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Swedish Stock and Bond Returns, 1856–2012

Daniel Waldenström

Swedish stock and bond returns, 1856–2012[*]

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Abstract

This chapter presents historical evidence about Swedish stock prices, dividends, and yields on government fixed-interest securities. Monthly returns are presented since 1901 for stocks, since 1874 for government long-term bonds and since 1856 for short-term Treasury bills or central bank discount rates. Annual stock price and returns indices from 1870 are also presented. Altogether, these series comprise the longest financial asset price database for Sweden to date. An important ambition is to provide information about the quality of the financial data, how they are constructed and how they are modified so as to ensure consistency across time. The chapter also outlines the basic institutional and economic framework of the Swedish stock and money markets. Research has shown that asset prices are influenced by the extent of trading activity as well as by the legal setting and microstructural characteristics. Finally, the chapter offers some initial analysis of the new evidence: calculation of returns for different periods, examination of trends and trend breaks in returns, dividends, volatility and cross-country returns correlations, and computation of equity risk premia across holding periods and historical eras.

JEL: G12, N23, N24
Keywords: Historical stock returns, Historical bond yields, Stockholm Stock Exchange, Equity risk premium.

1. Introduction

This chapter presents evidence about the long-run evolution of Swedish financial market returns over the past one hundred and fifty years. Specifically, monthly returns on stock investments on Sweden's dominant secondary stock market, the Stockholm Stock Exchange, are documented since 1901, the short-term risk-free rate of return is presented from 1856 and a representative long-term government bond yield from 1874. The chapter also contains a preliminary version of a new annual stock price and returns index for the period 1870–2012, using previously unexplored evidence of historical stock prices, dividends and equity capital from the last decades of the 19th century.

The main ambition with this chapter is to provide a basis for the construction of homogeneous long-term series of stock and bond returns in Sweden. This is an important task since not only have the actors providing financial price information changed over time, but so have their standards for defining key concepts such as a stock price index or the return on a long-term government bond. The institutional preconditions for trading and pricing financial instruments on the Swedish financial market differ across eras, which means that quoted prices may not necessarily be comparable across time periods. The chapter therefore contains a description of the main institutions surrounding secondary financial markets in Sweden since the beginning of the industrial era in the late 19th century.

In order to construct the basic long-run series, the chapter borrows from previous findings of Swedish scholars working on historical financial returns. In his ambitious treatment of the entire Swedish economy during and after the First World War, Anders Östlind analyzed activities on the Swedish stock market and even constructed the first stock price index that adjusted for new issues and stock splits (Östlind 1945). Later, Birger Möller presented a large investigation of the Swedish stock market during the first half of the 20th century and several new pieces of evidence (Möller 1962). Extending these contributions, Per Frennberg and Björn Hansson were the first to compile a truly homogeneous set of long-run series of Swedish stock and bond market returns, spanning most of the 20th century (Frennberg and Hansson, 1992a). Their series in the first essays covered the period 1919–90. Since then this dataset has been extended by Hossein Asgharian and Björn Hansson at Lund University. In addition, Waldenström (2002) studied stock market taxes using a stock market price index going back to 1906 that was based on an index created by the Stockholm Chamber of

Commerce, published in its review *Kommersiella Meddelanden*. There are a few other attempts to generate stock indices going back to the beginning of the 20th century. In a study of whether stock prices tend to converge to certain levels that investors may deem affordable, Burnie and De Ridder (2011) use data on stock prices collected annually at year's end from the Stockholm Stock Exchange, beginning in 1900. Finally, the business magazine *Affärsvärlden*, which published the most important Swedish stock market index during the past century, included in its 90th anniversary edition a yearly series dating back to 1901. However, that series is based, not on systematic evidence but primarily on journalistic guesswork.[1]

The present chapter builds on these earlier contributions and extends the Swedish stock and bond market dataset by adding almost two decades of earlier historical monthly stock prices and returns, updating the series to the present day. Altogether, this adds about four new decades of monthly stock returns. In addition, the preliminary annual stock prices and returns dating back to 1870 result in a continuous stock market series that covers virtually the whole era of Sweden's industrialization and its aftermath.

The chapter also presents new evidence on bond and money markets. Specifically, prices on long-term government bonds are collected back to 1874, which is forty-five years earlier than the starting date of the yield series Frennberg-Hansson dataset. I have also compiled monthly short-term money market yields, proxied by the Riksbank discount rate for most of the period, going back to November 1856.

Internationally, there is a long-standing literature that describes and analyzes long-run financial market returns; see, e.g., Ibbotson and Sinquefield (1976) and Dimson, Marsh and Staunton (2001). Two previous contributions with specific relevance to this chapter are the studies of long-run stock and bond returns in Norway by Jan Tore Klovland (Klovland 2004a, 2004b). Another relevant contribution is the recent study of long-run stock and bond returns in Finland by Nyberg and Vaihekoski (2011).

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[1] Nonetheless, this series has become widely used, also in academic studies such as Dimson, Marsh and Staunton (2001).

2. Historical development of the Swedish financial markets

2.1 The Swedish stock market

The Swedish stock market emerged gradually during the second half of the 19th century. One of the largest brokers in Stockholm was mandated by the City in 1863 to hold the first auction of securities; this is generally considered to be the foundation year of Sweden's largest stock exchange, the Stockholm Stock Exchange. At that time there was a growing demand for organized trading in financial securities, primarily stocks and corporate bonds. In the initial years, no governing authority closely directed the business activities on the Exchange. In 1866, however, the City of Stockholm set up the Trade and Shipping Commission (*Stockholm stads handels- och sjöfartsnämnd*), which exercised the supreme operative and regulatory control of the Exchange. Auctions were held only once a month until 1895, after which they became weekly.[2] Securities auctions were also held in some other cities but, as shown by Algott (1963), these market-places never accounted for an important share of Sweden's total securities trading.

The trading framework on the securities auctions was such that buyers and sellers submitted their orders to the responsible broker in good time before the monthly auction. Then, at the auction, the broker declared the orders one at a time, followed by an opportunity for investors to either accept the trade or offer either higher or lower bid or sell orders. The broker then recorded the number and value of traded securities. Trading activity was relatively slight at first. Figure 1 shows the value of traded securities (stocks and bonds) as a share of market capitalization from the beginning of the Exchange's practices to the present day. As can be seen, trading activity was relatively low in the 19th century and in the middle of the 20th century, and relatively high during the early and late 20th century.

[Figure 1 about here]

As Sweden's industrialization gradually took hold during the last decades of the 19th century, many new corporations issued stocks to a growing population of investors. This led to demands for a more organized market for securities trading. The monthly, and in the late 1890s weekly, auctions without a fixed list of shares or firm rules for pricing were clearly not

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[2] Longer descriptions (in Swedish) of the early development of the SSE can be found in Belfrage (1917), Beije (1946) and Algott (1962).

sufficiently continuous for the market participants. Algott (1963) refers to the contemporary critical discussions. For this reason, the Stockholm Stock Exchange was thoroughly reorganized in 1901. The new trading structure was largely copied from the Copenhagen Stock Exchange, except that the existing auctioning system was retained, in contrast to Copenhagen's dealership market. Trading in Stockholm was conducted by the head of the Exchange, who called out the registered stocks in a predetermined order. When a stock was called out, all market participants were able to state the levels at which they were willing to buy/sell (bid and ask quotes). When a bid and an ask level matched, a trade was registered and the transaction was completed.

Under the new framework, trading was confined to listed securities. Listing was contingent on approval of a written application submitted to the board of the Stock Exchange, containing detailed information about the security (e.g., articles of association and the latest audit report). Moreover, only brokers certified by one of the City's councils were allowed to broker deals on the Exchange. The Exchange's membership was small initially, only a handful or so during the first five years, but when membership was extended to banks in 1907, it rose to more than 20. Trading initially took place three times a week; daily auctions were introduced in the 1910s.

Several stock price lists were published in this early era. Before 1912, the Exchange did not compile an official price list; instead, brokers and banks published their own lists in newspapers (Algott, 1963, pp. 121f).

When the First World War started in 1914, Sweden left the international gold standard and the Stockholm Exchange closed down for three months (August 3rd to November 3rd). Leaving the gold standard, combined with an initial boom in the export-oriented domestic industry, led to a higher rate of inflation in Sweden during the war. This inflation boom was one of the factors behind a remarkable increase in trading activity on the Exchange during these years; stocks are normally one of the few forms of inflation-proof investment. The increased economic activity spurred increased volumes of new equity issues, which were at century-high levels (2–4 percent of total market capitalization) during this period (Waldenström, 2004). Figure 2 presents the evolution of market capitalization as a share of GDP from 1870 to 2012. The increased activity also attracted new market actors; the number of stock exchange member firms increased from 20 in 1908 to 28 in 1914 and 46 in 1921. After the

war, however, the spectacular bull market turned into a devastating crash when Sweden joined the gold standard at the prewar parity, which set off a deflationary spiral and plummeting stock prices.[3]

[Figure 2 about here]

The spectacular wartime bull market also inspired politicians in Parliament and the liberal-socialist government to finally incorporate the Swedish stock market in the national legislation. Acts passed in 1919 and 1920 formally regulated both the financial intermediaries dealing and trading in stocks and the Stockholm Stock Exchange.[4] One important change was that the government took charge of appointing the Exchange's board. Moreover, the right to establish new stock exchanges was restricted. In practice, though not formally, the Stockholm Stock Exchange acquired a monopoly of organized securities trading in Sweden. This legislation remained intact until the end of the 1970s and the Exchange's monopoly status was not abolished until 1992. Thus, the legislative changes in 1920 were of immense importance in the long run.

Another consequence of the First World War and the postwar global depression, which greatly affected the Stockholm Stock Exchange, was the economic crisis in Sweden in the early 1920s, when industrial production almost halved. The government launched a devastating deflationary monetary policy in order to bring the exchange rate back to the same level in relation to gold as during the classic gold standard. On top of this, Swedish commercial banks faced a period of systemic financial distress caused by the economic depression.

The early 1930s was another turbulent period that affected the Stock Exchange. Great Britain's departure from the gold standard in September 1931 caused both economic and political problems in Sweden. The discount rated was doubled in a few days and the Stockholm Stock Exchange actually closed for three weeks. In 1932, by far the largest industrial conglomerate in Sweden failed in an enormous debt scandal with both governmental and international connections. This was the infamous "Kreuger Crash", named

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[3] For an account of the Swedish WWI economy and the deflation crisis, see Haavisto and Jonung (1995).
[4] Securities Intermediation and Stock Exchange Act (*Lag om fondkommissionsrörelse och fondbörsverksamhet*), SFS: 1919:240, Stockholm Stock Exchange Act (*Börsordning för Stockholms Fondbörs*), SFS: 1920:222.

after the conglomerate's owner Ivar Kreuger, whose suicide in Paris on April 12th initiated the crisis. His holding company, Kreuger & Toll, owned large blocks of shares in all the main Swedish industrials.

After the Kreuger crash, the Swedish stock market was stagnant. Trading activity decreased and new listings were few. The Second World War put an end to Sweden's relatively unregulated financial markets. Wartime mobilization and the effect of disrupted patterns of trade gave rise to an increased need for public funds, which necessitated a series of new laws to regulate the credit and financial markets. Banks and other financial market actors were required to offer funds to the central government. Furthermore, strict controls were imposed on cross-border capital flows.

In the history of the Swedish stock market, the postwar period up to roughly 1980 was on the whole relatively quiet. The wartime credit and capital market regulations were intact. Credit markets were entirely controlled by state authorities, especially the Riksbank, Sweden's central bank. Stock exchange trading activity was relatively low. For these reasons, the period is sometimes described as a "financial ice age". At the same time, the Swedish economy performed well, with annual real per capita GDP growth at 2–3 percent. Swedish companies were highly profitable and could meet most of their financial needs from retained earnings. Consequently the stock market became relatively unimportant as a source of funds. About 40 new companies floated their stock on the exchange in the 1950s and early 1960s, which brought the total number of listed companies up to 115. In the following decade, however, the number decreased by 20 (Boman, 1988). In these decades the valuation of the Swedish stock market was very low. Some of the main factors behind this weak development were no doubt the strict rules for issuing and floating new shares, listing and participation in trading at the Stockholm Stock Exchange.[5]

In the 1970s, financial innovations aimed at increasing stock market turnovers were introduced in the Western world, including Sweden (see Werin, 1993). One of the major moves was the introduction of computers in trading systems. More trades were executed at a faster pace and more customers were able to acquire exchange information and submit trades thanks to the wider outreach of brokerage firms and banks.

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[5] For a description of how Swedish stock market regulations hampered activities and values and how developments from 1980 onwards changed all this, see Hägg (1989, p. 57–100).

In 1980 Sweden was still a highly regulated economy with virtually no stock market activity, regulated capital and credit markets, and a debate about "wage earner funds", a scheme designed to shift corporate ownership to trade unions by way of higher corporate taxes. All this changed dramatically largely through a series of reforms, starting with the deregulation of capital markets and international capital movements in the 1980s, tax reforms in the mid-1980s and early 1990s and an end to the idea of wage-earner funds in the early 1990s. As a result of technological developments and the reforms of Swedish financial markets, of which the deregulation of credit and currency in the latter half of the 1980s was the most important, the Swedish stock market boomed. In the 1980s the stock market index rose twelvefold, or four times as much as the Dow stock index in the US. The boom attracted both new capital and new actors. By 1997, 352 IPOs were registered on the Stockholm Stock Exchange, a dramatic increase from the low levels in earlier decades (Holmén and Högfeldt, 2005). A derivatives market, OM ("Optionsmäklarna"), also emerged in Sweden in the second half of the 1980s. This market enabled investors to trade a number of new financial instruments, such as options and warrants, which offered insurance mechanisms as well as new investment opportunities that did not exist on the Stockholm Stock Exchange.

Further important changes occurred on the Swedish stock market in the 1990s. In 1993, trading was opened up for non-residents, which led to an increase in foreign ownership of the exchange-listed stocks from a few percent to forty percent in the course of a decade (Henrekson and Jakobsson, 2012). Another change was the formal end to the Exchange's trading monopoly, allowing securities trading to take place elsewhere. Other market actors organizing trading started to grow and in 1998 the Stockholm Stock Exchange was acquired by the largest of the private actors, OM, forming the OM Stockholm Stock Exchange ("OM Stockholmsbörsen"). As a consequence, the exchange ceased to be a semi-public market place and became a privately owned for-profit company selling products associated with securities trading.

In the early 21st century, the OM Stockholm Stock Exchange expanded by purchasing the Helsinki Stock Exchange in 2003 and changed its name to OMX. In 2005 OMX acquired the Copenhagen Stock Exchange and in 2006 the Iceland Stock Exchange. In 2008, OMX was itself purchased by Nasdaq, which gave the market-place its current name, NASDAQ OMX Nordic. These organizational changes have not involved any dramatic changes in securities

trading on the Stockholm stock market. The new owners have, however, introduced several new features, including new lists containing various selections of Nordic securities as well as separate listings for small-, middle- and large-sized companies in terms of equity capital.

