

THE DAVID HUME INSTITUTE



ASSET CLASSES FOR A CHANGING WORLD

Papers presented at a Conference,  
Edinburgh, 2nd June 1992

Sponsored by the World Gold Council in  
association with The David Hume Institute

Hume Occasional Paper No.36

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**1992**

**The David Hume Institute  
21 George Square  
Edinburgh EH8 9LD**

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**ISBN 1 870482 32 8**

**Printed by Pace Print (Edinburgh) Ltd.**

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## FOREWORD

As recent events have made very clear, the challenge facing investment professionals in the 1990s continues to grow. Questions of global economic stability, the long-term effects of the break-up of the Soviet Union and the demographics of an ageing Western population place greater and greater demands on investment professionals. In the long-term accurate and imaginative asset allocation will provide one key to success in the new world order.

This David Hume Occasional Paper presents the views of Professor Ronald MacDonald, currently Robert Fleming Professor of Finance and Investment in the Economics Department of the University of Dundee; Terry Arthur, Consulting Actuary; Roy Batchelor, Professor of Financial Economics at City University Business School; London, and Roger Murphy of the World Gold Council. The papers were originally presented at a seminar sponsored by World Gold Council and The David Hume Institute. The interest aroused by the seminar, and the increasing relevance of its subject matter, has led the Institute to believe that the proceedings should receive a wider circulation. Nonetheless, as ever, it must be declared that, as the Institute is a charity, it has no collective opinion on the topics ventilated in its publications and that the views expressed are those of the authors alone.

Hector L MacQueen  
Executive Director  
October 1992

# **CURRENCY MOVEMENTS, COUNTRY PREFERENCES AND EXCHANGE RATE FORECASTING**

*Ronald MacDonald*

## **Introduction**

One of the main features of the evolution of the international monetary system over the last 15 years or so has been the lifting of restrictions on the movement of capital by most OECD countries and the rapid deregulation of financial markets. The abolition of controls has enabled investors to construct portfolios which are diversified across countries and may be composed of a wide variety of financial instruments. However, the very process of deregulation has, many would argue (see MacDonald, 1988, for a summary), resulted in considerable exchange rate volatility. It may be further argued that such volatility, because it is inherently unforecastable, reduces the incentive of investors to hold an internationally diversified portfolio. Of course, the participation of currencies in exchange rate arrangements like the European Monetary System (EMS) makes the forecastability of exchange rates much easier. But again there must remain considerable uncertainty, particularly for currencies like sterling, where the commitment to the EMS is still not completely credible and also because one may be interested in forecasting a bilateral currency which is not anchored by the EMS: for example, the dollar-sterling exchange rate.

What I would like to do today is to address the issue of the forecastability of currencies from the perspective of the recent academic literature. However, I firmly believe that what I have to say will be of interest to a wider audience than the academic community. I shall initially demonstrate two empirical regularities of the recent floating experience: first, that currencies have indeed been volatile and, secondly, that such volatility has been unpredictable. I will then go on to discuss some popular explanations for recent

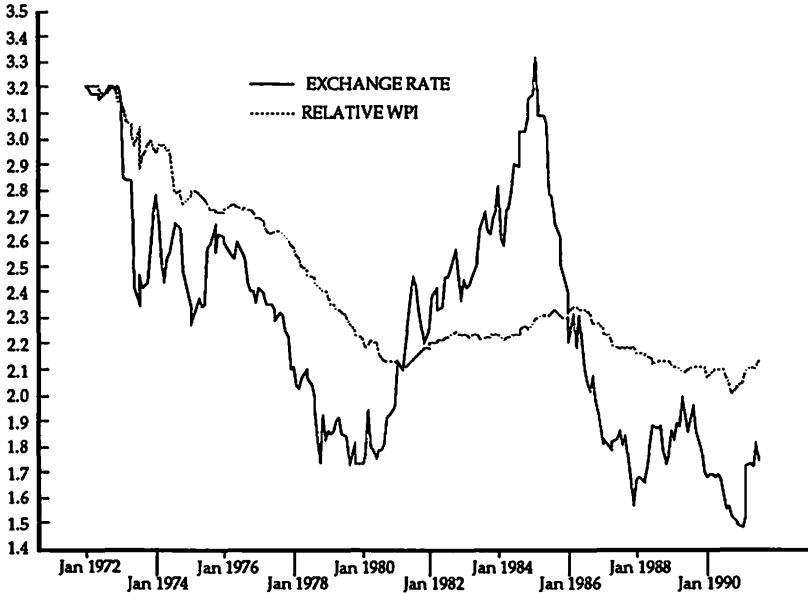
exchange rate behaviour and make brief reference to a very large empirical literature which suggests that popular explanations of exchange rates have little explanatory power. I will then go on to argue that this finding may be attributed to the fact that the recent exchange rate literature has overlooked an important aspect of exchange rate modelling and, once this factor is taken into account, highly satisfactory exchange rate forecasts can be made. This factor shall be referred to as "country preferences", or "country risk", and may, in turn, be modelled using the price of gold.

## **The Volatility and Unpredictability of Exchange Rates**

Since the early 1970s all of the major currencies have been involved with some form of flexible exchange rates. One of the salient features of the floating rate experience has been the volatility of exchange rates. Such volatility may be picked up in a number of ways. If one takes an historical perspective, then exchange rates have been highly volatile relative to the Bretton Woods system of fixed but adjustable exchange rates. For example, the volatility of the G-7 bilateral US dollar currencies has increased, on a monthly average basis, by a factor of around 5 in the recent float compared to the Bretton Woods period. Now for many, given the nature of the two regimes, this may not be too surprising, but it would, I believe, be surprising to many of the early proponents of flexible rates such as Milton Friedman (see Friedman, 1953). Friedman, for example, believed that the Bretton Woods system was a crisis system and that it imparted considerable instability into exchange rates and the international monetary system. In contrast, a flexible rate system was predicted to be a stable system in which excessive currency movements would be attenuated by the stabilising role of speculators. This outcome was perceived to be a consequence of the fact that it offered an effective adjustment mechanism.



