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THE HISTORICAL EQUITY RISK PREMIUM IN AUSTRALIA: POST-GFC AND 128 YEARS OF DATA

Tim Brailsford¹, John C. Handley² and Krishnan Maheswaran³

Abstract:

We present an updated set of estimates of the historical equity risk premium in Australia covering the 128 calendar years from January 1883 to December 2010. Relative to bonds (bills), the observed equity premium has averaged 6.1% (6.5%) p.a. over this period and we report a similar number for later periods of relatively good quality data. We also provide estimates that incorporate an adjustment for distributed imputation credits and include the annual time series of data relating to each of the underlying components – stock, bill and bond returns and inflation.

Keywords:

Cost of Capital; Equity Risk Premium; CAPM; Valuation.

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JEL Classification:

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1. Introduction

In an earlier study, Brailsford, Handley and Maheswaran (2008) (hereafter BHM (2008)) provide estimates of the historical equity risk premium (or equivalently, estimates of historical excess returns) in Australia for the period 1883 to 2005. These and other estimates are particularly useful given the need for the equity risk premium in a variety of settings in both academe and practice. In this short paper, we update the historical estimates to include the latest available data to the end of 2010. The motivation for this update is twofold. First, there have been a number of significant developments in financial markets, subsequent to the end point of the previous study, notably including the global financial crisis (GFC) of 2008, which are not reflected in the earlier data. Second, in addition to providing updated tables of summary statistics, we believe it is useful to also provide the annual time series of data relating to each of the underlying components – stock, bill and bond returns and inflation.

Given the fundamental nature of the ex-ante equity risk premium and the direct relevance it has to practice, our purpose is not to debate the various alternative approaches to estimation or whether ex-post historical measures can represent ex-ante expectations, but rather to simply document the historical record. We do, however, note that the observability of past returns appears to be an important factor contributing to the continued use of historical data in this context.¹

2. Method

Our sources and methodologies are consistent with our earlier study in BHM (2008). In particular, we use the same stock, bill and bond return and inflation data for the period 1883 to 2005,² and supplement these data with five years of additional data for the calendar years 2006 to 2010 as follows.

2.1 Stock Returns

Daily closing values of the All Ordinaries Price Index and the All Ordinaries Accumulation Index during 2006 to 2010 are obtained from the Australian Stock Exchange. The annual Historical Stock Accumulation Index Series of BHM (2008) is extended by setting the 2006-10 annual values of the series equal to the average value of the All Ordinaries Accumulation

¹ As Dimson, Marsh and Staunton (2002, p.163) note: "... in practice, and perhaps because of its measurability, the historical risk premium is often treated as a proxy for the prospective risk premium".

² See BHM (2008) for full details of data sources and construction of the return series.

Index in each December. This leads to an annual series of (discrete) stock returns – attributable to dividends and capital gains/losses – for the 128 calendar years from 1883 to 2010. Similarly, the annual Historical Stock Price Index Series of BHM (2008) is extended by setting the 2006-10 annual values of the series equal to the average value of the All Ordinaries Price Index in the respective Decembers. This leads to an annual series of (discrete) stock returns – attributable to capital gains/losses – for the 128 calendar years from 1883 to 2010. The annual dividend return is implied from the Historical Stock Price Index and Historical Stock Accumulation Index each year. Specifically, the implied dividend return each year is equal to the simple difference between the annual return on the stock accumulation index and the annual return on the stock price index.

2.2 Bond Returns

Daily yields on 10 year Commonwealth Government treasury bonds during 2006 to 2010 are obtained from the Reserve Bank of Australia (RBA) website. The annual Historical Bond Return Series of BHM (2008) is extended by setting the 2006-10 annual values of the series equal to the yield at the end of each respective December.

