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Getting into Bonds

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In early 1994 there was substantial turmoil in international bond markets. Bond prices slumped, sending yields (interest rates) on bonds and related financial instruments soaring. Bonds denominated in Australian dollars were caught up in the rout, as a result of which interest rates on long-term government bonds in Australia rose from 6.35 per cent in January 1994 to 9.35 per cent in August 1994. Rising long-term bond yields eventually induced the Reserve Bank of Australia to raise short-term interest rates (tighten monetary policy), a move which saw a subsequent brief rally in bond yields.[1] Figure 1 shows the recent history of long-term bond yields in Australia and a selection of other developed countries.

Many people believe that price instability connotes market irrationality. Rational prices, it seems, must always be stable. The sharp movement of bond prices in 1994 has been interpreted in some quarters as a speculative bubble that could not have been 'driven by fundamentals'. The implication is that markets were seized by a wave of hysteria and temporarily broke loose from their rational moorings.

Financial economists do not dismiss the claim that markets are subject to bouts of irrationality. Indeed, the technical literature recognises that asset price bubbles (departures from fundamentals) may even be rational.[2] The difficulty lies in distinguishing bubble behaviour from sudden changes in the fundamental determinants of asset prices. If there is good reason to believe that 'fundamentals' might have changed, the hypothesis of bubble behaviour becomes less plausible.[3]

But whereas the notion of asset price bubbles, rational and irrational, has a respectable intellectual foundation, the view, held by some commentators, that asset markets are mere casinos in which 'high rolling' speculators drive prices from pillar

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[1] Since the market price of a bond is the discounted present value of a stream of future cash flows, bond prices move inversely with interest rates or yields. A period of falling bond yields is referred to as a 'rally' since it corresponds to rising bond prices.

[2] See LeRoy and Gilles (1992) and Weller (1992) for discussions of rational and irrational asset price bubbles.

[3] Garber (1994) re-interprets two famous historical episodes of alleged bubble behaviour — the Dutch tulip mania and the South Sea bubble — and concludes that they were entirely the result of sudden changes in fundamentals rather than departures from fundamentals.

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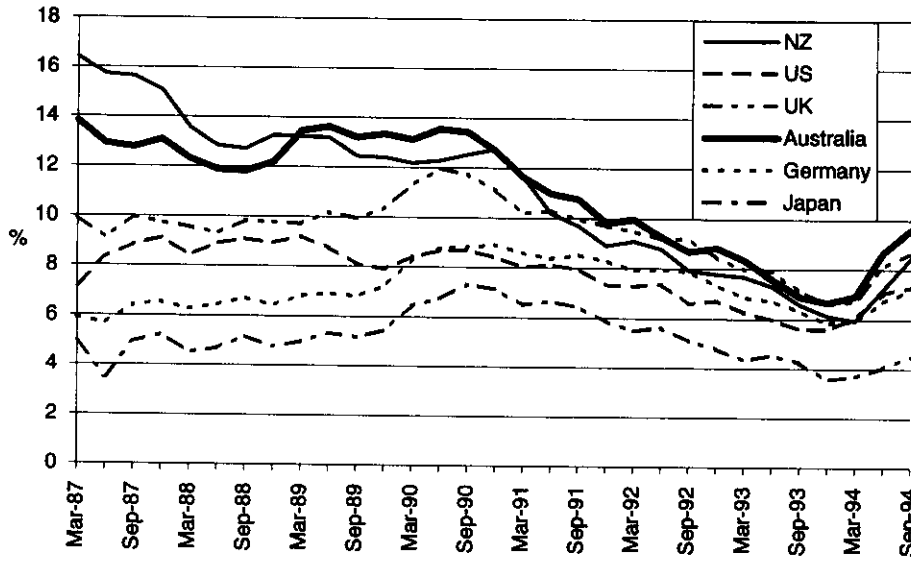
Figure 1

Long-term bond yields in Australia and selected countries, 1987-94



Source: Reserve Bank of New Zealand.

to post for their own financial gain, does not. For these observers, the idea that fundamental economic forces play any role in asset price determination is akin to admiring the emperor's new clothes. There are many obvious differences between a gaming casino and the international bond market. For example, whereas participants in gaming casinos expect (statistically speaking) to lose money, bond traders expect to make money, and generally succeed in doing so. Casinos play no role whatsoever in the allocation of society's scarce resources amongst competing productive enterprises; they represent pure consumption. Asset markets, on the other hand, and bond markets in particular, are financial switching mechanisms, directing resources towards those enterprises most highly valued by the investing public and away from those considered less profitable. There is a world of difference between the (creditable) claim that asset prices occasionally depart from fundamentals and the (discredited) claim that there are no fundamentals to depart from!

