International Stock Returns and Expected Inflation: Evidence from Pre-War Data

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James Ross McCown
Meinders School of Business
Oklahoma City University
2501 N. Blackwelder
Oklahoma City, OK 73106

405-521-5473
tlahuiz@msn.com

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Abstract:

This research examines the relations between expected inflation and real returns on stocks for six industrialized countries during the pre-World War II period. Negative correlations are found, consistent with the findings of other researchers for the postwar period.

Fama's (1981) proxy theory attempts to explain the negative relation, based on his finding of a strong positive correlation between real returns and real output growth for the postwar period. The real return/output growth correlation is found to be zero for the U.S. and France, and negative for Germany, for the pre-1914 period. (JEL E31, G12, N10, N20)

Many researchers have investigated the relation between inflation and stock returns. This topic is of interest because it sheds light on the processes that generate stock returns. Investors would also like to know whether or not stocks are good hedges against inflation risk and if past inflation rates can be used to predict future stock returns. Some researchers have focused exclusively on U.S. stocks, including Fama (1981) and Geske and Roll (1983). Other researchers have examined international stocks including Firth (1979), Solnik (1983), Gultekin (1983), Mandelker and Tandon (1985), Kaul (1987), and Boudoukh and Richardson (1993).

Most researchers have used post-World War II data. Fama (1981) finds a negative relation between expected inflation and real stock returns for the U.S. stock indexes. Gultekin (1983) finds that the relations between nominal stock returns and both expected and realized inflation are negative for several foreign countries, but positive for the UK. Firth (1979) also finds the relation for the UK is positive. Solnik (1983) finds the negative relation holds for many countries for both nominal and real stock returns. Mandelker and Tandon (1985), and Kaul (1987) also find a negative correlation between real stock returns

and expected inflation for several countries, including the UK. Each of the researchers examine a slightly different time period, which causes inconsistent results for the UK, but for most countries' stock indexes the relation is significantly negative.

There has been much less research into the pre-World War II data. Kaul (1987) examines the data for the U.S. and Canada for the period from 1926 to 1940, and finds the relations between real stock returns and expected inflation to be positive but statistically insignificant. Boudoukh and Richardson (1993) analyze nominal U.S. stock returns from 1802 to 1990 and find the correlation with expected inflation to be negative for a one-year investment horizon but positive for a five-year horizon. They also examine data for the UK from 1820-1988 and obtain similar results. They do not conduct a separate analysis of the pre-war data.

The purpose of this research is to examine the pre-war data for six industrialized countries: Denmark, France, Germany, Sweden, the UK, and the U.S., to determine if the stock return/inflation correlation is different from the post-war results. The pre-war period is interesting not just from an historical perspective, but because it allows us to view what happens under different monetary regimes. All of these countries were once on the gold standard, some of them suspended it during World War I only to return to it a few years later, and all of them suspended it permanently in the thirties. The gold standard was a fixed exchange rate regime.

The data have been broken down into two main time segments: (1) the pre- World War I period, going back as far as the data are available, to 1913, and (2) the interwar period from 1919 to 1939.

Computing expected inflation can be difficult. The researchers cited above use many different methods to compute expected inflation. This research uses four different methods of computing expected inflation, but the results are approximately the same for each method.

To summarize the results: Simple correlations between realized inflation rates and nominal stock returns are uniformly positive for the pre-war data. The correlations between realized inflation and real returns, however, are almost all negative. Also, the correlations between real returns and expected inflation are negative for most countries, and significantly so for Germany, the UK, and the U.S.

In order to understand the underlying causes of the inflation/stock return relations, the underlying macroeconomic variables are examined. The correlation between real output growth and lagged real returns is statistically indifferent from zero for France and the U.S. for the pre – 1914 period, and negative for Germany. (The correlation between real growth and contemporaneous real returns is positive for Germany). This contrasts with post-war findings, which indicate a universally positive, statistically significant relation. The relation for the interwar period (1919 – 1939) is positive for all six countries. The pre – 1914 findings for France, the U.S., and Germany show it is possible to have a negative real return/expected inflation correlation without the key assumption of Fama's (1981) proxy theory: A positive output growth/real return correlation.

