

# Changes in Economic and Financial Structure and the International Integration of Capital Markets over the Past Century and a Half

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**Abstract:** The focus of this paper is on market integration and the evolution of financial-market institutions over the years 1871 to 2020 and the relationship linking the two. One of its key findings is that changes in the exchange-rate regime, and in particular the change to more flexible exchange rates in the early 1970s, have had no lasting negative effects on the degree of financial integration. I attribute this observed neutrality of the change in the regime to the development of forward-looking markets that allowed market participants to hedge the risks inherent in the greater volatility of exchange rates under floating. I go on to present data that are consistent with conjecture.

**Keywords:** financial integration, exchange rates, interest rates, prices., monetary neutrality, financial history

**JEL classification:** F31, F33, G15, N20

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What do we mean by financial integration and why do we care about it? Well it all goes back to Adam Smith. George Stigler in a paper to mark the two hundredth anniversary of the publication of Smith's magnum opus *The Wealth of Nations* stated the basic theoretical issue succinctly (Stigler, 1976, p. 1201):<sup>1</sup>

“Smith had one overwhelmingly important triumph: he put into the center of economics the systematic analysis of the behavior of individuals pursuing their self-interest under conditions of competition. This theory was the crown jewel of *The Wealth of Nations* and it became, and remains to this day, the foundation of the theory of the allocation of resources. The proposition that resources seek their most profitable uses, so that in equilibrium the rates of return to a resource in various uses will be equal, is still the most important substantive proposition in all of economics.”

Why such closeness matters is straightforward and also comes directly from Smith, The more nearly equal are the returns to capital across countries, the more efficient is capital investment and the overall allocation of resources. If returns are systematically higher in country A than in country B, then that self interest to which Stigler alludes will lead to higher investment in A and lower investment in B, This in turn will narrow or eliminate the return differential and thus increase societal welfare..

In this paper, I use data for interest rates and prices for a broad group of countries over the long period from 1870 to 2020 to construct measures of real interest rates as proxies for the overall rates of return on capital. I go on to use these measures to examine the behavior of the Smithian model – how close these rates have been to one another in different countries at various points in time and how the relationship linking them has changed over the broad span of history.

One of the questions that looms large here is how the eight decades since the end of World War II stack up against the classical gold standard era that began in the 1870s and lasted until the outbreak of

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<sup>1</sup> Stigler presented this paper at a conference the Mont Pelerin Society held at the University of St. Andrews, Scotland about 35 miles along the coast road from Smith's birthplace in Kirkcaldy. Among the other paper presenters at the conference were Stigler's fellow Chicagoans and, like him, future Nobelists, Ronald Coase and Milton Friedman along with Friedrich Hayek, then already a Nobelist. For more on the conference and some further discussion of Smith see ‘The Unmatched Wealth of Adam Smith,’ my (unbylined) article in the Citibank *Monthly Economic Letter* in October 1976.

World War I in 1914. Both eras have been described as exemplars par excellence of globalized markets, albeit with some debate about which of the two eras was more so.<sup>2</sup>

A second key question concerns the impact of exchange-rate flexibility on the degree of market integration. At the time flexible rates came into being and indeed even before that, the idea of exchange-rate flexibility was surrounded by a good deal of intellectual controversy. One objection was that flexible rates simply would not work – no market would develop to facilitate currency trading in such a situation. From today’s vantage point that objection seems laughable, but it came from an otherwise knowledgeable observer. A more plausible sounding objection that continues to hold some sway is that the fluctuations in nominal exchange rates inherent to a flexible-rate system would hamper capital flows and the integration of world markets.<sup>3</sup>

The actual facts of the matter, however, belie those fears. What this study shows is that the seven plus decades since the close of World War II international financial markets have become more, not less, integrated. Integration, moreover, has been a continual process with the flexible-rate period also showing more, not less, integration than the Breton-Woods period that preceded it and more, not less, integration as time has passed. The data presented below demonstrate this quite clearly. After reviewing those data, I go on to present evidence with regard to how this greater integration has come about.

## **I. Introductory material: The literature on financial and economic integration**

The empirical literature on capital-market integration and on economic integration more generally has become quite voluminous during the course of the past three decades. Contributors to this literature have come from a variety of sub-disciplines in economics – macroeconomics, international finance, economic history, and the finance field more generally. An initial spate of papers came in the 1980s

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<sup>2</sup> See the discussions in Jackson and Lothian (1993) and Bordo, Eichengreen and Kim (1998). The title of the latter, rather revealingly so, is ‘Was There Really an Earlier Period of International Financial Integration Comparable to Today?’

