EXPLORING AGGREGATE ASSET PRICE

FLUCTUATIONS ACROSS COUNTRIES

Measurement, determinants and

monetary policy implications

by

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Contents

List of symbols used in the tables

A change (first difference) AU Austraiia

E2 adjusted R2 BE Belgium

SEE standard error of the equation CA Canada

DW Durbin Watson statistic DK Denmark

LM(x) Lagrange-multiplier test (p-vaiue); Fl Finland
x is the number of lags considered FR France

CH(x)Chow test (p'value); x is the year DE Germany
that splits the sample JP Japan

* significant at the 10% levei NL Netherlands

** significant at the 5% ievel NO Norway

*** significant at the 1% level SE Sweden

(.) figures in brackets under coefficient GB United Kingdom
estimates are t-statistics US United States

— not appiicabie

n.a. not available

(c) constrained coefficient: long-run elasticity equal to one

w.s. wrong sign

AP aggregate asset price index

P price level

TC total private credit

Y nominal GDP

M (broad) money stock

FE forecast error

RL long-term interest rate

RS short—term interest rate

business sector profits

linear trend

G raphs

Introduction1

Asset prices have undergone major medium-term fluctuations since the

early 1980s, sometimes ending in sharp downward corrections. This has

been true of equity prices: a generalised vigorous upswing preceded the

global stock market crash of October 1987, while a more protracted cycle

took place in japan. it has also been true of real estate prices, as sizable

movements in residential and commercial property prices have occurred

in many industrialised countries (eg. BlS (1990) and (1993)).

Such fluctuations are of course not new; the last similar episode took

place in the early 19705. Yet the recent cases have attracted particular

attention on the part of economists and policy-makers. One reason is

their impact on economic activity and on the soundness of financial insti—

tutions. It is widely believed that the boom-bust nature of asset price fluc-

tuations has exacerbated the business cycle, fuelling the upswing, magni—

fying the downswing and slowing down the current recovery. And the

disruption caused to balance sheets of economic agents, notably banks,

has threatened or resulted in widespread financial distress: the experience

of some Anglo-Saxon and Nordic countries as well as Japan are prominent

examples (BIS (1991), (1992) and (1993)). A second reason is that the

prolonged upswing, in contrast to that in the early 1970; occurred against

the backdrop of generally moderate and declining inflation and typically

positive inflation-adjusted interest rates, often higher than output growth

rates. Questions about the determinants of such asset price fluctuations

and about the extent to which monetary authorities should pay attention

to them in the formulation of policy have thus come to the forefront of

debate.2

Against this background, the objective of the present study is three-fold. Firstly, it is to develop an aggregate asset price index for several of the major industrialised countries so as to summarise the information contained in the separate movements of the three asset prices exhibiting major fluctuations, viz. residentiai property, commercial property and share prices.3 Such an index faciiitates the comparison of broad asset price movements over time and across countries, gives some empirical content to popular notions of general asset price "inflation" and "defla-tion" and may highlight patterns of behaviour that would otherwise remain undetected. Secondly, it is to begin to analyse what factors may explain the observed movements in the index. The approach tries to combine basic insights from microfinance theory and macroeconomics. Finally, it is to provide preliminary evidence on the usefulness of the aggre-gate asset price index as an input in the design of monetary policy.

The analysis is largely exploratory in nature. The theoretical underpin-nings of the index and its construction couid be refined; the development of a formal representation of the workings of the economy would permit a more unified treatment of the various issues addressed; greater atten-tion to country-specific features and more thorough statistical testing would be needed to obtain more definitive answers. Tackling these aspects, however, would take the study well beyond its intended scope.

Section I briefly reviews the main characteristics of asset price move-ments during the last two decades; a detailed description of the construc-tion of the aggregate price indices for the various countries is contained in Appendix I.

Section il looks at the possible determinants of the observed fluctua~ tions in the aggregate index. After outlining some of the conceptual underpinnings of the analysis, the section provides a stylised comparison of fluctuations in the 1980s and T9705. On the basis of an examination of

very simple relationships between asset prices, output, profits, interest

rates and credit, it is argued that a distinguishing feature of the more

2 As, for instance, in the recent debate in the United States on the stance of monetary poiicy

or the earlier discussion injapan (e.g. Bank oijapan (1990) and Shadow Open Market Committee

(1993)).

3 The inspiration for this analysis was provided by two pieces of work in the Australian

context, by Callen (i991) and Biundell—Wignall and Bullock (1993). which develop and use a

variant of such an index. See also BiS (1993) for a cross-country perspective.

'EO

recent episode was the role played by the relaxation of credit constraints

in the wake of financial liberalisation. This hypothesis is then subjected to

more formal econometric tests.

Section lll. by contrast, takes aggregate asset prices as given and

considers their potential usefulness as an element in the design of mone-

tary policy. Two popular types of analysis are performed. The first sub—

section examines the extent to which the inciusion of the aggregate index

improves the performance and stability of traditional demand for money

functions; in severai cases the improvement of the economic and statis—

tical properties of the equations is substantial. The second sub~section

explores the information content of the index with respect to inflation

and output. Part of the analysis applies popular statistical techniques

already extensively used in the assessment of other potential ieading indi—

cators, such as simple monetary aggregates, divisia indices, credit and

various interest rate spreads (so-called "Granger—causality" tests). A fuller

explanation of these tests is given in Appendix ii. The section aiso exam"

ines the same question on the basis of the ability of aggregate asset price

movements to explain the forecasting errors of a major international

institution.

The conclusions briefly summarise the main findings of the paper. They also highlight some of the key lessons of the recent asset price fluctua— tions for central banks as the institutions responsible for the conduct of monetary policy but aiso as guarantors of the integrity of the financiai system.

I. A bird' -eye view of asset price movements

The sharp movements in individual asset prices since the early 1980s have been amply documented (eg. BIS (1988), (1990) and 0992)). Graph 1 provides an alternative perspective on these developments. lt plots for each country a summary measure of asset prices. or aggregate asset price index, constructed as a weighted average of national price indices for equities and real estate, both residentiai and commercial. As explained in detail in Appendix E, the weights represent estimates of the shares of these assets in total private sector wealth. The index provides a number of insights into the behaviour of asset prices, both across countries and over time.

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175

150

125

100

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250 ~

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T25

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75

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Graph 1

Real aggregate asset prices

1980 = 100; semi-logarithmic scales

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United States France

.... _ _ Beigium

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}apan _ M Sweden Jl _

_.__ United Kingdom ____ Finland l l

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75

85 9O 7O 75 80

90

175

150

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75

Note: The real asset price index is a weighted average of equity and residential and commercial

real estate price indices deflated i)

of private sector wealth.

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y consumer prices. The weights are based on the composition

The graph indicates that over the last ten years a large number of countries have experienced a "cycle" in real aggregate asset prices, i.e. an upswing followed by a downswing in the index deflated by the price level (consumer price index). The severity of such movements, however, has varied widely. The sharpest fluctuations have taken place in some of the Nordic countries and in japan. In Japan. Sweden and Finland asset prices rose by well over 100% between 1980 and 1989, only to see a considerable part of that increase reversed since then. Similar, though less pronounced, movements have occurred in Norway. In the United Kingdom the upswing can actually be traced back to the mid-19705: an increase of some 120% from trough to peak was only moderately affected by the recession in the early "E9805. At the other end of the spectrum, asset price upswings have been far less marked in countries such as Belgium, the Netherlands and Germany.