The cyclicality of the money supply processes during the pre-war period is also examined. In most cases, money supply growth is unrelated to real output growth in the pre-war period. Exceptions are for the U.S. for the interwar period and for the UK for the entire prewar period.

Section I reviews the theoretical background. Section II describes the data. Section III examines the relations between stock returns and expected and realized inflation. Section IV examines the underlying causes of the inflation/stock correlations by investigating the underlying macroeconomic variables. Section V concludes.

I. Theoretical Background

Fisher (1930) hypothesized that the real and monetary sectors of the economy are unrelated, resulting in a nominal return that varies directly with the expected inflation rate:

(1) $$r_{N,t} = r_{R,t} + \beta E[\pi_t \mid \Omega_t] + \varepsilon_t$$

where $r_{N,t}$ is the nominal stock return, $r_{R,t}$ is the real return, and π_t is the inflation rate. Ω_t is the information set used by investors to forecast inflation. According to Fisher, β should equal one, so that nominal returns move one-to-one with expected inflation and real returns are unrelated to expected inflation. From (1), the covariance between expected inflation and the nominal return can be expressed as:

(2) $$\mathrm{Cov}\left(r_{N,t}, E\left[\pi_t \mid \Omega_t\right]\right) = \mathrm{Cov}\left(r_{R,t}, E\left[\pi_t \mid \Omega_t\right]\right) + \beta \mathrm{Var}\left(E\left[\pi_t \mid \Omega_t\right]\right).$$

The second term on the RHS of (2) is positive, but if the covariance between the real returns and expected inflation is sufficiently negative then the covariance between the nominal returns and expected inflation can be negative. Researchers have found negative relations between expected inflation and real stock returns for most countries during the postwar era.

Fama (1981) explains the negative relation between real returns and expected inflation for the U.S. using the quantity theory of money. He assumes that the money supply process is exogenous and that real stock returns are positively related to real output growth. His first assumption has been questioned by many but he shows how his second assumption

is strongly supported by the post-war data for the U.S. Other researchers find a positive relation between real stock returns and real output in the post-war data for the U.S. as well as foreign countries, including Mandelker and Tandon (1985) and Kaul (1987). Fama says that the negative relation between real stock returns and inflation is a proxy for the negative relation between inflation and output, via the money demand function. Geske and Roll (1983) and Kaul (1987) retain Fama's assumption concerning money demand but drop the assumption of money supply exogeneity. A counter-cyclical money supply process, which Kaul shows is the case for the countries he studies for the post-war period, reinforces the negative relation between real activity and inflation. A procyclical money supply process, however, can counteract the money demand effect and result in real activity and inflation being either unrelated or positively related, with the result that real stock returns might become either unrelated or positively related to inflation. This is how Kaul explains his positive (but statistically insignificant) results for the correlation between real stock returns and expected inflation for the U.S. and Canada, during the period from 1926 to 1940.

In this research, we examine the relations between output growth and real stock returns for the countries in our sample, and also examine the cyclicality of the money supply processes, in order to determine whether Fama’s proxy theory can explain the pre-war results. These issues are discussed in Section IV.

II. The Data

The sources of the data are listed in the appendixes. Some of the stock return data used in this research include dividends and some do not, but that does not make any difference for our purposes because the correlations between the returns with and without

dividends are very high. The only differences are in the means. For example, the correlation between the monthly returns for the CRSP value-weighted portfolios of U.S. stocks, with and without dividends, from 1926 to 2000, was 0.9992.

This research uses annual data. The time periods examined for each country vary according to the availability of the data. The only data available for Denmark and Sweden are for the interwar period. The German and UK stock exchanges were closed for the duration of World War I, from 1914 to 1918. Data for the interwar period for Germany are sporadic and are not used in this research. The German stock exchanges were closed during the period from July, 1931 to April, 1932. Also, even though the German stock exchanges were open during the hyperinflation of 1922 – 1923, inclusion of this atypical event could seriously skew the results. An examination of the behavior of stock prices during a hyperinflation is a topic for a completely separate study.