2.3 Bill Returns

Daily yields on 90 day Bank Accepted Bills during 2006, 2007 and 2008 are obtained from the RBA website. Daily yields on three month treasury notes during 2009 and 2010 are also sourced from the RBA website.³ The annual Historical Bill Return Series of BHM (2008) is extended by setting the (December) 2006, 2007, 2008, 2009 and 2010 values of the series equal to the geometric average of the “bill” yields at the end of the previous four quarters (for example, the December 2006 value is based on the yields at the end of December 2005, March 2006, June 2006 and September 2006). For this purpose, “bills” refer to 90 day Bank Accepted Bills from December 2005 to December 2008 and to three month treasury notes from March 2009. Each return in the series reflects the annual return on a rolling investment in bills assuming reinvestment on a quarterly basis.

³ As noted in BHM (2008, p.84), the Commonwealth Government suspended issues of three month treasury notes in December 2002 and so yields on 90 day Bank Accepted Bills were used from that time. However, yields on three month treasury notes have been used since March 2009 following the recommencement of issuance by the Commonwealth Government at that time (See Australian Office of Financial Management (2009)).

2.4 Imputation Credit Yields

Weighted average imputation credit yields on the All Ordinaries Index during 2006 to 2010 are sourced from the Australian Taxation Office (ATO) website. The annual imputation credit yield series of BHM (2008) is extended by setting the 2006-10 annual values of the series equal to the (weighted) average imputation credit yield for the 12 months ending in each respective December.

2.5 Inflation

The annual Inflation Index Series of BHM (2008) is extended by using the December year end values of the “CPI: All Groups Weighted Average of Eight Capital Cities” series for each year from 2006 to 2010, as sourced from the Australian Bureau of Statistics (ABS).

3. Results

Table 1 sets out various statistics of the historical equity risk premium in Australia over a number of sample periods from January 1883 to December 2010. The differing start dates of 1883, 1937, 1958 and 1980 correspond to periods of increasing data quality but decreasing time series sample size. In BHM (2008), we document concerns about data quality the further back into the past one looks. In particular, we consider 1958 as a critical break in our sample period reflecting a switch from relatively poor quality data to relatively good quality data and suggest that there are sufficient question marks over the quality of data prior to 1958 to warrant any estimates based thereon to be treated with caution. The selection of 1988 as a start date of a sub-period reflects the introduction of the dividend imputation tax system in Australia.

As reported in the tables, AM is the arithmetic mean, SD is the standard deviation and GM is the geometric mean. The equity premium is defined as the (simple) difference between the stock return and the relevant proxy for the risk free rate – the return on bills or the return on bonds. Calculations are based on discrete returns and the stock return takes into account cash dividends and capital gains/losses. The real return is equal to the geometric difference between the corresponding nominal return and the inflation rate for that year.

From Table 1, our results show that:

- Relative to bills, the nominal equity risk premium averaged 6.5% p.a. over 1883–2010 and 6.6% p.a. over 1958–2010, which are both statistically significant (at the 5% level); and
- Relative to bonds, the nominal equity risk premium averaged 6.1% p.a. over 1883–2010 and over 1958–2010, which are both statistically significant (at the 5% level).

In comparison to our previous study, these estimates represent only a small decline on the estimates for the corresponding periods based on data up to the end of 2005 despite the inclusion of the GFC. That is, the long-term nature of the series has the effect of washing out particularly extreme episodic events and on the basis of these estimates, there appears to be no material adjustment required as a result of the GFC.

[INSERT TABLE 1 ABOUT HERE]

Table 2 sets out similar statistics of the historical equity risk premium in Australia assuming (distributed) imputation credits are valued at 50 cents in the dollar.⁴ Relative to 10 year bonds (bills), the grossed-up nominal equity risk premium has averaged 6.3% p.a. (6.6% p.a.) over 1883–2010. Relative to 10 year bonds (bills), the grossed-up nominal equity risk premium has averaged 6.5% p.a. (7.0% p.a.) over 1958–2010, which is a period of relatively good quality data.