<sup>3</sup> One qualification is required. The Bretton Woods system was not one of rigidly fixed rates among countries but one of pegged rates with periodic interventions of one sort or another and occasional revaluations and devaluation when balance of payments pressure mounted up.

0followed by a second wave in the 1990s that continued into the new century. Among the latter group were studies by Frankel (1992), Goodwin and Grennes (1993), Jackson and Lothian (1993), and Lastrapes (1998).<sup>4</sup> More studies soon followed and continued to be published well into the next decade.<sup>5</sup>

The Jackson and Lothian (1993) paper is particularly noteworthy since it was the first to document what has come to be known as the u-shaped pattern of international market integration – high levels of market integration in the last quarter of the nineteenth century up until World War I, low levels from then until the end of the 1940s and then high levels once again.

In that paper, Paul Jackson and I examined the behavior of real long-term bond yields in nine countries over the period 1871 to 1990. We were interested in the extent of capital-market integration and how that changed over time. We measured integration by the cross-country dispersion of real interest rates. A specific motivation was to see if the exchange-rate regime affected behavior.

I have much the same goals in this paper but with the passage of time have been able to come up with a richer set of data. Here I have close to double the number of countries and have added another three decades worth of data. The latter is particularly important. In the past three decades, data have become available on changes in the institutional nature of the foreign-exchange market that can possibly shed light on behavior since the advent of floating rates.

Jackson's and my conclusion was that while the regime did matter for nominal interest rates it did not appear to matter at all for real interest rates. We conjectured that the reason we observed neutrality of this sort was that institutions that enabled economic agents to hedge the increased volatility in financial markets – both bond markets and foreign exchange markets – had evolved endogenously. I picked up on this in Lothian (2000) and Lothian (2001).

The measure of financial integration that I use here, as in earlier work, is the degree of dispersion of real interest rates internationally. In Irving Fisher's analytical framework (see in particular, Fisher,

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<sup>4</sup> Reviews of this literature include Mussa and Goldstein (1993), Obstfeld and Taylor (1998), von Furstenberg (1998), and O'Rourke and Williamson (1999).

<sup>5</sup> See O'Rourke (2002), Obstfeld and Taylor (2004), Lothian (2000), Lothian (2002).

1907, pp. 279-280), the real rate of interest is the real rate of return on physical assets – in his terminology the “commodity rate of interest.” It in turn is linked to the real rate of interest on financial assets via an arbitrage relationship. Using this framework, we can view the cross-country differential in real returns on financial assets as having two components: the differential in real rates of return on physical assets in the two countries and the two within-country differentials between real interest returns on physical assets and on financial assets:

$$\rho_t - \rho_t^F = [\rho\kappa_t - \rho\kappa_t^F] + [(\rho_t - \rho\kappa_t) - (\rho_t^F - \rho\kappa_t^F)] \quad (1)$$

where  $\rho_t$  and  $\rho_t^F$  are the *ex ante* real interest rates on financial assets,  $\rho\kappa_t$  and  $\rho\kappa_t^F$  are the real returns on the physical assets in the two countries, and the superscript  $F$  denotes the foreign country. The first term on the right-hand side reflects the degree of arbitrage across countries; the second, the degree of financial intermediation within the two countries.

Rewriting this equation in terms of anticipated rather than actual rates of inflation, we get:

$$r_t - r_t^F = [\rho\kappa_t - \rho\kappa_t^F] + [(\rho_t - \rho\kappa_t) - (\rho_t^F - \rho\kappa_t^F)] + [(\pi_t^* - \pi_t^{F*}) - (\pi_t - \pi_t^F)] \quad (2)$$

where  $r_t - r_t^F$  is the differential in ex post real interest rates, and  $[(\pi_t^* - \pi_t^{F*}) - (\pi_t - \pi_t^F)]$  is the relative differential between anticipated and actual inflation rates. In the comparisons that follow, I use the current rate of inflation as a proxy for the anticipated rate.