Since World War I constitutes a break in the series for Germany and Britain, separate examinations of the data for the U.S. and France are made for the pre – 1914 and interwar periods. Barsky (1987) shows how the time series process for inflation in the U.S. was more persistent in the interwar period than in the pre – 1914 period. He describes the earlier period as “essentially white noise”.

Tables 1, 2, and 3 show summary statistics for real stock returns, inflation rates, and money supply growth rates. The French, American, and British stock returns have higher volatility during the interwar period than in the pre – 1914 period. In all cases, the real stock returns have higher volatility than the corresponding inflation rates. Inflation rates have high first-order autocorrelation during the interwar period for Denmark and France, as Barsky

(1987) found for the U.S. The persistence of the British inflation rate during the interwar period is low, and not noticeably different from the pre – 1914 period.

Concerning the money supply growth rates, the only noticeable pattern is that the volatility is higher during the interwar period than during the pre – 1914 period for France, the UK, and the U.S.

III. Stock Returns and Inflation

A. Realized Inflation

Table 4 shows the simple correlations between nominal stock returns and realized inflation. Both lagged and contemporaneous inflation rates are utilized. Robust standard errors are computed using the generalized method of moments and corrected for heteroskedasticity and autocorrelation with the methodology of Andrews and Monahan (1992). All of the correlations with the contemporaneous inflation rates are positive and most are statistically significant. Gultekin also examines these relations for the post-war period but finds that nominal returns for Germany, Italy, Switzerland, and the U.S. are negatively correlated with inflation and only the returns for the UK are positively related to inflation. Boudoukh and Richardson (1993) regress nominal U.S. returns against realized inflation and find a positive, significant relation for the 1870 – 1990 period, using one-year returns, and positive, significant relations for 1802 – 1990 and 1914 – 1990 using five-year returns.

Table 5 shows the correlations between realized inflation rates and real stock returns. In this case, the contemporaneous correlations are almost all negative, and most are statistically significant. The problem with this analysis is that the same price level data are

used to compute the real returns as are used to compute the inflation rates. Therefore, at least one component of the real returns is perfectly negatively correlated with the inflation rates, and it is no surprise that the total real returns show the negative correlations. The solution is to use some measure of expected inflation, rather than realized inflation.

B. Expected inflation

The other researchers cited in this paper use various methods to compute expected inflation. This research uses four different methods. The first two methods have already been shown in table 5. First, under the dubious assumption that investors possess perfect foresight, expected inflation will be equal to realized inflation. Under this scenario, the correlations are almost all negative and significant. The second method uses once-lagged inflation as the forecast. With the exception of the two subperiods for France, the correlations are negative and those for Denmark, the UK, and the U.S. are statistically significant. Both of these methods are used by Gultekin (1983), who obtains negative correlations for many countries in the post-war period, except the UK.

The third method of computing expected inflation utilizes contemporaneous nominal interest rates as a proxy for expected inflation. This method is used by Fama (1981), Geske and Roll (1983), Gultekin (1983), and Solnik (1983). In Table 6, it is seen that Germany and the UK have negative, significant correlations for the pre – 1914 period, whereas the UK has a positive, significant correlation for the interwar period. The fourth method was devised by Boudoukh and Richardson (1993), and is shown in Table 7. Real returns are regressed against realized inflation, and two lags of inflation rates and nominal interest rates are used as instrumental variables:

(3) $$\left(r_{R,t} - \alpha - \delta\pi_t\right) \otimes W_t = 0$$

where

(4) $$W_t = \left(1, \pi_{t-1}, \pi_{t-2}, I_{t-1}, I_{t-2}\right).$$

The generalized method of moments is used to estimate (3). Robust standard errors are obtained using the method of Andrews and Monahan (1992). For the U.S. and the UK, the relations between expected inflation and real stock returns are negative and statistically significant.