**Fig 1 Nominal Rate and Exchange Prices  
Deutschemarks per US dollar**

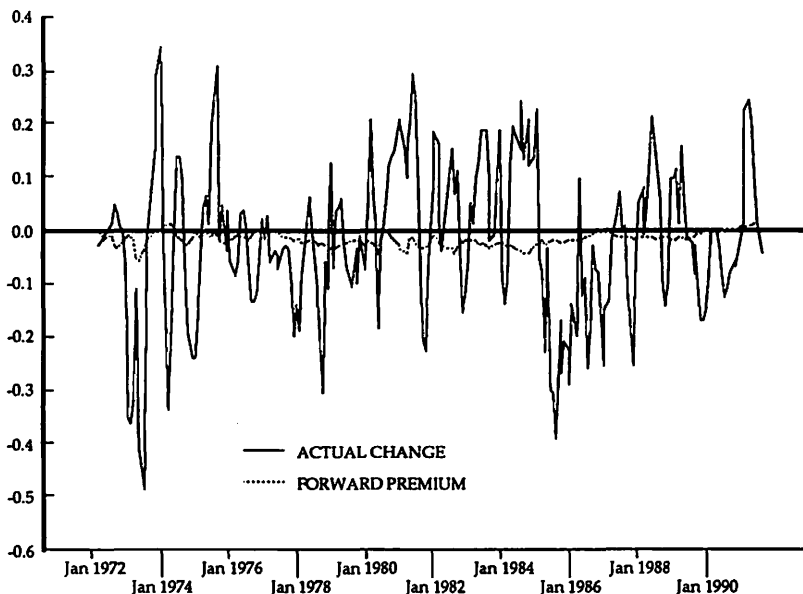


Exchange rates have also been volatile relative to what are widely regarded as fundamentals, such as commodity prices. For example, consider Figure 1 in which we have plotted dollar-deutschemark against relative US-German wholesale, or producer, prices. The volatility of exchange rates is clear from this diagram and by implication so is the volatility of the real exchange rate, that is the nominal exchange rate adjusted for relative prices. Such volatility may be confirmed by comparing the standard deviation of a variety of nominal exchange rates with the standard deviations of the corresponding prices series; the standard deviations of the former are around 10 times that of the latter (see Macdonald, 1988). Again, the recent failure of exchange rates to track prices would come as a surprise to an early proponent of flexible exchange rates, like Friedman, who predicted that flexible rates would follow relative prices very closely.

The second empirical regularity that I would like to mention is that exchange rates have largely been unpredictable. This lack of predictability may be illustrated in two ways. In asset markets (and in the absence of risk) the forward, or futures, price of an asset is often taken to be the market's prediction of the spot price in some future period. With respect to the foreign exchange market, the forward premium is often interpreted as the market's consensus view of what it expects to happen to the exchange rate over the maturity horizon of the forward contract. That is,

$$\text{FORWARD PREMIUM} = \text{EXPECTED CHANGE} \\ \text{IN THE EXCHANGE RATE}$$

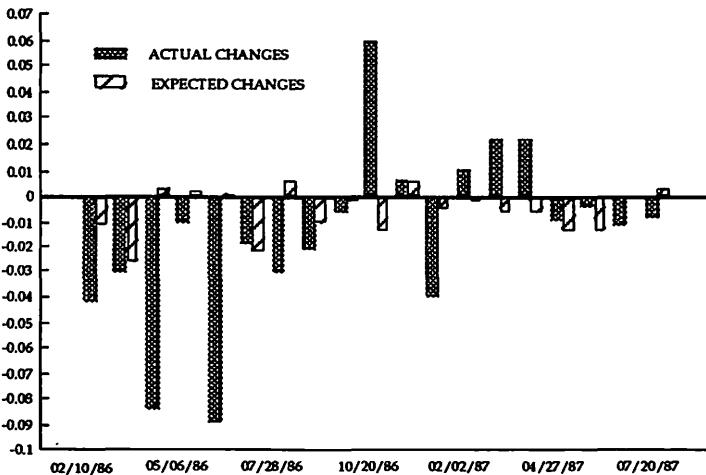
**Figure 2: Actual Changes and Forward Premium  
Deutschemarks per US Dollar**



In Figure 2 I have plotted the three month forward premium for dollar-mark for the recent experience with floating exchange rates against the actual change in the exchange rate. If the premium was a good predictor of the exchange rate change, there should be a very

close correspondence between these two series. Clearly there is not. There are two interpretations one may place on this divergence. First, there may be a considerable amount of new information hitting the market between the time the forward contract was set and the actual spot outcome and therefore the latter is unpredictable on the basis of information available at the time the forward rate was set. The second interpretation - and these interpretations are not necessarily mutually exclusive - is to argue that the forward premium also reflects a risk premium and this premium may explain the discrepancy between the actual and expected outcome. I should like to return to the risk premium interpretation presently. A second way of measuring the unpredictable nature of exchange rates is to plot the actual change against the expected change produced by one of the leading consensus forecasting outfits such as Money Market Services. In Figure 3 we have the actual change in dollar-mark against that expected (in terms of the median response) by the main European exchange rate forecasting outfits. Again we see that there is a very poor correlation between actual and expected values and again this may be interpreted either in terms of the arrival of new information and/or risk.

**Fig 3: Exchange Rate Forecasts  
Deutschemarks per US dollar**



## **Explaining Exchange Rate Behaviour**

How then may one explain the recent behaviour of exchange rates (that is, their volatile and unpredictable nature)? There are a number of possible explanations. An increasingly popular view is to say that speculators, the villains of many a plot on international financial stability, are to blame. This may be due to the inherent irrationality of such individuals; their portfolio positions rely on fads and fashions and are unrelated to any notion of the fundamental determinants of exchange rates. This kind of notion has recently been articulated in the 'so-called' noise-trader paradigm (see Schleifer and Summers, 1990) which goes on to demonstrate that such individuals, despite their irrationality, need not go out of business in the longer term (this was a prediction of Friedman - for individuals to be irrational means that they must be losing money and eventually they must go out of business). An alternative speculation story is to say that even if speculators are rational (that is, they base their predictions on all available information) they may not be able to take sufficient profitable positions because of institutional constraints. The usual example here is to cite commercial banks as the natural candidates to embody the role of stabilising speculators envisaged by someone like Friedman and to recognise that traders within such institutions are severely constrained in terms of the open positions they can take on a day-to-day basis. These views have been offered from time to time by, for example, Ronald McKinnon (1988).