A comparison of the aggregate asset price movements in the 19805 with those in the 19705 suggests a number of observations (see Tables 3 and 2). Certain similarities clearly exist: iarge movements occurred during both periods, they were a global phenomenon and. typicaliy. the same set of countries experienced the sharpest fluctuations in each case.

Nevertheless. certain differences are also apparent. Firstly, the increases in the i9805 have generally occurred over a much longer period — at ieast five years compared with two or three at most in the early 19703.4 Secondly, their amplitude has typically been considerably greater; a notable exception is the Netherlands, where a relatively small upswing in the early 19705 was followed by a much larger one in the second haif of the decade, out of step with virtually all the other countries and of greater amplitude than that in the 1980s. Thirdly, in most countries the downswing in real asset prices in the 1980s has involved larger declines in nominal terms than that in the previous decade, which no doubt partly explains the more severe impact of asset price deflation on the balance

sheet of both financial and non-financial economic agents in recent years.

Finally, the correlation of the index across countries is generally signifi-

cantly higher in the 19805 (see Tabie 3).5

4 An analysis oi the movements in equity prices heading up to 1970 and other complementary

indicators suggest that this conclusion is not a spurious result of the period for which the series

are available. In Finland the upswing in the 1970: may have been as long as seven years, which is

still somewhat shorter than that in the 1980s.

5 As is the correlation of returns (percentage changes), which is not included.

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Table 1

The two upswings in real aggregate asset prices

"E9705 _ 1980s .

Cumu- Years Trough Peak ' Cumu- Years Trough Peak

iative % from year" year ' lacive % " from year - year

change' trough _ _ _ . change1 . trough -

to peak - '_ - to peak '

AU i4 1 1971 1972 53 7 1982 1989

BE . . .. 10 3 (1970) 1973 59 S 1984 1989

1 7 4 1 975 1 979

CA . .. 18 3 (1970) 'E 973 52 S 1984 1989

DK 28 2 (1970) 1972 63 3 1982 19853

FI ..... 20" 3" (1967) 1974 191 10 1978 19883

FR 2 1 (1971) 1972 67 7 1982 19903

DE 25 2 (1971) 1973 39 5 1987 1991

3P 114 7 1966 1973 164 12 1977 1989

NL 11 3 (1970) 1973 52 7 1982 1989

57 4 1 974 1 978

NO . . . 34 3 (1970) 1973 73 9 1980 19893

SE 11 2 1974 1976 114 9 1980 19893

GB 47 2 (1970) 1972 102 8 1981 1989

US 15 2 1970 1972 37 8 1981 19893

1 From trough to peak. 7- Where the trough year couid not be identified cleariy because the aggregate price series did not extend sufficiently far back in time, the bracketed year corresponds to the most likely trough, on the basis of movements in the available component indices and independent information. 3Upswing interrupted by at least a one-year downward movement. 4 On the basis of movements in the equity price index, the trough appears to have been in 1967. The change in the aggregate index is measured from the earliest year avaiiable, 1971.

Looking beyond the aggregate index to its components several points stand out. Equity prices generally exhibit the largest fluctuations, and commercial property prices are significantiy more voiatile than house prices (see Tables 4 and 5); nonetheiess, because of the relative shares in

the index, it is mainly residential property (65—70%) and equity (15—25%) prices that drive its movements (Table 6).

Real estate prices have in fact accounted for over half of the total change in the real aggregate asset price index in both upswings and down- swings in a majority of countries, but their dominance was more marked in the 19705. Similariy, the upswing in the overall index in the 19805 has a distinct pattern, being mainly driven by equity prices in the first half of the decade and by real estate prices in the second. By comparison with the

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Table 2
The two downswings in aggregate asset prices"

In real terms in nominal terms
19705 19805 19705 19805

Cumu- Years Trough Cumu~ Years Trough Cumuiative %

Iative % from year Iative % from year change

change peak to change peak to

trough trough

AU ~24 6 1978 ~11 1 1990 54 — 5

BE ~17 2 1975 - 6 3 ~ 6 3

~21 5 1984 12

CA ~10 1 1974 ~15 1 1990 1 ~40

DK ~25 2 1974 ~19 2 1987 ~ 2 ~12

Fl ..... ~31 4 1978 48 4 ~ 8 ~38

FR ~16 5 1977 —6 2 —- 38 —1

DE.. ~22 3 1976 ~4 1 ~ ~10 ~1

JP ..... ~31 4 1977 ~28 3 ~ 10 ~23

Ni. ~11 1 1974 ~ 5 2 1991 ~ 2 3

~39 4 1982 ~23

NO ~34 5 1978 ~21 3 ~ 4 ~14-

SE ~10 1 1977 ~27 3 w 2 ~12

(38'... ~43 4 1976 ~17 3 ~ 7 w 2

US ~24 2 1974 ~9 1 1990 ~8 —4

*The period is defined by the change in the real index from peak to trough or. where no trough was identified in the 1980s, to 1992.

upswing in the 19705, the relative contribution of equity and commercial real estate prices was typicaiiy higher in the 19803, mirroring a decline in that of residential property prices.

While it provides a useful basis for analysis, describing asset price movements by reference to the aggregate asset price index and national averages can understate the economic significance of asset price swings.

The window over which the movements are measured corresponds to the troughs and peaks in the aggregate index rather than in the individual components; the variations in individual series may thereby be under—stated. For example, commercial reai estate prices in the United Kingdom went through a major cycle in the 19803, but the strength of the upswing is hardly reflected in the figures because they bottomed only in

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Table 5

The two downswings in real aggregate asset prices:

individual components*

19705 19805

Residen» Commer— Equities Residen- Commer— Equities

tiai cial rial cial

property property property property

Cumuiative percentage change

Australia ..... — 8 ~44 ~59 ~— 4 ~ 9 ~28

Beigium ...... 0 ~32 ~31 16 ~1 3 ~27

~35 7 10

Canada ...... 2 n.a. ~37 ~12 n.a. ~22

Denmark ..... ~ 7 ~32 414 ~12 22 ~40

Finland ...... ~25 ~43 ~52 ~44 ~41 ~61

France ...... ~ 5 ~24 ~55 3 ~36 4

Germany ..... ~24 ~29 1 5 ~17 ~11

Japan .... ~30 ~34 ~21 4 7 ~57

Netheriands. . . 9 ~36 ~35 ~ 3 6 ~12

~44 ~28 ~ 1

Norway ...... 9 ~ 9 ~74 ~26 ~40 ~ 9

Sweden ...... 3 ~22 ~26 —-'| 1 9 ~41

United Kingdom ~22 n.a. ~66 ~24 w55 ~ 4

United States . . ~ 1 n.a. ~53 ~ 8 ~10 M11

*The period is defined by the change in the aggregate index from peak to trough identified in Table 2.

1986, six years after the aggregate index (Table 4 and Graph Al.1, Appendix 1). Moreover, regionai variations in real estate price dynamics can be very large. In the United States, for example, major desynchronised swings occurred successively in the Mid-West, the North-East and the South—West during the 1980s. Similarly, London and Paris have seen

booms and busts which are diluted in the country-wide measures.