[INSERT TABLE 2 ABOUT HERE]

Table 3 presents corresponding results assuming (distributed) imputation credits are valued at 100 cents in the dollar. As expected, the increase in the value attached to imputation credits leads to an increase in the historical equity risk premium. For instance, if we focus on the period since the introduction of imputation 1988-2010, then the equity risk premium estimate relative to bonds increases from 5.0% in Table 1 to 5.9% in Table 2 and then 6.8% in Table 3 (using the nominal arithmetic mean). Notwithstanding, we note that due to restrictions on data availability and the short sample period involved since the introduction of imputation,

⁴ For clarity, we only gross up the value of distributed imputation credits. In this case, the stock return takes into account cash dividends, the value of imputation credits attached to those dividends and capital gains/losses. Any value attributed by the market to retained imputation credits should already be included in the observed capital gain/loss.

these estimates are considered to be indicative only of the potential impact that imputation may have on the equity risk premium in Australia.

[INSERT TABLE 3 ABOUT HERE]

Finally, Figures 1 and 2 provide a plot of the time series of annual returns on the underlying components – stock, bill and bond returns and inflation – which have been used in the construction of these estimates. The annual observations of each series are detailed in the appendix.

[INSERT FIGURES 1 & 2 ABOUT HERE]

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TABLE 1
Historical Equity Risk Premium 1883-2010

This table sets out various statistics of the historical equity risk premium over a number of sample periods from January 1883 to December 2010. The first four periods are ones of increasing data quality but decreasing sample size. The fifth period reflects the introduction of the dividend imputation tax system in Australia. AM is the arithmetic mean, SD is the standard deviation, GM is the geometric mean. The base data are: (i) an annual series of nominal equity premia defined as the (simple) difference between the nominal stock return and the nominal risk free rate; and (ii) an annual series of real equity premia defined as the (simple) difference between the real stock return and the real risk free rate, where the real return each year is equal to the geometric difference between the nominal return and the inflation rate. The stock return is based on a stock accumulation index and takes into account cash dividends and capital gains only. Two measures of the risk free rate are used: the return on bills and the return on bonds. Calculations are based on discrete returns. * indicates significant at 5% level based on a two-tailed t-test.

Period	Years	Nominal			Real		
		AM	SD	GM	AM	SD	GM
PANEL A: Relative to Bills							
1883–2010	128	0.065*	0.168	0.050	0.064*	0.159	0.051
1937–2010	74	0.063*	0.201	0.042	0.061*	0.188	0.043
1958–2010	53	0.066*	0.229	0.040	0.064*	0.215	0.041
1980–2010	31	0.059	0.234	0.031	0.057	0.221	0.032
1988–2010	23	0.051	0.195	0.030	0.050	0.189	0.031
PANEL B: Relative to Bonds							
1883–2010	128	0.061*	0.166	0.047	0.061*	0.158	0.048
1937–2010	74	0.057*	0.199	0.037	0.055*	0.186	0.038
1958–2010	53	0.061*	0.227	0.036	0.060*	0.212	0.037
1980–2010	31	0.058	0.229	0.032	0.056	0.216	0.032
1988–2010	23	0.050	0.188	0.031	0.049	0.182	0.031

TABLE 2
Historical Equity Risk Premium 1883-2010
(Grossed-up for the Value of Imputation Credits
assuming Credits are Valued at 50 Cents in the Dollar)

This table sets out various statistics of the historical equity risk premium over a number of sample periods from January 1883 to December 2010. The first four periods are ones of increasing data quality but decreasing sample size. The fifth period reflects the introduction of the dividend imputation tax system in Australia. AM is the arithmetic mean, SD is the standard deviation, GM is the geometric mean. The base data are: (i) an annual series of nominal equity premia defined as the (simple) difference between the nominal stock return and the nominal risk free rate; and (ii) an annual series of real equity premia defined as the (simple) difference between the real stock return and the real risk free rate, where the real return each year is equal to the geometric difference between the nominal return and the inflation rate. The stock return is based on a stock accumulation index and takes into account cash dividends, capital gains and the value of imputation credits assuming (distributed) credits are valued at 50 cents in the dollar. Two measures of the risk free rate are used: the return on bills and the return on bonds. Calculations are based on discrete returns. * indicates significant at 5% level based on a two-tailed t-test.