To summarize, the four methods come to the same general conclusion of a negative relation between real stock returns and expected inflation during the pre-war era. The only exception is for UK stocks during the interwar period when using the contemporaneous nominal interest rate as a proxy for expected inflation, which yielded a positive correlation. The other three methods indicate a negative relation for the UK for that period, two of which are statistically significant. These results are consistent with the results found by most researchers for the post-war period. The next step is to look at the underlying macroeconomic variables to determine whether or not the causes of the negative relation are the same during the pre-war period as during the post-war period.

IV. Stock Returns and Macroeconomic Variables

As explained in the introduction, it is the positive relation between output growth rates and real stock returns that is the underlying foundation of Fama's (1981) proxy theory, that he uses to explain the negative relation between real stock returns and expected inflation. Fama finds that real U.S. stock returns from 1954 to 1976 are positively related to

output growth rates. Kaul (1987) also finds a positive relation for U.S. stocks in the post-war period, as well as for the stocks of Canada, the UK, and Germany. For the 1966 – 1979 period, Mandelker and Tandon (1985) find positive relations for the U.S., Belgium, the UK, France, Canada, and Japan using GNP. None of the researchers find any negative relations between the two variables for any country during the post-war era.

Fama (1981) computes the correlations between output growth and both contemporaneous and lagged stock returns. Kaul (1987) and Mandelker and Tandon (1985) use lagged returns. Table 8 shows the correlations for this research using real output growth and lagged and contemporaneous returns. The correlations with the lagged returns show an interesting pattern. Of the four countries for which pre – 1914 data are available, France, Germany, and the U.S. show negative relations between lagged real returns and output growth, and the German result is statistically significant. The British result, however, is positive and statistically significant for the pre – 1914 period. Of the five countries for which data are available for the interwar period, all of them show positive correlations using the lagged return, and the correlations for Denmark, Sweden, and the U.S. are statistically significant. Kaul (1987) examines these relations for the 1926 – 1940 period for the U.S. and Canada and finds positive correlations. Thus, even though the real return/output relations during the interwar period are similar to those of the post-war period, the pre – 1914 relations using the lagged returns are non-positive except for the UK. Even though the pre – 1914 results for France and the U.S. are not statistically significant, they contrast with the postwar results of Fama (1981), Mandelker and Tandon (1985), and Kaul (1987), who find uniformly positive, statistically significant relations. The results for this research for France, Germany, and the U.S. show that the positive real return / real output correlation is not a

necessary condition for a negative real return / expected inflation correlation, contrary to Fama's theory.

Geske and Roll (1983) and Kaul (1987) show how the money supply process will affect the relation between stock returns and inflation. A counter–cyclical money supply process reinforces the negative relation between real output and inflation. A procyclical money supply process, which Kaul shows was the case for the U.S. for the 1926 – 1940 period, will counteract the money demand effect and can result in either zero correlation between real output and inflation or even positive correlation. Kaul found positive, but statistically insignificant correlations between real returns and inflation for the U.S. and Canada for the 1926 – 1940 period.

Table 9 shows the correlations between money growth and real output growth for France, Germany, the UK, and the U.S. As is the case for the other variables used in this research, the time periods examined are dictated by the availability of the data. No money supply data have been found for Denmark or Sweden. For the most part, the pre-war money supply processes are uncorrelated with output. As Kaul (1987) found, there was a pro-cyclical money supply process for the U.S. during the interwar period. The UK shows a counter-cyclical, statistically significant process for the entire 1882 – 1938 period, using lagged money growth, and a procyclical process for the pre – 1914 period, using contemporaneous money growth. The countercyclical money supply process of the UK reinforced the negative relation between output and inflation. The correlations for the French and German money supplies are statistically indifferent from zero. As Kaul found, the U.S. had a statistically significant procyclical money supply process during the interwar period. Kaul came to the conclusion that the pro-cyclical US monetary policy is responsible

for the positive correlation between real returns and expected inflation during that period, but his results are statistically insignificant. Referring back to Tables 6 and 7, we recall our findings that the correlations between real returns and expected inflation are *negative* and insignificant for the interwar period for the USA. Both our results and Kaul's results for the interwar period may be attributed to sampling error.