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Ii. Explaining the aggregate asset price movements

Some conceptual underpinnings

What may have lain behind the observed aggregate asset price fluctua-
tions? In order to answer this question some frame of reference is
needed. A useful starting—point is the present value formula, famiEiar in
finance theory. The formuia states that the price of any asset price (AP) in
terms of the general price level (P) may be written as a function (f(.)) of
the real income received from the asset in any given period (UP), the
expected future nominal growth rate of that income (g) and the nominal
discount rate (or required rate of return) (r), the sum of a risk—free rate
plus a risk premium specific to the asset:6

E: f [a r g,
P P ′ ′

(+)(-)(-)

A higher anticipated income from the asset tends to raise its price, a
higher yield on alternative assets or a higher risk premium to reduce it.
The basic idea behind this formulation is that arbitrage should ensure that,
in equilibrium, the yield on all assets, adjusted for risk, is the same (Ross
(1987)).

The present value benchmark has the merit of highlighting a set of vari—
abEes of interest in explaining asset prices. However, it can only be an
approximate guide to an empirical analysis: neither the ex ante required
rate of return nor expectations about the future income from the asset
are directly observable or explained by the model,7 Moreover, the rela~
tionship is expected to hold only in equilibrium, and the costs of portfolio
adiustment in certain markets, notably real estate, may result in significant
short—run deviations of actual from "theoretical" prices.

5 For an asset whose income and discount rate are expected to remain constant over time

$AP\,|\,,\,.\,.$

the formula becomes $T9 = F\,.\,TE$ as long as $r > g$, the condition that ensures that the price is bounded. Note also that r and g may aiternau'vely be defined in real terms. by subtracting and adding the inflation rate from the denominator of the expression.

7 The determination of the risk premium calls for further assumptions about economic agents' risk preferences; that of expectations for some view about the expectation formation mechanism. Since neither expectations nor the ex ante required rate of return are directly observable, it is not possible to test the two hypotheses independently. This has been the source of considerable ambiguities in the interpretation of statistical exercises based on the formula.

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in addition, the present value benchmark is not free of conceptual shortcomings. One drawback relates to its application to the explanation of residential property prices, one component of the composite asset: the demand for housing is partly driven by the desire to consume the services from the asset rather than by the expected pecuniary gains from the investment. A second drawback is the limited scope that the benchmark provides for identifying the influence of general monetary and credit conditions, which is confined to the discount factor. This ignores the possible effect that the availability, rather than the cost, of finance can have on economic agents' demand for assets. A few words may clarify this point.

Admittedly, much of the macroeconomic literature has viewed changes in monetary conditions as affecting asset markets and hence economic activity through induced changes in yields.3 However, recent work has drawn closer attention to the relevance of non—interest-rate factors by pointing to information asymmetries in capital markets

between funds users and suppliers. Under these conditions, interest rates and yields on assets (eg. equities) may be inefficient mechanisms for the allocation of funds: they may fail to provide suppliers with sufficient safe- guards to secure an appropriate ex ante return. For example, raising the interest rate charged on a loan would on average attract the worst risks to a lender unable to differentiate between the riskiness of a set of borrowers or projects. Since no repayment is forthcoming when the project fails, the demand for funds associated with riskier proiects is less sensitive to increases in the contractual interest rate" Therefore, higher contractual rates may after a point not raise expected returns to the lender at all and rationing of funds may result.

There are indeed many variations on this basic theme, depending on the particuiar financial instrument considered and the assumptions made about the distribution of information and the contractual possibiiities

9 This is true of both Keynesians and monetarists, although the spectrum ofassets and hence relative yields considered varies: one interest rate. typically interpreted as a bond rate, is consid- ered in the popular iSILM model first developed by Hicks (1937); the analysis is extended to the return on equity by Tobin (1961) and to a wider spectrum of asset returns by e.g. M. Friedman (1956) and M. Friedman and Meiselman (1964).

" If the contractual rate is 10%, the expected cost to the borrower on a project with a 99% probability of failure and a 1% probabiiity of meeting the repayment obligations is 0.1%. The cost is 10% on one that is guaranteed not to fail. The differential sensitivity implies that out of a given pooi of projects with identical expected returns the safer projects will be the first to be deterred by a high contractual rate. See Stiglitz and Weiss (1981) and (1986).

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open to the parties.10 For present purposes only a few lessons from this strand of the literature are relevant. Firstly. the costs of external finance

are typically higher than those of internal finance. Secondly, interest rates and yields may be a poor guide to the effective (opportunity) cost of funds, especially external funds. Other contract terms may be quite important, not least coliateral. Finally, under these conditions the availability of internal and external funding is relevant, not just its cost as measured by the observed interest rate: agents may be finance-constrained.

This work has also led to a renewed focus on credit rather than money as the variable that best captures the impact of changes in financial conditions on the economy." Together with internally generated cash flow or income, credit represents the main source of funds for the acquisition of goods, services and assets. Changes in the terms on which credit is granted are thus a crucial eiement in the transmission of monetary impulses.

Delving further into history, certain strands of thought have highlighted the role that changes in credit conditions may have in generating or amplihting the business cycle, partly by interacting with asset prices. Elements of this story, for example, can be found in authors of the Austrian tradition (eg. Von Mises (1934)) and were more fully articulated in Fisher's (1932) theory of debt deflation.12 The role of credit in fuelling asset price booms has been amply documented by Kindleberger (1978) and considered in some detail by Minsky (1982).

The relationship between credit and asset prices is multifaceted. The relaxation of credit constraints can have a direct and indirect effect on valuations. Agents may directly utilise credit to purchase real and financial assets. Indirectly, expenditures on goods and services tend to generate an upswing in economic activity, helping cash flows and brightening prospects for future income on assets, thereby buoying their valuation. In turn,

1° On the equity market, see. for instance, Myers and Majluf (1984). Gertler (1988) and Borio (19903) contain short overviews of the topic.

1' See, for instance, Greenwald, Stigiitz and Weiss (1984), Bernanke and Blinder (1988). Bernanke and Gertler (1989) and, Greenwald and Stiglitz (1993) or Stiglitz and Weiss (1992). Traditionally, both monetarists and Keynesian; have been quite willing to confront their views on the basis of paradigms that played down the autonomous role of credit. Despite this prevalent attitUde, many economists have not neglected credit, regardless of any emphasis on rationing. See, most nombly, Brunner and Meltzer (1974) and B. Friedman (1983).

12 See also Keynes (1931) for the impact of declining asset values on banks' willingness to lend and hence on economic activity.

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higher asset values, either induced by the credit expansion itself or in response to autonomous factors, strengthen the net worth of agents and hence their borrowing capacity, not least by increasing the value of collateral. A self-reinforcing process can easily develop.

Some authors have stressed the speculative nature of the later stages of the boom, when investment decisions may be primarily driven by anticipated capital gains rather than the income stream to be derived from the assets (eg. Kindleberger (1978) and Minsky (1982)). Especially when those expectations become disconnected from underlying fundamentals in the real economy, the stage is then set for a period of falling asset prices, painful adjustments in the balance sheets of overstretched financial inter~ mediaries and borrowers and declining or negative credit growth. The same factors that reinforced the upswing now operate in reverse, exacerbating the downswing. The experience of severai countries in the recent business cycle has followed this scenario fairly closely.13

The foregoing analysis contains some useful ciues as to the variables to be considered when explaining movements in aggregate asset prices. On the basis of the present value formula, some measure of the income from the assets should be included. Since the components of the aggregate are equities and real estate, in the absence of more precise statistics income from capital (which includes also rents) and GDP may be taken as proxies. in addition, GDP may help to capture that part of the demand for residential real estate that is driven mainly by the desire to consume housing services rather than by investment considerations. A long—term interest rate can proxy the yield on alternative assets. Finally, although both money and credit have a bearing on asset prices, credit merits particular attention.