This article seeks to provide some background on bond markets for the general reader.[4] In particular, it describes institutional aspects of bond markets and the mechanics of government bond issue in Australia. Rather than adjudicate on whether or not bond prices are subject to bubble behaviour, an issue that requires

[4] Several textbooks treat the subject matter of this paper in even greater detail. Jüttner (1990) and Davis and Lewis (1993) are two popular examples.

more than passing familiarity with a highly technical literature, the article proceeds from the orthodox perspective that bond prices reflect fundamentals. It then asks what fears and/or expectations might have been responsible for the bond price collapse of recent times. We begin, however, with some basic facts about bonds and their economic function.

Debt and Taxes

A 'bond' is a debt instrument. It represents an agreement on the part of a borrower (the issuer of the bond) to make a series of regular payments ('coupons') to the lender (holder of the bond) plus a final repayment of the principal (face value of the bond) at a specified maturity date. The difference between bonds and other types of debt instrument, such as mortgages, is that bonds are always tradable. Bonds are designed to be exchanged, so that the original lender of funds who purchased the bond when it was first issued may not be the same party to whom the principal is paid upon maturity.

The tradability of bonds implies that a bondholder need not wait until the maturity date in order to 'get his money back'. Sale of the bond part-way through its term will return principal and accrued interest to the lender. If bond prices have risen in the meantime, reflecting lower interest rates available on alternative investments, the bondholder may even make a capital gain on his investment. For the borrower's part, she is indifferent to the identity of the lender and simply needs to know in whose favour the cheques for coupon payments and principal should be drawn.

Bonds can be held in one of two forms: as bearer securities, or as inscribed stock.[5] The advantage of inscribed stock over bearer securities is that a record of ownership is kept at a central registry. Thus, title to the bonds is not affected by loss or theft of the bond certificates. Ownership of bearer securities is evidenced by physical possession of the certificates, leaving them vulnerable to theft or accidental destruction. On the other hand, bearer securities leave no traceable record of transaction or ownership, which makes them popular with bondholders who wish to avoid entanglements with regulatory or taxation authorities.

Traditionally, the most active sellers of bonds have been governments, which sell bonds to finance expenditure in excess of their taxation revenue. There are only three ways for a government to finance its expenditure: taxation, sale of bonds (borrowing from the public) and printing money (borrowing from the central bank).[6] Responsible governments avoid the third of these alternatives except in

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[5] While this is true in principle and also in practice in international bond markets, Australian government bonds are no longer issued as bearer securities.

[6] A fourth way in which governments finance expenditure is through the sale of public assets, such as public trading enterprises. Under the cash accounting conventions adopted by most Western governments, however, the proceeds of asset sales are regarded as negative expenditure rather than financing transactions. There are therefore only three ways of financing *measured* government expenditure.

dire necessity.[7] Borrowing from the public via bond sales should also be kept within limits on account of the adverse impact on private-sector fund-raising (the 'crowding out' problem).

The great bulk of bonds traded on Australian bond markets are issued by the different levels of government and their associated public authorities. The (domestic) market for corporate bonds opened only as recently as 1987 with the first local issue of unsecured notes by BHP Finance Limited. Since then, the market has developed strongly, following the growth of mortgage securitisation and the issue of subordinated debt by banks. But it is still small relative to the market for Commonwealth and semi-government debt.[8]

On the other side of the market, the main purchasers of bonds are financial institutions, especially managed investment funds. Bonds are attractive to investors for three reasons: they offer a predictable income stream extending over a long period of time; there is, generally speaking, a low risk of default by the bond-issuer; and, because of their long maturity, bonds offer good prospects of capital gains as bond prices move in response to changes in general economic conditions.