## II. Data and Empirical Results

The data that I use here are annual data for consumer prices, short-term and long-term interest rates. These data span 17 countries over the years 1870 to 2020.<sup>6</sup> The countries included in the sample

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<sup>6</sup>With differencing of the price data, the actual sample is reduced a year to 1871 to 2020. This is not a completely balanced array, however. **Error! Main Document Only.**Data for long-term real rates are missing for the following countries and time periods: Belgium, 1913-1914; Finland, 1939-1947; Germany 1922-1924 and 1944-1947; Ireland 1871-1920; the Netherlands, 1945; Switzerland, 1871-1880.

are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Sweden, Switzerland, the United Kingdom and the United States. I use these data to construct yearly estimates of *ex post* real short-term and long-term interest rates. These, in turn, serve as the bases of the yearly series of cross-country standard deviations of the two series that I construct to assess the extent of financial integration. Figures 1a and 1b show time-series plots of five-year averages of these yearly cross-country standard deviations for short-term and long-term real interest rates respectively. Table 1 shows the means of the two yearly series for various subperiods.

One feature of the charts that stands out very clearly is the extreme degree of dispersion of both rates during the two world wars and to a lesser extent the interwar period. During all three of these periods we see fragmentation of the world's capital markets rather than integration. This is in sharp contrast to what we see in the period 1871 to 1914 during the heyday of the classical gold standard. Prior to the onset of the wartime and depression-related dislocations of the world economy, the cross-country standard deviations plotted in the charts were low, implying relatively close links among real interest rates internationally.

This is not simply an artifact of the data. There is a host of descriptive literature and other empirical evidence attesting to the closeness of the inter-country links between both capital markets and goods markets in this period.<sup>7</sup> Stock markets like the bond market studied here were internationally linked. International arbitrage activities were commonplace. Commercial and investment banking systems of the major countries were international in their scope. Rondo Cameron (1991, p. 3) in the introduction to *International Banking, 1870-1914* describes the period as one in which “international

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Data for short-term real rates are missing for the following countries and time periods: Australia, 1945-1947; Belgium, 1915-19; Canada, 1870-1933; Denmark, 1870-1874; France, 1914-1921; Germany, 1922-1924, and 1945-1949; Ireland, 1870-1921; Italy, 1870-1885 and 1915-1921; Japan, 1870-1878 and 1939-1956; the Netherlands, 1945; Norway, 1966; Portugal, 1870-1879.

<sup>7</sup> The literature here has become voluminous. See *inter alia* Jackson and Lothian (1993), Lothian (2000, 2016), O'Rourke (2002), O'Rourke and Williamson (1999), Williamson (1996).

investment reached dimensions previously unknown and the banking systems of the world achieved a degree of internationalization also without precedent.”

Once the dislocations of the two world wars and the Great Depression were over, we again see relatively low cross-country dispersion of real interest rates and therefore relatively high levels of integration. This is the case for both the Bretton-Woods and the floating-rate periods. We see it clearly both in the charts and in the subperiod means presented in Table 1. For both rates, the standard deviations under Bretton Woods are very close in value to their counterparts in the gold-standard era and for the latter three and a half decades of the flexible-rate period noticeably lower – 51 basis points in the case of short-term rates and 64 basis points in the case of long-term rates.

Table 2 provides some additional numerical precision to these comparisons. Shown in the table are the results of two dummy variable regressions used to conduct ANOVA –type tests of the real interest rate series. These took the form:

$$SD_{it} = \alpha + \beta_1 DWWI + \beta_2 DINT + \beta_3 DWWII + \beta_4 DBW + \beta_5 DF + \varepsilon_{it} , \quad (3)$$

where  $S_{it}$  is the standard deviation of the  $i$ th interest rate at time  $t$ ,  $DWWI$  is a dummy variable for 1914 to 1918,  $DINT$  is a dummy variable for 1919 to 1938,  $DWWII$  is a dummy variable for 1939 to 1949,  $DBW$  is a dummy variable for 1950 to 1972,  $DF$  is a dummy variable for 1973 to 2000, and  $\varepsilon_{it}$  is the error term. I omitted a dummy for the gold-standard period 1871 to 1914. The intercept, therefore, serves as an estimator of cross-country real interest rate dispersion during that 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 gold standard.

Not at all surprisingly, both war-time dummies and the interwar dummy are statistically significant. The Bretton-Woods and floating-rate dummies in contrast are all negative but only in the case

of short-term rates under Bretton Woods is the coefficient significantly different from the gold-standard estimate for both the full flexible-rate period and its latter portion.

What the data show, therefore, is that over the close to eight decades that have transpired since the end of World War II, both the twenty plus years of Bretton-Woods and the fifty years of floating rates that followed, the cross-country dispersion of real rates again has proven low. much as it did in the late nineteenth and early twentieth centuries, a period often described -- admiringly by some, disparagingly by many others -- as “the age of liberalism.” In short, there have been two eras of globalization over the last century and a half-- albeit with differences of various sorts as I and others have pointed out. ). Flexible exchange rates, moreover, have not in the end hindered that process.