The following pages provide a stylised comparison of the relationship between aggregate asset prices and the identified economic variables in the 19805 and 19705. It is argued that the distinguishing characteristic of the 19805 has been the role played by credit as a result of the relaxation of credit constraints in the wake of liberalisation and heightened competi—tion in the financial industry. This hypothesis is then subjected to more rigorous statistical tests.

'3 See, for example, Greenspan (1991a) and (1991b), Bank of England Quarterly Bulletin (1991), Oklna and Sakuraba (1994), Blundell-Wignall and Bullock (1993) and, for an overview, O'Brien and Browne (1992). For evidence of a credit crunch beyond the banking sector, and more specifically in the US private placement market, see Carey et al. (1993).

23

Table 7
Real aggregate asset prices and
economic growth in the two upswings1

1970s 39805

Australia .... 0.73 i .68

Belgium 0.522 2.27

1.033

Canada 0.86 1.57

Denmark 2.35 2.32

Finland 1.11 3.52

France 0.13 3.07

Germany 2.58 1.93

japan l.31 2.58

Netherlands 0.662 1.89

4.084

Norway 2.37 2.91

Sweden 3.08 5.20

United Kingdom 3.44 3.38

United States 1.09 1.25

1Trough-to-peak percentage increase in the real aggregate asset price index as defined in Table 1 divided by trough-to-peak percentage increase in real GDP. 11970—73. 3197549. 4 1974518.

Sources: OECD and national data.

A suggested interpretation

No doubt the vigorous and proionged economic expansion of the 19803 goes a long way towards explaining the larger cumulative rise in real asset prices during the period in comparison with that in the 19705. But the ratio of the growth rate of the real asset price index to that of output was higher in the 19803 than in the 19705 (Table 7). The second upswing of the 19705 in the Netherlands is the clearest exception, the ratio being among the highest recorded in either period; other counter—examples are Germany, where it was somewhat higher in the 1970s, and the United Kingdom and Denmark, where it was not very different. This suggests that generally other factors must have been at work.

The explanation for the stronger upswing in asset prices can hardly lie with interest rates. True, in both episodes countries with relatively low inflation-adjusted interest rates appear to have experienced steeper asset price increases (Graph 2), But inflation~adiusted interest rates were generaily low or even negative during the 1970: upswing and considerably

24

Graph 2

Real aggregate asset prices and inflation-adjusted interest rates

200

150

100

Percentage change in real aggregate asset prices1

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'35 AU 8E5. 7" ~~~~~~

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—1 0 1 2 3 4 5 6

Inflation-adjusted interest rates?

' Trough to peak. 3 Averages of quarterly ten-year government bond yields less an uncentred three-year moving average of consumer price inflation over the period defined by the movement in the real asset price index for each country» 31974—78 (interest rate not available for the 1970473 upswing). 41975—79. 51970—73.

higher and positive during that in the 19803. They tended to be lower than the growth rate of output in the first episode and higher in the second. On both counts asset price movements should thereby have been damp~ ened.

Admittedly, adjusting for tax provisions can substantiaiiy reduce the opportunity cost of funds. This factor was particularly significant in countries with relativeiy high inflation, and hence typically higher nominai

25

Graph 3
Inflation-adjusted cost of borrowing for house purchases
In percentages

Tax adjustment2 Post-tax cost

[:2] Pro-tax cost l

United States Sweden3 Denmark

l

10

Finland

I

73 77 81 85 89 92 73 77 81 85 89 92 73 77 81 85 89 92

Founyear (for i992. three-year) periods ending in the year indicated

1 Defined as the re—tax mort a e rate less the rate of consumer rice inflation. 2 Based on the

. P g 3 _ . p

to ersonal income tax rate. 3 New series Since 1986.

P P

interest rates, and for those agents able to deduct borrowing costs from

their tax liability. For example, in the Nordic countries, where full

deductibility of mortgage payments combined with persistent inflation, the post-tax cost of funds for the purchase of residential property was actually negative for much of the 19803 (Graph 3). The same is true of the United Kingdom. Yet, a favourable tax treatment existed also in the 1970s

26

and the post—tax cost was actually rising for most of the period preceding and accompanying the i980$ upswing. It was only in the late stages of the boom that prices appeared to respond to this increase, partly following a tightening of tax provisions. Therefore, by themselves tax factors do not appear to account for the change in the relationship between interest rates and asset prices between the two upswings.

Part of the explanation may lie with the behaviour of profits, defined also to include a rent component. The economic expansion of the past decade has generally been regarded as especially propitious for the income from capital. A rise in the share of national income accruing to profits could help to account for the greater sensitivity of asset prices to GDP. Higher rates of return could iustify a lower responsiveness to interest rates.

The available evidence suggests that this explanation may be relevant for some countries but not for all. Profits did tend to rise faster in the 19805 than in the 19705 (Table 8). Just as with interest rates, the behaviour of profits seems to account for part of the cross—country differences observed in the two periods (Graph 4). But the responsiveness of asset prices to profits was on average greater during the 19803 upswing. it was sharply higher in the three Nordic countries experiencing the largest asset price booms, namely Finland, Sweden and Norway. it was consider- ably lower only in Germany and Belgium (Table 8).

The above reasoning suggests that judging from traditional bench-
marks for the assessment of asset values it is not easy to account for the
upswing in the 19805, at least if that in the early 19705 is taken as the basis
for comparison. For some countries, notably Germany, where the recent
upswing in asset prices has been relatively subdued by international stan—
dards, the strength of output and/or profits may by itself go a long way
towards providing an answer. For others. however, especially those expe—
riencing the sharpest movements, other significant factors appear to have
been at work. The same may be said. exceptionally, of the second upswing
in the 19705 in the Netherlands, which in some respects resembles that
experienced by other countries in the subsequent decade,

Credit seems to have the necessary credentials to fill the gap in the
explanation. As shown in Graph 5, at least in those countries where the
asset price boom was most marked in the 39805 (Finland, Sweden,
Norway, Japan and the United Kingdom) or where the disruption caused
by the downward correction in valuations has caused great concern

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Graph 4
Real aggregate asset prices and real profits

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0 20 40 60 80 100 120

Percentage change in real profits2

1Trough to peak. 11974—78. 31975479. '1970w—73.

(Australia and the United States) there is a relatively close correlation
between the ratio of private credit to GDP and asset price movements. In
most of them this correlation appears closer than in the 19705.

To a large extent, the major expansion ofcredit during the past decade
reflected a relaxation of credit constraints in the financial industry in the
wake of both market—driven and policy-determined structural develop-
ments." Their end-result was greatly to increase competitive pressures in

1" For a global perspective on these developments. see Broker (1989), OECD (1992) and BIS
((1991) and (1992)).