An alternative way of explaining recent exchange rate behaviour has been provided by the academic literature on exchange rate determination. This literature can at a theoretical level, at least, give an explanation for exchange rate volatility and unpredictability which is consistent with rational, profit-maximising investor behaviour. The most popular framework employed by academics for analysing the exchange rate is the so-called asset approach to the exchange rate. This view takes as its starting point the simple idea that since an exchange rate is the relative price of two currencies, it is, by definition, an asset price and should therefore behave in an analogous way to other asset prices such as bond prices and share prices. Indeed, returning to the issue of volatility discussed at the

outset, if one compares the volatility of exchange rates with that of other asset prices the degree of volatility is in fact very similar. Why are asset prices often relatively more volatile than goods and commodity prices? The key to answering this question lies in understanding that, for any asset, the expected price in the future may have a considerable bearing on the current price because if, for example, investors, on balance, expect a particular currency to depreciate in the future, they will be unwilling to hold it in the present and their attempts to offload the currency will result in a current depreciation (this is, of course, facilitated for assets by their relatively low transactions costs). The importance of expectations may introduce the kind of irrational speculative activity referred to above or it may give an explanation for exchange rate movements which is perfectly consistent with the rational and efficient use of information.

Within the asset market approach there are effectively two classes of models defined with respect to the menu of assets each believes to be important for the determination of exchange rates. One category, which is usually referred to as the monetary group, concentrates on relative excess money supplies, that is the supply of money over the demand for money as defined by variables such as income:

$$\text{EXCHANGE RATE} = F(\text{RELATIVE MONEY SUPPLIES,} \\ \text{INTEREST RATES AND INCOME LEVELS})$$

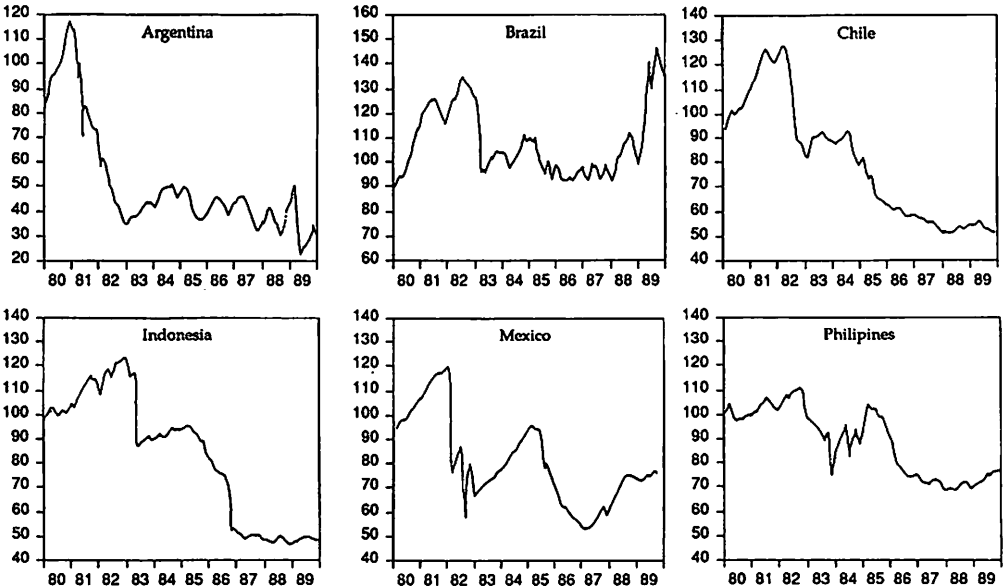
This monetary view assumes that non-money assets, such as government debt denominated in different currencies, are perfect substitutes. An alternative asset model, usually labelled the portfolio balance model, stresses that non-money assets are, reasonably enough, likely to be imperfect substitutes, and therefore risk agents require a risk premium over and above the expected return (these models are discussed in some detail in MacDonald, 1988, 1990, and MacDonald and Taylor, 1992). The portfolio model emphasises that non-money assets, such as government debt, have a crucial bearing on the behaviour of the exchange rate. Unfortunately, the empirical literature offers very little support for either version of the asset approach (see MacDonald, 1988, 1990 and MacDonald and Taylor, 1992). In particular, the empirical evidence shows that such models fail to track exchange rates particularly well on an 'in-sample' basis

and, further, that they fail to forecast on an out-of-sample basis better than a simple random walk model (in fact, they often do worse than the simple random walk model) over periods of as little as one month to 12 months ahead.

## **Country Preferences, Risk Premia and the Price of Gold**

One other important empirical finding to emerge from the recent exchange rate literature is the somewhat surprising one that researchers, despite having devoted considerable energy to the task, have failed to tie down and model risk premia in foreign exchange markets (see MacDonald, 1990). However, the important point to note here is that this literature without exception is couched in terms of trying to measure an *exchange* risk premium. The risk premium may in fact be of a different kind. It may be what we shall refer to as a country/political risk premium. This premium may be understood in the following way. In deciding to invest in a particular country the investor, as we have argued, will be interested in the relative attractiveness of locating tangible assets and other 'taxable' forms of wealth in that country. Such attractiveness is often picked up in exchange rate models by incorporating relative interest differentials. However, when one is considering investing in a foreign country there is, in addition, to exchange rate risk, the potential creditworthiness of that country. In its extreme form this could simply refer to the ability or willingness of a country to fulfil its implicit or explicit contracts to asset holders. In a less extreme form it could refer to the effects of tax changes or potential tax changes on the attractiveness of holding a component of one's wealth in a foreign country. We refer to such effects as country risk. In extreme scenarios these effects may well be picked in terms of interest rates, but in less extreme circumstances they are unlikely to be and ideally one would wish for an independent measure of such risk. We shall turn below to what a better measure might be, but before doing so let's give an extreme example of what we mean by country risk.

Consider the outbreak of the international debt crises in 1982. As illustrated in Figure 4 the currencies of debt-burdened countries depreciated sharply and such depreciation generally proved to be persistent. These depreciations may be attributed primarily to the substantial deterioration in the attractiveness of owning assets located in the debt-burdened countries and this decline, in turn, emanated from the fiscal difficulties these countries faced. Such fiscal difficulties stemmed from the high world real interest rates and, in particular, the relatively tight monetary policy pursued by the US. As it became clear that the LDCs would find it difficult to service their debt it also became apparent that the after-tax returns in these countries would fall, and so the currencies depreciated in real and nominal terms. This depreciation effected adjustment to a new balance of payments equilibrium. That is to say, the reduction in the net inflow of funds necessitates a diminished current account deficit which, in turn, requires real currency depreciation. This is of course a rather extreme example which, I believe, serves to illustrate the more general point that from time to time as countries move through different political and, in particular, tax regimes, they are likely to display a changing creditworthiness profile to investors.



How may we model this country preference effect? One natural candidate is the price of gold. From the perspective of our discussion, gold may be viewed as an "asset without a country": that is, since it may be held outside the jurisdiction of all tax authorities, it is not subject to any country-specific uncertainties that relate to claims on future output. The idea underlying this special type of freedom from risk may be seen more clearly, perhaps, by referring to a simple example.