2.2 Swedish bond and money markets

The Swedish bond market emerged in the middle of the 19th century. At first, the most important borrowers on the domestic market were mortgage associations and industrial corporations (Gårdlund, 1942). The Swedish government did issue bonds, but these were floated almost exclusively in foreign markets up until the 1920s. From the interwar period onwards, the Swedish government has been the main borrower and almost all of its loans have been issued to the domestic market.

Secondary bond trading in Sweden has traditionally been conducted outside the organized stock exchange. Investors have traded bonds over the counter at banks or in bilateral block transactions. The Stockholm Stock Exchange has regularly listed bond prices since the late 19th century. Within the Exchange, however, bond trading takes place in several markets, depending on the type of loan. Convertible public sector loans are quoted alongside stocks on the A (main) and O (subsidiary) lists. Premium lottery bonds are traded separately. Finally, there is a retail market – the SOX market – in which bonds are transacted freely. The volume of secondary trading on the Exchange has generally been smaller for bonds than for stocks.

Although bonds were not always traded actively on the Stock Exchange, quoted bond market prices have been published in several listings by the Stock Exchange as well as by stockbrokers and banks. In the postwar period, the Swedish secondary bond market has been dominated by trading in government and mortgage loans. Corporate bonds have been relatively few and are normally held by investors until maturity.

Stock returns and bond prices and yields are reported in both nominal and real terms, using inflation data from various sources. Annual consumer price index data are collected from the Riksbank project on *Historical Monetary and Financial Statistics for Sweden*, described in Edvinsson and Söderberg (2010). A monthly price index does not exist for the entire period. Frennberg and Hansson (1992a) use the Swedish National Board of Health and Welfare's cost-of-living index to construct a monthly price index back to 1918.

3. Stock market data

3.1 Constructing stock market returns and indices

The monthly return R_t on an investment can be divided into two parts:[6] a capital gain component, $P_t - P_{t-1})/P_{t-1}$, reflecting the change in the stock price P between two months divided by the initial month's price, and a dividend yield component, D_t/P_{t-1}, reflecting the cash-flow return on a stock investment:

$$R_t = \frac{(P_t - P_{t-1}) + D_t}{P_{t-1}}.$$

Annual returns are compounded continuously, that is, they are computed as accumulated monthly returns over the year's span. Letting R_t^T denote the return of year T recorded in month t, the total return during one year can be written as:

$$R_t^T = \prod_{t=1}^{12} (1 + R_t).$$

In this analysis, returns are typically expressed as annual returns to make them easily interpretable and comparable across securities. The annualized return is calculated as a geometric mean:

$$Annualized\ return\ R_t^T = \left(\prod_{j=1}^{12} (1 + R_t) \right)^{\frac{1}{12}} - 1.$$

The price index P is measured as the market value of listed stocks at the end of the measurement period. This analysis presents two different stock market indices: a *stock price index*, reflecting only the capital gain component, and a *stock return index*, in which both capital gain and dividend yield are included.

Taxes and transaction costs are not incorporated explicitly in this analysis. This means that

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[6] A broad returns concept could also include the yield from reinvested cash flows.

returns are pre tax and transaction costs, and therefore higher than what the investor actually obtains in the end. Accounting for taxes is potentially important, not least in a historical perspective, as taxes on capital gains and dividend income have not been constant over time. For example, prior to 1991 the tax on capital gains depended on how long the transacted assets had been held, with tax rates typically decreasing as the duration of the holding increased (see Dahlquist and Sellin, 1996).

3.2 Sources for stock market data

The natural basis for analyzing stock returns in Sweden is market data from the country's prime market place, the Stockholm Stock Exchange. At times the Exchange has used more than one listing, the "A-list" for the largest and most traded companies, and the "B-list" for smaller and less frequently traded shares. For most of the studied period, the stock price indices are based on prices and capital data for companies in the A-list.

The stock price index of this study is value-weighted, i.e., the stock price of each firm is weighted with the size of the listed equity capital's current market value. Value-weighted indices are the most common variant in today's markets, but historically one may argue whether an equal-weighted or even a trading volume-weighted index would be more representative of markets where only a minority of listed shares are actually being traded.[7]

For the period October 1901–December 1918, the new Swedish stock price and returns indices constructed by Gernandt, Palm and Waldenström (2012) are used as the main source. These indices are based on manually collected firm-level stock price data from weekly periodicals and reprints from the official price list of the Stockholm Stock Exchange. The Exchange did not publish an official price list prior to 1912; listings supplied by other market actors have been used instead. The two most recognized sources from that period are *Arthur Mattssons fondnoteringar*, used for the period October 1901–April 1909, and a price list compiled by the largest Swedish commercial banks for May 1909–December 1911.[8] From 1912 onwards, the Exchange's official price list is used.

Specifically, the stock price lists provide information about bid and ask quotes, the close

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[7] In an analysis of the early Stockholm Stock Exchange market, Gernandt, Palm and Waldenström (2012) find that the choice of price weighting scheme does affect the performance of indices, but hardly over the long run.
[8] The banks' list was published in a leading daily newspaper, *Svenska Dagbladet*, up to April 1910 and thereafter in the weekly periodical of the Swedish Bankers' Association, *Ekonomiska Meddelanden*.

high/low (final close is the average of the high and the low), the dividend per share and the nominal price per share.[9] Dividend payments are reported for the current and the previous year, and monthly dividend payout-weights estimated for the Stockholm Exchange in the 1950s by Möller (1962) were used. Balance-sheet information was assembled from Key-Åberg's *Svenska aktiebolag och enskilda banker*, a yearly catalogue covering about half of Sweden's joint-stock companies. Standard balance-sheet items concerning assets and liabilities are reported, as are, in most cases, profit and loss accounts.[10]

Starting in December 1918, the weekly Swedish financial chronicle *Affärsvärlden* published a composite stock price index that was later named *Affärsvärldens Generalindex* (AFGX).[11] This index has ever since been one of the main Swedish stock price indices used, not least because of its long history. AFGX is a capital-weighted index and up to 1998 it only included firms on the Stockholm Stock Exchange's A-list. Frennberg and Hansson (1992) use AFGX as their base index. During the early period December 1918 – December 1921, *Affärsvärlden's* index is headed "Changes in market value of the 41 most important industrial, transport and shipping firms".[12] The selection of firms was based on the premise that they belonged to the Exchange's A-list of most traded companies. Between 1934 and 1959 Frennberg and Hansson use Möller's (1962, pp. 185–187) slightly modified version, which also includes insurance companies.

Frennberg and Hansson make some additional adjustments to render the indices fully comparable over time. These adjustments differ somewhat between sub-periods depending on changes in the methods for calculating the published indices.

First, Frennberg and Hansson include banking companies, which for some reason were left out of the composite stock index up to 1941. To do this, they use a separately listed banking stock index reported from 1921 and data on relative market capitalization weights in Möller (1962, p. 187).

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[9] Note that the bid and ask quotes reflect the final positions of buyers and sellers after the auctions ended and are not the type of bids and asks quoted by market makers in continuous dealership markets.
[10] See Gernandt, Palm and Waldneström (2012) for further details on the prices and balance sheets during 1901–19.
[11] Strictly speaking, AFGX was introduced in 1937; its predecessors had other names, as mentioned in the main text.
[12] In Swedish: *värdeförändringar i milj. kr å de 41 viktigaste industri-, trafik- och rederipappren* (*Affärsvärlden* 1920, p. 4220).

Second, a major adjustment is made concerning the role of dividends. Notably, the early version of AFGX was not a pure price index; it included dividends paid out during the year. To arrive at a pure stock price index, Frennberg and Hansson (1992) adjust for this by using data on dividend payouts at the end of each year and subtracting the monthly (one twelfth) accrued dividends from the index. During December 1921 – December 1923, *Affärsvärlden*'s index was a pure price index and therefore needs no adjustment with respect to dividends.

A third adjustment was made for the period December 1927– December 1934 with respect to the role of the dominant Krueger companies. During this sub-period, *Affärsvärlden* reported two distinct stock indices; one included and the other excluded the two firms dominated by the Swedish industrial magnate Ivar Kreuger: Svenska Tändsticksaktiebolaget (later Swedish Match) and the telephone company L. M. Ericsson. The final index uses the former up to and including March 1932 and the latter thereafter. The reason for this is the dramatic collapse of the Kreuger empire in mid-March 1932 following Ivar Kreuger's suicide in Paris on March 12, 1932. The switch results in the final index capturing the entire price fall occasioned by the "Kreuger crash" while avoiding the problems generated by the fact that the two companies were not listed for many years after the crash. Besides this measure, Frennberg and Hansson adjust for an awkward correction for accrued dividends which *Affärsvärlden*'s published index contains.[13]

For the period December 1959 – December 1986, Frennberg and Hansson (1992) use the published AFGX and adjust it by subtracting paid out dividends and adding accrued dividends. Thereafter, AFGX was calculated as a pure stock price index and is therefore used without any adjustments.

From 1995 up until 2012, the updated version of Frennberg's and Hansson's stock price index and the extension made for this chapter are based on the stock price index computed by the Scandinavian Information Exchange, SIXGX. The reason for switching from AGFX to SIXGX is mainly practical, more precisely that only the latter index has a readily available corresponding stock returns index during this period.

This chapter also presents new evidence about Swedish stock returns during the initial phase

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[13] Specifically, the index makers subtracted a twelfth of a standard annual interest rate of five percent instead of the actual dividends paid out.

of Sweden's industrialization, the period 1870–1901. The evidence is based on a new market dataset from the Stockholm Stock Exchange. However, these early stock market data, and the resultant stock price and returns indices, are kept somewhat separate from the main analysis on account of the greater uncertainty about their overall quality. As the historical overview above showed, secondary securities trading in Stockholm was organized in monthly auctions, with no official listing or regular pricing of a fixed set of listed corporate stocks. Trading activity was quite low, at least before the 1890s, and the low level of liquidity makes quoted market prices uncertain. Nonetheless, there was recurrent trading in a number of stocks and the indices created rely on the same approach as in 1901–19, namely price changes on repeatedly traded and quoted stocks. Furthermore, although the new indices are indeed capital-weighted, information about book equity of traded stocks is only available for single years, so new issues, splits and other company events may be missing in the database.

The source for market prices, book equity and dividends for the period 1870–91 is Aurell (1892), a report containing bi-monthly prices and company information for all stocks and bonds traded in Stockholm. The number of companies with recurrent bi-monthly pricing ranged from 10 to 30 in the 1870s, and from 40 to 50 during the 1880s and early 1890s.

During the decade 1891–1901, i.e., between the Aurell (1892) source and Gernandt, Palm and Waldenström's (2012) index, which starts in 1901, a preliminary capital-weighted index was created based on the ten most traded (and also among the largest in terms of book equity) stocks on the exchange. They are companies engaged in manufacturing (Stora Kopparbergs Bergslags AB, Uddeholms AB), railways (Stockholm-Västerås-Bergslagens Järnvägs AB, Gefle-Dala Järnvägs AB), shipping (Göta kanalbolag 1:a klass), banking (Skånes Enskilda Bank, Industrikreditaktiebolaget i Stockholm, Stockholms Handelsbank) and insurance (Försäkringsaktiebolaget Skandia). For these ten corporations, year-end market prices and information about the latest dividend were collected from the Stockholm Stock Exchange's stock price listings, collated and published by the local stockbrokers John Håkansson and J. H. Zethræus.

3.3 Dividends
A dividend index is calculated by taking each year's dividend yield, published at year end as a percent of the stock price level, and dividing it by the stock price index presented above.

Data on dividends come from various sources. The period up to 1919 is based on the information from stock price listings used by Gernandt, Palm and Waldenström (2012). For the period 1870–1901, the source is the same as for market prices described above.

For the period 1919–95, data collected by Frennberg and Hansson (1992) are used. Specifically, data were reported as annual dividend yields in Möller (1962) for 1919–59, in the Riksbank's Statistical Yearbooks for 1960–72 and in the Swedish chronicle *Veckans Affärer* thereafter.

For the period since 1995, the dividend yield is calculated from the difference in percentage change between the stock return index and the stock price index. Specifically, the difference between the monthly total return $R_t = (P_t - P_{t-1} + D_t)/P_{t-1}$ and the monthly capital gain $(P_t - P_{t-1})/P_{t-1}$ is D_t/P_{t-1}. Multiplying the dividend yield by P_{t-1} gives the dividend income. This dividend income each month is aggregated at the annual level and a dividend index point is computed, from which the current monthly dividend yield D_t/P_t can be retrieved.

3.4 Inflation

Annual consumer price index data are collected from the Riksbank project *Historical Monetary and Financial Statistics for Sweden*, described in Edvinsson and Söderberg (2010). A monthly price index does not exist for the entire period. Frennberg and Hansson (1992) construct a monthly index by using the Swedish National Board of Health and Welfare's quarterly cost-of-living index, which was available back to the late 1910s, amended by a monthly wholesale price index reported by Statistics Sweden. I extend the monthly price index back to 1901 by linearly interpolating yearly consumer prices.

The quality of monthly inflation series is generally poorer than that of the stock and bond market observations. Consumer prices have not been tracked carefully at the monthly level in Sweden for most of the studied period and are therefore imputed by using time series properties of other data-generating processes (wholesale prices, time). Consequently, monthly inflation is by construction less volatile and not as representative of the actual fluctuations as are the other series in the dataset.

4. Bond and money market data

4.1 Short-term government bill returns

The short-term yield on a government bill is often used as a measure of the risk-free rate of return in the economy. Today, governments continuously issue treasury bills with different maturities, from 30 to 120 days. Historically, however, no such market rates are available for Sweden before the 1980s. The Swedish government issued longer term fixed-interest securities to the capital market, with time to maturities down to two years. In the absence of a standard short-term market interest rate, this study uses the discount rate (*diskonto*) as a proxy for the risk-free rate for most of the studied period.

The discount rate was set by the central bank, the Riksbank, from November 1856 until the early 1980s. It has been an important market interest rate in Sweden in the sense that banking laws stipulated that commercial banks had to follow it when setting their own borrowing and lending rates. Frennberg and Hansson (1992) compare the discount rate with the interest rates paid by banks for deposits in the postwar period. They find that the discount rate was roughly the same as these deposit rates in the period as a whole, though somewhat higher until the 1970s and somewhat lower thereafter. However, the discount rate is by no means a perfect variable for our purposes. It is set statutorily by the central bank with reference to a number of considerations, including monetary policy objectives. It does not fluctuate in the short-term in relation to general economic conditions and therefore does not reflect the fluctuations in the true risk-free market rate.

In 1983 the Swedish National Debt Office started floating treasury bills (*statsskuldsväxlar*) at different maturities, which were thus the first official money market bills in Sweden. Here we use the 30-day bill as proxy for a risk-free market rate of return, starting from January 1983. The source for these bills is the Riksbank website.[14]

The monthly risk-free return is calculated as a simple yield of the annualized discount rate (up to 1983) or the 30-day Treasury bill (thereafter):

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[14] In the early 1980s commercial banks issued short-term bank certificates in a specific auction market. This market yield is used by Frennberg and Hansson (1992) instead of the discount rate for the early years in the 1980s before the introduction of treasury bills ("statsskuldsväxel"). Since these bank certificates come from the private market, whereas the discount rate and treasury bills are linked to the public sector, this project does not use the yields on bank certificates.

$$R_t^f = \frac{Discount\ rate_t\ or\ Treasury\ bill_t}{12}.$$

4.2 Long-term government bond returns

Two series associated with the return on a long-term government bond are presented. The *yield to maturity* reflects the return on a bond that is held until it matures. In the case of an eternal government bond without a maturity date, a consol, the yield to maturity is simply the flat yield defined as $Y = \frac{Coupon}{Bond\ Price}$, where $Coupon$ denotes the bond's fixed cash flow and $Bond\ Price$ is the market-quoted price. Bonds with a fixed maturity date have slightly more complicated yield expressions (see Campbell, Lo and McKinlay, 1997, ch. 10).