28

Table 8
Real aggregate asset prices and real profits

	1970s		1980s	
	Profits[1] sensitivity[2] Cumulative percentage change	Asset price Ratio of percentage changes	Profits[1] sensitivity[2] Cumulative percentage change	Asset price Ratio of percentage changes
Australia[3]	18	0.77	73	0.72
Belgium	6	1.084	71	0.82
			10	2.665
Canada	90	0.20	39	134
Denmark	25	1,15	30	211
Finland	33	0.60	35	5.51
France	19	0.09	72	0.93
Germany	5	4.58	52	0.76
japan	68	1.67	109	1.50
Netherlands[3] . .	21	1,334	20	2.56
			8	2.666
Norway	47	0.73	30	2.49
Sweden	27	0.42	44	2.58
United Kingdom	27	1.76	38	2.67
United States . .	21	0.71	42	0.89

'Profits in the business sector divided by the corresponding deflator. ITrough—to-peak

percentage increase in the real aggregate asset price index as defined in Table 1 divided by

troughvto-peak percentage increase in reaE profits. 3 Real profits caiculated as the profit share

in the business sector multiplied by real GDP. 419TOe73. 51975—79. 61974—78.

the industry and to broaden the range of borrowing opportunities. in the process, they also heightened the impact of pre-existing tax provisions which encouraged indebtedness and which had been less powerful during the period when credit rationing was prevalent. The resulting environ-ment provided fertile ground for a self—reinforcing spiral of credit and asset prices, with faster credit expansion raising asset prices and higher asset prices in turn relaxing credit constraints further. The likelihood of such a process is especially high in the transition period. as agents adjust to the newly-found freedom and a lack of familiarity with the new financial conditions leads to errors of iudgement on the part of both lenders and borrowers.

29

100

200

150

100

125

100

75

Graph 5

Real aggregate asset prices and credit

Left-hand scale (1980 = 100):

Rea? aggregate

a 55 at p ri ces

Right-hand scale:

_____ Total private

credit/GDP ratio

x.

Lawlmsartulu:

Sweden

ElElEiElEliiEiEiiillli

80 90

Finland

300

200

100

200

150

0.9100

iiiilillllllliliiliiilil

Urlited Kingdom

200

150

100

125

100

Sources: National data and authors' estimates.

30

While quite general, the heightening of competitive pressures has not been uniform. The mixture of government and market forces as engines of the process has varied across countries. And so has the scope, timing and speed of the structural changes, depending on initial conditions and specific factors, It is precisely such differences that help explain the international pattern of asset price movements.

The countries where asset price movements have been comparatively greater, or at least more disruptive, have all seen significant structurai changes in their financial system during the past decade. The impact of deregulation has been particuiarly strong in Norway, Sweden and Finland, all of which moved from a system where credit was rationed to one of open competition in the space of a few years around the mid-19805. Deregulation was also particularly broad-ranging in Australia before 1985.15 Though considerably more gradual, the cumulative deregulatory process has been important in Japan (Takeda and Turner (1992)). A significant step was the easing of restrictions on corporations" access to international capital markets beginning in the mid—19805. This facilitated their speculative investments in both equity and property markets ("Zaitech").l" Similarly, less regulated non-bank credit institutions thrived and became heavily involved in lending to the real estate market.

The case of the United Kingdom is rather unique. in that the financial conditions of the early 1970s and 19805 were similar in many respects. in particular, both periods were characterised by a heightening of competi—tive pressures, partly in the wake of deregulation. In the early to mid-19805 (direct and indirect) restrictions on credit were abolished and greater competition between banks and buiiding societies was encouraged, thereby reinforcing an underlying market trend. In the early 19705 the lifting of interest rate and quantitative restrictions as part of the Competition and Controi Act of 1971 fuelled a credit expansion and a boom and bust cycie in asset prices, notably commercial real estate

(eg. BIS (1990)). The case of the Netheriands is also special: the major asset price cycle of the second half of the 19705, which was driven by housing prices, was preceded by an intensification of competition among

'5 On Norway, see Solheim (1990) and Commission on the Banking Crisis (1992); on Sweden. Englund (1990); on Finland, Bruniia and Takala (1993), Nyberg and Vihri'ala (1993) and Bordes (1993); on Australia, MacFarlane (1989).

15 On the changes in the financing and investment patterns ofjapanese corporations, see Bank of Japan (1991).

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credit intermediaries and a significant broadening of government mort— gage guarantees for the acquisition of dwellings.17

In the United States a significant heightening of competitive pressures did occur in the 19805 in the wake of several deregulatory moves, notably as regards deposit rates and the lending powers of savings and loan insti- tutions in the commercial property sector in the early to mid-19805. But market forces were primarily responsible for the increase in competition between banks, on the one hand, and securities firms and capital markets more generally, on the other — the acceleration ofa trend that dates back to the "£9705. One symptom of this process was the debt—financed takeover wave, a factor which contributed to the rise in stock prices.18 Another was the greater eagerness of banks to take on risks in commer- cial real estate lending.

From a broader perspective, the heightening of competitive pressures has influenced asset prices not only within the narrow confines of domestic markets, but also through the linkages between them. The growth of cross-border capital flows has played a roie. Following the

liberalisation of capital controls, for instance, finance companies in Sweden were quick to expand their lending activities in the commercial real estate market in London, a source of subsequent heavy losses. The cross-border activities of Japanese banks and investors have helped to boost preperty prices in several countries. The internationalisation of finance is probably one factor behind the higher correlation of asset prices across national boundaries in the 19805.

At the other end of the spectrum, in Germany, which has seen rela tively little structurai change, asset price movements have been more subdued. They have also been moderate in Denmark in comparison with its Nordic neighbours, consistently with its earlier and much more gradual deregulation process.

At the same time, it would be incorrect to attribute the credit expan— sion of the past decade soleiy to a structural heightening of competitive pressures. Monetary policy has to take a share of the responsibility. Admittedly, on balance, the impact of monetary policy on the amplitude of

17 Banks had developed new mortgage structures with low initial downpayments and had become less conservative as regards minimum loanutowalue ratios. lnjuly i975 municipal govern- ments introduced mortgage loan guarantees for the acquisition of existing residential property; until then the guarantees had been available only for newiy-built dweilings.

'3 For a detailed analysis of such highlynieveraged transactions, including banks' involvement, see Borio (1990a and 1990b) and references therein.

32

asset price movements in the 19805 has arguably been less important than in the early 19705. The earlier episode was marked by a generalised expansionary stance. This was in part connected with the Bretton Woods

arrangements, which made it difficult for countries to insulate themselves from external monetary shocks. In the past decade, by contrast, monetary discipline was greater. Inflation gave way to disinfiation, and inflation-adiusted interest rates were in general considerably higher.

Nevertheless, a comparatively easy monetary stance probably exacerbated the price movements in several countries, especially those exhibiting the largest asset price upswings. To different degrees, in Norway, Sweden and Finland domestic and/or external constraints on interest rate poiicy in the wake of deregulation provided ampie liquidity for the asset price boom (eg. Solheim (1990), Dennis (1993) and Currie (1993)). Policy in japan was arguably not consistent with restraint in borrowing. The steep upswing was accompanied by declining interest rates, in part geared to checking the appreciation of the yen/dollar exchange rate foilowing the Louvre Accord of 1987 (eg. Takeda and Turner (1992)). Policy was comparatively easy also in the United Kingdom, at least when the pound shadowed the Deutsche Mark in the second half of the 19803 (e.g. George (1993)).

By contrast, the firm monetary discipline enioyed by Germany, in conjunction with little structural change in its financial system, arguably goes a iong way towards explaining the more muted asset price movements there. Part of this disciplining effect has undoubtediy filtered through to the other ERM countries. The tighter monetary policy pursued in Australia in comparison with that in some of the Nordic countries probably tempered the credit/asset price spiral that followed deregulation.