Table 3, which is an abbreviated version of a table in my earlier paper “Financial Integration Over the Past Three Centuries,” (Lothian, 2001) picks up on both phenomena highlighted in the data analyzed here -- the international capital-market fragmentation brought about by war and other extreme economic dislocations versus the normal tendency towards international capital-market integration otherwise. In the data presented in Table 3 we see relatively high dispersion figures during the two war-time periods, the French Wars and surrounding years from 1790 to 1819 and the American Civil War and surrounding years from 1860 to 1874. In the remaining 175 years we see what I have just categorized as “normal.”

This is extraordinary. What it suggests is that barring outright cataclysm, markets work very well and have done so in vastly different time periods. The gains from trade win out, more than counterbalancing the myriad other forces that intrude on economic behavior. I do not believe this experience in capital markets in the eighteenth century is pure happenstance either. John Devereux and I in our paper “Exchange Rates and Prices in the Netherlands and Britain over the Past Four Centuries” (Lothian and Devereux, 2022) examine the purchasing power parity relation over a sample period that encompasses both sample periods studied here. We find no effect in the two countries’ goods markets of any of the factors that might also be thought to affect their capital markets. The only outside factor that seems to matter for real exchange rates is the industrial revolution in Britain that began in the 1780s.



### III. Why so little effect of floating?

Milton Friedman published his famous article the “Case for Flexible Exchange Rates” in 1953. (Friedman, 1953). Eighteen years later in August 1971 what Friedman had advocated actually came to pass. President Nixon closed the gold window and the United States did indeed move to flexible rates. The impetus for the move came from the rising inflation of the late 1960s and early 1970s, its effects on the United States balance of payments, and foreign countries’ reactions to the resultant dollar inflows.

Prior to the move, a good deal of controversy surrounded the Friedman proposal and that continued long afterwards. In 1967, Friedman and Robert Roosa, an economist, turned government policy maker and later investment banker, faced off in a debate on the subject. Roosa expressed doubts that flexible rates would work on any level. “Individual foreign exchange traders and bankers would have an almost impossible task in groping for a going rate that could take all these conflicting [economic] influences into account,” he opined. He then went on to raise questions about the negative feedback effects that flexible rates might have on the rest of the economy. “I am really puzzled over what could happen to the allocation of capital among and within countries, over time, with exchange rates fluctuating frequently and at times widely,” he said. “Often, indeed, those differentials in interest rates and profits that help to bring capital to its most productive uses would simply be off set.” Roosa was not alone. Charles Kindleberger voiced similar concerns in an article entitled “The Case for Fixed Exchange Rates 1969,” a title that was an obvious takeoff on Harry Johnson’s “The Case for Flexible Exchange Rates 1969,” itself a takeoff on Friedman’s original paper (Johnson 1969; Kindleberger 1969).

For a decade following the move to floating, nominal exchange rates were quite volatile. This volatility in turn gave rise to further questions with regard to the viability of the floating-rate system and the validity of existing exchange-rate theory, in particular the purchasing-power-parity theorem.<sup>8</sup> These criticisms, however, turned out to be more than a bit overblown, though not without some kernel of truth.

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<sup>8</sup> See Shafer and Loopesko (1983) and the related comments by Dornbusch (1983), .

Even though nominal and real exchange rates were volatile, such volatility was not an across-the-board phenomenon. Very much of that volatility was exclusively dollar-related (Lothian, 1986). Quite arguably this was associated with the track that U.S. monetary policy had been on during the Great Inflation and confusion about where it was headed. Purchasing power parity, moreover, even with the paucity of data available then, proved more resilient than the critics realized (Lothian, 1985). As more data became available and researchers became increasingly cognizant of the necessity of long spans of data to distinguish between temporary and permanent movements in real exchange rates, purchasing power parity regained its theoretical respectability.<sup>9</sup>

Where truth does to some extent appear to have crept in is in the effects that this volatility had on capital markets. As the figures in the two bottom rows of Table 1 showed, the initial years of the float were in fact marked by greater dispersion of real interest rates than under Bretton Woods. Market integration by this measure was hampered. This greater dispersion, however, did not last and was in fact reversed as time passed and as the bottom row of the table shows. Why was this so?