Imagine that the world consists of two economies, country 1 and country 2, and three forms of assets in which investors may hold their wealth: net claims on 1, net claims on 2, and gold. The net claims may be interpreted as physical assets or as net financial claims against the government or private sectors of the two countries. The prospective returns on these claims will depend crucially on economic and political developments in each country. For example, an adverse macroeconomic shock in 1, other things equal, will reduce the relative attractiveness of these net claims on 1. Similarly, political developments that imply higher tax rates on claims on 1, other things equal, will reduce the relative attractiveness of these net claims. Either of these shocks to 1 will reduce the attractiveness of holding claims on 1 and increase the attractiveness of other assets, namely claims on 2 and gold and this change in investor preferences will lead to changes in the market prices: higher currency 1 prices for both gold and currency 2, in other words a depreciation of currency 1 against currency 2.

In order to quantify such effects empirically, we must make some simplifying assumptions. The assumptions we make here follow those used in recent work at the IMF (Dooley and Isard, 1983, 1991 and Dooley, Isard and Taylor, 1992) in which it is assumed that there are only two types of shocks: (a) monetary shocks and (b) shocks which affect currency preferences, which are interpreted as 'real' shocks. Monetary shocks are deemed to have no effects on the relative attractiveness of holding assets in different countries. These may include both global and country-specific inflationary shocks which are accompanied by an accommodating monetary policy which effectively holds constant the expected real yields on claims



on 1 and 2. Such shocks will lead to changes in nominal interest rates and hence the nominal carrying cost of holding gold, which, in turn, leads to jumps in the price of gold.

This approach has been tested in a recent study by some colleagues at the IMF (Dooley, Isard and Taylor, 1992). Their methodology essentially involves taking the exchange rate equation defined above and adding in the price of gold. Since this equation includes relative money supplies, income levels and interest rates any significant relationship unearthed between gold and the exchange rate must indicate that gold has explanatory power over and above these variables. As a test of whether the information contained in the price of gold actually reflects the key role that gold has played as an asset, results are also calculated using the price of wheat instead of the price of gold. The exchange rates modelled in this study are sterling-dollar, deutschemark-dollar, yen-dollar, french franc-dollar and the deutschemark-yen rate and the period considered is January 1976 to December 1990.

The results of this study are, I believe, of considerable interest. First, the price of gold is strongly statistically significant for all currencies. Additionally, there is a negative relationship between the price of gold and the above noted currencies; that is, an increase in the dollar price of gold is associated with an appreciation of, say, the mark-dollar and therefore a depreciation of the dollar. I noted earlier that exchange rate models generally fail to track currencies particularly well even over historical periods. However, the inclusion of the price of gold results in a spectacular increase in the historical explanatory power of these exchange rate relationships. In particular the coefficient of multiple correlation - the  $R^2$  statistic - increases by an average factor of 6 when the price of gold is included. Interestingly, this success is not repeated when the price of wheat is used instead of gold: wheat has no significant explanatory power in such relationships.

Perhaps the most interesting aspect of this work concerns the finding that the exchange rate model that I have outlined, modified to include the price of gold, can outperform a simple random walk model in an out-of-sample forecasting context. This is an important

finding which contrasts with the results described in much of the recent exchange rate literature. Recent work that I have conducted with a colleague at Dundee suggests that the above results also hold true in a simpler exchange rate model based on purchasing power parity.

## Concluding Comments

In my talk today I hope to have demonstrated that over the recent experience with floating currencies, exchange rates have been both volatile and unpredictable and that this may mean that investors do not end up holding an optimally diversified international portfolio. If investors could forecast currencies better, they may be able to move closer to the optimal portfolio. However, we have argued that much recent thinking on exchange rates has ignored the issue of country risk. Using the concept of gold "as an asset without a country" and the argument that changes in country preferences are systematically reflected in the price of gold, recent empirical work may be interpreted as offering indirect evidence that exchange rate movements are largely coterminous with events that change currency preferences for holding claims on different assets. This finding is, I believe, an important one and perhaps warrants further research into the pricing of other assets.

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# **ASSET CLASSES AND ASSET ALLOCATION WILL PENSION FUNDS FOLLOW FASHION OR FUNDAMENTALS IN THE 1990s?**

*Terry Arthur*

## **Introduction**

In 1955 the average UK pension fund had well over 50% in UK fixed interest bonds and well under 50% in equities. The bond proportion steadily declined over the succeeding 15 years which together with changes in market values resulted in a bond proportion of around 30% by 1977.

For the next decade, there was little if any further deliberate reduction in the bond proportion although with hindsight this would have been beneficial. Market value changes, however, reduced the bond proportion to well under 20%. The balance became more diversified and was invested overseas and in property.

This trend has continued and today, despite the fact that since their 1987 peak the return on equities has lagged bonds and cash by very considerable margins, funds have been invested into even more equities. By the end of 1991 the equity proportion of UK pension funds had risen to almost 80%, while bonds had fallen to under 10%.

## **'Justification' for Current Equity Levels**

During the late 1980s a large number of papers were published which aimed to justify maintaining high equity proportions in pension fund portfolios during a period of inflated equity prices. In brief, these papers generally contained two related errors:

- (1) Commonly the projected returns for various asset classes were based on extrapolation of historical returns, with income and unrealised gains amalgamated into a single figure.

The error of simple extrapolation on this basis is that it significantly overstates future return. Consider what happens when there is a rise in price in a single equity. Statistically this increases the past return and *reduces* the future return; extrapolation manages to boost the future return as well.

In addition whilst dividends have kept pace with prices their cover in the UK is by some measures now only half of the average of the last thirty years. In other words earnings yields fell during the eighties to a low point in Summer 1987. It was quite clear that returns must fall, yet extrapolation made every price rise seem the forerunner of another one.

- (2) The second fundamental error was that these self-reinforcing expectations formed a large part of many asset/liability studies. The resulting array of possible returns for equities was such that, over a long enough period, the *worst* equities scenario was better than any other class's *best*.

These studies also utilised diversification theory based on Modern Portfolio Theory and independence of asset classes. The result of research on this basis therefore depends on which asset classes were selected for inclusion and which asset classes were excluded. Add in a new asset class which was originally excluded, such as gold for example, and the mix can change quite radically. Several studies sponsored by the World Gold Council have illustrated this point.