Formal statistical evidence

The interpretation of events just outlined implies a set of testable propositions which may be examined with the help of formal statistical tools. Firstly, to the extent that the asset price boom of the early 19705 was

more closely associated with interest rates which were low in relation to the expected income stream from the assets than with credit availability, the explanatory power of credit may be expected to be generaily higher in the 19803. Secondly, the distinctive influence of credit in the 19805 should be clearest in those countries experiencing maior structural

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Table 9

Credit bivariate regression results

log (9): a + B (1%),

Whole period 19705 19805

;3 t-sta- R1 B esta» El {3 t-sta- R1
tistic tistic tlstic

(2.96) 0.26 —1.'i 6* (1.94) 0.23 (5.74) 0.73
(3.70) 0.38 0.29 (0.73) 0.06 (3.61) 0.50
(2.96) 0.27 029* (2.00) 0.25 (1.59) 0.11
(2.53) 0.21 1.68 (0.61) —0.07 (2.01) 0.22
(6.48) 0.66 ~51???M (3.23) 0.54 (4.34) 0.60
(6.98) 0.69 —0.88'1"* (3.01) 0.47 (10.16) 0.89

(3.69) 0.40 —0.50 (0.34) —0.12 (4.39) 0.65

(13.74) 0.87 ' ' (. 0.52 (11.64) 0.92

(2.24) 0.15 (. 0.79 (4.16) 0.58

(8.79) 0.81 (. 0.01 (10.70) 0.90

(8.67) 0.77 . (. 0.29 (5.52) 0.71

.. . 'i (7.43) 0.71 190* (1.89) 0.22 093*" (7.22) 0.81

US.... 077*" (8.24) 0.74 —O.93 (1.46) 0.09 0,87%:-E (7.18) 0.81

changes in their financial system and the largest asset price swings. Finaliy,
since the relationship between total private sector credit and money has
changed significantly during the past two decades following the liberalisa-
tion process, the period should also contain interesting clues as to the
relative usefuiness of the two variables in explaining aggregate asset price
movements.

Simple bivariate relationships are broadly consistent with the
hypotheses put forward regarding the relative importance of credit over
time and across countries. This is indicated by the regression results of
the (iog of the) real asset price index on the ratio of total private sector
credit to nominal GDP (Table 9). When the equation is estimated over
the whole sample, the coefficient on credit is in fact invariably statisticaily
significant and correctly signed. As judged from the fraction of the vari—
ability in the real asset price inclex "accounted for" by credit (W), the
explanatory power is generally highest (of the order of 70% or more) in
those countries experiencing the largest asset price swings (Finland,
Norway, Sweden, Japan and the United Kingdom) and in the United
States. The results also suggest that the relationship is generally cioser in

the i9805 than in the 19705: virtually all the R1 are substantially higher and so are a majority of coefficients, some of which are actualiy incorrectly signed in the 1970s.

The evolution of the relationship can be better assessed by adding one observation at a time and plotting the recursively estimated coefficients (Graph 6). In countries where the financial environment changed profoundly in the 19805 (Finland, Norway, Sweden, Australia and the United States) there is a clear tendency for the responsiveness of asset prices to credit to rise during the period. In France this occurs mainly after 1987, the year in which the ceilings on bank credit ("encadrement de credit") were lifted. In the Netherlands, where structural changes took place earlier, the main shift is in the mid-1970s. By contrast, in the remaining countries there is not much evidence of a clear break, though the relationship is typically estimated more precisely in the later period." In the case of the United Kingdom, the relatively stable sequence of esti- mates is not inconsistent with the fact that the financial conditions surrounding the two booms were quite simiiar. More movement could have been anticipated for japan, however.

In simple bivariate relationships the credit variable may also capture the explanatory power of other factors not explicitly included in the rela- tionship to the extent that credit is correlated with them. A more reliable test should control for the influence of these omitted variables.

The natural benchmark to adopt is the present value formula described at the outset of the section. Accordingly, the real asset price can be written as a general function of the level of real profits20 (UP, the proxy for the income from the composite asset). nominal GDP growth (a proxy for its longer-term growth) and a nominal long-term interest rate (RL, the proxy for the discount rate). It is to this benchmark that a credit variable is added in the form of the ratio of total private credit to nominal

GDP (TC/Y).21 A linear trend (T) is also included to limit the risk of

spurious correlation.

'9 As indicated by separate estimation over the two subusamples, this finding is not iust the

result of the inclusion of additional observations (Table 9).

1° For the Netherlands and Australia, in the absence of a sufficiently long and UpvtO—date

series on business sector output this variable was approximated by the profit share times real

GDP using OECD data. Since the ratio of business to total output has remained approximately

constant over time or changed little, no significant biases should be introduced by this procedure.

1' For Denmark, only bank credit was available.

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Recursive coefficients of the credit term:

Graph 6

Finland

bivariate model

Recursive coefficient

(the shaded areas represent

+/-2 standard errors)

liilllii

llllll llli

japan

Elliilliilll'llllli-

Sweden United Kingdom

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United States Australia

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Graph 6 (cont)

Germany Canada

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Denmark Netherlands

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70 75 80 85 90 70 75 80 85 90

Sources: National data and authors' estimates.

The regressions are estimated on annual data. The specification used is
a standard "error correction" model, which allows for considerable flexi-
bility in the dynamic interaction of the variables. Up to one lag (Le. one
year) for each variable is included. Each variable is entered in (lagged)
levels and (contemporaneous) first difference. The variable to be
explained, Le. the real asset price, is entered in first differences.22 Because

21 For Finland, however. the best equation was expressed only in the form of first differences.

37

Table 10

Credit and asset prices

	TCIY		A(TC/Y)		SEE	P12	0R2	Estimation
	Coefficient	t—statistic	Coefficient	t—statistic				Permd
AU.	—	—	—	—	0.05	0.53	e	1971432
BE..	0.82"	(2.32)	2.17***	(6.48)	0.03	0.84	+0.41	1971—92
CA.	—	—	~7		0.06	0.43	—	1971—92
DK.	—	—	—	—	0.05	0.86	—	197131
Fl...	m	m	1.73%	(2.16)	0.10	0.54	+0.10	1973~92
FR..	——	—	127*	(2.02)	0.06	0.31	+031	1971492
DE.	1.31mi"	(3.87)	——	—	0.05	0.53	+0.43	1972—90
JP.	.. ..	1 .16"*""		(2.93)	0.06	0.62	+0.14	1966—92

NO. 3.20““: (4.45) 104* (2.12) 0.07 0.65 +0.45 1972—91

SE.. — — 1.48*** (4.28) 0.06 0.65 +0.12 1971792

68. 0.50“: (2.43) 2.00*** (5.56) 0.04 0.87 +0.25 1971—92

US.. 0.54% (3,75) -— u 0.05 0.35 +0.35 1969792

Note: Statistics based on the regressions reported in Table A||3.1.

its logarithm is taken, it is the percentage rate of change of the real asset
price which is to be explained. The general form of the regression there—
fore is

$$\Delta \log\left(\frac{P}{P}\right) = a + \sum a_i x_m 2x.x,..1 + a_i \log[53$$

P t P

where i = 1, 2, 3, 4

Xi = Alog Y, RL, log l/P. TC/Y

)_1+ (1)1“

Two general points are worth noting. Firstly, the above specification
uses actuaE growth rates of GDP as a proxy for the expected future
growth of income from the asset23 and does not model explicitly the risk
premium. It is possible that part of any correlation detected between
credit and the asset price index may be due to the fact that movements in
credit may capture some of the expectational and risk elements not
accounted for by the other variables. Secondiy, as already discussed, the
relationship between asset prices and credit is bE—directional: increases in

