

**CHANGES IN THE DEGREE
OF INTERNATIONAL FINANCIAL INTEGRATION
OVER THE PAST THREE CENTURIES**

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In the research reported in this paper I examine the degree of international financial market integration in all three of these episodes as well as during the two quite lengthy periods in between. To do so I use multi-country data for the near 300-year span of years from 1700 to 1998. The measure that I use to judge the degree of integration is the cross-country standard deviation of real interest rates. I compute these for both short-term and long-term interest rates for groups of countries that vary over time according to data availability.

A major focus of this exercise is on the differences and the similarities in behavior across the various subperiods. A particularly important question here is how eighteenth century experience stacks up against the two later episodes. Another question has to do with the forces that operated in these three episodes, the most recent one in particular.

I reach two conclusions. The first is that financial integration has been the rule rather than the exception over this long historical period. Major wars and the Great Depression of the 1930s intervened and temporarily arrested the process, but in each instance such interruptions proved to be transitory. The second has to do with the types of changes that have occurred in the integration process over time. In the main these appear to have involved a broadening of the

markets involved, in terms both of geographics and the number of assets involved. This latter issue is something that I am currently investigating.

I. Historical Overview

In this section I discuss various features of the three episodes of financial integration that I have just identified, the periods 1690 to 1789, 1875 to 1914 and 1975 to 1998. Since the earliest of the three is the least well known I deal with it in greater detail than the later two.

I.A. The Eighteenth Century

In the sixteenth century the Italian city states reigned supreme in trade and finance. Initially it was Venice that occupied the top spot. In 1550, or thereabouts, Genoa took over. During the course of the next hundred years, however, the situation changed dramatically (Kindleberger, 1984).

As the seventeenth century drew to a close, the Dutch Republic was the world's foremost commercial empire and Amsterdam its most important financial center. Banking, foreign exchange trading, stock trading and bullion trading all were located in Amsterdam. Amsterdam, moreover, was the conduit for the funds that Dutch investors directed abroad, principally though not exclusively in the direction of England.

The Dutch of this era were financial innovators and active international arbitrageurs. Perpetual bonds were a Dutch invention. Futures contracts, margins, short sales and many other financial-market instruments and techniques that we look upon as modern were commonplace then (Homer and Sylla, 1976). During these years, London and Amsterdam became closely linked financially (Eagly and

Smith, 1976; Neal, 1990). Amsterdam, however, was the senior partner, providing the stabilizing force for London during times of English financial crisis.

²² The Amsterdam Exchange, the center of Dutch financial trading activities, underwent a substantial change during this period, greatly broadening the types of assets traded and becoming much more international in its focus. In the early decades of the seventeenth century Dutch East India Company shares, a small number of commodities and bills of exchange were the sole trading vehicles. A century later, the Amsterdam Exchange had become a world market in which a wide range of securities and commodities were traded.¹

England, in contrast, only started to develop into a financial power at the end of the seventeenth century. Then, however, development came rapidly. The initial event in this process was the chartering of the Bank of England in 1694 as part of the Tonnage Act. It was a broad package of package of fiscal measures that included among other things a tax on beer. The Bank's assigned role was to make loans to the government, which it did shortly after its establishment.

These years also saw the rapid rise of English commercial banking. The number of banks in London increased from between 25 and 30 in the years 1750-65, to 50 in 1770, to 70 in 1800. Banks outside London, the country banks, grew even faster, from a dozen or so in 1750, to 334 in 1797, to double that number in 1810 (Ashton, 1955, pp. 179-183). During this period, too, the London Stock Exchange was set up and an active market in foreign exchange got underway.

Then as now information and finance were closely linked. Greatly facilitating the operation of both the foreign exchange market

and the securities market, as well as the development of English finance more generally, was the coincident development of a financial press. In 1681, the first publication regularly reporting financial market price quotes was established. Several competitor publications others quickly followed. The best known and longest in operation was the twice-weekly Course of the Exchange founded in 1697 by John Castaing, a London broker and Huguenot immigrant, and published by him until his death in the 1730s and by a variety of subsequent publishers over the course of the next eighty years. This eighteenth-century version of Reuters, and its earlier and later counterparts arguably were the sine qua non for the development of London into the major world financial center that it later became. For subsequent scholarly research, Castaing's publication also has proven highly valuable. In their studies of the London and Amsterdam markets during this period, Eagly and Smith (1976) and Neal (1990) used these data extensively, as had Ashton (1955) some decades earlier. If one event can be said to mark the completion of England's transformation, however, it is the development of London to the point where it eclipsed Amsterdam as an international financial center. This took place in the decade or so following the Napoleonic War.