I have argued elsewhere that it was to be expected, that the increased volatility of exchange rates would result in institutional change. (Lothian, 2000). Markets to hedge the resultant increased risk, would develop. The insights of Telser and Higinbotham (1977) and Telser (1981) are pertinent here. Consider organized futures markets, which are the focus of those two studies. Developing and operating such markets is costly. These costs, however, are mostly independent of the state of the spot market in the particular good, but the benefits are not. The benefits increase along with the increase in the risk inherent in spot-market price changes. As the volatility of spot prices increases, risk increases, and the cost of not having a futures market in the good increases enough that eventually its establishment becomes viable.

It all hinges upon whether the benefits – the reduction in these opportunity costs – exceed the costs of establishing and operating the new market. Certainly, this offers a way to explain the development and

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<sup>9</sup> Frenkel (1986), Edison (1987), and Lothian (1990) are early studies using long-span time series data to investigate the behavior of real exchange rates.

timing of the host of forward-looking markets that has taken place since the advent of floating. As the costs of not hedging exposure in foreign exchange markets, money markets and other financial markets rose, new instruments, new markets, and new corporate finance techniques were developed.

Working in the same direction and itself in large part an endogenous response to economic conditions was the erosion and eventual removal of regulatory impediments to international capital mobility – capital controls, interest-rate ceilings and the like.

Table 4 presents data from the *Triennial Central Bank Surveys* of the Bank for International Settlements on turnover in the foreign exchange market. Shown in the table are total transactions and a breakdown into spot transactions and what I have labeled forward-looking transactions. The latter is an aggregation of outright forwards, foreign-exchange swaps, currency swaps and options and other products. Chart 2 presents a picture of the spot and forward-looking transactions from 1989 to 2022. As both the table and chart indicate the forward-looking transactions now pretty much swamp spot transactions. The bulk of the forward transactions, in turn, is made up of foreign exchange swaps.

The first noteworthy feature of these data is the tremendous size of the market. Contrary to the fears voiced by Roosa, Kindleberger, and others, the foreign exchange market under the floating-rate regime has indeed thrived. People clearly have had no difficulty at all in operating in this market. The second noteworthy feature of these data is the tremendous growth in forward-looking transactions relative to spot transactions. Total foreign exchange market turnover is now huge, \$7.5 trillion per day in April 2022, and has been so for well over a decade. That is up from \$524 billion per day in April 1989. Of this year's figure of \$7.5 trillion per day, \$5.4 trillion per day – a whopping 72 per cent– is made up of forward-looking transactions. As theory would suggest, a foreign exchange market that could handle the increased traffic occasioned by flexible rates did indeed develop. It did so, moreover, in such a way that investors were provided with instruments with which they could hedge the risk of the increased volatility of real and nominal exchange rates and resultant increased risk that were features of the changed exchange-rate regime.

The data from the BIS only begin in 1989. A question that has arisen is when did foreign-exchange swaps start and begin to achieve some prominence? I have been unable to come up with much in the way of hard data on this question. The online site Investopedia states that it was 1981 when the first foreign exchange swap was transacted, a swap between the World Bank and IBM.<sup>10</sup>

I strongly suspect, but do not know for sure, that foreign exchange swaps may have had a very much earlier incarnation. The Netherlands in the seventeenth century was the seat of financial innovation. It saw the advent of perpetuities, futures contracts, margins, short sales and a number of other financial-market instruments (Homer and Sylla, 1996). The Amsterdam Exchange, the center of Dutch financial trading activities, evolved into a world market in which a wide range of securities and commodities were traded (Homer and Sylla, 1996; Dehing and t'Hart 1997). It would not be surprising to find out that foreign exchange swaps were yet another Dutch innovation of that era. Even earlier, a wave of financial innovation took place in northern Italy during the thirteenth century. Again, it would not be at all surprising to find out that foreign exchange swaps were part of that package too. This is particularly so since such transactions would have provided a convenient way of circumventing Church-imposed usury prohibitions.

In any event, the first half of the 1980s was a period in which financial innovation was an important on-going process. I was able to see it close up. I was at Citibank then. I had left the Citibank economics department in 1983 and joined the corporate finance team as their economist. That was the time during which the interest-rate swaps market was beginning to get into full swing. My corporate finance colleagues at Citi were in the forefront of that development. At about the same time, I was asked by the Citibank treasury unit in New York to write a position paper on interest-rate futures and the use of that market to hedge interest-rate risk. The commercial bankers were unsure what to do about it and were worried that it would simply be a source of increased risk.

#### **IV. Conclusions**

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<sup>10</sup> See Manning (2023) who cites the World Bank as the source for this information.