Financial institutions that issue long-term liabilities, like life insurance companies and pension (superannuation) funds, seek long-dated securities to hold as assets against their liabilities. They are natural investors in bond markets. Banks and depository non-bank financial institutions also hold bonds under regulatory requirements imposed upon them to hold a proportion of their asset portfolios in the form of 'prime assets'. Mutual funds or 'unit' trusts assemble portfolios of bonds and/or other financial assets against which they issue shares or 'units' to the public. This is an increasingly popular vehicle whereby individuals participate directly in the income and capital-growth opportunities available in domestic and international bond markets. Some bond market mutual funds in the United States are larger than most commercial banks.

Eurobonds

The greatest fillip to bond trading internationally came with the development of the Eurobond markets beginning in the 1960s. Technically speaking, Eurobonds are bonds sold by foreigners into a domestic market which are denominated in either their own or a third currency. Thus, bonds issued by BHP into the London market and denominated in Australian dollars or US dollars would qualify as a Eurobond issue. The reference to Europe merely reflects the history of these instruments, which dates from the Vietnam War and the associated growth of foreign-domiciled US dollar bank balances. Restrictions on capital inflow into the United States

[7] It is, of course, appropriate for the central bank to allow the money supply to grow in line with the increasing demand for money occasioned by the growth of the economy. This is effected by central bank purchases of securities (domestic or foreign government bonds) in secondary markets. As explained below, financing the government's budget deficit and managing the growth of the money supply are both conceptually and operationally distinct.

[8] For more detail on the Australian corporate bond market, see Bruce et al. (1991:216-17) and Davis (1993:275-7).

through traditional banking channels around this time also spurred the search for alternative means for US corporations to raise funds abroad. In the intervening 30 years, the Eurobond markets have flourished, producing an amazing variety of bonds and bond-like instruments. Many Australian corporate and official borrowers have tapped the Eurobond markets, either directly in their own names, or in association with banks.

Although the bonds traded in international markets are many and varied, especially in the Euromarkets, they share certain common features:

- most bonds have a specified maturity date[9] and are issued for terms of at least one year;[10]
- most bonds carry coupons payable at regular intervals (annual or semi-annual);[11]
- coupons are either fixed as a proportion of the face value of the bond or vary in line with a published international interest rate (e.g. the London Inter-Bank Offer Rate);
- as debt instruments, bonds confer no equitable interest in the borrower upon the lender, although bonds may be 'convertible' into equity on specified terms;
- bonds can be denominated in any currency, including currencies foreign to the country of domicile of both the issuer and the bondholder, and there is no need even for coupons and principal to be paid in the same currency; and
- bonds are rated by international bond rating agencies according to their perceived risk of default, those failing to reach the minimum rating necessary to qualify as 'investment grade' being known colloquially as 'junk bonds'.

Australian Bonds

Bond prices in Australia are heavily influenced by two factors: borrowing decisions of the Commonwealth government and bond prices struck in offshore markets (most especially, the United States).[12] Bond prices vary with the perceived riskiness

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[9] Bonds without a specific maturity date, so-called 'perpetual' bonds, are not unknown but are extremely rare.

[10] Tradable debt instruments issued for terms of less than one year are referred to as 'bills' or 'notes'.

[11] Bonds without coupons are known as 'zero coupon bonds' or 'zeros'. The coupons attached to a 'straight' bond (a bond whose coupons are fixed rather than variable) can be 'stripped' and sold separately, thus creating a zero coupon bond synthetically.

[12] While bonds issued in different currencies are not perfect substitutes, they are close substitutes, once allowance is made for exchange-rate risk. The prices of bonds in different national markets should therefore move in sympathy with one another, again allowing for changes in the outlook for exchange rates.

of the issuer. Generally speaking, sovereign borrowers (governments) have the lowest perceived risk of default.[13] This is because governments possess the sovereign right to raise revenue through taxation. Short of revolution, governments can use their coercive power (backed by military force) to extract tax revenue from their citizens. Furthermore, responsible governments go to great lengths to avoid defaulting on their obligations, both to ensure their own continued access to bond markets in future and so as not to disturb the waters for private borrowers within their jurisdictions. All of this paints governments a deep low-risk hue in the eyes of potential bondholders.