A third country in which financial development came early and for which interest rate data are available is Sweden. While Sweden was not a financial power of the same magnitude as the Dutch Republic, it was of some importance from a banking standpoint. The Bank of Sweden was chartered in 1656 as a private commercial bank. In 1668, it was taken over by the state and became the first central bank. It did however continue with its commercial banking functions, accepting deposits from and making loans to individuals and firms. Interest on both was set by law. It is this set of legislated and

only occasionally changing rates that are available for the earlier half of the sample period.

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I.B. The Classical Gold Standard Era

The period from the mid-1870s until the start of World War I was the heyday of the gold standard. It was, moreover, an era of considerable economic and financial stability, and by all indication, a time of substantial economic and financial integration. Studies of the period and qualitative evidence drawn from a variety of contemporary sources suggest that the securities and foreign exchange markets during those years were among the most integrated that the world has seen. Stock and bond markets were international in focus. International arbitrage activities were commonplace. Commercial and investment banking in all of the major countries, including the United States, was, or soon became, internationalized.

Rondo Cameron in commenting on the period wrote: "[In] the generation or so before World War I ... international investment reached dimensions previously unknown and the banking systems of the world achieved a degree of internationalization also without precedent" (1991, p. 3). Indeed the degree of internationalization was such that debate has centered around the question of whether it has yet been matched.

This internationalization was manifest in both trading and corporate finance. Trading of securities, equities as well as bonds, took place on a global scale. U.S. railroad bonds, which were traded widely on the London Stock Exchange and also in continental financial centers such as Paris and Amsterdam (Michie, 1987; Wilkins, 1991), are a prime example. Corporate finance techniques included the international syndication of bank loans, global bond issuance, and foreign-currency-denominated bond financing.

Recent studies of the period paint much the same picture as the qualitative evidence. These include the studies of financial market

integration by Bordo, Eichengreen and Kim (1998), Jackson and Lothian (1993), Lothian (2000), and Obstfeld and Taylor (1997), the study of savings and investment by and Taylor (1996), the study of cross-country real wage behavior by Williamson (1995), and of capital flows by Grassman (1980), as well as the book now in manuscript form of Obstfeld and Taylor. All show substantial similarities between the degree of integration during the gold standard era and during the past several decades. The only debate, if it can in fact be called that since any disagreements have been rather low key, is with regard to which period has seen greater integration.

I. C. The 1980s and 1990s

The last two decades have been a time of substantial institutional change in financial markets and, it seems, substantially increased and still increasing, financial integration. An important question that arises with regard to this period, however, is why real exchange rate volatility, which increased so dramatically in the early 1970s, has apparently mattered so little. Intuitively, one might have expected it to have hindered the process of integration rather severely.² That, however, does not appear to have happened.

The reason, I elsewhere have argued (Lothian, 2000), is that the institutions surrounding international finance underwent a major evolution, an evolution that was itself largely a response to the increased volatility of these years and the increased risk that it occasioned.³ Regulatory impediments to international capital mobility – capital controls, interest-rate ceilings and the like – were eroded and then removed because they became much more costly in this new environment. New financial instruments and new markets developed that enabled investors to mitigate the effects of exchange-rate

volatility. Combined, these endogenous institutional changes appear to have more than offset the effects of the increased volatility.

In this regard, consider the following quote from an article written in the early 1980s by Walter Wriston, the former chairman of Citibank and one of the principal architects of this institutional change (see Wriston, 1986, p.133):

“Today except in a very few instances, national borders are no longer defensible against the invasion of knowledge, ideas, or financial data. The Eurocurrency markets are a perfect example. No one designed them, no one authorized them, and no one controlled them. They were fathered by controls, raised by technology, and today are refugees, if you will, from national attempts to allocate credit and capital, for reasons that have little to do with finance or economics.”