The effect of floating exchange rates on international market integration has been a bone of contention for 60 years or more. One view has it that it would be a disaster, that a switch from fixed to floating rates would set back market integration tremendously. The alternative take is that economies will adjust to the change and that that adjustment will counteract any deleterious effects that might result from increased volatility under floating.

My findings in this paper are fully consistent with this latter position. The data that I use to investigate the degree of capital-market integration are multi-country time series for real money market rates and real long-term bond yields for a sample of 17 countries over the period 1871 to 2020. This is a more geographically extensive body of data than any used elsewhere and spans a much longer period of floating rates.

The switch to floating has resulted in no permanent damage to market integration. On the contrary, the dispersion of real short-term interest rates among countries is in fact appreciably less under floating than under either the pegged exchange-rate system of Bretton Woods or fixed exchange-rate gold standard system. For long-term bond yields the dispersion under floating is roughly the same as under Bretton Woods, but this may in fact simply be the result of one episode, the European debt crisis of a decade ago and its effects on bond yields. When I go on to compare experience over this 150-year sample period with experience in earlier centuries, I find a complete mesh. In anything other than extraordinarily difficult circumstances, a strong tendency towards integration manifests itself. This is so in the eighteenth century, the early part of the nineteenth century, and in the 150 years studied here.

In each period, interruptions occurred but then the integration process began anew. It did so, moreover, spontaneously. Financial integration was something that was neither planned nor 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 integration process going through thick and thin.

Indeed the movement back to greater integration that we have observed recently initially proceeded in spite of, rather than because of, the actions of governments.<sup>11</sup>

The reason why floating rates have not had the adverse effects that their critics attributed to them is, I believe, the result of the tremendous increase in the availability of forward-looking instruments that can be used to hedge increases in risk. New markets developed and existing markets expanded. What we economists often are prone to ignore, however, is that behind these market workings lie the actions of human agents. New markets do not spring forth fully grown like Athena from Zeus's head. People dreamt them up and then beavered away in the background making them viable.

A fascinating episode in this regard is the development of organized futures market in foreign exchange, that prior to the move to floating, did not exist.

In 1971 Leo Melamed, the chairman of the then named Chicago Mercantile Exchange, a seat of commodity futures trading, took a look at the changed exchange-rate situation and came up with the idea of a market in foreign exchange futures. His immediate payback was to get derided by all and sundry (Melamed, 2014). He decided, however, that it would be wise to get an expert opinion. He arranged a meeting with Milton Friedman. With some trepidation he broached the question of a foreign-exchange futures market to Friedman. According to Melamed, "His response was as immediate as it was positive. 'It is a wonderful idea ... You must do it.'" As Melamed relates further, "Stunned, I asked if he had considered the fact that this would be a break with tradition, bringing finance to the futures market. He responded, as I believed, that it should make no difference. Hardly believing my ears, I asked whether he would put his answer in writing (Melamed, 2012)." Friedman did so. The result was a short but eminently clear, paper that is a fine and very prescient piece of scholarship in its own right (Friedman, 2011).

Friedman concluded his analysis with the statement:

Changes in international financial structure will create a great expansion in the demand for foreign cover. It is highly desirable that this demand be met by as broad, as deep, as resilient a

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<sup>11</sup> This last paragraph draws on Lothian (2001).

futures market in foreign currencies as possible in order to facilitate foreign trade and investment. Such a wider market is almost certain to develop in response to the demand.

All of this and more happened. The market worked and so did the market for markets.

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**Table 1. Subperiod means of yearly cross-country standard deviations of real interest rates  
17 countries, 1871-2020**

	short-term rates	long-term rates
1871-1914	2.06	2.11
1915-1921	7.11	6.26
1922-1938	2.68	2.39
1939-1949	6.06	8.10
1950-1972	1.58	2.07
1973-2020	1.72	1.50
1973-1983	2.64	2.23
1984-2020	1.45	1.37

Note: The data source is the Jordà-Schularick-Taylor Macrohistory Database. The countries making up the sample are Australia, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, Portugal, Sweden, Switzerland, the United Kingdom and the United States. Real interest rates are measured as the difference between the nominal interest rates and the contemporaneous rates of consumer price inflation.