Private agencies (like Standard & Poors and Moody's) specialise in rating the riskiness of bonds. Not surprisingly, government bonds are ranked among the least, if not *the* least, risky of all bonds traded on bond markets. The risk rating awarded to a sovereign borrower is important not just because it influences the price of government bonds but because the rating of the sovereign will influence the prices of all bonds, private and public, denominated in the currency of the country in question. The price of sovereign debt sets a floor for the prices of all other debt denominated in domestic currency.

Commonwealth Government Debt: The Mechanics

The Commonwealth government issues bonds to finance its budget deficit and to meet repayments of principal on maturing debt. Sales of bonds to finance the budget deficit add to the stock of outstanding debt, whereas sales of bonds to meet amounts due on maturity serve to refinance part of the existing stock of public debt. In its capacity as the Commonwealth government's banker, the Reserve Bank of Australia assists the government to plan the issue of new bonds into the market. Commonwealth bonds are sold at irregular intervals by public tender and in lot sizes determined by the Commonwealth Treasury in conjunction with the Reserve Bank.

Commonwealth bond tenders are auctions at which licensed bond dealers submit bids to purchase various parcels of bonds at specified prices (yields). The Treasury accepts bids in ascending order of yield (that is, it sells bonds to those who bid the highest prices first, and works down the list of bids). In this way, the government ensures that its debt is financed on the most attractive terms available in the market. The maturity structure and coupon rate of the bonds tendered for sale is determined by the Treasury in consultation with the Reserve Bank. From time to time, the Commonwealth government has issued bonds denominated in foreign currency directly into international bond markets. It has even placed debt privately with large individual and institutional investors offshore. In recent years, however, the Commonwealth has redeemed most of the outstanding stock of its foreign-currency denominated debt and has not sought to reissue.

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[13] Governments of some less developed countries, especially in Latin America, are an obvious exception. Even in these cases, however, rates of interest on sovereign debt set a floor for rates on private debt raised in the same currency.

As a general rule, the Reserve Bank does not purchase Commonwealth bonds in the primary market (that is, newly-issued bonds). It may do so on occasion but only to replace stock maturing from its portfolio. By avoiding the purchase of newly issued bonds from the government, the Bank insulates the money supply from the impact of government deficit financing.[14] Were the Bank to make net purchases of Commonwealth bonds directly from the government, it would effectively finance the government budget deficit through the issue of its own liabilities. Since Reserve Bank liabilities represent money, such an exchange would be tantamount to financing the deficit by means of money creation. This practice is to be avoided since it is highly inflationary if conducted for any length of time.

On the other hand, the Reserve Bank is an active trader of Commonwealth bonds in the secondary market. By buying or selling bonds in the secondary market, the Reserve Bank raises or lowers the rate of growth of its balance sheet, which in turn affects the degree of liquidity in the money market. Such trading activity on the part of the Reserve Bank is referred to as 'domestic market operations' and constitutes the principal means by which the Bank administers monetary policy. As the Bank sells (buys) Commonwealth bonds, it engineers a shortage (surplus) of cash in the official short-term money market, which in turn places upward (downward) pressure on overnight interest rates and subsequently on interest rates further along the yield curve (i.e. on longer-dated securities).[15]

Deficits vs Surpluses

Whenever the government runs a budget deficit financed through the sale of new bonds to the public, the stock of government bonds on issue increases. Whether or not this increase is *real* depends upon the rate of inflation. If the rate of inflation exceeds the percentage increase in the nominal value of the outstanding debt, the real value of the debt declines. This provides a way to determine how much of an increase in the government's fiscal deficit is real and how much is nominal. One simply calculates by how much the deficit raises the real value of the stock of outstanding public debt.[16]

When the government runs a budget surplus, on the other hand, it repays outstanding debt. The more surpluses a government runs, the more it draws down the stock of its outstanding debt. Eventually, the public debt would disappear, and the government would begin to accumulate claims on the private sector.

When the Commonwealth government declared a series of budget surpluses in the late 1980s, it held 'reverse' bond tenders in order to repurchase outstanding debt. The Reserve Bank conducted the tenders on behalf of the government and repurchased Commonwealth bonds in descending order of yield (that is, the lowest priced bonds were repurchased first). Reverse tenders were also held overseas as

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[14] For a discussion of the separation of Commonwealth deficit financing from monetary policy, see Reserve Bank of Australia (1993).

[15] For a detailed discussion of the mechanics of monetary policy, see Carmichael and Harper (1994).