Several economists who have commented on my earlier work on this question, have suggested that I test this hypothesis empirically. I intend to do so in future work. My plan is to construct several alternative measures of regulatory stringency and of the degree of financial sophistication and to use these together with measures of exchange-rate risk as regressors in equations explaining the time path of real interest rate dispersion.

III. Theoretical Considerations

The measure that I use to judge international financial integration is the degree of dispersion of real interest rates internationally. As Frankel (1992) and von Furstenburg (1998) have pointed out, real interest rate equalization is a quite stringent criterion. It involves behavior not only in financial markets but in the economy

as a whole. One way to see this is to consider the following standard decomposition of the real interest differential:

$$r_t - r_t^* = [(R_t - R_t^*) - ds_t] + [ds_t - (B_t - B_t^*)], \quad (1)$$

where $r_t - r_t^*$ is the real interest rate differential, $(R_t - R_t^*)$ is the nominal interest rate differential, ds_t is the percentage change in the nominal exchange rate and $(B_t - B_t^*)$ is the inflation differential.

The first term on the right of (1) is the deviation from (*ex post*) uncovered interest parity (UIP). The second is the deviation from relative purchasing power parity (PPP). For real interest rates to be equal, either UIP and PPP, or their analogues under fixed exchange rates, equality of nominal interest rates and equality of inflation rates, to hold perfectly or their deviations have to totally offset one another. In that case the right-hand side of (1) will be zero and r_t and r_t^* will be equal. In such circumstances, differences in the exchange-rate regime do not affect the usefulness of this criterion. In principle, the only difference between fixed and floating exchange rates is that ds_t by definition is zero under fixed rates, and in most circumstances non-zero under floating. Real interest equality is therefore a useful criterion for gauging the degree of integration over long periods of time, periods in which exchange rate regimes have changed with some frequency. As such, it is ideally suited the types of comparisons made in this paper.

In the absence of perfect foresight, distinctions between actual and anticipated rates of inflation and actual and anticipated rates of exchange-rate change, and hence between *ex ante* and *ex post* real yields, all become relevant. In this case we can write an

analogue to (1) as

$$(2) \quad r_t - r_t^* = (\Delta_t - \Delta_t^*) + \epsilon_t$$

where $(\Delta_t - \Delta_t^*)$ is the difference in *ex ante* real yields, which in parallel fashion to (1) is equal to the sum of the deviations from *ex ante* UIP and PPP, and where ϵ_t is the difference in the inflation-prediction errors in the two countries,

$(E[B_t] - B_t) - (E[B_t^*] - B_t^*)$, where $E[\dots]$ is the usual expectation operator. This expression, in turn, is equal to $(E[B_t] - E[B_t^*]) - (B_t - B_t^*)$, the difference between the foreign and domestic deviations of the actual and anticipated rates of inflation.

In the empirical work that follows, I use *ex post* measures of real interest rates throughout, but focus almost exclusively on the relationships in quinquennially averaged data. Under the usual assumptions of rational expectations, prediction errors will be mean zero, and therefore are likely to be reduced somewhat by this averaging.

One additional caveat with regard to the usefulness of this measure needs to be made. Real interest differentials like other such cross-country measures are asymmetric indicators in the sense that wide differentials are *prima facie* evidence against integration, while narrow differentials are ambiguous in their implications. Narrow differentials could arise either because of international integration or some fortuitous harmonization of domestic influences in otherwise closed economies. In the case of real interest rates, a narrowing of cross-country differentials could in principle be the result of changes in real variables in the two countries. Whether that is likely in practice

is another matter, since in order for it to be so the real sides of the economies in question would have to be totally isolated from one another.

III. ²*Data and Empirical Results*

The interest-rate data are annual observations for long-term bond yields (generally government bonds) and a variety of short-term, money market interest rates for samples of ten countries and seven countries respectively. The ten-country sample is made up of Belgium, France, Germany, the Netherlands, Sweden, the United Kingdom, the United States, Canada, Italy, and Norway; the seven-country sample excludes the last three. The sample period varies according to data availability, but at its longest – short-term real rates for both the United Kingdom, and the Netherlands – runs from 1700 through 1998.