Period	Years	Nominal			Real		
		AM	SD	GM	AM	SD	GM
PANEL A: Relative to Bills							
1883–2010	128	0.066*	0.168	0.052	0.065*	0.160	0.053
1937–2010	74	0.065*	0.201	0.045	0.064*	0.188	0.046
1958–2010	53	0.070*	0.230	0.044	0.068*	0.215	0.045
1980–2010	31	0.066	0.235	0.038	0.063	0.221	0.038
1988–2010	23	0.060	0.196	0.039	0.059	0.190	0.039
PANEL B: Relative to Bonds							
1883–2010	128	0.063*	0.166	0.049	0.062*	0.158	0.050
1937–2010	74	0.060*	0.199	0.040	0.058*	0.186	0.041
1958–2010	53	0.065*	0.227	0.040	0.063*	0.212	0.041
1980–2010	31	0.065	0.230	0.038	0.062	0.216	0.039
1988–2010	23	0.059	0.189	0.040	0.058	0.183	0.040

TABLE 3
Historical Equity Risk Premium 1883-2010
(Grossed-up for the Value of Imputation Credits
assuming Credits are Valued at 100 cents in the Dollar)

This table sets out various statistics of the historical equity risk premium over a number of sample periods from January 1883 to December 2010. The first four periods are ones of increasing data quality but decreasing sample size. The fifth period reflects the introduction of the dividend imputation tax system in Australia. AM is the arithmetic mean, SD is the standard deviation, GM is the geometric mean. The base data are: (i) an annual series of nominal equity premia defined as the (simple) difference between the nominal stock return and the nominal risk free rate; and (ii) an annual series of real equity premia defined as the (simple) difference between the real stock return and the real risk free rate, where the real return each year is equal to the geometric difference between the nominal return and the inflation rate. The stock return is based on a stock accumulation index and takes into account cash dividends, capital gains and the value of imputation credits assuming (distributed) credits are valued at 100 cents in the dollar. Two measures of the risk free rate are used: the return on bills and the return on bonds. Calculations are based on discrete returns. * indicates significant at 5% level based on a two-tailed t-test.

Period	Years	Nominal			Real		
		AM	SD	GM	AM	SD	GM
PANEL A: Relative to Bills							
1883–2010	128	0.068*	0.168	0.054	0.067*	0.160	0.054
1937–2010	74	0.068*	0.201	0.048	0.066*	0.188	0.049
1958–2010	53	0.074*	0.230	0.047	0.072*	0.215	0.049
1980–2010	31	0.072	0.235	0.044	0.070	0.222	0.045
1988–2010	23	0.069	0.197	0.048	0.068	0.191	0.048
PANEL B: Relative to Bonds							
1883–2010	128	0.064*	0.166	0.051	0.064*	0.158	0.051
1937–2010	74	0.063*	0.199	0.043	0.061*	0.186	0.044
1958–2010	53	0.069*	0.227	0.043	0.067*	0.213	0.045
1980–2010	31	0.071	0.230	0.045	0.068	0.217	0.045
1988–2010	23	0.068	0.190	0.049	0.066	0.184	0.049