V. Conclusions

Real stock returns are negatively correlated with expected inflation during the pre – World War II period for most countries under study. This is consistent with the results that other researchers have found for the postwar period. An examination of the underlying macroeconomic variables does not support the proxy theory developed by Fama (1981). The real returns are negatively correlated with real output growth in some cases, particularly in the pre – 1914 period. The conclusion must be that there are other factors causing the negative return/inflation relationship than just through the money demand function as hypothesized by Fama.

Table 1: Summary Statistics, Real Stock Returns, Annual Data.

Country	Time period	Mean return	Standard Deviation
Denmark	1923 – 1939	0.67 %	12.29 %
France	1857 – 1937 1857 – 1913 1919 – 1937	-0.65 0.79 0.97	12.59 6.37 18.55
Germany	1871 – 1913	1.03	14.73
Sweden	1919 – 1939	-0.10	19.65
UK	1868 – 1913 1919 – 1939	1.58 5.95	7.30 20.30
U.S.*	1802 – 1939 1802 – 1913 1919 – 1939	6.65 6.82 8.30	17.04 14.68 25.83

* U.S. returns include dividends. The others do not. See the text for further discussion. See the appendixes for sources of data.

Table 2: Summary Statistics, Inflation Rates, Annual Data.

Inflation Rates:

Country	Time period	Mean	Std Dev	ρ_1	ρ_2	ρ_3	ρ_4
Denmark	1923 – 1939	-0.54 %	6.13 %	0.783	-0.341	0.074	0.192
France	1857 – 1937 1857 – 1913 1919 – 1937	1.82 -0.56 2.70	10.93 4.27 16.10	0.542 0.308 0.506	-0.057 -0.229 -0.181	0.184 0.054 0.260	-0.229 -0.125 -0.242
Germany	1871 – 1913	0.25	8.57	0.183	-0.313	-0.007	-0.291
Sweden	1919 – 1939	-4.26	12.79	0.192	0.250	-0.242	-0.208
UK	1868 – 1913 1919 – 1939	-0.39 -2.33	4.68 14.96	0.283 0.225	-0.170 -0.226	0.106 0.087	-0.098 -0.035
U.S.	1802 – 1939 1802 – 1913 1919 - 1939	-0.04 -0.31 -0.80	8.83 9.13 5.61	0.243 0.173 0.650	0.051 0.047 -0.207	-0.120 -0.110 -0.097	-0.015 -0.017 0.001

See the appendixes for sources of data.

Table 3: Summary Statistics. Money Supply Growth Rates. Annual Data.

Country	Time period	Mean	Standard Deviation
France (M2)	1898 – 1939 1898 – 1913 1919 – 1939	8.38 % 4.64 8.24	9.84 2.99 11.27
Germany (M2)	1877 – 1913	5.66	3.81
UK (M3)	1881 – 1939 1881 – 1913 1919 – 1939	2.94 2.04 1.99	5.01 1.67 6.12
U.S. (M2)	1868 – 1939 1868 – 1913 1919 – 1939	5.07 5.45 2.91	6.44 5.32 8.03

See the appendixes for sources of data.

Table 4: Correlations Between Realized Inflation Rates and Nominal Stock Returns.

		Simple Correlations with Realized Inflation At time:	
Country	Time period	T-1	T
Denmark	1923 – 1939	-0.276 (0.188)	0.401** (0.164)
France	1857 – 1937	0.431** (0.134)	0.400** (0.145)
	1857 – 1913	0.227 (0.137)	0.374** (0.106)
	1919 – 1937	0.512** (0.252)	0.537** (0.191)
Germany	1871 – 1913	-0.157 (0.123)	0.231 (0.169)
Sweden	1919 – 1939	0.104 (0.133)	0.363** (0.088)
UK	1868 – 1913	-0.143 (0.103)	0.231** (0.087)
	1919 – 1939	-0.187 (0.303)	0.359** (0.105)
U.S.	1802 – 1939	-0.089 (0.097)	0.215** (0.106)
	1802 – 1913	-0.114 (0.131)	0.251 (0.135)
	1919 – 1939	-0.002 (0.157)	0.312 (0.311)

Correlations and standard errors are computed using the generalized method of moments. Standard errors (in parentheses) are adjusted for autocorrelation and heteroskedasticity using the method of Andrews and Monahan (1992).