As a proxy for the *ex ante* real interest rate I use the spreads between the nominal rates and the contemporaneous rates of inflation. The price-level data used to construct these estimates are for the most part for GDP (or GNP) deflators beginning in 1870 and linked to either CPIs or WPIs before that date.⁴ For the money market rates, the errors introduced by this procedure probably are somewhat less of a problem than for the long-term bond yields. For the short-term interest rates the actual rate of inflation is likely to provide a better estimate of the anticipated rate of inflation than it is for the long-term interest rates. Also, as mentioned earlier, I use five-year averages of these basic data as units of observation. Arguably this provides somewhat more accurate estimates of anticipated rates of inflation than the annual data.

Table 1 provides a summary of the time periods over which the various countries' data are available. As the table indicates, these

differ substantially among countries. As it also shows, there are a fair amount of other missing observations. This is an additional reason for my focusing on the cross-country dimension of the data.

III.A.²² *Overview of Real and Nominal Yield Behavior*

Figure 1 and Table 2 provide overviews of the data. Plotted in Figure 1 are cross-country standard deviations of quinquennial average *ex post* real short-term interest rates and *ex post* real long-term interest rates for the maximum number of countries for which data are available in any particular quinquennium. I refer to these measures throughout as the “composite” standard deviations.⁵ Table 2 presents averages of these figures for various subperiods.

Additional information on cross-country real interest rate behavior over this long sample period is provided by the regression results reported in Table 3. The independent variables in these regressions were a set of zero-one dummy variables for the various subperiods. I ran these regressions for the two composite standard deviations and also for the Dutch-English short-term real rate standard deviation. I defer discussion of this last regression until the next section of the paper.

The dummy variables and the periods for which they took the value of one were as follows: DWW2, a World War II dummy, 1940-49; DWW1, a World War I dummy, 1915-1919; DCW, a U.S. Civil War dummy, 1860-1874; DFN, a French Revolution and Napoleonic War dummy, 1790-1819; D18 an eighteenth century dummy, 1700-1789; D19, an early nineteenth century dummy, 1820-1859; DGS, a gold standard dummy, 1875-1914; and DBW, a Bretton Woods dummy, 1950-1969.⁶ I omitted a dummy for the most recent period of floating exchange rates (defined here as 1970-1998). The constant

serves as an estimator of cross-country real interest rate dispersion during this subperiod. The corresponding estimator for any other subperiod is the algebraic sum of the coefficient for that subperiod's dummy and the constant. The standard t test for the significance of such a coefficient is therefore a test for significantly higher or lower real interest rate dispersion during the subperiod in question than under the current float.

The principal findings that emerge from this exercise have to do with differences in behavior across the various subperiods. One thing that is quite clear, and this ought not be surprising, is that wars matter a lot. World Wars I and II, the Napoleonic War and the American Civil War were all characterized by markedly greater real interest rate dispersion than during most of the peacetime periods, World War II particularly. The dummies for these periods all have sizable and statistically significant coefficients. The dummies for the peacetime periods in general have small and insignificant coefficients. The exception is the interwar period. It is the one additional period of substantial cross-country real interest rate dispersion. It has a much higher standard deviation than any of the peacetime periods, and in fact is only exceeded in that regard by World War II. The difference between the interwar period on the one hand and the gold-standard years and the post-World War II subperiods on the other is well known. I have documented it in several papers dealing with the issue of international financial integration (Lothian, 1997; Lothian, 2000). Obstfeld and Taylor (1997) discuss it in detail. The difference vis-à-vis the two earlier peacetime periods (1820-59 and 1730-89) has gone largely unnoticed.

That international financial integration was so diminished during the interwar years is not surprising. This was a period of

extreme macroeconomic variability and domestic financial instability in most of the world's major economies. Friedman and Schwartz (1982) in their study of monetary trends in the United States and the United Kingdom point to substantial differences between monetary and overall economic behavior during the 1930s and in the rest of their century-plus sample period. Schwert (1989) points to the same thing being true with regard to both stock returns and the other U.S. financial and macroeconomic data series that he examines. All show much greater variability during the depression years of the 1930 than either earlier or later in the long period that he analyzes.

The other side of this coin, the substantial similarity among all of the peacetime periods other than the interwar period, deserves some comment. What it shows is the long-lived nature of the movement toward international economic and financial integration. The current period and the classical gold standard periods have many of the same earmarks, but so also do the current period and the two much earlier periods. In the absence of truly major disruptions, there has been a strong tendency toward financial integration. The interwar period was different from other peacetime periods in this regard because it was different in most other important respects.