FIGURE 1
Historic Stock Returns
1883 - 2010

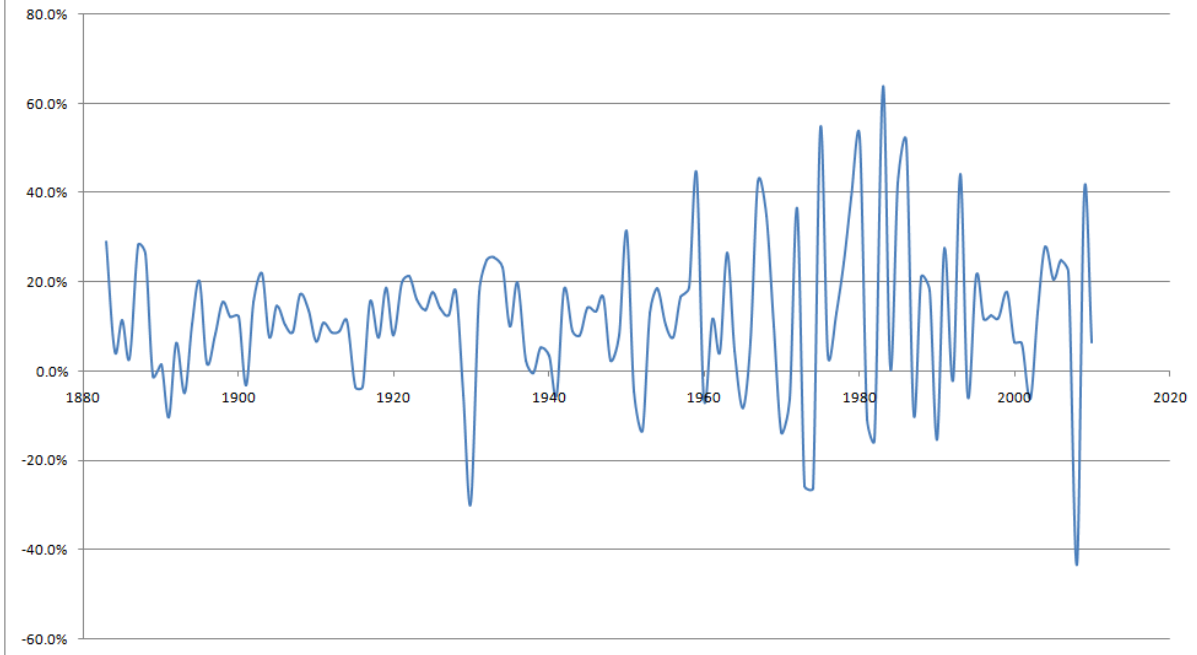
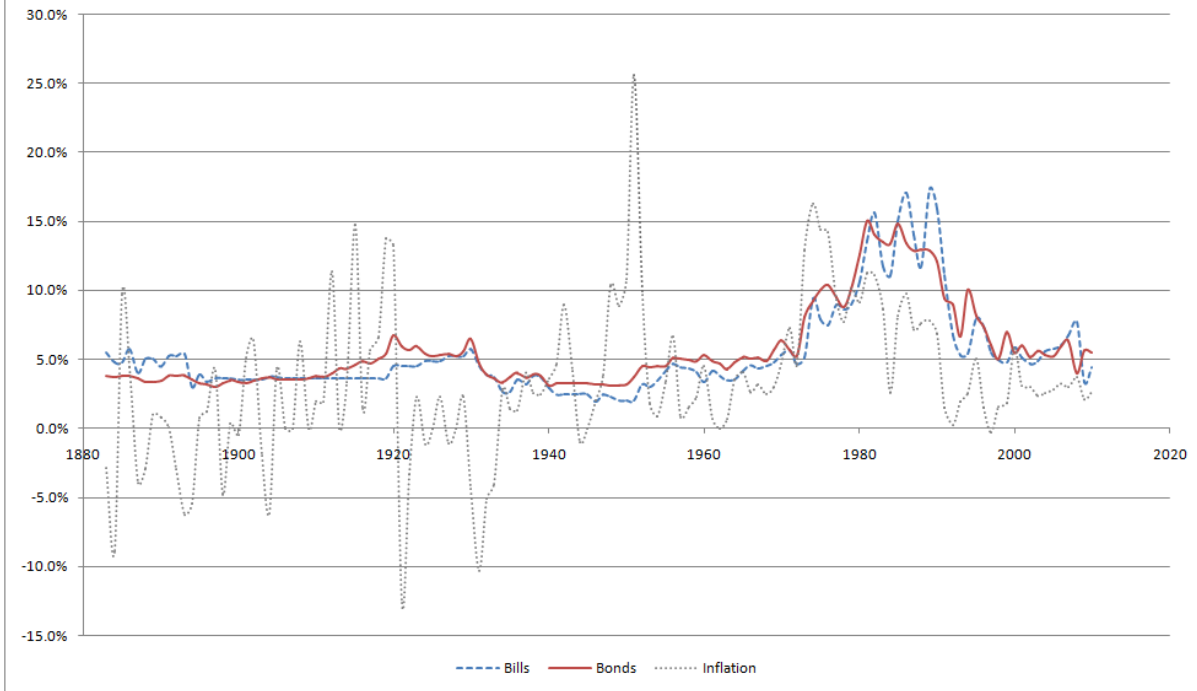