The other bond return series presented here uses *holding period returns* of bonds as a basis. A holding period return is defined as the sum of the capital gain associated with bond price changes and the accrued interest associated with the coupon payment. The monthly holding period return, HPR_t, of a government consol can thus be defined as:

$$HPR_t = \frac{(P_t - P_{t-1})}{P_{t-1}} + \frac{Coupon}{12}.$$

Frennberg and Hansson (1992) show how the holding period return expression differs for bonds with limited maturity.

This chapter presents forty-five years of new evidence on long-term government bond yields and their associated holding period returns, covering the period 1874–1918. The main source of these new observations is stock price lists for the Stockholm Stock Exchange, where government bonds were regularly listed and traded throughout this period. Specifically, the stockbrokers John Håkansson and J. H. Zethreaus published price lists in the local newspapers.[15] Government bonds of 1872 (4 percent coupon), 1880 (4 percent), 1887 (3.6 percent) and 1914 (5 percent) were used. The lists contain bid and sell prices, and sometimes buy prices, reported for each bond. Yields are based as far as possible on bid (or buy) prices. There are, however, many occasions when no prices are reported and the series therefore have

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[15] The listings are also kept on microfilms at the Stockholm Stock Exchange, from which they were retrieved for this chapter.

missing values. To get continuous series, bid prices were imputed using sell prices (typically about 10 basis points higher) or interpolated using a linear time trend.[16]

For the period 1919–83, yields and holding period returns are reported by Frennberg and Hansson (1992). Up to the end of 1949 they use month-end prices on government consols collected from the monthly magazine *Ekonomiska Meddelanden* and the Riksbank's yearbooks. For the period 1950–82 they retrieve prices and coupons from published yields to maturity on government bonds with approximately 10 years to maturity, using information in the Riksbank's yearbooks and the Swedish National Debt Office (*Riksgäldskontoret*).

From January 1983 onwards, yields on 10-year government bonds are collected from the Riksbank's statistical databases. The calculation of the monthly long-term government bond yield index is based on the monthly holding period return. For the period before 1987 this is the percentage change in the bond price level and a twelfth of the annual coupon. For the period thereafter the calculation is done by assuming that the bond is a zero coupon bond, following the methodology of Frennberg and Hansson (1992).

5.   Descriptive analysis

Figure 3 presents stock returns on the Swedish stock market since 1901. The series are indexed so that they all equal one in October 1901, the starting date for the stock price index at the reorganized Stockholm Stock Exchange. Several interesting patterns emerge. First, the long-run picture differs quite markedly between prices and returns. Real prices were virtually unchanged throughout the 20th century up to 1980, when they started to increase. In contrast, real returns steadily increased, which emphasizes the historical importance of dividends to Swedish investors.

[Figure 3 about here]

The level of stock returns has not been constant over time. Business cycles and periods of financial and economic crisis have led to fluctuations in corporate profits as well as in

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[16] Two longer periods were imputed using other bonds. First, during May 1879–December 1880 the 1872 bond had bid prices imputed from the 5-percent government bond of 1870. Second, during August 1886 – February 1888, the 1880 bond had its bid prices imputed from the 4-percent bond issued by the state-controlled Swedish Public Mortgage Association (*Sveriges Allmänna Hypoteksförening*).

investors' income and wealth returns. This warrants an investigation into the extent to which stock returns in Sweden have varied over time. Table 1 provides a set of summary statistics of Swedish stock market returns for different sub-periods. Using the arithmetic average to calculate the mean return since 1901 gives an annual real return of 7.6 percent. There were, however, some decades when the real market return was much higher than this; in the 1950s it was almost 13 percent and in the 1980s and 1990s it was 20–25 percent. In other decades it was lower and in the 1910s and the 1970s the average return was even negative.

Table 1 decomposes the stock returns into the price change, or capital gain, component and the dividend income component. The average nominal annual continuously compounded stock return over the entire study period, 1901–2012, is 7.8 percent. Adjusting for consumer prices almost halves the return to 4.2 percent. Decomposing the total nominal return of 7.8 percent, about half comes from nominal capital gains (3.8 percent) and half from the dividend yield (3.9 percent). What the table also shows, however, is a considerable variation in stock returns across eras. Investing in the stock market portfolio in either 1930 or 2000, and then selling a decade later, resulted in losses. In contrast, an investment in the portfolio in 1980 yielded an average return of almost 30 percent each year! It is also noteworthy that almost all of the variation across decades comes from differences in stock prices, whereas dividends have been fairly stable over time (see further on dividends below).

[Table 1 about here]

Another way of assessing the variation in stock market returns is to look at the individual months and years when returns were extremely high or low. Table 2 provides such evidence by listing the top and bottom ten months (Panel a) and years (Panel b) based on a ranking of all returns during the entire period studied. The list of dates in the table also provides a snapshot of the historically important events in the history of the Swedish stock market.

Looking at the highest returns, it is striking that most of them stem from the period after 1980. Nine out of ten top years and eight out of ten top months occurred during the 1980s, 1990s or the 2000s. This reflects the long boom on the Swedish stock market that occurred after 1980. However, some of the top months represent bounce-backs during recessions. The highest monthly return, on November 1992, occurred in the middle of the 1990s financial crisis but reflects the sudden drop in the Swedish exchange rate after the Riksbank decided to leave the

ERM's fixed exchange rate system. The high returns in single months during the banking crisis of 1921 and 1922 likewise reflect bounce-backs.

Looking at extremely bad months and years, the share of years from earlier historical eras is higher. The worst month on the Swedish stock market over the past 112 years was March 1932, when the industrialist Ivar Keuger committed suicide and his conglomerate collapsed. The other bottom return months also reflect important economic or political events, including collapses of financial firms that mark the beginning of financial crises (November 1907, September 1990, October 2008), global stock market crashes (October and November 1987) or political events such as Germany's invasion of Denmark and Norway during the Second World War (April 1940). The picture of the lowest yearly returns is similar; they are typically associated with the major economic crises and political turbulence during the historical period under study.

[Table 2 about here]

The volatility of stock prices is one of the most distinct features of this form of investment, distinguishing it from most other forms of financial investment such as bonds or bank deposits. Figure 4 shows the evolution of stock market volatility on the Stockholm Stock Exchange since 1901. Volatility is calculated as the 12-month standard deviation of the nominal capital gain, presented as a rolling window over the entire period. There are three peaks in volatility: the early 1920s (deflation and a banking crisis), the early 1930s (international financial crisis and the Kreuger crash) and the early 1980s (devaluations and stock market boom).

As can be seen from Figure 4, stock market volatility varies over time. Determining whether this variability is significant or merely a matter of nuances requires a more systematic take. I therefore applied the estimation methodology for detecting and measuring structural breaks in time series proposed by Bai and Perron (1998, 2003). The results of this estimation are indicated by the horizontal solid line.[17] Stock price volatility on the Swedish stock market did

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[17] In short, Bai and Perron's (1998, 2003) method has three main steps. First, it tests for the existence of one or more structural breaks. All tests signaled that the time series contained one or several structural breaks. Second, the exact number of statistically significant breaks is estimated. All tests (in particular the Bai and Perron sequential method and the Bayes Information Criterion) suggested that there is one break. Third, a linear regression model of the kind $y_t = a + \sum_i^k b_i D_i$ is fitted, where D_i denotes the ith time dummy after an estimated

indeed increase significantly from the early 1980s onwards. In this estimation the recent era been the most volatile in the modern history of Swedish stock markets, which may contradict some preconceptions about the role of technological development in stock market volatility. The second most volatile period was the interwar era, which is hardly surprising considering the extreme economic and political turbulence in this period. The quietest periods were the early 1900s and the postwar era up to 1980.

[Figure 5 about here]

As apparent from the analysis above, dividends have been a significant part of total stock returns in Swedish stock markets. Figure 5 displays the evolution since 1901 of dividend yields on the Stockholm Stock Exchange, calculated as the annual average dividend level divided by monthly stock prices. Although the monthly variation in the series is considerable, dividend yields follow a fairly clear secular decreasing trend. An application of the Bai and Perron (1998, 2003) time series method for estimating structural breaks revealed two significant breaks in the mean dividend yield. Dividends hovered around five percent up to the early 1940s; they were somewhat lower, around four percent, in the postwar period up to around 1980 and then decreased again to a level of around three percent. It is difficult to tell just what explains the level of dividends. One hypothesis, put forward by Baskin (1988), is that in early financial markets firms used dividends to overcome information asymmetries vis-à-vis stock investors. By making stocks more similar to fixed-interest securities, e.g., bonds, a smaller premium was sufficient when firms acquired external finance.

[Figure 5 about here]

Turning to fixed income returns, Figure 6 shows the evolution of the yield on two securities: a long-term government bond and a short-term Treasury bill (actually, the Riksbank's official discount rate) going back to the middle of the 19th century. As can be seen from the figure, there has been a high degree of correlation in the yield levels of these two instruments. The short-term rate lies somewhat below the long-term government bond rate in the latter part of the 20th century, except during the turbulent era in the 1990s when the Riksbank raised its

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break. Fitted values $\hat{a}$ and $\hat{b}_t$ accordingly represent the levels of volatility before and after each estimated break. One model parameter to set before testing is that the length of segments separated by a break has to be at least 20 percent of the total segment length, resulting in a maximum number of breaks of three.

short-term rates to dramatic levels in an attempt to support the fixed exchange rate (which was abolished after a short time).

[Figure 6 about here]

A comparative view of the long-run evolution of inflation-adjusted returns on stocks, bonds and bills is provided in Figure 7. The main message is that stock investments have performed dramatically better over the course of the past 112 years than any of the fixed-interest securities. Note, however, that this only holds when dividend yields are incorporated; by themselves, stock price gains do not outperform yields on government bonds or bills. The order of magnitude is of interest. A stock investment of 100 SEK in 1901 rendered a portfolio worth 44,200 SEK in 2012 when dividends were reinvested and only 900 SEK when they were not. For government bonds, the same investment would give a portfolio of 1,300 SEK and for short-term Treasury bills 700 SEK. Note that these ex post comparisons do not take into account the additional risk associated with stock investments.

While stocks outperformed fixed-interest securities over the period as a whole, this was not the case in the first half of the 20th century. Up to 1950 both government bonds and bills represented a better investment than a stock purchase regardless of how dividends are treated. This is explained by the dramatic collapse of stock prices during the financial crises in the 1920s and 1930s. The total value of the stocks on the Stockholm Stock Exchange dropped by two thirds between December 1917 and December 1920 and by half between December 1930 and December 1932.

[Figure 7 about here]

As already mentioned in the introduction and data sections above, this chapter also presents a new stock price index and a new stock returns index for Sweden beginning in 1870, which allows an analysis of the entire era up to modern times. Due to a scarcity of data, at present these indices are only available annually. Furthermore, one sub-period (1892–1901) is based on a relatively small set of traded stocks and is therefore potentially less representative than both earlier and latter periods. Figure 8 displays the evolution of nominal and inflation-adjusted stock prices and returns on the Stockholm Stock Exchange during the late 19th century. There were two boom years, 1871–72, when prices rose by a total of 56 percent and

returns by almost 80 percent. This was followed by an international financial panic and long depression, when prices fell and even total returns were negative for a few years. In the period as a whole, it can be seen that capital gains were modest and most of the total return came from the dividend yield. As reported in Table 1, total returns averaged eight percent a year between 1870 and 1901 and capital gains were somewhat over three percent.[18]

[Figure 8 about here]

Table 3 presents summary statistics for bond and bill returns, both for the entire period and for the same sub-periods as for stock returns in Table 1. The average annual real return on a Swedish government short-term security was 1.7 percent over the entire 20th century and up to 2012. For long-term government bonds the average annual real return was only marginally higher, 2.1 percent. There is, however, a considerable variation across decades. Nominal yields were highest in the early era up to 1930 and in the 1980s and 1990s, largely due to relatively high inflation. Overall, comparing long-term and short-term yields suggests that the term premium, i.e., the return to investors for holding securities with longer maturities, has been significantly positive in almost every period in the past.

The last column of Table 3 presents estimates of the *equity risk premium,* that is, the return on equity (capital gains plus dividends) in excess of the return on safe assets such as government bonds or treasury bills. The equity risk premium (ERP) at time period t can be defined as:

$$ERP_t = \frac{(1 + R_t)}{(1 + R_{f,t})} - 1$$

Using this equation, the formula for calculating the annualized equity risk premium based on compounded monthly returns and premia is:

$$Annualized\ ERP_t = \left(\prod_{t=1}^{12} (1 + ERP_t) \right)^{\frac{1}{12}} - 1$$

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[18] The share of dividend yields in total returns was 54 percent during 1870–1901, but 66 percent when the two boom years of 1871–72 are excluded.

The typical argument for the existence of an equity risk premium is that investors demand compensation for holding volatile and risky corporate stocks instead of fixed-interest securities with lower returns, volatility and default risk.[19] Table 3 shows the equity risk premium calculated as the difference between the nominal stock market return and the nominal short-term bond, both over a holding period of one year. Looking at the entire period 1901–2012, the equity risk premium is 2.5 percent per year using geometric average returns and 4.7 per year using arithmetic average returns. Extending the period back to 1870 increases the premia to 3.8 percent and 5.6 percent, respectively. Interestingly, these premia are closer to what Frennberg and Hansson (1992b) found for the period 1919–90: 3.6 and 5.5 percent, respectively. In other words, the historical time dimension matters for the estimation of equity premia, as has been found for other countries (see Goetzmann and Ibbotson, 2006) and now also for Sweden.

A closer look at the equity premia across time periods reveals a striking degree of variation. There are decades when the equity premium is virtually zero (e.g., the 1900s and 1970s) or even negative (the 1910s through 1930s and the 2000s), and decades when it is substantial (the 1950s, 1980s, 1990s). Holding stocks for one year has thus not been a universally successful strategy, not even when averaged over a decade.

[Table 3 about here]

It is not sufficient to evaluate the premium for holding risky assets at just the annual level. Most people's investment horizons are much longer than that. When saving for retirement, the relevant time horizons are a matter of decades rather than years. Figure 9 presents further evidence on the evolution of the equity risk premium by presenting the premium when holding periods are extended from 1 year to 5, 10 and 30 years. The lines show monthly observations of excess nominal stock returns that are held for 1, 5, 10 and 30 years ahead. For this reason, the picture with a 30-year horizon ends in 1982 as that is the latest year for which a 30-year period of returns is observable in the data.