## What are the Fundamentals for the 1990s?

- 1 *Liabilities* Since pension fund liabilities are the *raison d'être* for pension fund assets, any review of asset allocation should start by looking at the liabilities. It seems clear that the diversity of liability profiles will continue to increase - demography, personal pensions and the market for corporate control will see to that.
- 2 *Assets* It follows to match this that there should be similar diversity in asset distributions. The only reasons for this not being so are:

- i if equities are assumed to out-perform significantly over all except the shortest period, together with a propensity for all funds to accept risk or;
  - ii if there is some correlation between risk-averse funds and a youthful membership and vice versa. The opposite is in fact much more likely which would mean *greater* diversity of assets than liabilities.
- 3 *Cash Flows* Because of liability maturity, the difference between liability cash flows and asset cash flows can be minimised, in many cases, only by much greater bond proportions.
- 4 *Market Values* The direct importance of asset values comes only at realisation, whether to pay benefits or to purchase other assets. Consequently price volatility, equated to risk in Modern Portfolio Theory, is much less significant than commonly supposed and indeed can be seen as an opportunity not a threat.
- 5 *Pricing Structure* The attempt to discover a "normal" pricing structure for asset classes is a chimera. There are only current prices and their effect is much greater than the effect of any supposed long-term relationship or "risk premium". If an asset class is "overvalued" by 25% (and there have been many times at least with hindsight when this was the case) then the loss on purchasing it at that value is never recovered. And even if looked at in yield terms, a "normal" 2% p.a. out-performance of equities (say) over bonds would take almost twenty years to catch up.

## **What Does This Mean for Asset Allocation?**

Broadly speaking the 1990s will see an overall reduction in equity proportions and a greater willingness to switch amongst asset classes to profit from over or under-valuation. Switching will be made easier by the availability of derivatives such as index futures. The 1990s will see a greater dispersion of asset allocations and

indeed a greater variety of securities, both quoted and non-quoted, appearing on the scene. In addition there will be a return to favour of some traditional asset classes such as property and index-linked gilts which are currently badly under-represented.

Speculating a little further on asset classes, there is already some evidence that the proportion of *quoted* equities in issue is reducing. In the United States, for example, it reduced at the rate of 5% p.a. or so during the 1980s due to acquisitions, management buyouts and other "going private" transactions.

A greater proportion of unquoted and therefore less marketable assets in pension funds will loosen the grip of short-term performance measurement based on market values. This will feed back into less concern with the market value fluctuations and more concern with long-term cash flows. As a result institutions should become more willing to hold other asset classes such as property. The realisation that equities are not, and cannot be, *the* long-term answer to the exclusion of all else will not only revive interest in bonds but will also stimulate the development of new bond/equity hybrids supplementing existing hybrids like convertibles. The wider range of asset classes will have a knock-on effect on diversification studies.

The possible role of gold here is very interesting. I am not an advocate of unreconstructed Modern Portfolio Theory which underpins much of diversification wisdom and which points to a role for gold even in the poorly-performing 1980s. However, the justifications of diversification remain and could be reconciled with Modern Portfolio Theory by certain changes including a lengthening of the underlying time-intervals. This is likely to disclose that gold remains contracyclical with equities and thus has diversification benefits. Historically poor performance, if limited to say a decade or so, will become an advantage rather than a drawback. Gold could therefore make a major come-back along with property and index-linked gilts.

## Gold as a Pension Fund Asset Class

How should a professional adviser view gold as a pension fund asset class?

All too frequently the starting point is the erroneous attitude that gold does not produce an income. In fact gold can be lent, securely, and produce a small income of around 1-2%. Rates are low because there are few borrowers (mainly gold producers matching their assets and liabilities). One reason for so few borrowers is because for half a century the world has favoured credit expansion and inflation which has generally made it cheaper over the long-run to borrow depreciating money.

Gold still retains all the necessary features of money - marketability, consistency, durability and divisibility. If the outlook for an investor in gold is viewed as poor, the outlook should be good for a borrower - who can borrow it, sell it for cash, spend the cash, pay tiny interest, and later purchase and repay the gold.

If gold is such cheap money why borrow anything else? Because if you borrow gold you might have to spend a lot of (depreciated) money to buy the gold later to repay the loan. However, if that is the case there should be many willing lenders eager to be repaid in a non-depreciated currency. The underlying reason why there are not is that there is little investor interest in gold. One reason why gold has not performed is that its price has a consumption component and a *money* component. The money component and its importance to the gold price has dropped away, but it *might* start to return. And in the meantime an exposure to gold via the Forward markets provides an overall return equal to that on cash, plus any unanticipated price increase.

A large running income is not essential to most pension funds, as anyone who invests in Japanese equities must accept. Gold income is certainly comparable to Japanese equity income. The reason why income is at a premium is to do with tax - other investors, taxed heavily on capital than income, bid up the price of low-income assets, leaving the high assets looking cheap for pension funds. That



was the theory anyway. As it has crumbled, so has the case against gold.

Gold is really a form of Index-Linked Gilt, which the actuaries cried out for - and got, on a 2% yield - fifteen years ago. They remain relatively unimportant - unloved despite a tiny issue compared with conventional bonds. If they became big, questions about default *must* arise - after all, other gilts have been reneged upon (via inflation) throughout history so why should this be any different? Yet pension funds hold index-linked gilts and do not hold gold. The question which pension fund trustees should now be asking is why not? I personally believe the time has come for a serious reconsideration of gold as a pension fund asset class.

## **GOLD AS AN INVESTMENT: TEN (STYLISTED) FACTS**

*Roy Batchelor*

In 1988, I was asked by the World Gold Council to survey the investment properties of gold. My expertise is in economics and finance, and not in gold. But I reasoned that the sort of factors which ought to be taken into account when deciding what kind of investor should hold gold, and in what amount, would be no different than for any other investment. I soon discovered that many others had taken the same view, and applied the ideas of modern portfolio theory to gold. Some of their insights were reported in the July/August 1989 issue of *Gold Review*. The results of my own exercise are therefore not entirely new. In particular, like these earlier researchers, I concluded that holding a small quantity of gold alongside a diversified portfolio of financial assets can be expected to increase returns and reduce risk.

However, most studies of gold investment have applied modern portfolio theory by computing the conventional measures of return and risk which would be relevant to a dollar-based investor. Two distinctive features of my study are that (a) the properties of gold are assessed from the viewpoint of investors in nine currencies separately, and (b) reasonable objections to the use of modern portfolio theory are met by computing some less conventional measures of the riskiness of gold.

This article summarises my results, in the form of ten stylised facts about gold. A stylised fact is a statistic or a relationship which is particularly striking, and must be explained by any valid theory of how the gold market works. I start by listing the familiar facts about the return and risk of gold for a dollar investor. I then look at what happens when gold is viewed from the standpoint of non-dollar investors, and from the standpoint of investors with objectives different from those assumed by modern portfolio theory. Finally, I draw some conclusions about the opportunities and constraints offered by investment in gold.