FIGURE 2
Historic Bill and Bond Returns



APPENDIX – Time Series of Annual Returns on the Underlying Components

Year	Stock Accumulation Index	StockPrice Index	Bills	Bonds	Inflation
1883	0.290	0.219	0.055	0.038	-0.029
1884	0.044	-0.017	0.048	0.037	-0.088
1885	0.113	0.047	0.048	0.038	0.098
1886	0.029	-0.036	0.058	0.038	0.044
1887	0.282	0.206	0.040	0.036	-0.040
1888	0.262	0.195	0.050	0.034	-0.029
1889	-0.011	-0.068	0.050	0.034	0.010
1890	0.014	-0.048	0.045	0.035	0.008
1891	-0.104	-0.159	0.053	0.038	0.001
1892	0.063	-0.007	0.053	0.038	-0.030
1893	-0.049	-0.113	0.054	0.038	-0.063
1894	0.106	0.029	0.030	0.035	-0.054
1895	0.201	0.126	0.039	0.033	0.008
1896	0.017	-0.037	0.034	0.032	0.012
1897	0.085	0.030	0.036	0.030	0.042
1898	0.155	0.097	0.036	0.033	-0.048
1899	0.121	0.067	0.036	0.035	0.003
1900	0.122	0.070	0.035	0.033	-0.004
1901	-0.032	-0.079	0.035	0.033	0.051
1902	0.156	0.098	0.035	0.035	0.064
1903	0.219	0.159	0.035	0.036	-0.020
1904	0.075	0.022	0.038	0.037	-0.061
1905	0.146	0.095	0.038	0.035	0.043
1906	0.102	0.058	0.036	0.035	0.000
1907	0.088	0.046	0.036	0.035	0.000
1908	0.173	0.126	0.036	0.035	0.063
1909	0.135	0.090	0.036	0.036	0.000
1910	0.067	0.025	0.036	0.038	0.020
1911	0.107	0.062	0.036	0.038	0.019
1912	0.086	0.036	0.036	0.039	0.113
1913	0.089	0.038	0.036	0.043	0.000
1914	0.114	0.059	0.036	0.043	0.034
1915	-0.035	-0.083	0.036	0.046	0.148
1916	-0.034	-0.084	0.036	0.049	0.014
1917	0.155	0.095	0.036	0.047	0.056
1918	0.075	0.019	0.036	0.050	0.067
1919	0.187	0.126	0.036	0.054	0.138
1920	0.081	0.025	0.045	0.067	0.132
1921	0.199	0.126	0.045	0.059	-0.126
1922	0.213	0.148	0.045	0.057	-0.033
1923	0.162	0.102	0.045	0.059	0.023
1924	0.137	0.076	0.049	0.054	-0.011
1925	0.177	0.114	0.049	0.052	0.000
1926	0.141	0.082	0.049	0.053	0.023
1927	0.124	0.065	0.053	0.054	-0.011
1928	0.177	0.115	0.053	0.053	0.000
1929	-0.053	-0.101	0.053	0.056	0.022
1930	-0.296	-0.339	0.058	0.065	-0.044
1931	0.177	0.113	0.045	0.047	-0.103
1932	0.248	0.199	0.039	0.039	-0.051
1933	0.256	0.211	0.038	0.036	-0.041
1934	0.232	0.191	0.026	0.033	0.028
1935	0.101	0.062	0.026	0.037	0.014
1936	0.198	0.154	0.035	0.040	0.014
1937	0.024	-0.017	0.032	0.037	0.040
1938	-0.005	-0.051	0.038	0.039	0.026
1939	0.053	0.002	0.037	0.038	0.025
1940	0.035	-0.017	0.029	0.031	0.037
1941	-0.055	-0.101	0.025	0.033	0.047
1942	0.184	0.124	0.025	0.032	0.090
1943	0.089	0.045	0.025	0.032	0.041
1944	0.080	0.036	0.025	0.032	-0.010
1945	0.141	0.096	0.025	0.033	0.000
1946	0.133	0.092	0.020	0.032	0.020
1947	0.166	0.127	0.025	0.032	0.039
1948	0.024	-0.011	0.023	0.031	0.104
1949	0.081	0.040	0.020	0.031	0.088
1950	0.314	0.267	0.020	0.032	0.108