Looking first at the 1-year horizon, the premium oscillates around the zero line and is positive in about two thirds of the months (478 out of 744). For 5-year holding periods, the share of

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[19] For an extensive discussion of the equity risk premium, see Goetzmann and Ibbotson (2006).

months with a positive equity premium increases to three fourths (938 out of 1,271). This share, about three fourths, of months with a positive premium is also true for the 10- and 30-year investment horizons. However, the historical pattern shows that many of the negative premiums emanate from the negative stock returns of the 1920s and 1930s. Turning instead to just the postwar era, the share of positive months rises to 92 percent for a 10-year holding period and to 100 percent for a 30-year period. No such increase in the share of positive months can be discerned for the shorter holding periods.

[Figure 9 about here]

How internationally integrated are Swedish financial markets and how has this changed in the long run? There are many ways to assess this question. This study offers two intuitive yet simplistic approaches. In Figure 10, the stock price and stock returns indices on the Stockholm Stock Exchange are compared with the equivalent index for financial markets in the United States, namely Standard and Poor's composite stock price index at the New York Stock Exchange. Data on U.S. stock prices and returns come from Robert Shiller's book *Irrational Exuberance* and updated versions of the database presented in that book (Shiller, 2000). As the figure indicates, the long-run investment outcomes in these two markets are both similar and different. Looking at the temporal variation, both markets exhibit the same major downturns and increases in the past century. Still, the period before 1980 was much more favorable for American stock market investors than it was for Swedish. The total return in the U.S. was higher than in Sweden by one order of magnitude. Real stock prices were almost constant in Sweden up to 1980 and only marginally positive in the U.S.

[Figure 10 about here]

Another way of assessing the international integration of Swedish financial markets is to look at co-movements of stock returns across markets. Figure 11 shows rolling 36-month correlations of nominal stock returns in Stockholm and New York since 1901. There is a considerable variation in co-movements over time, with virtually no correlation in many periods and almost 0.8 in other periods. The level seems to increase slightly after 1980; particularly after 1990 the correlation has hovered between 0.5 and 0.8. Possibly, this change reflects the impact of developments in information technology as well as the financial liberalizations and deregulations that the world has seen since the 1980s.

[Figure 11 about here]

6.   Concluding remarks

This chapter presents historical evidence about Swedish stock prices, dividends, and yields on government fixed-interest securities. The monthly stock returns series spans the latest 112 years, from 1901 to 2012, and the new evidence on annual stock prices and returns back to 1870 gives time series covering more than 140 years. The government long-term bond series dates back to 1874 and the short-term bill returns back to 1856. Altogether, the series presented in this chapter represent the longest financial asset price database available for Sweden to date.

An important contribution of the chapter is the information about the quality of the statistical evidence, how the series are constructed and how they have been adjusted to be comparable over time. Furthermore, the chapter describes the institutional context of the stock and money markets at which the asset prices were quoted.

The chapter's final sections present a set of preliminary analyses of the new evidence. Returns are calculated for different periods, trends in returns, dividends and volatility are examined, correlations with other countries' financial markets are computed and the equity risk premium is presented across several dimensions. Among the most significant findings are those which show how asset returns and equity risk premia differ considerably across both historical eras and holding periods. Although holding stocks with returns equal to the whole market index typically generate better return than bonds over the long run, there are several examples from history when this is not the case.

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Figure 1: Turnover rate at the Stockholm Stock Exchange, 1870–2012
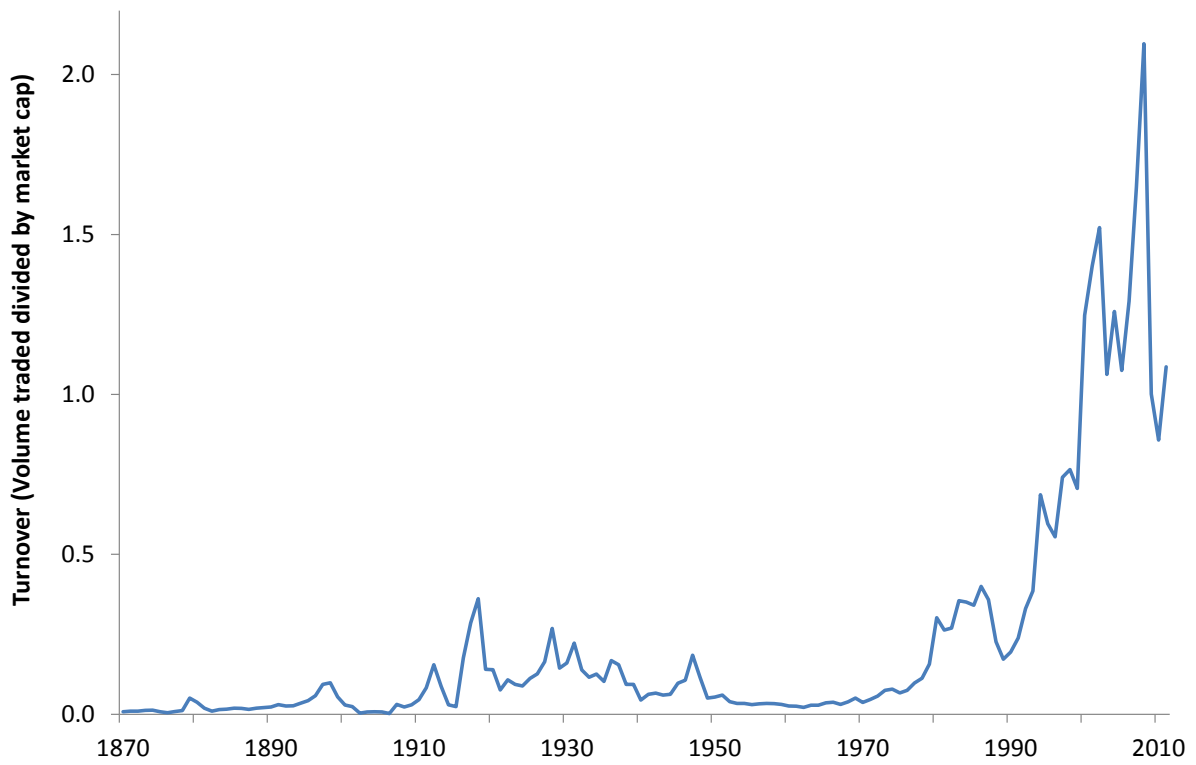
Note: Turnover rate is defined as the value of the total volume traded divided by market capitalization (value of listed shares). *Sources*: Appendix Table 1.

Figure 2: Market capitalization at the Stockholm Stock Exchange over GDP, 1870–2012.
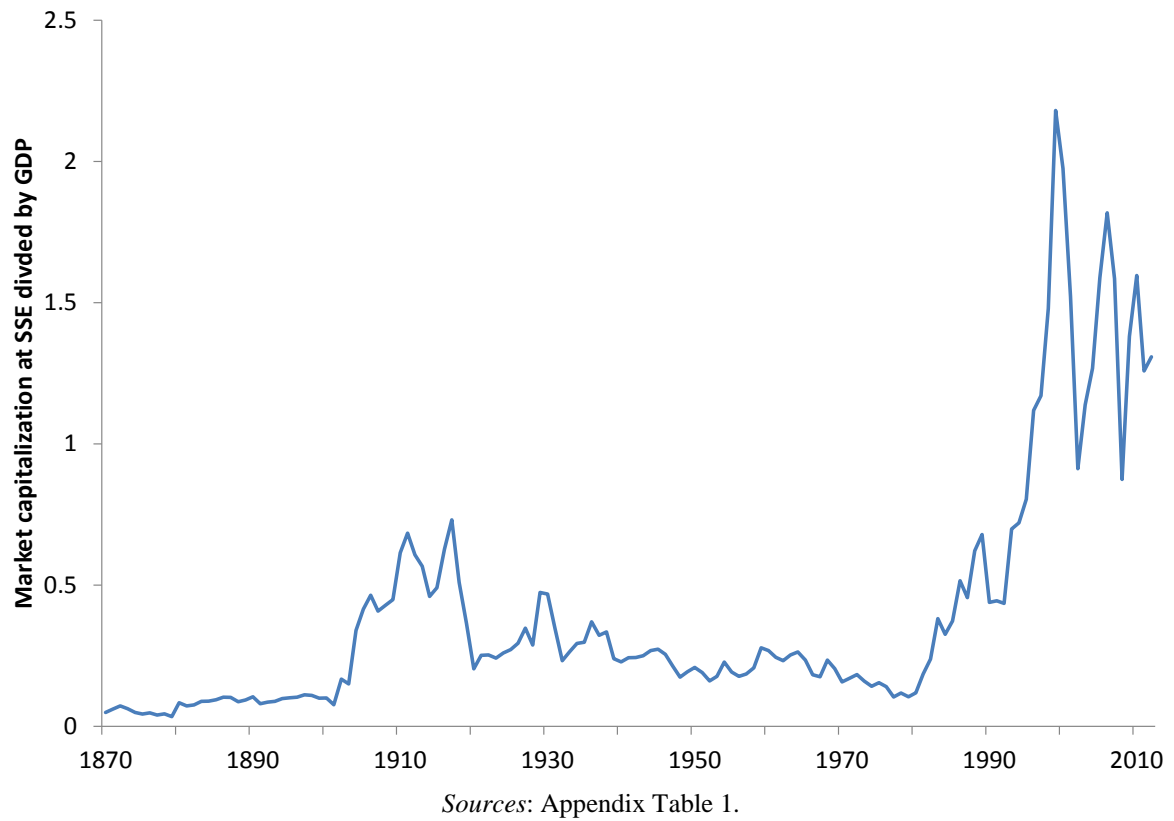
Figure 3: Stock prices and returns in Stockholm, 1901–2012

Stock price index (nominal) — Stock price index (real)
Stock return index (nominal) — Stock return index (real)
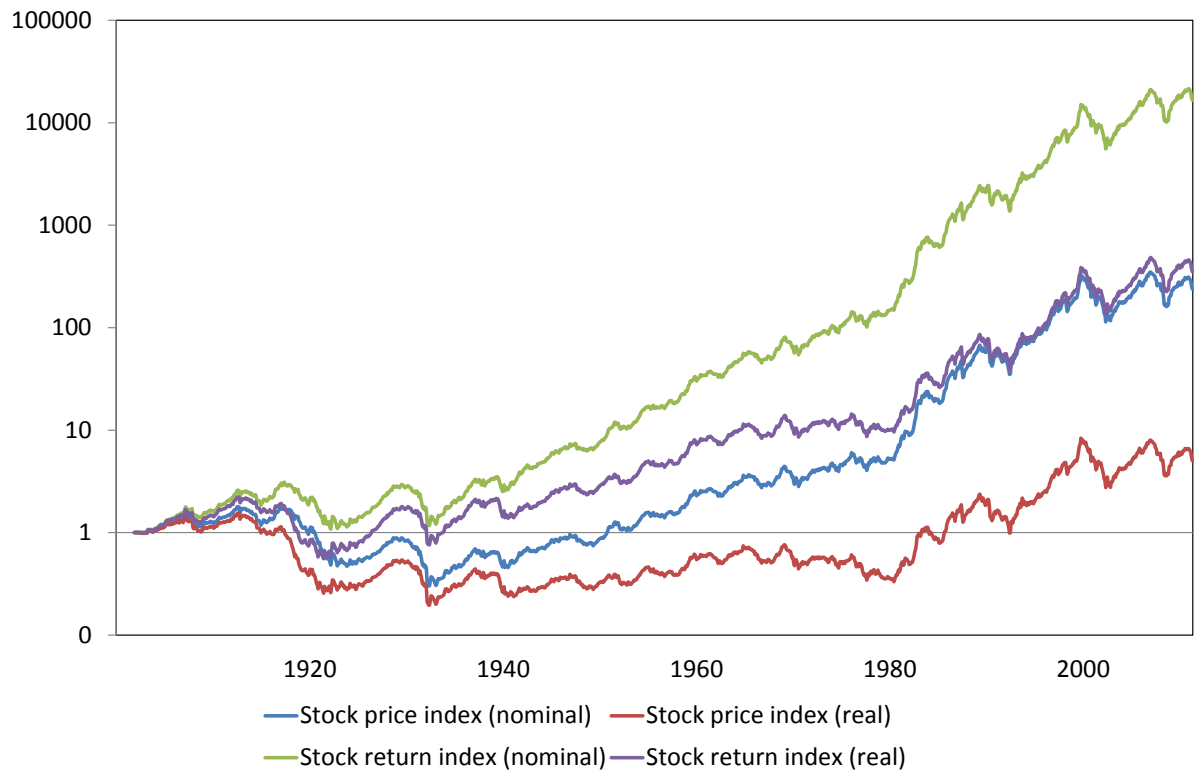
Figure 4: Stock price volatility on the Stockholm Stock Exchange
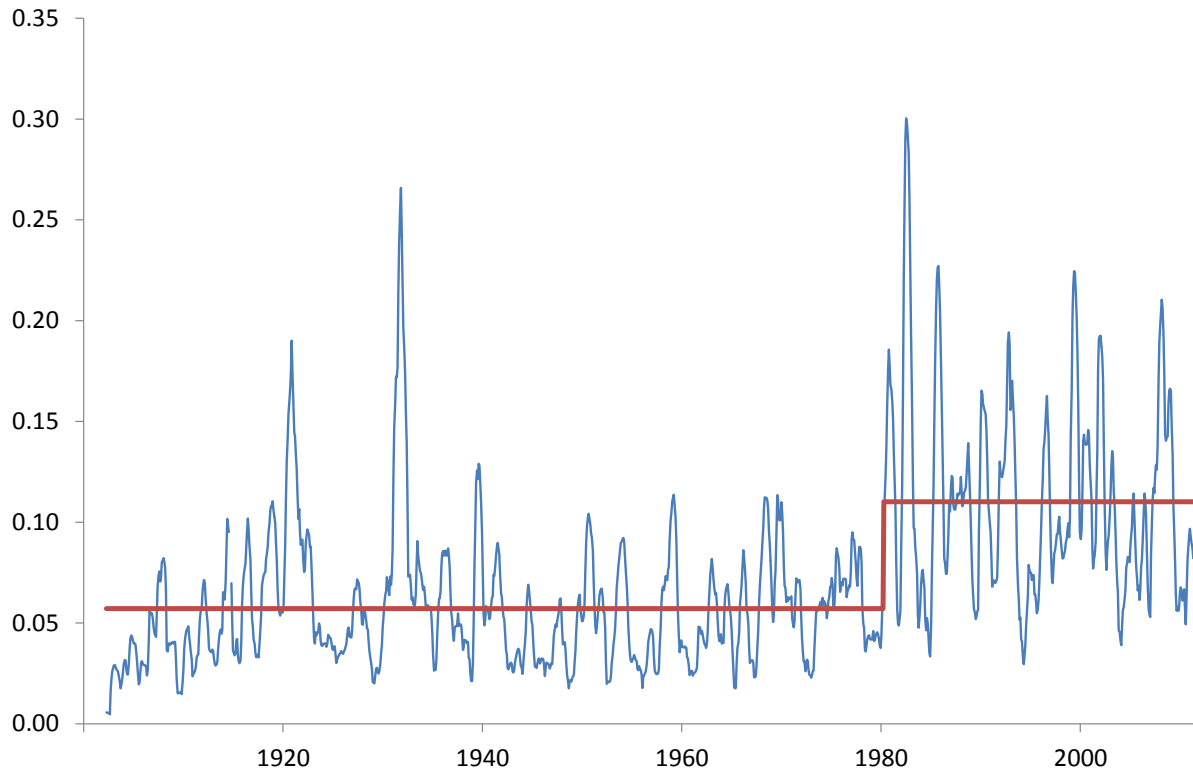
Note: Volatility is measured as the 12-month standard deviation in monthly nominal capital gains, measured at the middle of the period. The solid horizontal line shows the fitted values of a linear model with a structural break in mean volatility, dated July 1980, with statistical significance at the 5-percent level. The structural break was estimated using the Bai and Perron (1998, 2003) methodology.