13 Other specifications were tried but they did not improve the explanatory power of this

variable.

credit tend to raise asset prices and higher asset prices contribute to the relaxation of credit constraints. Any observed contemporaneous correlation will capture both elements. This is not a serious shortcoming in the present context, however, since the hypothesis examined fully acknowledges the existence of mutually reinforcing effects.24

The complete regression resuits are reported in Appendix Ill, Table Alil.1.25 The key findings concerning the relevance of the credit variable are summarised in Table 10. They are broadiy consistent with those derived from bivariate relationships. Credit is again statistically significant in all the countries experiencing the largest asset price movements and in those where their behaviour has caused great concern; although it does not appear in the Australian equation, this is only the result of imposing a constant relationship over the whole sample, as wiii be shown shortly. Only in the case of Canada and Denmark is no statisticaiiy significant effect apparent.26 For the Netherlands, it was not possible to obtain a reasonable equation for the period as a whole without aliowing for shifts in the relationship in the mid-W705 (see below).

in order to identify a possible structural break, two types of test were performed. in the first, only the coefficients of the creciit variables (level

1" There are essentially two ways of disentangling the two effects. The first wouid be to estimate the regressions by some form of instrumental variable technique, which wouid help to single out the influence of credit on asset prices. The technique, however, entails a significant loss of precision in the estimates ("statistical efficiency"), a very serious problem given the few degrees of freedom of the regressions performed. Alternatively, a full model which endogenised both credit and asset prices could be developed. This, however. falls outside the scope of the

present study.

25 The regressions were estimated by OLS through a singie-step procedure. The equations perform fairly well according to the usual econometric standards. The coefficients are correctly signed and generally highly significant and the R25 are mostly around 50% or higher. Only two regressions show some (weak) signs of serial correlation in the residuals. indicating that possibly some systematic information is not fully taken into account. The interest rate term is significant in the majority of equations. By contrast, the income growth terms (in levels or first differences) are often insignificant; in some countries the growth of earnings is perhaps better proxied by the first difference in the profit term (e.g. Australia, Beigium and Norway). Cointegration tests were also run for the variables appearing in the long-run solution of the equations, obtained by setting the first difference variables to zero. The Dickey-Fuiler tests could not reject the existence of a cointegrating relationship oniy in the case of Denmark and the United States and (almost) France and Germany. By contrast, if, following Kremers et ai. (1992). the significance of the coefficient on the lagged level of the dependent variabie was used as a guide, the presence of cointegration could not so easily be rejected. Either way, the restricted number of observations avaiiable should caution against appiying to the data results derived from asymptotic distribution theory. Moreover, the hypothesis tested does not necessarily imply the existence of a iong~run relation» ship between credit and asset prices.

15 This result proved to be robust to the inclusion of other variables of potential reievance, notably the inflation rate.

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Table 12

Stability of the credit coefficients

TCIY ancm R2

19705 19805 19705 19805 19705 19805

Coeffin t-sta- Coeff— t-sta~ Coeffi- t~sta- Coeffi» esta-
cient tistic cient tistic cient tistic Cient tistic

Fi.. — m — m —2.10 (0.95) 2.14 (2.33) 0.18 0.62

NO 1.36 (0.81) 4.44% (8.48) 0.24 (0.14) 1.0 r- (4.03) 0.51 0.95

SE. n - w — —0.40 (0.59) 1.6 (3.72) 0.30 0.71

us. 038 (0.69) OBS-W (328) ~ — — e 0.22 0.43

N0te:Al| parameter estimates were ailowed to vary over the two sub-samples. Some overlapping observations were ailowed so as to increase the degrees of freedom.

and first difference) were permitted to differ between the 19705 and 19805 ("conditional stabiiity" tests, Table 11). in the second, the whole equation was estimated over the two sub—periods, allowing for a few overlapping observations so as to increase the degrees of freedom ("unconditional stability" tests, Table 12).27 The tables show only the resuiting coefficients for credit and, unless of interest, just those associ— ated with the equation where the statistically insignificant terms in credit (level or first difference) over the two sub-periods have been dropped. Table 12 illustrates only the more relevant country cases.

The results of the tests are broadly consistent with prior expectations. The conditional stability tests confirm the evidence of a statistically and economically significant break for most of the reievant countries, including Finland, Sweden, France (after 1987) and the Netheriands (since 1975), the absence of a change in the relationship in the United Kingdom and the failure of credit to have explanatory power in Canada and Denmark (Tabie 11). They now also reveal a break in japan and signs of a significant and growing correlation between asset prices and credit in Australia.28 They indicate that the significance of the credit ratio in Germany does not

survive the separate estimation over the two sub—periods. Admittediy, the

7] In both cases the noncredit variables retained in the regressions were those of the best regressions over the whole sample (Table AllI.1).

2" Even if the first difference of the credit ratio is dropped, the levei term is virtually signifi-cant at the 10% level (p-value equal to 10.2%). This is consistent with the findings of Blundeli-Wignall and Bullock (1993).

41

150

125

100

75

150

125

300

75

250

225

200

175

150

125

100

75

Graph 7

Asset price simulations: constant credit ratio

Actual (19802100) Fitted ,,,,, Simulated

United States Germany

iiaaiiiiiliiiilaiiilii

Australia Belgium

lllllliEEEEElElElEElEE EEEEEllllllllElEElllll

fapan France

lliiEEllilllllllllllll iiiiliiitisiiiliiiiiii

70 75 80 85 90 70 75 8O 85 90

42

150

125

100

75

150

75

250

225

200

175

150

125

100

75

200

175

150

125

100

75

250

225

200

175

150

125

100

75

50

25

70

Graph 7 (cont)

United Kingdom

Sweden

1111l1111l1111l1111111

llllllllElllllllllllllll

Finland

Norway

_ \

1111l1111l1111l1111

_ \

\\ A

IIIIIIIIIIIIIIIIIIIII'ldl

75 80 85 9O

70 75 80 85 90

43

200

175

150

125

100

75

250

225

200

175

150

125

100

75

50

25

hypothesis of a stable reiationship cannot be reiected for the United States and Norway. but separate estimation of all the parameter estimates of the regression confirms the view that the relationship is stronger and better determined in the past decade, a pattern also evident for Finland and Sweden (Table 12). The country ciearly at variance with a priori expectations is Belgium, for which there is evidence of a break, on balance raising the importance of credit.

How high is the explanatory power of credit? A useful way of assessing this is to keep the value of the ratio of credit to GDP constant at the Eevel of the trough in the asset price preceding the 19805 upswing and to simu-late the equation on the basis of the coefficient estimates from the 19805. The estimated value of the asset price caiculated using the historical observations of the credit ratio ("fitted") can then be compared with the simulated one, the difference representing the part of the movement accounted for by credit. This is done in Graph 7, which also shows the actual path of the asset price index: a comparison with the fitted value indicates how close the estimated equation tracks the observed fluctua-tions in the first place.29 The simulations are dynamic: the simulated value

in any given period is used as the basis for prediction in the foiiowing

period. The effect can then cumulate over time."