## **Objections to Portfolio Analysis of Gold**

The record of gold as an investment suggests strongly that gold should be valuable in increasing the yield and reducing the risk of a well diversified financial portfolio. Many investors use gold in this way. However, many others are cautious of acting on the evidence outlined above. The following objections to the above analysis deserve attention:

- 1 *Most of the evidence on gold as an investment assumes that the investor is interested in dollar returns.*
- 2 *What if I am interested in returns in another currency?*

**Fact 5 The properties of gold as an investment are independent of the home currency of the investor.**

In my study, I looked at real returns and risks in gold, cash, bonds and stock market investments from the point of view of investors in nine countries. Returns and risks in gold are compared with risks and returns on an equally weighted portfolio of domestic financial assets country by country in Table 2. Gold produces relatively high real returns in all countries but one. Only in Japan have returns on financial assets kept pace with gold. Risks in gold are high in the short-term but low in the long-term in all countries. And in all cases, gold has been an effective hedge against fluctuations in financial asset values.

Table 2: Gold in nine currencies

Country	Av Return		Volatility		Corr of returns (5 year)
	Gold	Eq Wtd	1 qtr	5 year	
Belgium	4.54	3.83	43.6	9.6	-.56
France	4.92	2.97	43.9	9.2	-.70
Germany	3.97	2.89	43.0	9.1	-.68
Italy	4.68	0.97	45.4	10.4	-.74
Japan	1.21	5.67	47.7	10.5	-.70
Netherlands	3.16	1.97	44.3	9.1	-.58
Switzerland	2.52	1.11	42.5	9.3	-.64
UK	3.98	2.48	46.2	8.5	-.80
US	5.95	2.12	50.4	11.4	-.66

*Portfolio theory assumes that risk is measured by the volatility of returns on an asset.*

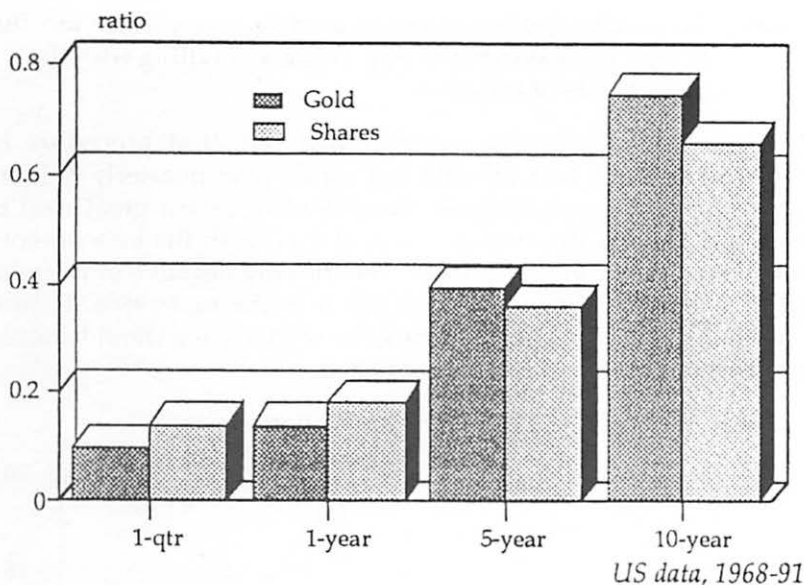
*What if, as a fund manager, I am more concerned about the risk that returns on assets do not match the return required to meet future liabilities?*

**Fact 6 A long-term investor is more likely to match long-term liabilities using gold than using stock market investment.**

The "volatility" and "required return" measures of risk are related. If an asset produces an average return (AV) with a standard deviation (SD), then the probability that the actual return will exceed an actuarially required return (RR) depends on the normalised excess return ratio  $(AV - RR)/SD$ . The higher is this ratio, the more likely that the required return will be met.

Figure 1 compares this ratio for gold stock market investment and for an equally weighted portfolio of financial investments, over progressively longer holding periods, and assuming a dollar-based investor with a conservative real return target of 1 per cent per annum. The shares-only portfolio dominates the equally-weighted

### Excess Return: Risk Ratios Gold v Shares



portfolio on this criterion. The shares-only portfolio also dominates gold for short-term investments, since the high short-term volatility of gold makes it relatively unattractive to fund managers aiming to meet short-term liabilities. But the combination of high returns with lower long-term volatility means that gold investments dominate shares as vehicles for long-term liability matching. For fund managers with more ambitious real return targets, gold would look even more attractive.

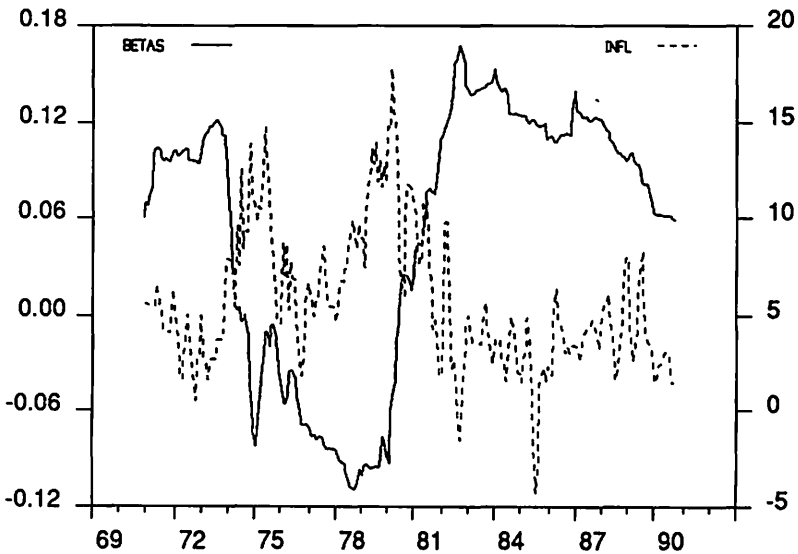
*All these figures on returns and risks are based on a limited amount of data, from the 1970s and 1980s. But I am interested in the future.*

*What guarantee is there that gold will continue to be a good hedge against financial risks in the 1990s?*

**Fact 7 The hedging effectiveness of gold does vary over time. But it varies in a systematic way, rising and falling with the general rate of inflation.**

In Figure 2 I have used a complicated statistical procedure to estimate how the beta on gold has varied over quarterly holding periods in the years 1968-88. There is obviously a great deal of variation around the average value of 0.14, with the beta on gold relatively high in the early 1970s, very heavily negative in the mid-1970s and early 1980s, and high again in the mid-1980s. If such variations in past values of beta were random, we should indeed mistrust forecasts of future values of beta.