[16] For a discussion of real and nominal budget deficits, see Makin (1990).

the government sought to repurchase foreign-currency denominated bonds that it had issued into foreign markets.[17]

Bond Pricing

A 'straight' bond represents a sequence of cash flows of predetermined value at prespecified dates. A coupon payment will be received by the bondholder at regular intervals throughout the life of the bond together with a final coupon plus the principal upon maturity. This pattern of cash flows is perhaps the simplest available in modern financial markets, and is straightforward to price. Potential purchasers of such a cash flow discount the various payments at appropriate interest rates to calculate their present value, and add the different amounts together to obtain the market price of the bond.[18] The price of the bond thus represents the amount that would need to be invested today to generate the stream of future cash flows promised by the bond issuer at interest rates prevailing in the market at the time of purchase. Bond pricing obeys the classical principles of price theory: the market price of a bond is driven by the return available on the highest-valued alternative investment opportunity of equivalent risk available to potential investors.

Of course, as in standard price theory, such a price is the market equilibrium price. Can the price depart from its equilibrium value in real markets? Should the price of bonds rise above its equilibrium value, many borrowers will seek to issue bonds to take advantage of their low yields (indeed, to exploit the arbitrage opportunity implied by such a disequilibrium to borrow at the low bond yield and simultaneously invest at the higher interest rate available on the equivalent alternative investment). Similarly, should the price of bonds fall below its equilibrium value, many investors will clamour to purchase high-yielding bonds, if possible even short-selling the equivalent alternative investment, and in the process drive bond prices back towards their equilibrium value. It cannot be ruled out that bond prices depart from equilibrium (and hence that opportunities exist for riskless arbitrage in long-term funds markets), but powerful forces are thereby set in train to eliminate disequilibrium and return bond prices to their equilibrium level.

Bond Prices and Real Returns

Bond prices, like all asset prices, are underpinned by opportunity cost. The price of a bond is determined by reference to the most nearly equivalent alternative investment instrument. The same is true of a piece of real estate; it can be priced only by reference to what we know the market will pay, or has paid, for an equivalent site elsewhere. If bond prices change over time, it is because the returns available on alternative investments of equivalent risk change commensurately.

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[17] For more detail on the management of budget surpluses, see Harper and Pearce (1990).

[18] The interest rates used in this exercise are those applying to alternative investments of identical maturity that carry the same risk as the bond. Technically speaking, the interest rates used will be those drawn from the 'zero-coupon yield curve'.

One reason that bond prices move is that *real* returns available on alternative investments change. If the returns available on real investment projects rise, even if they are somewhat riskier than bonds, bond prices will be affected. Potential investors will be attracted by the higher real returns available outside the bond market and sell bonds in order to secure those higher returns. The net sale of bonds will accordingly induce a fall in bond prices (a rise in bond yields) until potential bondholders are satisfied that bonds are priced commensurately with the real returns available elsewhere.

Can a rise in real returns on alternative investments explain the collapse of bond prices earlier this year? It is unlikely to be the only explanation because real returns do not change suddenly. But expectations of such changes can be volatile. One source of uncertainty about real returns available in the world economy might be the rapid growth of China. The Chinese economy is growing at a rate in excess of 10 per cent per annum. China is the most populous country on the face of the earth, with about a fifth of the world's population. When a country of this size grows at such a blistering pace, the likely demands imposed on world capital markets are extremely difficult to predict. There is no historical evidence upon which to call in order to discern how strong a demand for capital such growth will precipitate, and how capital markets are likely to respond. The growth of China could touch off a worldwide capital shortage, in which case real returns available to investors would certainly rise. Underpinning these rises would be projects in China offering massive returns to investors based upon the exploitation of China's relatively underdeveloped economy and gargantuan domestic market.

China clearly has the potential to generate higher real returns to capital worldwide. The fear or expectation of this event might have gripped bond markets and could have assisted the sell-off of recent months. It might be more than mere coincidence that bond yields are rising as the world's largest nation embraces market capitalism and opens the throttle of economic growth.

Bond Prices and Inflation

A far greater source of volatility in bond prices, however, is inflation. The long maturity of most bonds renders their prices especially sensitive to expectations of changing rates of inflation and/or currency depreciation. The longer the maturity of a bond, the more its nominal payoffs (coupons as well as principal) are exposed to the potential ravages of inflation. Investors uncertain of the future effect of inflation and/or currency depreciation on the real value of a bond's cash flow will discount its present value (price).

