolio and the losers' portfolio. Portfolios are value weighted.

Decile Rank	Average monthly return (%)
P1	-0.19
P2	**-0.20****
P3	**-0.27*****
P4	-0.01
P5	-0.00

P6	**0.07***
P7	**0.13*****
P8	**0.25*****
P9	**0.47*****
P10	**0.74*****
P10 - P1	**0.92*****

Table 10. Average monthly returns as a percentage for the 12-month formation and 3-month holding equally weighted portfolio between January 1870 and December 1930. Stocks are grouped in deciles based on price momentum. P10 consists of the top decile and P1 of the bottom decile of stocks.

Panel A – CAPM Alpha						
J	K =	1	3	6	9	12
1		**-1.04*****	**-0.44*****	-0.07	0.03	**0.15*****
		(-4.99)	(-3.94)	(-0.87)	(0.51)	(2.65)
3		-0.33	**0.29****	**0.28*****	**0.30*****	**0.34*****
		(-1.42)	(2.46)	(3.13)	(4.39)	(5.62)
6		-0.25	**0.38*****	**0.46*****	**0.66*****	**0.55*****
		(-1.05)	(2.84)	(4.87)	(8.60)	(8.16)
9		0.07	**0.61*****	**0.77*****	**0.75*****	**0.67*****
		(0.27)	(4.56)	(7.58)	(8.91)	(8.88)
12		0.16	**0.87*****	**0.79*****	**0.73*****	**0.62*****
		(0.60)	(6.29)	(7.73)	(8.59)	(8.23)
Panel B – CAPM Beta						
J	K =	1	3	6	9	12
1		**-0.50*****	-0.10	-0.17	-0.15	**-0.19***
		(-2.77)	(-0.78)	(-1.49)	(-1.48)	(-2.02)
3		**-0.38***	-0.00	**-0.30****	-0.18	**-0.35*****
		(-1.89)	(-0.02)	(-2.35)	(-1.70)	(-3.33)
6		**-0.81*****	**-0.31****	**-0.40*****	**-0.30****	**-0.37*****
		(-3.70)	(-1.96)	(-2.96)	(-2.45)	(-3.12)
9		**-0.89*****	-0.17	**-0.39*****	**-0.29****	-0.19
		(-4.05)	(-1.11)	(-2.67)	(-2.19)	(-1.47)

12	**-0.79*** **	-0.25	**-0.26***	**-0.23***	-0.08
	(-3.42)	(-1.54)	(-1.79)	(-1.70)	(-0.60)

*Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 11. The results of the twenty-five equally weighted momentum strategies are regressed against the market premium to test the robustness. Panel A shows the CAPM alpha and Panel B shows the CAPM beta for the equation: $R_i = \alpha_i + \beta_i(R_m - R_f) + \epsilon_i$. Momentum signals are calculated based on price and stocks are value weighted. Numbers in parentheses indicate t values. The sample runs from January 1870 to December 1930 at monthly frequency.

Decade	Average monthly Return (%)	CAPM alpha (%)	CAPM Beta
1870 – 1879	**1.31*** **	**1.17*** **	**-2.11*** **
1880 – 1889	0.28	0.05	-1.04
1890 – 1899	0.49	0.44	-0.46
1900 – 1909	**0.82*** *	**0.92*** **	0.41
1910 – 1919	**1.33*** **	**1.20*** **	-0.41
1920 – 1930	**1.28*** **	**1.34*** **	0.19
1870 – 1930	**0.92*** **	**0.87*** **	-0.25

*Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 12. Average monthly returns as a percentage for the 12-month formation and 3-month holding portfolio per decade between January 1870 and December 1930. CAPM alpha and Panel B shows the CAPM beta for the equation: $R_i = \alpha_i + \beta_i(R_m - R_f) + \epsilon_i$. Momentum signals are calculated based on price and stocks are value weighted. The sample runs from January 1870 to December 1930 at monthly frequency. The sample runs from January 1870 to December 1930 at monthly frequency. Since the sample includes 61 years, the last decade includes an extra year, running from January 1920 to December 1930.

12. Appendix D

Equally weighted Price Momentum Results

J	K =	1	3	6	9	12

1	Winners	0.16	0.10	**0.20*** **	**0.25*** **	**0.31*** **
	Losers	**1.52*** **	**0.97*** **	**0.54*** **	**0.37*** **	**0.27*** **
	W-L	**-1.35*** **	**-0.87*** **	**-0.33*** **	**-0.13** **	0.04
3	Winners	0.11	**0.32*** **	**0.36*** **	**0.39*** **	**0.44*** **
	Losers	**1.17*** **	**0.75*** **	**0.46*** **	**0.35*** **	**0.25*** **
	W-L	**-1.06*** **	**-0.42*** **	-0.10	0.04	**0.19*** **
6	Winners	**0.44*** **	**0.55*** **	**0.59*** **	**0.66*** **	**0.64*** **
	Losers	**1.20*** **	**0.89*** **	**0.59*** **	**0.41*** **	**0.39*** **
	W-L	**-0.76*** **	**-0.34*** **	0.00	**0.26*** **	**0.25*** **
9	Winners	**0.57*** **	**0.71*** **	**0.81*** **	**0.78*** **	**0.72*** **
	Losers	**1.14*** **	**0.87*** **	**0.53*** **	**0.41*** **	**0.38*** **
	W-L	**-0.57*** **	-0.16	**0.28*** **	**0.36*** **	**0.34*** **
12	Winners	**0.91*** **	**0.92*** **	**0.85*** **	**0.78*** **	**0.71*** **
	Losers	**1.00*** **	**0.77*** **	**0.54*** **	**0.45*** **	**0.43*** **
	W-L	-0.09	0.14	**0.31*** **	**0.33*** **	**0.27*** **