Year	Stock Accumulation Index	StockPrice Index	Bills	Bonds	Inflation
1951	-0.046	-0.083	0.020	0.038	0.256
1952	-0.133	-0.175	0.032	0.045	0.097
1953	0.130	0.077	0.030	0.044	0.018
1954	0.186	0.131	0.035	0.045	0.009
1955	0.103	0.047	0.042	0.045	0.034
1956	0.077	0.017	0.047	0.051	0.067
1957	0.167	0.105	0.044	0.050	0.008
1958	0.189	0.129	0.044	0.049	0.016
1959	0.443	0.381	0.041	0.048	0.023
1960	-0.062	-0.099	0.034	0.053	0.045
1961	0.116	0.066	0.041	0.049	0.007
1962	0.042	-0.001	0.038	0.047	0.000
1963	0.266	0.216	0.035	0.043	0.007
1964	0.044	0.005	0.036	0.048	0.035
1965	-0.082	-0.121	0.041	0.052	0.041
1966	0.067	0.021	0.046	0.050	0.026
1967	0.425	0.369	0.043	0.051	0.032
1968	0.348	0.307	0.045	0.049	0.025
1969	0.101	0.069	0.047	0.056	0.030
1970	-0.137	-0.167	0.053	0.064	0.047
1971	-0.061	-0.098	0.056	0.057	0.073
1972	0.364	0.318	0.046	0.053	0.047
1973	-0.258	-0.287	0.051	0.081	0.129
1974	-0.262	-0.309	0.094	0.092	0.163
1975	0.546	0.454	0.079	0.100	0.144
1976	0.036	-0.020	0.075	0.104	0.142
1977	0.132	0.066	0.089	0.095	0.093
1978	0.243	0.176	0.086	0.088	0.077
1979	0.390	0.320	0.090	0.101	0.101
1980	0.523	0.458	0.107	0.126	0.092
1981	-0.108	-0.144	0.136	0.150	0.113
1982	-0.153	-0.197	0.156	0.140	0.110
1983	0.637	0.566	0.117	0.135	0.086
1984	0.005	-0.037	0.111	0.134	0.026
1985	0.421	0.364	0.150	0.149	0.082
1986	0.511	0.457	0.171	0.134	0.098
1987	-0.096	-0.121	0.141	0.129	0.071
1988	0.211	0.161	0.117	0.130	0.076
1989	0.179	0.113	0.173	0.129	0.078
1990	-0.153	-0.201	0.159	0.121	0.069
1991	0.275	0.222	0.111	0.094	0.015
1992	-0.022	-0.060	0.068	0.089	0.003
1993	0.442	0.391	0.053	0.067	0.019
1994	-0.058	-0.092	0.054	0.100	0.025
1995	0.215	0.165	0.080	0.082	0.051
1996	0.117	0.072	0.074	0.074	0.015
1997	0.124	0.079	0.055	0.061	-0.002
1998	0.119	0.077	0.050	0.050	0.016
1999	0.176	0.135	0.048	0.070	0.018
2000	0.065	0.029	0.059	0.055	0.058
2001	0.061	0.026	0.051	0.060	0.031
2002	-0.062	-0.096	0.047	0.052	0.030
2003	0.134	0.087	0.049	0.056	0.024
2004	0.278	0.228	0.056	0.053	0.026
2005	0.206	0.157	0.058	0.052	0.028
2006	0.249	0.198	0.060	0.059	0.033
2007	0.223	0.179	0.067	0.063	0.030
2008	-0.433	-0.458	0.077	0.040	0.037
2009	0.404	0.341	0.033	0.057	0.021
2010	0.064	0.022	0.044	0.055	0.027