Figure 5: Dividend yield on the Stockholm Stock Exchange, 1901–2012
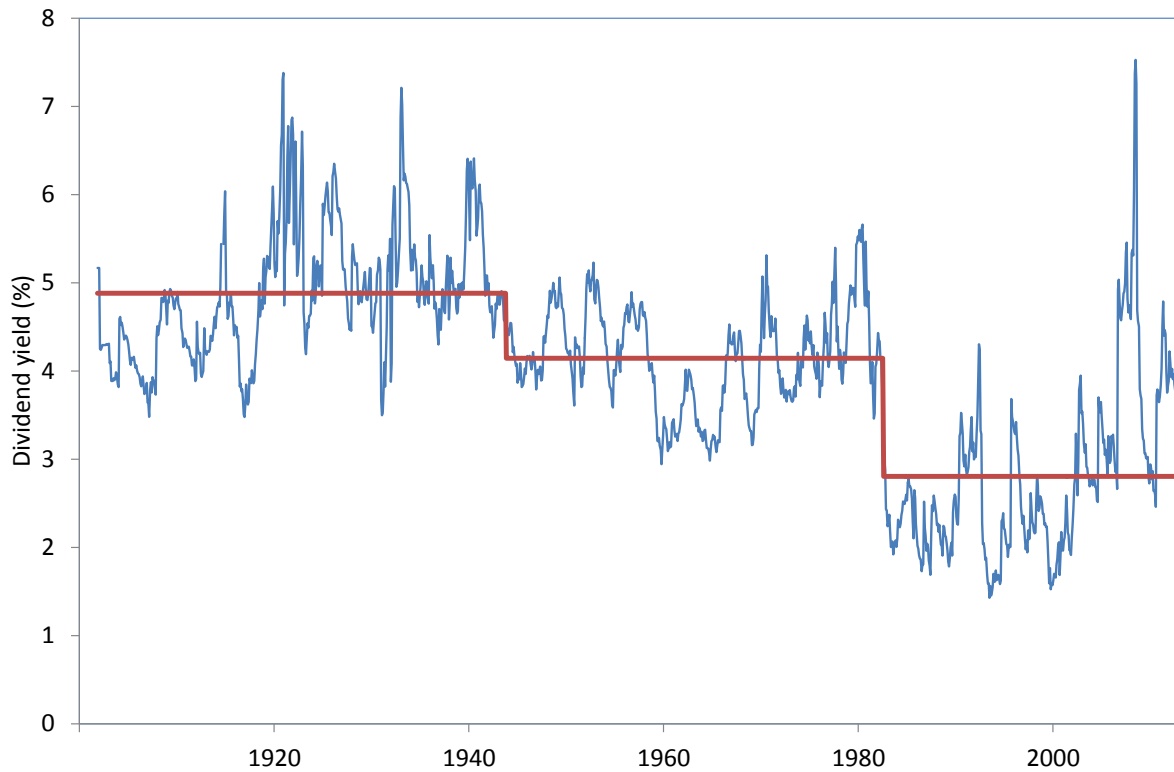
Note: The dividend yield reflects the dividend payout as a share of the stock price. The solid horizontal line shows the fitted values of a linear model with two structural breaks in the mean dividend yield, with statistical significance at the 5-percent level. The structural break was estimated using the Bai and Perron (1998, 2003) methodology. In the first period, ending with a break in December 1943, the average dividend yield was 4.9 percent. In the second period, between December 1943 and November 1982, the average dividend yield was 4.1 percent. In the third period thereafter, the average dividend yield was 2.8 percent.

Figure 6: Nominal yields on long- and short-term government bonds and bills
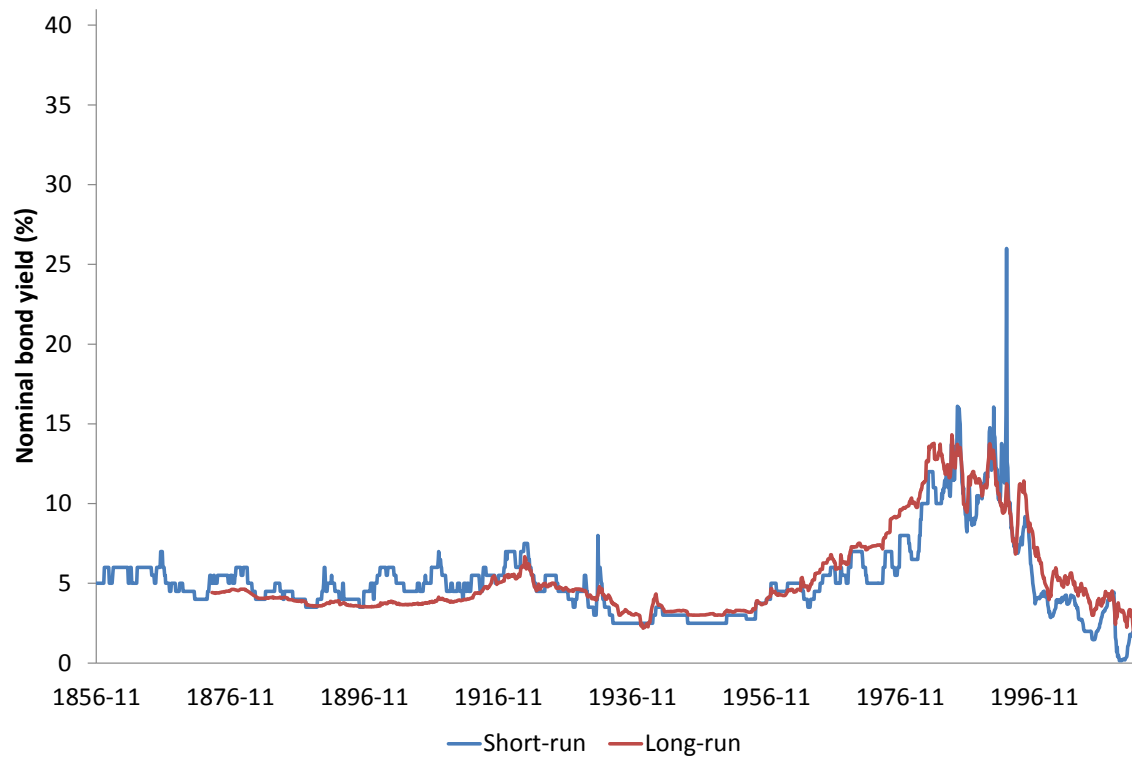
Figure 7: Stock, bill and bond returns indices, inflation adjusted, 1901–2012

Stock price index — Stock return index — Yield on short-run bill — Yield on long-run bond
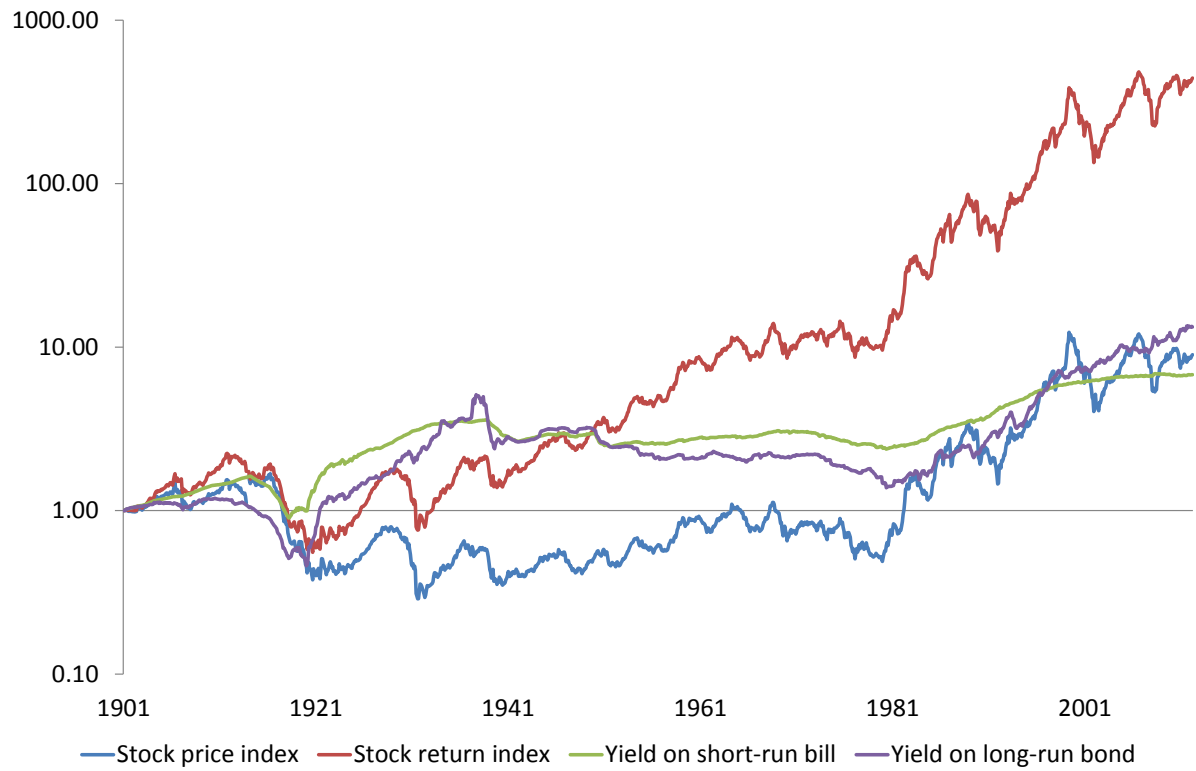
Figure 8: Stock prices and returns in Stockholm, 1870–1901

Nominal capital gain ——— Real capital gain ——— Nominal return ——— Real return
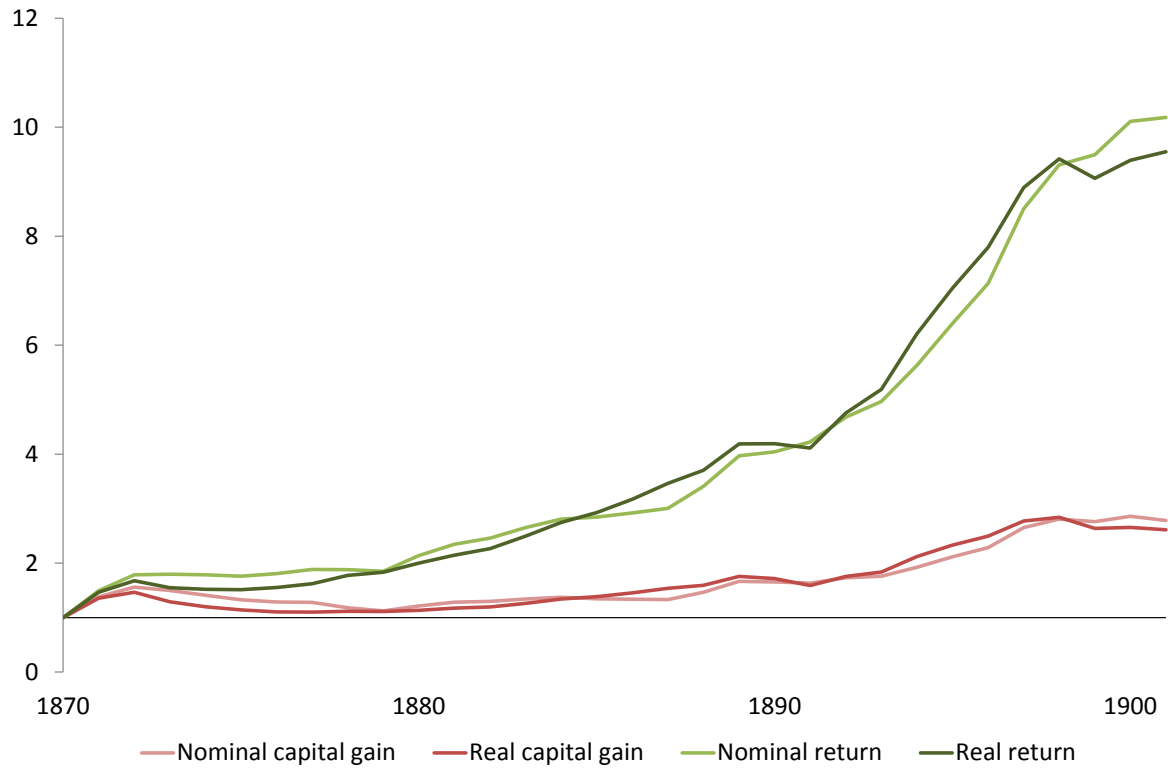
Figure 9: Equity risk premia across holding periods in Sweden, 1901–2012
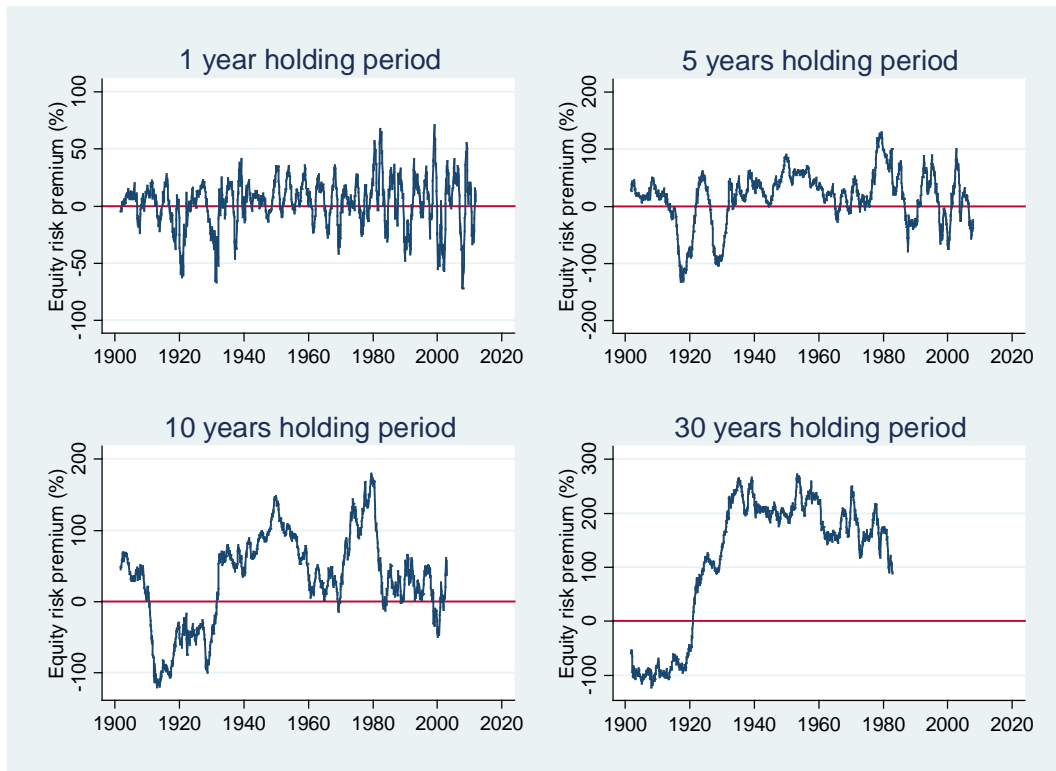
Note: The equity risk premium is measured as the return on equity (capital gains plus dividends) in excess of the return on safe assets such as government bonds or treasury bills.