** Two or more standard errors different from zero.

Table 5: Correlations Between Realized Inflation Rates and Real Stock Returns.

		Simple Correlations with Realized Inflation At time:	
Country	Time period	T-1	T
Denmark	1923 – 1939	-0.442** (0.171)	-0.061 (0.272)
France	1857 – 1937	-0.018 (0.181)	-0.488** (0.160)
	1857 – 1913	0.075 (0.170)	-0.284** (0.103)
	1919 – 1937	0.263 (0.273)	-0.252 (0.239)
Germany	1871 – 1913	-0.243 (0.129)	-0.359** (0.163)
Sweden	1919 – 1939	-0.033 (0.171)	-0.277 (0.212)
UK	1868 – 1913	-0.278** (0.091)	-0.427** (0.138)
	1919 – 1939	-0.266 (0.319)	-0.381** (0.099)
U.S.	1802 – 1939	-0.201** (0.080)	-0.308** (0.109)
	1802 – 1913	-0.201** (0.087)	-0.382** (0.122)
	1919 – 1939	-0.127 (0.141)	0.109 (0.334)

Correlations and standard errors are computed using the generalized method of moments. Standard errors (in parentheses) are adjusted for autocorrelation and heteroskedasticity using the method of Andrews and Monahan (1992).

** Two or more standard errors different from zero.

Table 6: Relations Between Expected Inflation and Real Stock Returns.

Using Contemporaneous Nominal Interest Rates as a Proxy for Expected Inflation.

Country	Time period	Simple Correlation	Standard Error
Denmark	1923 – 1939	-0.060	0.202
France	1872 – 1913	0.237	0.126
	1920 – 1937	0.004	0.084
Germany	1877 – 1913	-0.389**	0.122
Sweden	1919 – 1939	-0.062	0.275
UK	1868 – 1913	-0.539**	0.114
	1919 – 1939	0.438**	0.111
U.S.	1858 – 1939	-0.076	0.110
	1858 – 1913	-0.089	0.134
	1919 – 1939	-0.091	0.176

Correlations and standard errors are computed using the generalized method of moments. Standard errors are adjusted for autocorrelation and heteroskedasticity using the method of Andrews and Monahan (1992).

** Two or more standard errors different from zero.

Table 7: Relations Between Expected Inflation and Real Stock Returns.

Using the Method of Boudoukh and Richardson (1993)

$$\left(r_t - \alpha - \delta\pi_t\right) \otimes W_t = 0$$

$$W_t = \left(1, \pi_{t-1}, \pi_{t-2}, I_{t-1}, I_{t-2}\right)$$

Country	Time period	$\hat{\delta}$	Standard Error
Denmark	1923 – 1939	1.142	0.638
France	1873 – 1913	0.473	0.732
	1921 – 1937	0.292	0.299
Germany	1878 – 1913	-0.114	0.319
Sweden	1920 – 1939	-1.012	1.240
UK	1868 – 1913	-1.321**	0.469
	1919 – 1939	-0.431**	0.141
U.S.	1859 – 1939	-1.366**	0.592
	1859 – 1913	-0.936	0.655
	1919 – 1939	-0.304	0.742

The above equations are estimated using the generalized method of moments. Standard errors are adjusted for autocorrelation and heteroskedasticity using the method of Andrews and Monahan (1992).