Since expectations of inflation are closely influenced by the perceived independence of central banks from their host governments, the recent experience of New Zealand is instructive. Since 1989, the Reserve Bank of New Zealand has operated completely independently of the New Zealand government under a charter that defines its sole objective as the maintenance of low annual rates of inflation (0–2 per cent). The enhanced credibility of the Reserve Bank of New Zealand as an inflation fighter has substantially lowered expectations of inflation in New Zealand.

Commensurate with lower expectations of inflation, long-term bond rates in New Zealand have fallen steadily since 1989, falling below Australian long-term bond rates for the first time during this period (see Figure 1).

Heightened expectations of inflation could well have been fuelled, both in Australia and in the United States, by the prospect of a strong recovery in the world economy and by perceived laxity in Australian and US monetary policy. Whereas the Japanese economy is still mired in recession, the German economy has recovered surprisingly quickly and strongly. This, coupled with continued strong growth in the United States, has forced some upward revision of growth forecasts for the world economy.

While this would be sufficient by itself to fuel concerns over the outlook for world inflation, particular concerns have been expressed about the present and future setting of US monetary policy. Some analysts claim that the US federal funds rate (the key rate for the transmission of US monetary policy) should be 50–100 basis points (0.5–1 percentage point) higher than its current level. The fact that it is not, and that the Fed seems unlikely to raise the rate by this margin in the near future, has contributed to fears that US inflation will surge over the next 18 months to two years. These fears are exacerbated in some people's minds by recent appointments to the Board of Governors of the Federal Reserve System. Fairly or unfairly, the individuals concerned are regarded in certain quarters as inflation 'doves'.

At least the first of these concerns has also been expressed in Australia. Standard indicators of the stance of monetary policy (for example, the slope of the yield curve, or the difference between the yields available from short-term and long-term investments) were interpreted by some as requiring a tightening of monetary policy. Recent moves by the Reserve Bank to raise the cash rate (the Australian equivalent of the federal funds rate and the key transmitter of monetary policy in Australia) by a total of 175 basis points may have alleviated fears over the outlook for inflation. If so, long bond yields can be expected to stabilise or even to rally.

Widespread fears of future inflation are quite consistent with a bond market sell-off of the magnitude witnessed in the United States and Australia in recent months. It is a feature of high rates of inflation that they are volatile. The fear of a return to relatively high and variable rates of inflation in the medium term, on top of fears of a world capital shortage, could well have led investors substantially to discount future cash flows from bonds. Whether or not such fears are justified, however, is a matter about which economists are significantly divided in their opinions.

Bonds and Bubbles

There is a respectable and growing literature on the economics of price bubbles. The maintained hypothesis of this literature is that so-called 'fundamentals' are not the sole determinant of asset-price behaviour. In certain circumstances, asset prices can be subject to forces, rational or irrational, that lead them to depart from values implied by fundamental factors. Moreover, there may be no way of predicting when a bubble will form or when it will burst, which makes detection of bubbles in

empirical work extremely tricky. Even arch-rationalists of the 'efficient markets' school have conceded the existence of 'noise traders', traders who buy and sell on useless, irrelevant or false information and yet who survive to tell the tale. Fundamentals dictate that such traders would be stripped of their wealth by merciless arbitrageurs, poised to exploit ignorance and irrationality as soon as they spot it. And yet markets are simply not so perfectly arbitraged as the theory of efficient markets suggests. Prices can and do depart from fundamentals, whether rationally or otherwise.

Yet to concede the existence of bubble behaviour is not to imply that it is pervasive. Bubble theorists themselves admit the difficulty of empirically separating price movements based on fundamentals from those based on bubble-induced extrapolation. In any case, it is not necessary to resort to bubble hypotheses in order to explain recent behaviour in international bond markets. Of course, by the same token, one cannot rule out bubble behaviour. But there are reasonable grounds for interpreting recent turmoil in international bond markets within the standard paradigm of bond pricing. The uncertain outlook for both real and nominal interest rates in the face of unprecedented growth in the world's most populous country, and the fear of lax monetary policy in the world's largest economy, may together explain a good deal of the recent instability in bond prices.

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