Figure 10: Stock prices and returns in Stockholm and New York, 1901–2012
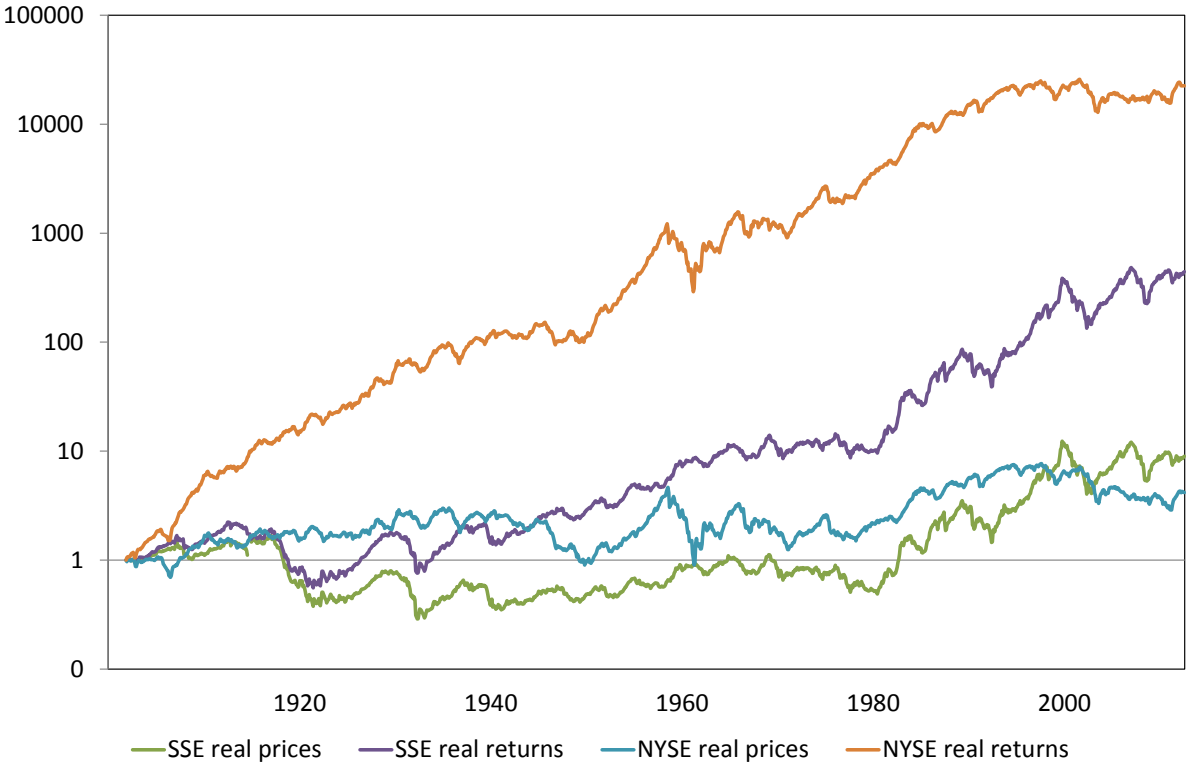
Figure 11: Moving correlations between Stockholm and New York returns, 1901–2012
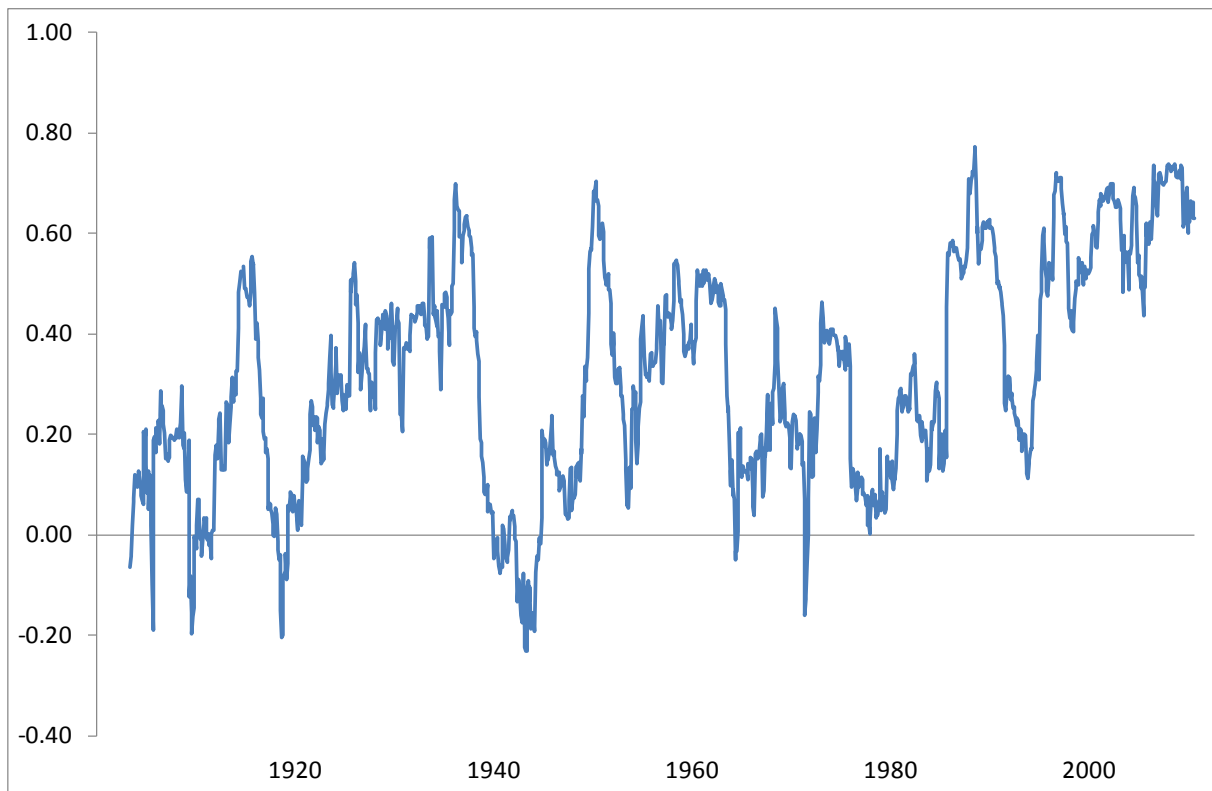
Note: The figure shows 36-month rolling correlations (date at the 18th month) between monthly stock returns in New York (Shiller, 2000, and updates at Robert Shiller's webpage) and in Stockholm (this dataset).

Table 1: Stock market returns in Sweden (percent)

	Nominal total stock return		Real total stock return		Nominal total capital gain		Real total capital gain		Dividend yield
	A	G	A	G	A	G	A	G	A
1901–2012	10.1	7.8	6.5	4.2	6.0	3.8	2.5	0.2	3.9
	(0.2)		(0.2)		(0.2)		(0.2)		(0)
1900–1909	5.5	5.1	4.2	3.8	2.5	2.2	1.3	0.9	2.9
	(8.6)		(9.4)		(8.1)		(8.9)		(1.5)
1910–1919	2.7	1.1	–4.9	–7.1	–1.3	–2.9	–8.7	–10.8	4.1
	(18.6)		(20.2)		(18.3)		(19.6)		(0.6)
1920–1929	3.6	2.2	8.0	7.0	–1.8	–3.2	2.3	1.4	5.5
	(17.8)		(14.4)		(17)		(13.7)		(0.8)
1930–1939	0.8	–1.9	0.2	–2.6	–4.0	–6.7	–4.6	–7.4	5.0
	(24.4)		(24.6)		(23.5)		(23.6)		(0.9)
1940–1949	10.1	9.7	5.5	5.1	5.0	4.8	0.7	0.4	4.7
	(8.6)		(9.5)		(7.9)		(9.1)		(0.9)
1950–1959	17.0	15.7	12.2	10.8	12.3	11.0	7.7	6.3	4.2
	(18.2)		(18.9)		(17.6)		(18.3)		(0.2)
1960–1969	8.7	7.5	4.8	3.5	5.0	3.9	1.3	0.1	3.4
	(16.7)		(17)		(16.1)		(16.3)		(0.3)
1970–1979	6.7	5.4	–1.8	–3.1	2.4	1.2	–5.8	–7.0	4.1
	(16.9)		(16.5)		(16.3)		(16)		(0.4)
1980–1989	32.1	29.4	22.9	20.3	28.6	26.0	19.6	17.1	2.7
	(26.7)		(25.1)		(26)		(24.6)		(1.1)
1990–1999	18.9	15.5	15.9	12.1	16.1	12.8	13.2	9.4	2.5
	(28.8)		(29.8)		(28.2)		(29.1)		(0.5)
2000–2009	5.2	–0.1	3.6	–1.6	1.4	–3.4	0.0	–4.9	3.5
	(33.6)		(33.5)		(31.3)		(31.2)		(4.2)
2010–2012	8.6	7.1	7.1	5.7	4.9	3.5	3.5	2.1	3.2
	(20.9)		(20.8)		(20.3)		(20.2)		(1.2)
1870–2012	10.9	9.0	7.9	6.1	6.6	4.8	3.7	2.0	4.3
	(0.2)		(0.2)		(0.2)		(0.2)		(0)
1870–1901	8.2	7.8	7.9	7.6	3.7	3.4	3.5	3.1	4.5
	(9.8)		(9.5)		(8.9)		(8.6)		(1.8)

Note: "A" stands for arithmetic mean and "G" for geometric mean. Standard deviations in parentheses.

Table 2: Extreme years and months on the Swedish stock market

Panel a) Months with highest and lowest nominal returns

Months with highest returns			Months with lowest returns		
Rank	Month	Return	Rank	Month	Return
1	1992:11	24.8	1	1932:3	−31.9
2	2009:4	19.5	2	1990:9	−25.3
3	1922:5	17.4	3	1987:10	−23.3
4	1983:2	17.3	4	2008:10	−19.9
5	1921:7	15.8	5	2002:9	−17.1
6	1999:12	14.8	6	1907:11	−16.2
7	2000:2	14.2	7	1987:11	−15.7
8	1922:4	13.7	8	2008:6	−15.7
9	1994:1	13.1	9	1940:4	−15.5
10	1986:3	12.8	10	1998:8	−15.1

Panel b) Years with highest and lowest nominal returns

Years with highest returns			Years with lowest returns		
Rank	Year	Return	Rank	Year	Return
1	1999	63.8	1	1918	−43.9
2	1983	50.1	2	2008	−43.3
3	2009	47.4	3	2002	−40.8
4	1986	46.2	4	1990	−40.1
5	1981	46.2	5	1931	−34.8
6	1993	46.0	6	1932	−28.3
7	1988	44.8	7	1970	−27.2
8	1959	44.7	8	1939	−26.2
9	2003	43.0	9	1914	−25.1
10	1996	42.2	10	1966	−24.8

Source:

Table 3: Fixed income returns and the equity risk premium in Sweden

| | Return on short-term bill | | | | Return on long-term bond | | | | Equity risk premium | |
| | Nominal | | Real | | Nominal | | Real | | | |
	A	G	A	G	A	G	A	G	A	G
1901–2012	5.4	5.3	1.9	1.7	6.2	5.8	2.8	2.1	4.7	2.5
	(0)		(0.1)		(0.1)		(0.1)			
1900–1909	5.2	5.2	3.7	3.7	3.4	3.3	2.0	1.9	0.3	–0.1
	(0.6)		(1.7)		(3.8)		(5.2)			
1910–1919	5.6	5.6	–2.5	–3.0	1.3	1.2	–6.4	–7.1	–2.9	–4.5
	(0.8)		(10.9)		(3.7)		(11.4)			
1920–1929	5.2	5.2	10.6	10.1	7.4	7.0	13.5	11.8	–1.6	–3.1
	(1)		(11.9)		(9.9)		(21.9)			
1930–1939	3.1	3.1	2.5	2.5	6.4	4.6	5.9	3.9	–2.3	–5.1
	(0.8)		(3.7)		(18.8)		(19.9)			
1940–1949	2.8	2.8	–1.3	–1.5	5.5	5.4	1.2	1.0	7.2	6.9
	(0.3)		(5.4)		(5)		(6.2)			
1950–1959	3.6	3.6	–0.8	–0.9	0.4	0.4	–3.8	–3.9	13.4	12.1
	(0.8)		(4.5)		(3.4)		(5.2)			
1960–1969	5.2	5.2	1.3	1.3	3.7	3.7	–0.1	–0.2	3.5	2.3
	(0.7)		(1.4)		(3.6)		(3.6)			
1970–1979	6.6	6.6	–2.1	–2.1	6.0	6.0	–2.5	–2.6	0.1	–1.1
	(1)		(1.5)		(2.5)		(3.5)			
1980–1989	11.5	11.5	3.7	3.6	11.2	11.0	3.3	3.0	20.6	17.9
	(1.6)		(3.4)		(7.2)		(8.5)			
1990–1999	8.4	8.3	5.2	5.2	14.7	13.9	11.4	10.6	10.5	7.2
	(4.1)		(3.1)		(14)		(13.7)			
2000–2009	2.9	2.9	1.4	1.4	6.8	6.5	5.2	4.9	2.2	–3.0
	(1.2)		(1.1)		(9.2)		(9.5)			
2010–2012	1.2	1.2	–0.2	–0.2	8.4	8.1	6.8	6.6	7.3	5.9
	(0.7)		(1.7)		(10.2)		(9.7)			
1870–2012	5.2	5.2	2.3	2.2	5.3	5.3	2.3	2.3	5.6	3.8
	(0.0)		(0.1)		(0.0)		(0.0)			
1870–1901	4.8	4.8	4.6	4.6	4.0	4.0	3.8	3.8	3.4	3.0
	(0.0)		(0.0)		(0.0)		(0.0)			

Note: "A" stands for arithmetic mean and "G" for geometric mean. Standard deviations in parentheses. The equity premium is calculated as the difference between the nominal stock return and the nominal yield on a short-term government bill.

Appendix Table 1: Market data of the Stockholm Stock Exchange, 1863–2012.