**Table 2. Regressions of yearly cross-country standard deviations of real interest rate on period dummy variables  
17 countries, 1871-2020**

Intercept	DWWI	DIW	DWWII	DBW	DFL	DFL1	DFL2	R <sup>2</sup> /SEE
<u>Short-term rates</u>								
2.535	4.839	0.21	5.648	-0.866	-0.813			0.503
0.294	0.794	0.557	0.657	0.502	0.407			1.95
8.621	6.097	0.376	8.591	-1.727	-1.997			
2.535	4.839	0.21	5.648	-0.866		0.107	-1.086	0.514
0.292	0.788	0.553	0.652	0.498		0.652	0.432	1.935
8.687	6.144	0.379	8.657	-1.74		0.164	-2.516	
		ss						
<u>Long-term rates</u>								
2.104	4.616	1.299	5.78	-0.037	-0.603			0.369
0.372	1.003	0.704	0.831	0.634	0.515			2.466
5.661	4.601	1.845	6.954	-0.058	-1.172			
2.104	4.616	1.299	5.78	-0.037		0.124	-0.82	0.374
0.371	1.003	0.704	0.831	0.634		0.831	0.55	2.464
5.666	4.605	1.846	6.96	-0.058		0.149	-1.491	

Note: The dummy variables and the periods for which they took the value of one were as follows: DWWI, a World War I dummy 1915-21; DIW, an interwar dummy, 1922-38; DWWII, a World War II dummy, 1939-49; DBW, a Bretton Woods dummy, 1950-1972; DFL, a floating-rate dummy for the years 1973-2000; DFL1, a floating-rate dummy for the years 1973-1983; DFL2, a floating-rate dummy for the years 1984-2000. Standard errors of the coefficients are immediately below the coefficients and t values below the standard errors.

**Table 3. Subperiod averages of quinquennial cross-country standard deviations**

Period	Short-term rates	Long-term rates
1700-1789	1.76	
1790-1819	3.65	3.87
1820-1859	2.22	1.50
1860-1874	3.94	3.51
1875-1914	1.50	1.17

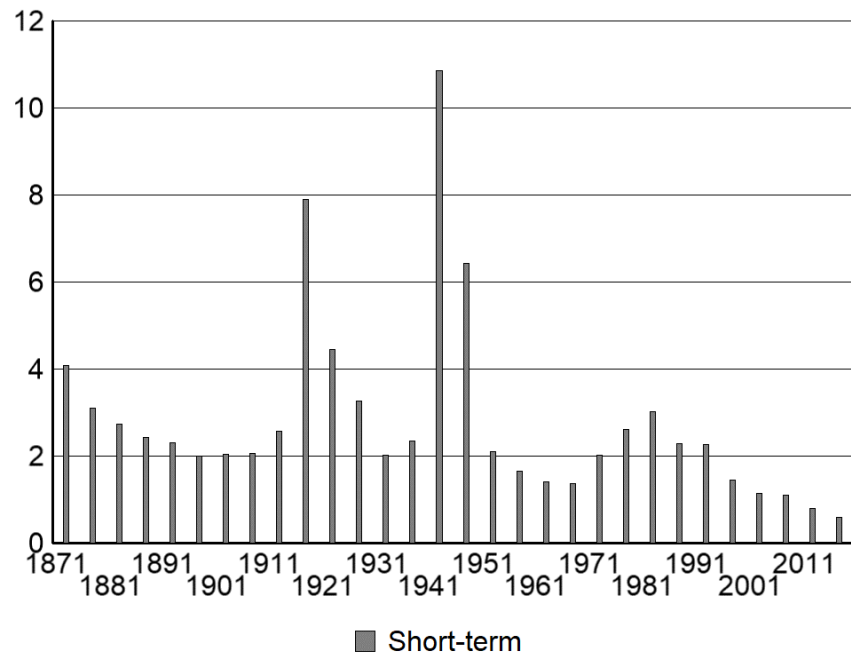
Note: The source for the Figures shown here is Table 1 in Lothian (2001).

**Table 4**  
**Foreign Exchange Turnover, 1989-2022**

	Total	Spot	Forward-looking instruments				Total
			Outright forwards	FX swaps	Currency swaps	Options and other	
1989	534	317	27	190			217
1992	776	394	58	324			382
1995	1137	494	97	546			643
1998	1430	568	128	734			862
2001	1,239	386	130	656	7	60	853
2004	1934	631	209	954	21	119	1303
2007	3324	1005	362	1714	31	212	2319
2010	3,973	1489	475	1759	43	207	2484
2013	5,357	2047	679	2240	54	337	3310
2016	5,066	1652	700	2378	82	254	3414
2019	6,581	1979	998	3198	108	298	4602
2022	7,506	2104	1163	3810	124	304	5401