III.B. The Eighteenth Century

For many purposes temporal variation in the number of countries in the sample does not matter. The ranking of subperiods according to degree of real interest rate dispersion, to cite the most important example, is largely the same whether or not homogeneity is imposed. We can see this in Table 4 which reports cross-country standard deviations both for the composite and for progressively larger samples of countries. As a rule, the current period appears slightly

more integrated than the gold standard period and both more integrated than either the Bretton Woods period (here proxied as 1950-1969) or the earlier peacetime periods. Again all generally appear more similar to one another than to the various war periods or to interwar period.

The one comparison for which the composite measure proves less than illuminating is the case of real short-term rates in the eighteenth century. Here it makes a good bit of difference whether we consider the Netherlands and the UK alone, or add Sweden as is done in for the composite measure beginning in the 1740-45 quinquennium. We can see this difference quite clearly in Figure 2 which plots the Dutch-English standard deviation along with the composite cross-country standard deviation shown in Figure 1. Without Sweden the cross-country dispersion of real interest rates is markedly lower and, more important, very similar to the figures for the composite in most of the later subperiods. The regression results reported in the last two columns of Table 3 suggest much the same thing. The coefficients of all of the peacetime dummies and all of the war dummies other than that for World War II are small in magnitude and insignificant.

Financial integration evidently came quite early to the Netherlands and the UK and was not easily and not often reversed. This of course is in line with the findings reported both by Eagly and Smith (1976) and by Neal (1990). Their conclusions about a high degree of financial integration between the two countries during the eighteenth century are thus borne out by the findings reported here.

The difference between the results with and without Sweden is a particular example of a broader and more general phenomenon. Financial integration is not unidimensional. It has, so to speak, an

intensive and an extensive margin. For any given group of countries, we see a tendency for real interest rate dispersion tend to decrease from one peacetime period to the next and hence for the “intensity” of financial integration to increase. In addition, however, we see the number of countries in the sample widen over time. This increased availability of data is not due simply to better record keeping. Money and bond markets simply did not exist in all of these countries early in the three-hundred year period considered here. Over time, however, they began to develop and the extensive margin gradually got pushed out.⁷

IV. Conclusions

In this paper, I have investigated international financial market behavior over the past three centuries and compared the degree of integration across various important subperiods. This is the first time that so temporally extensive a comparison has been attempted

What the paper shows is that integrated markets of one sort or another have been the rule rather than exception over this exceedingly long span of years. This should not be surprising to an economist, but to many of us who came of age in the immediate post-WWII decades – economist or not – I suspect that it is. The status quo, or so it seemed only three decades ago, was a world of rather well insulated, if not entirely isolated, economies.

Against this backdrop, the developments of the past several decades have at times seemed almost totally revolutionary not the case more generally. Financial integration to varying degrees has been characteristic of long periods in both the eighteenth and nineteenth centuries as also in the early part of the century now ending. The process, however, has been a discontinuous one. It has been

interrupted by major wars and their after effects, and in the case of the interwar years by the severe economic shocks of that era and governments' reactions to them. In each instance, however, the process of integration began anew.

It did so, moreover, quite spontaneously. Financial integration is not something that was either planned, or otherwise orchestrated from on high. In finance as elsewhere, the prospect of gains from trade exerts a powerful force. That has evidently been enough to keep the process going through thick and thin, through the many adversities of the past several centuries. Indeed the movement back to greater integration that is now very much still in progress, got underway and at last initially proceeded in spite, of rather than due to, the actions of governments.