**Gold Beta and Inflation**



However, if figures for the rate of inflation in the US are superimposed on the graph of beta, it is also obvious that there is a very strong inverse relationship between inflation and the hedge effectiveness of gold. The beta on gold has not simply varied randomly. At times of peak inflation - after the 1974 and 1980 oil price shocks - the beta on gold was at its lowest points. At times of

relatively low inflation, the beta on gold has risen towards zero. Gold is widely regarded as an "inflation hedge". Figure 2 shows the precise sense in which this is true. At times of high inflation, real returns on gold are particularly strongly negatively correlated with real returns on financial assets. Since real returns on financial assets typically fall as inflation rises, real returns to gold are likely to rise.

## Gold Investment and the Gold Price

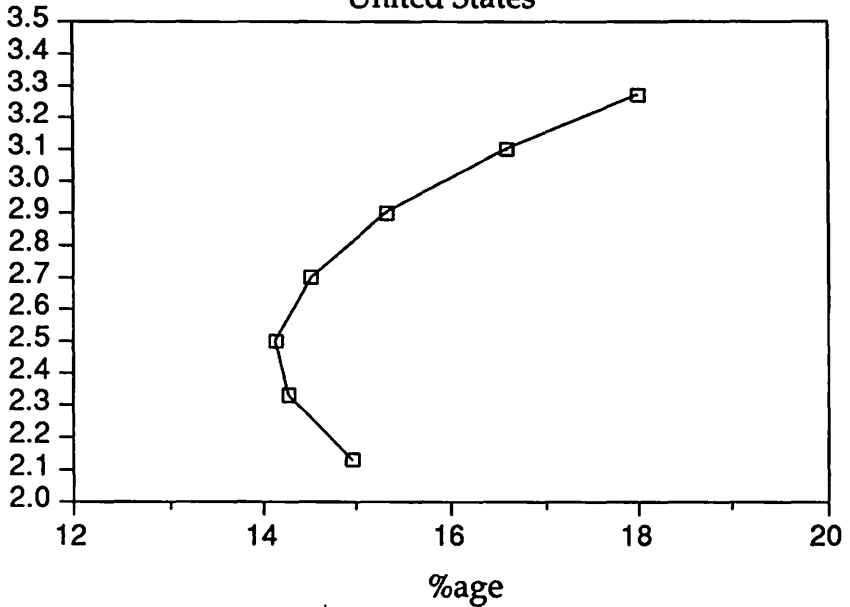
The optimum portfolio of gold and financial assets will vary from investor to investor, and from time to time, depending on the planning horizon of the investor, and the inflation environment. However, modern portfolio theory points to several constraints on what investors can expect to achieve by investing in gold, and I conclude by summarising these.

**Fact 8 To minimise risk in a well-diversified portfolio of dollar assets, around 10% should be held in gold.**

Figure 3 shows my estimate of the menu of return and risk open to an investor holding gold together with an equally weighted portfolio of bills, bonds and shares, assuming the beta on gold takes its average value. Increasing gold holdings from 0 to 10 per cent unambiguously improves the investor's position, reducing risk and increasing return. However, further increases in gold holdings increase return only at the expense of increased risk. Whether this would be desirable depends on how prepared the investor is to assume risk.

Parallel calculations of the risk-minimising share of gold for investors in other currencies produce higher figures, in the range 10-20 per cent. Of course, within each country, the optimum share of gold also varies with beta, and hence with inflation, rising as inflation rises and beta becomes more negative.

**Figure 3. Gold in Equally Weighted Portfolio  
United States**



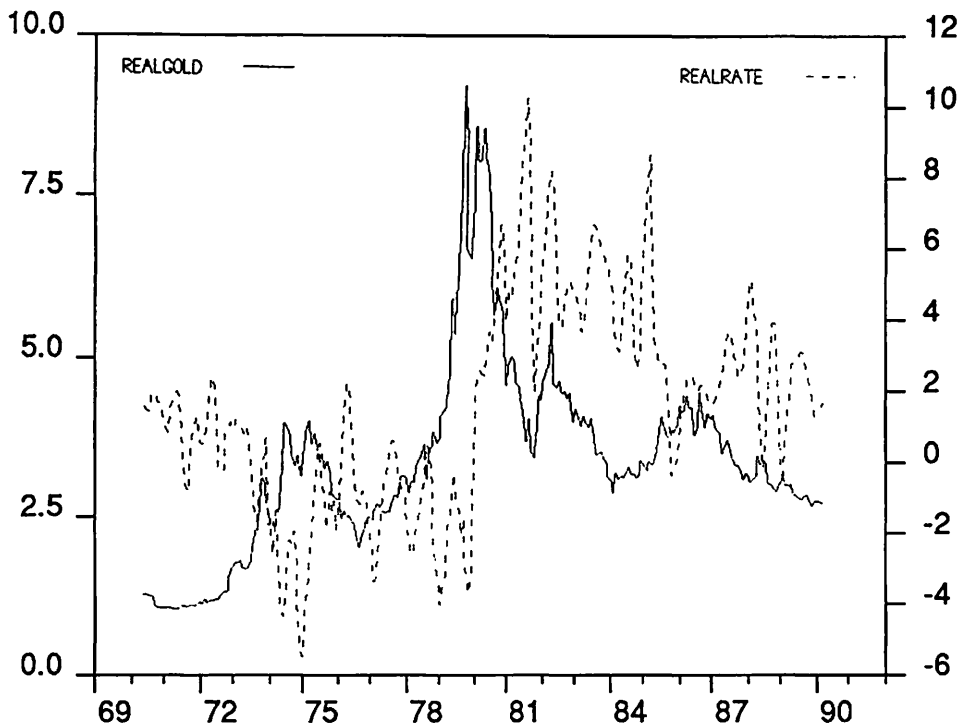
**Fact 9 Gold is most expensive when it is most useful to investors.**

If gold is regarded by investors as part of a portfolio which also contains financial assets, the demand for gold will be high when (a) the return on financial assets is low, or (b) the hedge effectiveness of gold is high. A high demand for gold will lead to a high price for gold.

These factors explain a great deal of the variation in the gold price seen over the past two decades. Figure 4, for example, compares the real rate of interest on bills with an index of the real price of gold. When real interest rates are low, in 1974-5 and 1980-1, the real value of gold is above trend. As real interest rates have risen after 1981, so has the real value of gold fallen below trend.