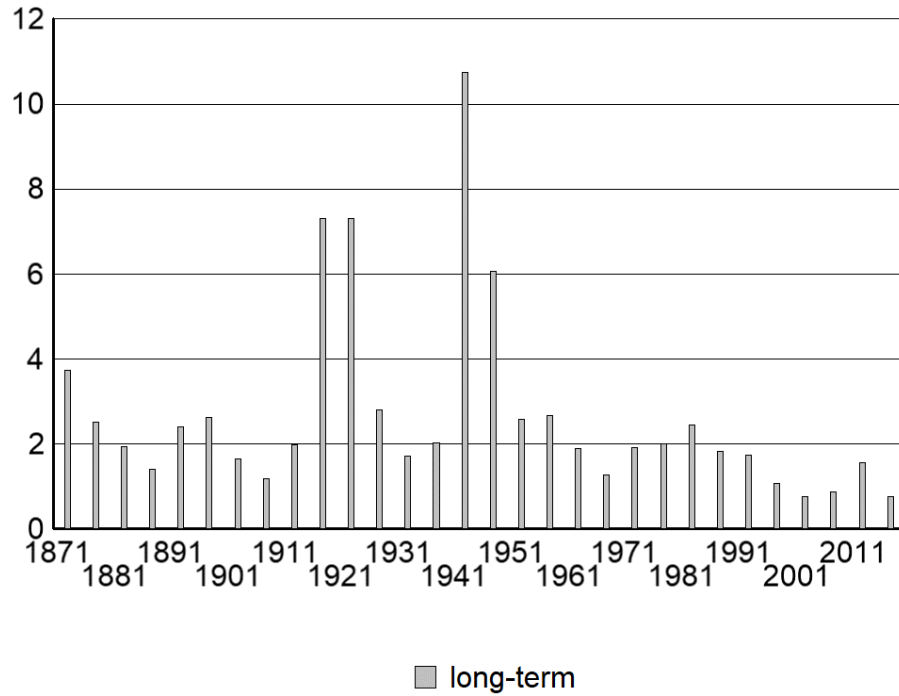
Source: Bank for International Settlements, *Triennial Central Bank Survey*, various issues.

**Figure 1a**  
**Five-year averages of yearly cross-country standard deviations of short-term real interest rates**

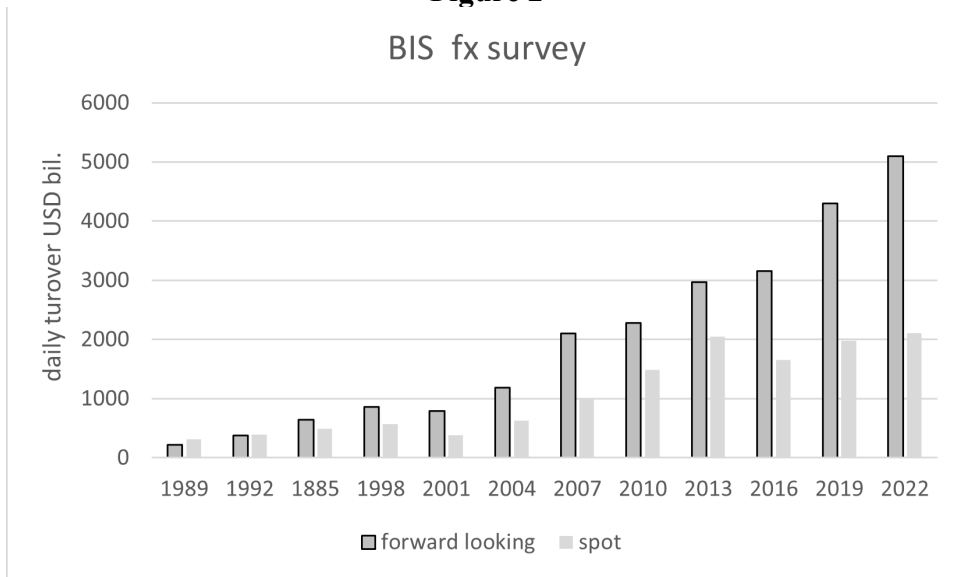




**Figure 1b**  
**Five-year averages of yearly cross-country standard deviations of long-term real interest rates**



**Figure 2**  
BIS fx survey



Source: Bank for International Settlements, *Triennial Central Bank Survey*, various issues.

Forward-looking transactions is an aggregation of outright forwards, foreign-exchange swaps, currency swaps and options and other products.