Figure1. Cross-country standard deviations, composite measures

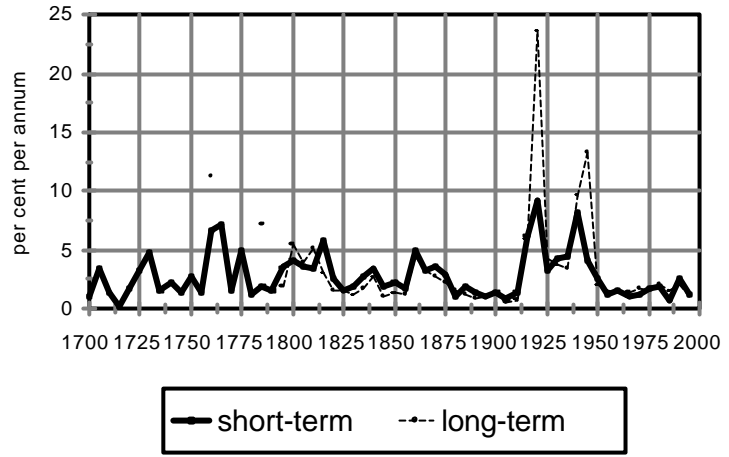


Figure 2. Cross-country standard deviations, Netherlands and UK

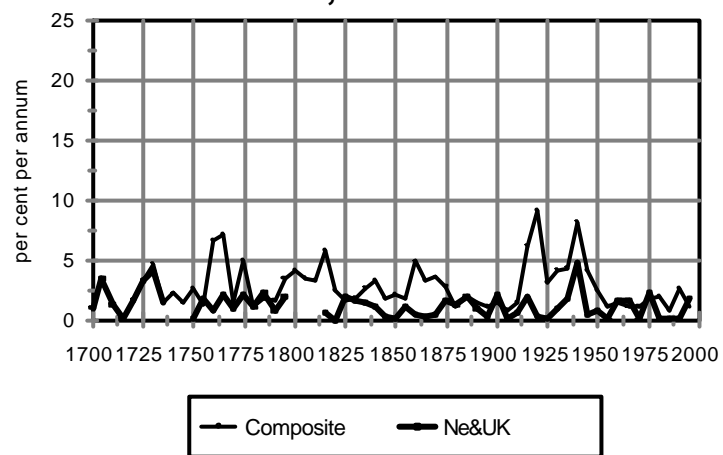


Table 1. Availability of real interest rate data

Short-term rates							Long-term rates										
Period	Country						Period	Country									
UK	Ne	Swe	Fr	Be	US	GE	UK	Ne	US	Fr	Ge	Be	Ca	It	No	Swe	
1700	X	X															
1705	X	X					1705										
1710	X	X					1710										
1715	X	X					1715										
1720	X	X					1720										
1725	X	X					1725										
1735	X	X					1735										
1740	X		X				1740										
1745	X		X				1745										
1750	X	X	X				1750										
1755	X	X	X				1755										
1760	X	X	X				1760	X	X								
1765	X	X	X				1765	X									
1770	X	X	X				1770	X									
1775	X	X	X				1775	X									
1780	X	X	X				1780	X									
1785	X	X	X				1785	X	X								
1790	X	X	X				1790	X	X								
1795	X	X	X				1795	X	X	X							
1800	X			X			1800	X	X	X	X						
1805	X			X			1805	X	X	X	X						
1810	X			X			1810	X	X	X	X						
1815	X	X	X	X			1815	X	X	X	X						
1820	X	X	X	X	X		1820	X	X	X	X						
1825	X	X		X	X		1825	X	X	X	X						
1830	X	X		X	X	X	1830	X	X	X	X	X					
1835	X	X	X	X	X	X	1835	X	X	X	X	X					
1840	X	X	X	X	X	X	1840	X	X	X	X	X					
1845	X	X	X	X	X	X	1845	X	X	X	X	X					
1850	X	X	X	X	X	X	1850	X	X	X	X	X					
1855	X	X	X	X	X	X	1855	X	X	X	X	X					
1860	X	X	X	X	X	X	1860	X	X	X	X	X				X	
1865	X	X	X	X	X	X	1865	X	X	X	X	X				X	
1870	X	X	X	X	X	X	1870	X	X	X	X	X	X	X	X	X	X