Table 13. Average monthly returns as a percentage of each equally weighted strategy between 1870 and 1930. The winners' portfolio consists of the top decile of stocks based on price momentum. The losers' portfolio consists of the bottom decile of stocks based on price momentum. W-L is the difference between the monthly returns of the winners portfolio and the losers portfolio. Portfolios are equally weighted.

Decile Rank	Average monthly return (%)
P1	**0.41*** **
P2	**-0.19*** **
P3	**-0.09*** **
P4	0.03
P5	**0.11*** **
P6	**0.14*** **
P7	**0.21*** **
P8	**0.28*** **
P9	**0.41*** **
P10	**0.78*** **
P10 - P1	**0.36*** **

Table 14. Average monthly returns as a percentage for the 9-month formation and 9-month holding equally weighted portfolio between January 1870 and December 1930. Stocks are grouped in deciles based on price momentum. P10 consists of the top decile of stocks based on price momentum and P1 of the bottom decile. Portfolios are equally weighted.

Panel A – CAPM Alpha (%)						
J	K =	1	3	6	9	12
1		**-1.36*****	**-0.88*****	**-2.12*****	**-0.16*****	0.01
		(-11.31)	(-10.37)	(-6.13)	(-3.40)	(0.32)
3		**-1.07*****	**-0.43*****	**-0.14****	-0.00	**0.15*****
		(-7.38)	(-4.67)	(-2.31)	(-0.10)	(3.06)
6		**-0.77*****	**-0.36*****	-0.05	**0.20*****	**0.17****
		(-5.07)	(-3.51)	(-0.72)	(3.02)	(2.53)
9		**-0.59*****	**-0.19***	**0.22****	**0.28*****	**0.27*****
		(-3.93)	(-1.80)	(2.53)	(3.57)	(3.85)
12		-0.12	0.11	**0.24*****	**0.25*****	**0.21*****
		(-0.74)	(0.93)	(2.48)	(2.96)	(2.89)
Panel B – CAPM Beta						
J	K =	1	3	6	9	12
1		**-0.36*****	**-0.19*****	**-1.51*****	**-0.42*****	**-0.32*****
		(-4.55)	(-2.62)	(-4.30)	(-7.24)	(-5.56)
3		**-0.36*****	**-0.24*****	**-0.58*****	**-0.54*****	**-0.53*****
		(-3.87)	(-3.08)	(-9.12)	(-8.42)	(-7.86)
6		**-0.63*****	**-0.61*****	**-0.73*****	**-0.72*****	**-0.90*****
		(-6.39)	(-7.07)	(-10.29)	(-9.20)	(-9.56)
9		**-0.71*****	**-0.76*****	**-0.96*****	**-0.94*****	**-0.73*****
		(-7.24)	(-8.54)	(-10.95)	(-9.74)	(-7.43)
12		**-0.86*****	**-0.84*****	**-1.03*****	**-0.94*****	**-0.73*****
		(-8.32)	(-8.44)	(-10.46)	(-9.21)	(-7.15)

*Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 15. The results of the twenty-five equally weighted momentum strategies are regressed against the market premium to test the robustness. Panel A shows the CAPM alpha and Panel B shows the CAPM beta for the equation: $R_i = \alpha_i + \beta_i(R_m - R_f) + \epsilon_i$. Momentum signals are calculated based on

price and stocks are equally weighted. Numbers in parentheses indicate t values. The sample runs from January 1870 to December 1930 at monthly frequency.

Decade	Average monthly Return (%)	CAPM alpha (%)	CAPM Beta
1870 – 1879	**-1.16*** **	**-0.42** **	**-2.81*** **
1880 – 1889	0.08	0.00	**-0.53*** **
1890 – 1899	-0.15	-0.18	**-0.90*** **
1900 – 1909	**0.90*** **	**0.89*** **	-0.04
1910 – 1919	**1.66*** **	**1.67*** **	-0.18
1920 – 1930	**0.82*** **	**0.85*** **	0.09
1870 – 1930	**0.36*** **	**0.25*** **	**-0.94*** **

*Significant at the 10% level, ** significant at the 5% level, *** significant at the 1% level

Table 16. Average monthly returns as a percentage for the 9-month formation and 9-month holding portfolio per decade between January 1870 and December 1930. CAPM alpha and Panel B shows the CAPM beta for the equation: $R_i = \alpha_i + \beta_i(R_m - R_f) + \epsilon_i$. Momentum signals are calculated based on price and stocks are equally weighted. The sample runs from January 1870 to December 1930 at monthly frequency. The sample runs from January 1870 to December 1930 at monthly frequency. Since the sample includes 61 years, the last decade includes an extra year, running from January 1920 to December 1930. Portfolios are equally weighted.