	(1) Total trading volume	(2) Stock trading volume	(3) Bond trading volume	(4) Market capitalization	(5) GDP by activity	(6) Turnover	(7) Trading volume /GDP	(8) Market cap / GDP
	(MSEK)	(MSEK)	(MSEK)	(MSEK)	(MSEK)	(1)/(4) (%)	(1)/(5) (%)	(2)/(5) (%)
1863	0.240				892		0.03%	
1864	0.207				874		0.02%	
1865	0.504				864		0.06%	
1866	0.399				898		0.04%	
1867	0.523				919		0.06%	
1868	0.814				916		0.09%	
1869	0.584				931		0.06%	
1870	0.378			49	988	0.78%	0.04%	4.91%
1871	0.627			63	1,035	1.00%	0.06%	6.07%
1872	0.815			84	1,164	0.97%	0.07%	7.24%
1873	1.069			86	1,372	1.25%	0.08%	6.23%
1874	0.886			69	1,411	1.29%	0.06%	4.87%
1875	0.460			60	1,382	0.76%	0.03%	4.38%
1876	0.332			68	1,435	0.49%	0.02%	4.74%
1877	0.470			57	1,431	0.83%	0.03%	3.96%
1878	0.676			59	1,326	1.15%	0.05%	4.44%
1879	2.212			43	1,278	5.09%	0.17%	3.40%
1880	4.241			113	1,356	3.74%	0.31%	8.37%
1881	1.924			100	1,379	1.93%	0.14%	7.24%
1882	1.015			107	1,421	0.95%	0.07%	7.54%
1883	1.857			127	1,431	1.47%	0.13%	8.85%
1884	2.073			128	1,436	1.63%	0.14%	8.88%
1885	2.467			131	1,396	1.88%	0.18%	9.39%
1886	2.516			136	1,316	1.85%	0.19%	10.32%
1887	1.958			128	1,254	1.53%	0.16%	10.24%
1888	2.250			117	1,346	1.93%	0.17%	8.68%
1889	2.752			133	1,417	2.08%	0.19%	9.36%
1890	3.586			156	1,488	2.30%	0.24%	10.46%
1891	3.772			125	1,563	3.02%	0.24%	8.00%
1892	3.441			132	1,544	2.60%	0.22%	8.58%
1893	3.608			135	1,528	2.68%	0.24%	8.82%
1894	5.134			147	1,505	3.48%	0.34%	9.79%
1895	6.939			162	1,601	4.28%	0.43%	10.13%
1896	10.210			175	1,694	5.84%	0.60%	10.32%
1897	18.920			203	1,821	9.32%	1.04%	11.15%
1898	21.129			215	1,959	9.82%	1.08%	10.98%
1899	11.505			212	2,118	5.44%	0.54%	9.99%
1900	6.378			219	2,185	2.91%	0.29%	10.02%
1901	3.915			213	2,125	1.84%	0.18%	10.03%
1902	1.302			210	2,107	0.62%	0.06%	9.98%
1903	2.524			228	2,288	1.11%	0.11%	9.96%
1904	6.324			245	2,331	2.58%	0.27%	10.51%
1905	7.184			271	2,390	2.65%	0.30%	11.34%
1906	2.847			1,240	2,670	0.23%	0.11%	46.44%
1907	36.50			1,178	2,889	3.10%	1.26%	40.76%
1908	28.56			1,255	2,931	2.28%	0.97%	42.82%

1909	38.66			1,301	2,899	2.97%	1.33%	44.88%
1910	87.40			1,917	3,118	4.56%	2.80%	61.47%
1911	180.53			2,173	3,178	8.31%	5.68%	68.38%
1912	318.25			2,059	3,388	15.46%	9.39%	60.76%
1913	180.02			2,061	3,636	8.74%	4.95%	56.67%
1914	51.60			1,730	3,762	2.98%	1.37%	45.99%
1915	50.92			2,135	4,349	2.39%	1.17%	49.08%
1916	604.75			3,430	5,472	17.63%	11.05%	62.67%
1917	1,322			4,624	6,329	28.59%	20.89%	73.06%
1918	1,586	1,581	5	4,392	8,611	36.11%	18.42%	51.01%
1919	526	520	7	3,734	10,243	14.09%	5.14%	36.46%
1920	328	324	4	2,352	11,566	13.96%	2.84%	20.33%
1921	162	146	16	2,133	8,477	7.59%	1.91%	25.16%
1922	195	146	49	1,809	7,153	10.78%	2.73%	25.29%
1923	161	114	47	1,724	7,145	9.35%	2.25%	24.12%
1924	170	127	43	1,916	7,384	8.85%	2.30%	25.95%
1925	233	179	53	2,076	7,646	11.20%	3.04%	27.15%
1926	285	201	84	2,259	7,674	12.62%	3.72%	29.43%
1927	444	350	94	2,705	7,790	16.40%	5.69%	34.73%
1928	621	507	115	2,317	8,058	26.81%	7.71%	28.75%
1929	576	492	84	3,985	8,407	14.45%	6.85%	47.40%
1930	638	512	126	3,975	8,488	16.05%	7.52%	46.83%
1931	602	531	72	2,708	7,796	22.24%	7.72%	34.74%
1932	240	162	78	1,728	7,437	13.88%	3.22%	23.24%
1933	226	135	91	1,954	7,399	11.58%	3.06%	26.41%
1934	301	200	101	2,389	8,137	12.59%	3.70%	29.36%
1935	264	184	81	2,580	8,670	10.25%	3.05%	29.76%
1936	575	487	87	3,421	9,244	16.81%	6.22%	37.01%
1937	511	438	72	3,299	10,239	15.48%	4.99%	32.22%
1938	334	265	69	3,569	10,685	9.37%	3.13%	33.40%
1939	266	192	73	2,835	11,830	9.37%	2.25%	23.96%
1940	129	84	45	2,881	12,632	4.47%	1.02%	22.81%
1941	211	132	79	3,362	13,831	6.27%	1.52%	24.31%
1942	245	169	75	3,683	15,105	6.64%	1.62%	24.38%
1943	243	109	133	4,068	16,258	5.97%	1.49%	25.02%
1944	281	125	156	4,498	16,763	6.24%	1.67%	26.83%
1945	464	188	276	4,784	17,515	9.70%	2.65%	27.31%
1946	536	188	348	5,040	19,764	10.64%	2.71%	25.50%
1947	868	222	646	4,699	22,034	18.48%	3.94%	21.33%
1948	490	132	358	4,263	24,465	11.49%	2.00%	17.42%
1949	249	188	61	4,888	25,340	5.10%	0.98%	19.29%
1950	319	218	101	5,901	28,276	5.40%	1.13%	20.87%
1951	406	223	183	6,758	35,508	6.01%	1.14%	19.03%
1952	249	168	82	6,359	39,611	3.92%	0.63%	16.05%
1953	236	153	84	7,015	39,703	3.37%	0.59%	17.67%
1954	325	240	85	9,591	42,119	3.39%	0.77%	22.77%
1955	260	189	72	8,680	45,130	3.00%	0.58%	19.23%
1956	286	160	125	8,740	49,371	3.27%	0.58%	17.70%
1957	336	220	115	9,808	52,962	3.42%	0.63%	18.52%
1958	380	261	119	11,412	55,116	3.33%	0.69%	20.71%
1959	496	358	138	16,137	58,013	3.07%	0.85%	27.82%
1960	442	342	100	16,981	63,275	2.60%	0.70%	26.84%
1961	433	318	115	16,980	69,442	2.55%	0.62%	24.45%
1962	384	277	107	17,600	75,648	2.18%	0.51%	23.27%

1963	583	428	155	20,550	81,257	2.83%	0.72%	25.29%
1964	689	601	89	24,075	91,343	2.86%	0.75%	26.36%
1965	846	735	111	23,770	101,342	3.56%	0.84%	23.46%
1966	754	656	98	20,000	109,586	3.77%	0.69%	18.25%
1967	652	506	146	21,000	119,583	3.10%	0.55%	17.56%
1968	1,159	891	268	30,000	127,784	3.86%	0.91%	23.48%
1969	1,425	912	231	28,200	137,947	5.05%	1.03%	20.44%
1970	883	708	175	24,000	152,975	3.68%	0.58%	15.69%
1971	1,311	1,062	249	28,400	167,126	4.61%	0.78%	16.99%
1972	1,881	1,602	279	32,900	179,643	5.72%	1.05%	18.31%
1973	2,410	2,034	376	32,100	200,265	7.51%	1.20%	16.03%
1974	2,639	2,111	528	33,500	236,884	7.88%	1.11%	14.14%
1975	2,842	2,061	781	42,700	276,086	6.65%	1.03%	15.47%
1976	3,270	2,146	1,123	43,800	311,851	7.46%	1.05%	14.05%
1977	3,432	1,751	1,681	35,000	336,939	9.81%	1.02%	10.39%
1978	4,947	1,817	3,131	44,000	373,436	11.24%	1.32%	11.78%
1979	6,899	1,900	4,999	44,000	420,438	15.68%	1.64%	10.47%
1980	17,041	7,598	9,443	56,461	475,040	30.18%	3.59%	11.89%
1981	25,262	18,580	6,682	95,909	517,326	26.34%	4.88%	18.54%
1982	36,555	29,054	7,501	135,691	569,881	26.94%	6.41%	23.81%
1983	86,000	75,000	11,000	241,960	634,618	35.54%	13.55%	38.13%
1984	81,000	71,000	9,919	231,000	708,723	35.06%	11.43%	32.59%
1985	97,000	83,358	14,586	284,641	763,610	34.08%	12.70%	37.28%
1986	173,000	141,660	31,000	433,000	840,304	39.95%	20.59%	51.53%
1987	147,700	124,566	22,700	412,051	904,392	35.85%	16.33%	45.56%
1988	139,400	115,000	24,400	614,000	988,046	22.70%	14.11%	62.14%
1989	128,200	113,000	15,200	744,000	1,096,193	17.23%	11.70%	67.87%
1990	102,300	94,000	8,300	525,000	1,196,088	19.49%	8.55%	43.89%
1991	133,200	125,000	8,200	558,000	1,255,284	23.87%	10.61%	44.45%
1992	182,500	166,000	16,500	552,000	1,269,103	33.06%	14.38%	43.50%
1993	343,700	321,000	22,700	892,000	1,276,770	38.53%	26.92%	69.86%
1994	670,500	628,000	42,500	977,000	1,355,746	68.63%	49.46%	72.06%
1995	703,100	664,800	38,300	1,180,000	1,468,283	59.58%	47.89%	80.37%
1996	936,200	918,100	18,100	1,688,000	1,509,366	55.46%	62.03%	111.84%
1997	1,362,000	1,345,600	16,400	1,838,000	1,570,262	74.10%	86.74%	117.05%
1998	1,845,800	1,829,900	15,900	2,413,000	1,630,486	76.49%	113.21%	147.99%
1999	2,624,700	2,608,900	15,800	3,717,000	1,704,541	70.61%	153.98%	218.06%
2000	4,469,300	4,455,900	14,400	3,583,400	1,813,900	124.72%	246.39%	197.55%
2001	4,000,500	3,994,400	6,100	2,855,700	1,876,741	140.09%	213.16%	152.16%
2002	2,707,400	2,701,800	5,600	1,779,700	1,950,718	152.13%	138.79%	91.23%
2003	2,459,000	2,453,200	5,800	2,314,200	2,032,805	106.26%	120.97%	113.84%
2004	3,397,900	3,390,700	7,200	2,699,100	2,128,951	125.89%	159.60%	126.78%
2005	3,768,241	3,763,500	4,741	3,507,300	2,208,465	107.44%	170.63%	158.81%
2006	5,528,876	5,521,000	7,876	4,275,000	2,351,089	129.33%	235.16%	181.83%
2007	6,542,076	6,523,670	18,405	3,958,690	2,498,031	165.26%	261.89%	158.47%
2008	4,705,292	4,693,974	11,318	2,239,352	2,561,909	210.12%	183.66%	87.41%
2009	3,434,024	3,417,100	16,924	3,412,566	2,471,261	100.63%	138.96%	138.09%
2010	3,640,265	3,627,000	13,265	4,229,605	2,650,126	86.07%	137.36%	159.60%
2011	3,807,619	3,798,500	9,119	3,496,356	2,778,941	108.90%	137.02%	125.82%
2012	2,904,196	2,892,000	12,196	3,739,806	2,914,017	77.66%	99.66%	128.34%

Note: All values in columns 1–5 are in current prices. GDP by activity from Edvinsson (this volume).

Appendix Table 2: Stock price and return indices, 1870–2012.

	Nominal stock price index (1901 = 1)	Real stock price index (1901 = 1)	Nominal stock return index (1901 = 1)	Real stock return index (1901 = 1)	CPI (1901 = 1)	Dividend index	Dividend yield
1870	0.359	0.385	0.098	0.105	0.934		
1871	0.497	0.521	0.147	0.154	0.953	0.092	6.07
1872	0.561	0.564	0.175	0.176	0.995	0.087	5.11
1873	0.538	0.497	0.176	0.163	1.083	0.088	5.34
1874	0.507	0.461	0.175	0.160	1.099	0.082	5.28
1875	0.477	0.438	0.173	0.159	1.088	0.073	5.00
1876	0.462	0.425	0.177	0.163	1.087	0.078	5.58
1877	0.460	0.424	0.185	0.170	1.085	0.054	3.89
1878	0.425	0.430	0.185	0.187	0.989	0.051	3.91
1879	0.403	0.428	0.182	0.193	0.944	0.047	3.82
1880	0.436	0.436	0.210	0.210	1.000	0.089	6.69
1881	0.461	0.452	0.230	0.226	1.021	0.053	3.77
1882	0.466	0.459	0.242	0.238	1.014	0.054	3.78
1883	0.483	0.486	0.261	0.262	0.993	0.061	4.15
1884	0.493	0.516	0.276	0.289	0.956	0.054	3.61
1885	0.483	0.533	0.279	0.308	0.907	0.048	3.26
1886	0.481	0.559	0.287	0.334	0.860	0.048	3.31
1887	0.479	0.591	0.295	0.364	0.810	0.047	3.25
1888	0.527	0.613	0.335	0.389	0.860	0.050	3.11
1889	0.599	0.676	0.390	0.440	0.886	0.046	2.50
1890	0.594	0.660	0.397	0.441	0.901	0.046	2.52
1891	0.587	0.611	0.415	0.432	0.960	0.058	5.92
1892	0.622	0.676	0.460	0.500	0.920	0.048	4.55
1893	0.632	0.707	0.488	0.545	0.894	0.046	4.36
1894	0.692	0.816	0.553	0.652	0.848	0.042	3.65
1895	0.761	0.897	0.629	0.741	0.848	0.042	3.29
1896	0.821	0.959	0.701	0.819	0.855	0.047	3.38
1897	0.953	1.066	0.835	0.935	0.894	0.042	2.61
1898	1.009	1.093	0.915	0.990	0.924	0.058	3.40
1899	0.992	1.014	0.933	0.953	0.979	0.062	3.71
1900	1.027	1.022	0.993	0.987	1.006	0.049	2.82
1901	1.000	1.004	1.000	1.004	0.996	0.052	5.17
1902	0.986	0.982	1.002	0.998	1.004	0.043	4.31
1903	1.069	1.047	1.100	1.077	1.021	0.041	3.82
1904	1.150	1.140	1.226	1.215	1.009	0.049	4.30
1905	1.272	1.235	1.406	1.365	1.030	0.051	3.98
1906	1.397	1.328	1.596	1.518	1.052	0.051	3.64
1907	1.204	1.089	1.424	1.287	1.106	0.054	4.51
1908	1.232	1.098	1.519	1.353	1.123	0.056	4.53
1909	1.263	1.135	1.628	1.463	1.113	0.061	4.81
1910	1.400	1.259	1.881	1.692	1.112	0.060	4.30
1911	1.547	1.351	2.161	1.887	1.145	0.061	3.91
1912	1.673	1.430	2.426	2.074	1.170	0.071	4.22
1913	1.613	1.375	2.428	2.070	1.173	0.072	4.49
1914	1.181	0.994	1.855	1.561	1.188	0.071	6.04
1915	1.352	0.990	2.201	1.612	1.365	0.061	4.52
1916	1.729	1.122	2.919	1.893	1.542	0.060	3.48
1917	1.674	0.861	2.934	1.509	1.945	0.065	3.88