1875	X	X	X	X	X	X	X	1875	X	X	X	X	X	X	X	X	X
1880	X	X	X	X	X	X	X	1880	X	X	X	X	X	X	X	X	X
1885	X	X	X	X	X	X	X	1885	X	X	X	X	X	X	X	X	X
1890	X	X	X	X	X	X	X	1890	X	X	X	X	X	X	X	X	X
1895	X	X	X	X	X	X	X	1895	X	X	X	X	X	X	X	X	X
1900	X	X	X	X	X	X	X	1900	X	X	X	X	X	X	X	X	X
1905	X	X	X	X	X	X	X	1905	X	X	X	X	X	X	X	X	X
1910	X	X	X	X	X	X	X	1910	X	X	X	X	X	X	X	X	X
1915	X	X			X	X		1915	X	X	X	X		X	X	X	X
1920	X	X		X	X			1920	X	X	X	X	X	X	X	X	X
1925	X	X	X	X	X	X		1925	X	X	X	X	X	X	X	X	X
1930	X	X	X	X	X	X		1930	X	X	X	X	X	X	X	X	X
1935	X	X	X	X	X	X		1935	X	X	X	X	X	X	X	X	X
1940	X	X		X	X	X		1940	X	X	X	X		X	X	X	X
1945	X	X	X	X	X	X		1945	X	X	X	X	X	X	X	X	X
1950	X	X	X	X	X	X		1950	X	X	X	X	X	X	X	X	X
1955	X	X	X	X	X	X		1955	X	X	X	X	X	X	X	X	X
1960	X	X	X	X	X	X		1960	X	X	X	X	X	X	X	X	X
1965	X	X	X	X	X	X		1965	X	X	X	X	X	X	X	X	X
1970	X	X	X	X	X	X		1970	X	X	X	X	X	X	X	X	X
1975	X	X	X	X	X	X		1975	X	X	X	X	X	X	X	X	X
1980	X	X	X	X	X	X		1980	X	X	X	X	X	X	X	X	X
1990	X	X	X	X	X	X		1990	X	X	X	X	X	X	X	X	X
1995	X	X	X	X	X	X		1995	X	X	X	X	X	X	X	X	X

Note: Data are described in a separate appendix, available from the author on request. The dates shown in the left columns in the two halves of the table are beginning dates of the respective quinquennia.

Table 2. Subperiod averages of quinquennial cross-country standard deviations

PERIOD	SHORT-TERM RATES		LONG-TERM RATES
	2.68		
1700-1789			
1700-1729	1.82		
1730-1789	3.11		7.10
1790-1819	3.65		3.87
1820-1859	2.22		1.50
1860-1874	3.94		3.51
1875-1914	1.50		1.17
1915-1919	6.22		5.87
1920-1939	5.23		9.10
1940-1944	8.22		10.16
1945-1969	2.08		4.01
1945-1949	4.08		13.62
1950-1969	1.58		1.60
1970-1998	1.55		1.43

Note: Figures are averages of the composite standard deviations.

Table 3. Regression results

<u>Short-term</u>	<u>rate</u>		<u>Composi</u>	<u>Long-term</u>	<u>rate</u>		<u>Short-term</u>	<u>rate</u>	<u>Dutch-English</u>
	coeff.	t value			coeff.	t value			
Constant	1.552	2.495		Constant	1.434	1.080	Constant	0.948	2.341
D18	1.131	1.574					D181	0.876	1.495
D19	0.673	0.817		D19	0.069	0.040	D182	0.779	1.496
DGS	-0.050	-0.061		DGS	-	-0.150	D19	0.051	0.093
DIW	3.682	3.743		DBW	0.169	0.081	DGS	0.215	0.394
DBW	0.026	0.026		DIW	7.669	3.652	DBW	-0.155	-0.244
DNW	2.095	2.381		DNW	2.436	1.236	DIW	-0.104	-0.158
DCW	2.386	2.214		DCW	2.079	0.904	DNW	0.220	0.305
DWW1	4.671	2.838		DWW1	4.434	1.262	DCW	-0.527	-0.729
DWW2	4.599	3.697		DWW2	10.460	3.938	DWW1	0.959	0.862
SEE	1.524			SEE	3.253		DWW2	1.105	1.599
RSQ	0.457			RSQ	0.532		SEE	1.036	
							RSQ	0.187	

Note: The dummy variables and the periods for which they took the value of one were as follows: DWW2, a World War II dummy, 1940-49; DWW1, a World War I dummy, 1915-1919; DCW, a U.S. Civil War dummy, 1860-1874; DFN, a French Revolution and Napoleonic War dummy, 1790-1819; D18 an 18th century dummy, 1700-1789; D19, an early 19th century dummy, 1820-1859; DGS, a gold standard dummy, 1875-1914; and DBW, a Bretton Woods dummy, 1950-1969. The sample for the long-term real interest rate regressions only begins in 1795. Hence D18 is omitted from that regression. In the Dutch-English standard deviation regression D18 is divided into two separate dummies D181 for 1700-1729 and D182 for 1730-1789.