** Two or more standard errors different from zero.

Table 8: Relations Between Real Returns and Real Output Growth Rates

		Simple Correlations with Real Returns At time:	
Country	Time period	T-1	T
Denmark	1928 – 1939	0.670** (0.142)	0.198 (0.135)
France	1858 – 1913	-0.057 (0.164)	0.140 (0.102)
	1919 – 1936	0.013 (0.203)	0.138** (0.048)
Germany	1871 – 1913	-0.441** (0.081)	0.248** (0.094)
Sweden	1919 – 1939	0.700** (0.049)	0.070 (0.262)
UK	1869 – 1912	0.408** (0.153)	0.030 (0.165)
	1920 – 1938	0.478 (0.346)	0.008 (0.120)
U.S.	1870 – 1938	0.310 (0.180)	0.041 (0.154)
	1870 – 1913	-0.163 (0.155)	0.039 (0.181)
	1919 – 1938	0.776** (0.080)	0.049 (0.143)

Correlations and standard errors are computed using the generalized method of moments. Standard errors (in parentheses) are adjusted for autocorrelation and heteroskedasticity using the method of Andrews and Monahan (1992).

** Two or more standard errors different from zero.

Table 9: Relations Between Money Supply Growth Rates and Real Output Growth Rates

		Simple Correlations with Money Supply Growth At time:	
Country	Time period	T-1	T
France	1899 – 1913	0.303 (0.198)	-0.012 (0.184)
	1920 – 1938	0.239 (0.165)	0.079 (0.177)
Germany	1878 – 1912	0.058 (0.089)	0.140 (0.102)
UK	1882 – 1938	-0.231** (0.091)	-0.057 (0.083)
	1882 – 1913	-0.134 (0.136)	0.480** (0.081)
	1919 – 1938	-0.187 (0.098)	0.013 (0.092)
U.S.	1870 – 1939	0.155 (0.124)	0.271 (0.219)
	1870 – 1913	0.066 (0.141)	-0.105 (0.125)
	1919 – 1939	0.225** (0.085)	0.650** (0.132)

Correlations and standard errors are computed using the generalized method of moments. Standard errors (in parentheses) are adjusted for autocorrelation and heteroskedasticity using the method of Andrews and Monahan (1992).

** Two or more standard errors different from zero.

Appendix A: Sources of Stock Return Data

Denmark	Lund and Engsted (1996)
France	*Annuaire Statistique de la France* (various issues)
Germany	www.nber.org
Sweden	Frennberg and Hansson (1992)
UK: 1868 – 1913 1919 – 1939	 www.nber.org Campbell (1996)
U.S.	Schwert (1990)

Appendix B: Sources of Interest Rate Data

Denmark	Long-term Bonds	Kaergaard (1991)
France: 1872 – 1913 1919 – 1937	Discount Rate, Open Market, Paris Government Bonds	www.nber.org Patat and Lutfalla (1990)
Germany	Private Discount Rate, Prime Banker's Acceptance, Open Market, Berlin	www.nber.org
Sweden	Prime rate	Campbell (1996)
UK	Open Market Rates of Discount, London	www.nber.org
U.S.	Commercial Paper Rate, New York	www.nber.org

Appendix C: Sources of Aggregate Price Data

Denmark	GDP Deflator	Lund and Engsted (1996)
France	Wholesale Prices	*Annuaire Statistique de la France*
Germany	Wholesale Prices	www.nber.org
Sweden	Private Consumption Deflator	Campbell (1996)
UK: 1868 – 1913 1919 – 1939	 Wholesale Prices Wholesale Prices	 www.nber.org Campbell (1996)
U.S. 1800 – 1889 1890 – 1914 1915 – 1939	 Wholesale Prices Wholesale Prices CPI	 U.S. Bureau of the Census Bureau of Labor Statistics Bureau of Labor Statistics

Appendix D: Sources of Money Supply Data

France	M2	Patat and Lutfalla (1990)
Germany	M2	Rolnick and Weber (1995)
UK	M3	Bordo (1993)
U.S.	M2	Bordo (1993)

Appendix E: Sources of Output Data

Denmark	Industrial Production	Mitchell (1992)
France: 1858 – 1919 1919 – 1936	 Industrial Production Industrial Production	 Mitchell (1992) www.nber.org
Germany	Industrial Production	www.nber.org
Sweden	Industrial Production	Mitchell (1992)
UK	Industrial Production	www.nber.org
U.S.: 1870 – 1929 1930 – 1939	 GNP GNP	 Romer (1989) U.S. Bureau of the Census (1975)

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