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1918	1.281	0.473	2.351	0.867	2.711	0.068	5.27
1919	1.011	0.390	1.959	0.755	2.593	0.059	5.79
1920	0.778	0.294	1.594	0.603	2.642	0.057	7.38
1921	0.570	0.288	1.244	0.629	1.977	0.038	6.67
1922	0.503	0.292	1.164	0.676	1.722	0.032	6.33
1923	0.481	0.282	1.161	0.682	1.703	0.023	4.80
1924	0.533	0.304	1.369	0.782	1.752	0.026	4.85
1925	0.579	0.340	1.578	0.927	1.703	0.032	5.54
1926	0.631	0.379	1.826	1.097	1.664	0.036	5.67
1927	0.756	0.457	2.308	1.396	1.654	0.034	4.46
1928	0.880	0.532	2.812	1.700	1.654	0.043	4.83
1929	0.828	0.510	2.754	1.695	1.624	0.043	5.16
1930	0.731	0.467	2.548	1.627	1.566	0.038	5.15
1931	0.458	0.300	1.669	1.092	1.528	0.025	5.50
1932	0.334	0.218	1.302	0.849	1.534	0.018	5.50
1933	0.373	0.249	1.550	1.032	1.502	0.022	5.88
1934	0.463	0.305	2.009	1.320	1.522	0.022	4.72
1935	0.488	0.317	2.213	1.437	1.540	0.023	4.76
1936	0.651	0.420	3.097	1.999	1.549	0.028	4.30
1937	0.621	0.385	3.078	1.906	1.615	0.031	5.00
1938	0.646	0.400	3.350	2.073	1.616	0.030	4.68
1939	0.493	0.284	2.688	1.552	1.732	0.032	6.41
1940	0.519	0.259	2.999	1.495	2.006	0.029	5.62
1941	0.606	0.268	3.730	1.648	2.263	0.031	5.08
1942	0.665	0.273	4.274	1.752	2.439	0.031	4.70
1943	0.709	0.292	4.778	1.970	2.426	0.032	4.50
1944	0.783	0.324	5.511	2.279	2.418	0.032	4.06
1945	0.828	0.345	6.066	2.524	2.403	0.033	3.97
1946	0.909	0.364	6.931	2.774	2.499	0.036	4.01
1947	0.846	0.336	6.688	2.654	2.520	0.037	4.32
1948	0.771	0.287	6.387	2.379	2.685	0.038	4.91
1949	0.840	0.317	7.292	2.752	2.650	0.038	4.48
1950	1.035	0.370	9.369	3.345	2.801	0.037	3.61
1951	1.222	0.372	11.539	3.512	3.286	0.048	3.97
1952	1.044	0.308	10.265	3.027	3.391	0.055	5.23
1953	1.182	0.349	12.146	3.582	3.391	0.053	4.51
1954	1.566	0.457	16.794	4.898	3.429	0.056	3.59
1955	1.466	0.403	16.352	4.499	3.635	0.063	4.28
1956	1.442	0.383	16.775	4.455	3.766	0.068	4.73
1957	1.500	0.384	18.192	4.652	3.911	0.072	4.78
1958	1.758	0.436	22.260	5.516	4.036	0.072	4.09
1959	2.515	0.615	33.011	8.073	4.089	0.074	2.94
1960	2.526	0.595	34.263	8.072	4.245	0.080	3.15
1961	2.510	0.578	35.104	8.085	4.342	0.087	3.45
1962	2.301	0.504	33.324	7.303	4.563	0.091	3.96
1963	2.850	0.606	42.739	9.087	4.703	0.095	3.32
1964	3.313	0.678	51.259	10.490	4.886	0.099	2.98
1965	3.549	0.686	56.646	10.941	5.178	0.113	3.19
1966	2.743	0.504	45.268	8.315	5.444	0.124	4.53
1967	2.851	0.506	48.964	8.696	5.630	0.127	4.45
1968	3.823	0.666	68.291	11.888	5.745	0.129	3.38
1969	3.911	0.656	72.092	12.087	5.964	0.140	3.58
1970	3.025	0.469	58.324	9.044	6.449	0.150	4.96
1971	3.683	0.533	74.012	10.714	6.908	0.152	4.12

1972	4.062	0.556	84.779	11.604	7.306	0.152	3.75
1973	4.046	0.515	87.621	11.147	7.860	0.158	3.91
1974	3.952	0.451	88.960	10.158	8.757	0.183	4.63
1975	5.112	0.535	119.519	12.517	9.549	0.200	3.91
1976	5.171	0.494	125.321	11.967	10.472	0.223	4.32
1977	4.360	0.370	109.700	9.304	11.791	0.218	4.99
1978	5.069	0.400	133.151	10.516	12.661	0.207	4.09
1979	5.005	0.360	138.118	9.936	13.901	0.237	4.73
1980	6.118	0.386	177.404	11.191	15.853	0.290	4.74
1981	9.631	0.557	289.913	16.754	17.304	0.339	3.52
1982	13.014	0.686	406.709	21.445	18.965	0.392	3.01
1983	21.619	1.044	688.889	33.270	20.706	0.433	2.00
1984	19.196	0.856	624.256	27.843	22.421	0.481	2.51
1985	24.121	1.019	803.508	33.960	23.661	0.507	2.10
1986	36.320	1.485	1234.301	50.479	24.452	0.656	1.81
1987	33.462	1.301	1160.709	45.132	25.718	0.806	2.41
1988	50.822	1.865	1803.934	66.196	27.252	0.970	1.91
1989	63.264	2.174	2292.398	78.764	29.105	1.207	1.91
1990	43.613	1.351	1619.800	50.165	32.290	1.488	3.41
1991	45.999	1.321	1758.852	50.510	34.822	1.600	3.48
1992	45.748	1.293	1803.842	50.986	35.379	1.503	3.29
1993	70.321	1.908	2825.601	76.662	36.858	1.022	1.45
1994	73.729	1.950	3010.548	79.610	37.816	1.196	1.62
1995	87.009	2.250	3631.703	93.934	38.662	1.746	2.01
1996	120.072	3.128	5179.898	134.962	38.380	3.257	2.71
1997	150.030	3.846	6626.042	169.843	39.013	3.156	2.10
1998	165.857	4.299	7493.292	194.247	38.576	4.054	2.44
1999	274.896	7.033	12720.402	325.430	39.088	4.376	1.59
2000	241.198	6.102	11346.166	287.066	39.525	4.966	2.06
2001	201.287	4.960	9662.145	238.109	40.579	4.303	2.14
2002	126.363	3.051	6193.143	149.514	41.422	3.739	2.96
2003	163.725	3.903	9128.919	217.620	41.949	4.610	2.82
2004	192.360	4.572	10414.523	247.557	42.069	4.839	2.52
2005	253.196	5.967	14194.425	334.532	42.431	7.171	2.83
2006	314.607	7.294	18199.402	421.950	43.132	8.380	2.66
2007	292.672	6.560	17733.182	397.464	44.616	15.969	5.46
2008	170.320	3.783	10758.766	238.989	45.018	12.368	7.26
2009	250.168	5.507	16429.821	361.651	45.430	7.534	3.01
2010	308.325	6.632	20801.469	447.425	46.492	7.586	2.46
2011	257.025	5.423	17952.052	378.747	47.398	11.356	4.42
2012	287.765	6.075	20964.224	442.586	47.368	10.849	3.77

Appendix Table 3: Yields on short- and long-term government securities, 1856–2012

	Short-term government bill yield (%)	Short-term government bill yield index (1901 = 1)	Long-term government bond yield (%)	Long-term government bond yield index (1901 = 1)
1856	5.00	0.11		
1857	5.00	0.12		
1858	5.00	0.12		
1859	6.00	0.13		
1860	6.00	0.14		
1861	6.00	0.15		
1862	6.00	0.16		
1863	6.00	0.17		
1864	6.00	0.18		
1865	6.00	0.19		
1866	6.00	0.20		
1867	4.50	0.21		
1868	4.50	0.22		
1869	4.50	0.23		
1870	4.50	0.24		
1871	4.00	0.25		
1872	4.00	0.26		
1873	5.50	0.27		
1874	5.50	0.29	4.40	0.32
1875	5.50	0.30	4.48	0.33
1876	5.50	0.32	4.59	0.34
1877	6.00	0.34	4.55	0.35
1878	6.00	0.36	4.63	0.36
1879	5.00	0.38	4.36	0.40
1880	4.00	0.39	4.09	0.44
1881	4.00	0.41	4.06	0.46
1882	4.50	0.43	4.11	0.48
1883	5.00	0.45	4.09	0.50
1884	4.50	0.47	4.12	0.51
1885	4.50	0.49	3.98	0.54
1886	4.00	0.51	3.87	0.58
1887	4.00	0.53	3.87	0.60
1888	3.50	0.55	3.60	0.65
1889	4.00	0.57	3.58	0.68
1890	6.00	0.60	3.68	0.68
1891	5.50	0.63	3.84	0.68
1892	4.50	0.66	3.86	0.70
1893	4.00	0.69	3.74	0.75
1894	4.00	0.71	3.60	0.81
1895	4.00	0.74	3.58	0.84
1896	4.50	0.77	3.55	0.88
1897	5.00	0.81	3.55	0.91
1898	5.50	0.85	3.62	0.93
1899	6.00	0.90	3.78	0.92
1900	6.00	0.95	3.87	0.93
1901	5.00	1.01	3.75	1.00
1902	4.50	1.06	3.66	1.06
1903	4.50	1.11	3.66	1.09
1904	5.00	1.16	3.67	1.13
1905	5.50	1.22	3.79	1.14

1906	6.00	1.28	3.87	1.15
1907	7.00	1.36	4.14	1.12
1908	5.50	1.44	3.93	1.22
1909	5.00	1.51	3.83	1.30
1910	5.00	1.58	3.95	1.31
1911	5.00	1.66	3.98	1.34
1912	5.50	1.74	4.09	1.36
1913	5.50	1.84	4.39	1.31
1914	6.00	1.93	4.77	1.25
1915	5.50	2.04	5.37	1.31
1916	5.50	2.15	5.05	1.39
1917	7.00	2.28	5.45	1.39
1918	7.00	2.44	5.52	1.38
1919	6.00	2.61	5.46	1.48
1920	7.50	2.79	6.49	1.32
1921	5.50	2.98	5.47	1.66
1922	4.50	3.13	4.76	2.00
1923	5.50	3.28	4.83	2.07
1924	5.50	3.46	5.00	2.10
1925	4.50	3.64	4.78	2.30
1926	4.50	3.81	4.73	2.44
1927	4.00	3.97	4.58	2.64
1928	4.50	4.14	4.65	2.72
1929	5.00	4.34	4.46	2.97
1930	3.50	4.51	4.11	3.36
1931	6.00	4.70	4.80	3.00
1932	3.50	4.92	4.01	3.75
1933	2.50	5.08	3.71	4.21
1934	2.50	5.21	3.01	5.38
1935	2.50	5.34	3.32	5.03
1936	2.50	5.47	3.03	5.69
1937	2.50	5.61	2.98	5.96
1938	2.50	5.75	2.46	7.39
1939	3.00	5.90	3.75	4.99
1940	3.50	6.10	3.66	5.32
1941	3.00	6.29	3.22	6.26
1942	3.00	6.49	3.24	6.42
1943	3.00	6.68	3.29	6.53
1944	3.00	6.89	3.24	6.85
1945	2.50	7.07	3.01	7.61
1946	2.50	7.24	3.02	7.81
1947	2.50	7.43	3.04	8.00
1948	2.50	7.62	3.09	8.12
1949	2.50	7.81	3.02	8.56
1950	3.00	8.01	3.32	8.20
1951	3.00	8.25	3.20	8.48
1952	3.00	8.50	3.30	8.29
1953	2.75	8.76	3.21	8.43
1954	2.75	9.00	3.37	8.24
1955	3.75	9.31	3.75	7.93
1956	4.00	9.67	4.05	7.97
1957	5.00	10.11	4.46	8.15
1958	4.50	10.59	4.27	8.60
1959	4.50	11.08	4.44	8.93

1960	5.00	11.64	4.44	8.99
1961	5.00	12.24	4.55	9.29
1962	4.00	12.79	4.83	10.21
1963	4.00	13.28	5.22	10.38
1964	5.00	13.89	5.87	10.42
1965	5.50	14.65	6.38	10.68
1966	6.00	15.52	6.35	11.21
1967	6.00	16.34	6.80	12.20
1968	5.00	17.26	6.19	12.95
1969	7.00	18.38	7.27	12.85
1970	7.00	19.70	7.32	13.83
1971	5.00	20.94	7.14	15.10
1972	5.00	22.02	7.34	16.07
1973	5.00	23.14	7.37	17.32
1974	7.00	24.57	8.17	17.75
1975	6.00	26.26	9.15	18.09
1976	8.00	27.91	9.61	19.15
1977	8.00	30.23	9.84	20.63
1978	6.50	32.43	10.09	22.25
1979	9.00	34.79	10.91	23.16
1980	10.00	38.40	12.61	23.54
1981	11.00	43.13	12.80	26.42
1982	10.00	47.76	13.01	29.52
1983	11.80	53.36	12.44	34.32
1984	11.50	60.14	12.25	39.12
1985	12.65	69.39	12.59	43.42
1986	9.30	76.71	10.58	54.20
1987	9.00	84.21	11.74	56.75
1988	10.40	92.97	10.93	66.53
1989	12.30	104.10	12.55	67.68
1990	14.15	118.85	12.35	77.47
1991	13.77	133.26	10.00	99.02
1992	10.68	152.53	9.91	110.20
1993	7.27	166.48	7.27	142.84
1994	7.91	178.90	10.89	126.30
1995	8.61	194.79	8.60	160.72
1996	3.71	206.95	6.85	196.92
1997	4.34	215.51	5.97	224.17
1998	3.46	224.76	4.17	272.07
1999	3.38	231.78	5.72	257.04
2000	4.11	240.79	4.86	294.10
2001	3.73	250.61	5.35	295.09
2002	3.62	260.96	4.71	330.18
2003	2.73	269.22	4.78	343.17
2004	1.99	275.06	4.03	385.18
2005	1.62	279.85	3.34	425.46
2006	2.97	286.07	3.81	421.72
2007	4.03	295.97	4.35	417.15
2008	1.60	308.10	2.43	521.22
2009	0.20	309.85	3.30	494.60
2010	1.30	311.17	3.28	510.07
2011	1.70	316.70	1.62	615.07
2012	1.05	321.37	1.53	629.91