## Real Gold Price and The Real Interest Rate



**Fact 10** The trend real return to gold in future is likely to be lower than that experienced in the 1970s and 1980s.

This is a conjecture, rather than an already-established fact. But it follows from Facts 1-9 above. For historical reasons, a certain mystique attaches to the workings of the gold market. However, I have shown that although the price of gold has fluctuated considerably in the past, there seem to be good reasons for these fluctuations, rooted in changes in real interest rates, and changes in the effectiveness of gold as a hedge instrument. In other words, returns to gold fit the pattern predicted by modern portfolio theory, and should in no way be regarded as mysterious.

Unfortunately, portfolio theory also predicts that long-term returns on a negative-beta hedge asset should lie below, rather than above, long-term real returns even on the least risky financial asset. One of the most ineluctable principles of finance is that you cannot get something for nothing. In the case of gold, the investor cannot expect to get immunisation against inflation-induced fluctuations in

financial asset values without paying a price in the form of a low own-return on the hedge asset, gold. The high returns on gold achieved in the 1970s may therefore prove less typical of the long-term performance of gold than the lower returns experienced in the 1980s.

# THE DYNAMICS OF THE GOLD MARKET

*Roger Murphy*

We would like to conclude the presentations with a brief overview of the gold market, and of how a pension fund could make a gold transaction.

## The Gold Market

- 1 **The Market** Gold is traded in an international market which like the foreign exchange market is continuously active. This means that positions can be opened and closed round the clock. As such there are a number of major centres for gold trading around the globe. In the Far East Hong Kong is the main market centre followed by Singapore. London and Zurich are the European centres with New York pre-eminent in the US.
- 2 **Market Participants** The players in the gold market can be categorised into four groups. The producers and fabricators are the main handlers of gold and are likely to have the largest positions. Producers are clearly naturally long of gold, and so their positions in the market are likely to be sales in the spot market and hedging activities on the short side in the forward and derivative markets. By the same token fabricators of jewellery and for gold's industrial uses are buyers and naturally on the short side. The second group are the arbitrageurs whose activities keep the gold price, spot and forward, in line with interest rates and foreign exchange rates. Thirdly there are the investors and speculators who are buying and selling gold to make a profit. The fourth group are the central banks who in combination hold around one-third of the world's stocks of gold. They are a growing source of liquidity to the market, typically by lending gold to intermediaries.

- 3 **Market Size** The size of the gold market is difficult to gauge, since no figures are provided for trading volumes in physical gold. Nevertheless, recent estimates have put volumes in the spot market at as much as 150 tonnes around the world per day. At current prices this would constitute an underlying value of \$1.6 billion per day. Although gold is constantly being traded somewhere in the world the price is also fixed twice daily in the London fix.
- 4 **The London Fix** At 10.30 and 3.00 daily the five members of the fix meet at N. M. Rothschild's. The other four members are Mocatta & Goldsmid; Sharps Pixley; Mase Wespac (who replaced Johnson Matthey); and Samuel Montagu. The five traders at the fix are each in telephone contact with their trading floors; these in turn are in contact with buyers and sellers around the world. A series of prices is considered until a price is found where supply and demand are exactly in balance. Thus the fix represents the momentary equilibrium price between a large volume of trades. Many suppliers and fabricators around the world base their daily decisions and bookkeeping upon the London fix.

## **The Mechanics of Gold Investment**

- 1 **Bullion Trading** There are a large number of houses that have bullion trading departments. These range from the five members who participate in the daily gold fix to most of the big European and American banks. In addition to trading in London, it is possible to trade gold in Zurich or through other offshore centres like Jersey. For an institutional investor it is easy to establish a relationship with one of these many bullion traders. This takes the form of a credit agreement between the investor and the trader's parent bank of the same nature as that with a foreign exchange dealer. Like foreign exchange gold can be purchased on a spot or forward basis. Settlement is typically two days although other arrangements are frequently made.

- 2     **Securitized Gold Products** In addition to gold bullion there are a small number of securitized gold investment vehicles. The Luxor fund in Luxembourg is a 75% to 100% physical gold product managed by Paribas; and the Prevista gold fund is managed exclusively for pension funds in Switzerland. These funds consist primarily of gold bullion and some include other financial assets such as other metals, bonds and cash deposits. The purpose of these funds is to permit the institutional investor to buy gold via stock markets. They are intended to track the gold price more closely than is typical for gold mining shares.
- 3     **Commission Charges** Gold can be bought at any time at the current market price in which case, for sizable investments, all commission costs are contained within the bid offer spread and there is nothing further to pay. Alternatively, gold can be bought at the relevant London fixing. In this case there is no bid offer spread but a negotiable commission applies. Smaller investors would naturally pay a higher commission.
- 4     **Storage Charges** Storage costs depend upon whether the gold is held on an allocated or unallocated basis. An unallocated gold account is analogous to a cash bank account. The investor has a paper claim on a specified amount of the general pool of gold which the bullion house holds. Like cash deposited in a bank the majority of the gold is lent on to other users to generate a profit for the bank. However, the gold can be sold or delivered at any time. Allocated gold on the other hand constitutes bars sold or delivered at any time. Allocated gold on the other hand constitutes bars which are individually registered in the investor's name and held separately in the bank's vaults. The owner may demand to inspect his or her gold at any time.
- 5     **Taxation** Allocated gold is defined by the UK Government as gold which has been physically delivered and as such it is subject to VAT. Unallocated gold, however, does not attract VAT. Similarly gold bought and sold offshore is not liable for VAT, unless it is brought into the UK. Moreover, there are

usually no storage costs to be paid for unallocated gold whereas storage is charged on allocated gold at a negotiable fee of up to 0.3% per annum.

- 6 **Comparative Trading Costs** The commission costs on buying and holding gold compare very favourably with those on other forms of investment. This table shows that apart from government bonds gold, with total fees of 0.39%, including storage and insurance, is the cheapest financial asset to buy and hold.

**Chart : Comparative Trading Costs**  
**Example Comparative Transaction Charges**

*Minimum Investment \$1 Million*

	%
Government Bonds	0.10
Gold	0.39*
Eurobond	0.50
Equities	From 1.00 †
Unit Trusts	From 2.00 ‡
UK Property	6.00
German Property	8.00
Fine Art	10.00
French Property	Up to 20.00

\* *Includes storage charges and insurance for 1 year in an allocated account*

† *Excludes stamp duty and custodial charges, transaction charges vary widely*

‡ *Excludes annual management fee, transaction charges are frequently higher*

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