Table 4. Cross-country standard deviations of real interest rates by subperiod and country group

	<u>Short-term rates</u>							<u>Long-term rates</u>										
	Number of countries							Number of countries										
	Composite	2	3	4	5	6	7	Composite	2	3	4	5	6	7	8	9	10	
1700-1789	2.68	1.76	3.11															
1700-1729	1.82	1.82																
1730-1789	3.11	1.73	3.11					7.10	7.10									
1790-1819	3.65	1.17	3.81	4.20				3.87		3.58	4.48	4.35						
1820-1859	2.22	1.00	1.57	1.47	1.43	2.38	2.28	1.50	1.15	1.47	1.53	1.61	1.48					
1860-1874	3.94	0.42	0.70	0.83	0.79	4.20	3.94	3.51	0.88	4.88	4.10	3.84	3.48	3.41	3.44	2.91	2.77	
1875-1914	1.50	1.16	1.52	1.48	1.38	1.52	1.50	1.17	1.15	1.26	1.28	1.31	1.26	1.20	1.17	1.20	1.17	
1915-1919	6.22	1.91	2.37	2.37	2.37	2.56	6.22	5.87	2.67	1.92	5.69	6.84	6.84	6.92	6.70	6.25	5.87	
1920-1939	5.23	0.84	1.71	4.04	5.98	5.40	5.23	9.10	0.84	0.98	3.96	11.21	10.60	9.95	9.33	9.41	9.10	
1920-1924	9.14	0.39	4.03	4.03	10.45	9.14	9.14	24.53	0.73	1.21	4.59	34.01	30.42	28.50	26.43	25.30	24.53	
1925-1939	3.93	1.00	0.93	4.05	4.50	4.15	3.93	3.96	0.87	0.90	3.75	3.61	4.00	3.77	3.64	4.11	3.96	
1940-1944	8.22	4.74	4.55	4.55	8.69	8.04	8.22	10.16	1.06	0.95	5.62	6.22	6.22	5.71	11.60	10.75	10.16	
1945-1969	2.08	0.94	1.34	1.68	2.25	2.08	2.08	4.01	1.34	1.01	4.11	4.03	3.96	3.70	4.12	4.08	4.01	
1945-1949	4.08	0.40	3.23	3.62	4.36	4.08	4.08	13.62	1.62	1.25	15.46	13.41	13.14	12.27	14.21	13.92	13.62	
1950-1969	1.58	1.07	0.86	1.19	1.72	1.58	1.58	1.60	1.28	0.96	1.27	1.68	1.66	1.55	1.60	1.62	1.60	
1970-1998	1.55	0.78	0.99	1.00	1.48	1.56	1.55	1.43	0.85	0.79	0.73	0.83	1.11	1.08	1.35	1.48	1.43	

Note: Figures are averages of cross-country standard deviations computed by quinquennia.

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Notes

¹ A short, but highly informative, discussion of Dutch experience during these years is contained in Homer and Sylla (1996, pp. 173-78).

² McKinnon (1990) makes this argument. Also see the survey of Mussa and Goldstein (1993) for a discussion of this issue.

³ For theoretical treatments of this issue see Telser (1981) and Telser and Higinbotham (1977).

⁴ A detailed description of series and sources is presented in a data appendix available from the author on request. Note that for Belgium, the WPI is used for the full sample period and for the Netherlands the CPI is used.

⁵ This number varies over time and across assets. For short-term interest rates, for example, data are available for only two countries in the early part of the eighteenth and as opposed to the ten countries for which there are long-term bond data in the twentieth century. As I point out below in the discussion of Table 4, these variations in sample sizes in general do not seem to make much substantive difference.

⁶ The sample for the long-term real interest rate regressions only begins in 1795. Hence D18 is omitted from this regression. In the Dutch-English standard deviation regression D18 is divided into two separate dummies D181 for 1700-1729 and D182 for 1730-1789.

⁷ There is an additional issue here – a within-country dimension to this extensive margin. This has to do with the number of markets, organized and otherwise that are integrated. In this study as most others markets for a small number of securities are compared. Financial markets obviously are much broader than that. Additionally they are only one part of an even broader capital market, including the markets for both physical and human capital.