In all countries the fitted series tracks the actual path of the aggregate

asset price reasonably well, suggesting that the estimated equations are a

usefui starting~point for the exercise. The explanatory power of credit is

especially high in those countries where the asset price booms and/or the

heightening of competitive pressures were most pronounced. In the case

of Finland and Norway, the adjusted series actually falls, suggesting that

other factors have an overall negative influence. In France, the two series

diverge in the period foiiowing the removal of credit restrictions}1 The

only country for which the results do not conform with a priori expecta-

Z" Alternatively. the difference between the actual and fitted value, i.e, the errors in the orig-

inal regressions, could have been used to adiust the simulated series. This could have allowed the

direct comparison of the actual and simulated series, but at the cost of concealing any potential

inadequacy of the fitted series as benchmark.

3" The precise question asked is: what would the asset price have been had credit remained

constant? Of course, to the extent that it is asset prices that drive credit rather than vice versa

the question is somewhat misleading. As before. the exercise is best interpreted as capturing the

overall impact of the crediu'asset price process or as identifying the upper bound to the unilateral

impact of credit.

3' in the United States the simulated series is actualiy fiat because credit was the only variable

found to be significant in the regression.

44

Table 13

Money versus credit:1

Credit omitted Credit and money included2

Money Money Credit

Significance level3

Australia .... J

Belgium 65.8

Canada .... —"

Denmark .... —"

Finiand 99.7

France 87.8

Germany 70.5

Japan 71.8

Norway .... 9.2:?

Sweden 89.9

United Kingdom . . . . 7.3::'5 5.74" (w.s.)

United States 52.4 89.6

iThe basic form of the regression includes the variables identified in the best regressions over the whole sample (Table Alll.1). Both the (simultaneous) first difference and (lagged) level of the ratio of broad money to GDP were tried. 2The basic equation used to calculate the significance levels includes only the significant credit terms. 3The significance level refers to the joint hypothesis that both terms can be omitted unless only one of them is significant. " Not applicable as credit was not statistically significant in the original equation and remained so after the inclusion of money. 5 The significance level relates to the equation that includes the insignificant level term; where the first difference is omitted the level term becomes significant but with the wrong Sign. 6The significance level relates to the equation that includes the insignificant credit term in first difference.

tions is again Belgium, for which the expianatory power of credit is considerable, though indeed generally lower than elsewhere. Even though the coefficient was not statistically significant when the whoie period was split, a simulation was carried out for Germany As the graph shows, the influence of credit is marginal in economic terms.

Finaliy, the relative explanatory power of credit and money may be tested by adding the ratio of money to GDP (M/Y) to the regressions with and without the credit ratio. In the light of the structural changes that have occurred during the period, it seems reasonabie to use broad monetary aggregates. The results on balance suggest that the incremental

explanatory power of money is negligible (Table 13). If the credit variables

are not included, money is statistically significant in only four countries,

viz. Belgium, Japan, Norway and the United Kingdom. Once credit is

45

included, a statistically significant effect survives only in the United

Kingdom and Norway, but the sign is correct only in the latter. By

contrast, credit remains significant in virtually aii the regressions even if

money is added, although sometimes the significance falls primarily

because of the loss of degrees of freedom.32 in Finland, credit becomes

only marginally insignificant.

On balance, therefore, the statistical evidence presented here is

consistent with the view that the relaxation of credit constraints, mainly

in the wake of financial liberalisation, has played a significant role in facili~

tating the observed ample movements in the aggregate asset price index

during the past decade. Both the cross~country and time series patterns

of correlations are broadly supportive of this hypothesis.

lll. Aggregate asset prices as inputs in the design
of monetary policy

The above analysis has considered the determinants of movements in the

aggregate asset price index, The separate question which the following

section begins to address is the extent to which such an index may be

useful as an input in the design of monetary policy.

It has now become more widely accepted that the primary gan of

monetary policy should be price stability (Bockelmann and Borio (1990)).

Granted, differences of opinion still exist and have recently been encour~

aged by a more hostiie macroeconomic environment. Nonetheless, by

and large there is a wider consensus that in the longer term "real" variables such as output and employment are not much affected by monetary factors while inflation is highly responsive to changes in monetary conditions. By contrast, there is Eess agreement, or at least greater uncertainty, about the time horizon over which the impact of monetary policy on the real economy may be disregarded, about the relationship between policy instruments and goals in the intervening period and about the very measurement of the monetary conditions consistent with price stability in

32 Similarly, some tests were carried out to assess whether bank or total credit was the more relevant variable. The results suggested that the broader definition was more appropriate.

46

the longer term.33 it is in this context that the asset price index is potentially most relevant.

A common tooi of policy design is the demand for money, the rela—tionship relating the money stock willingly held at any particular point in time to other economic magnitudes such as prices, output, weaith and the yields on alternative assets. This relationship has the merit of providing a constellation of mutually consistent values of several key variables. Depending on the specific conceptual and information framework in which it is embedded, it can thus serve a variety of useful functions. These range from the identification of the path of variables subiect to observantional lags (e.g. output) to the assessment of monetary conditions conducive to the achievement of medium-term inflation obiectives. Since the aggregate asset price index can be used in measuring wealth and yields on non-monetary assets, its explanatory power in a typical demand for money relationship could be considerable.

Another policy tool consists in statistical exercises aimed more

directly at evaluating the information which certain financial variables contain about future movements of economic magnitudes of interest, i.e. at identifying leading indicators. Though hardly sufficient by themselves, if complemented with a dose of good judgement such exercises can help the authorities to form a view about the likely evoiution of the economy and to adjust their policy accordingly. Here again the aggregate asset price index may prove useful, since the component asset prices tend to influence, and to reflect expectations about, future economic developments.

Against this background. the following pages begin to examine the properties of the aggregate asset price index as an input in each of the two types of analysis highlighted. The first sub-section assesses the contri— bution that the index makes to the statistical and economic properties of standard demand for money functions relating the money stock to the general price level, output and interest rates. The second iooks into the information content of the index as regards future inflation and output.

33 Hence the longstanding debate on indicators of policy stance, proximate and intermediate targets and information variables. For a review, see B. Friedman (i990) and, especially, Courakis (1981). tor an analysis of the types of statistical test consistent with the various categories of policy input, see Borio (1988a).

47

Aggregate asset prices and the demand for money

On a priori grounds, there are several reasons why asset prices might be expected to be relevant for the demand for money?1 Higher aggregate asset prices are typicaiiy associated with a higher value of transactions in financial and reai assets; higher money balances may be needed to carry out these transactions. More importantly, a rise in asset prices leads to a revaluation of the stock of wealth, which should have a positive influence

on the demand for money, especially in the case of broad aggregates. Similarly, in general the demand for money wiii not be independent of the composition of the rest of the portfolio; the aggregate price index can summarise information about the valuation of a major portion thereof.35

In contrast to the impact of the level of asset prices, the rate of change of nominal asset prices, as a proxy for their rate of return, can be expected to have a negative influence on the demand for money. As the yieid on aiternative assets rises, the quantity of money demanded should fail. in practice, however, it may be difficult to isolate this effect from that of a slow adjustment to changes in wealth, so that the net impact is a priori ambiguous."

Finaily, it is possible that any observed correlation between the money stock and asset prices may in fact capture supply—side effects rather than the determinants of the demand for money. Some sectors of the economy tend to increase their borrowing from financial institutions as a direct consequence of the rise in asset prices and such asset price increases are also likeEy to facilitate lending owing to the higher net worth of potential borrowers. The expansion of the assets side of banks' balance sheet (credit) may then drive that of the liabilities side (the money stock). Since the breadth and depth of these effects is likeiy to be greater after a heightening of competitive pressures in the financial system, asset prices may act as a proxy for them. If so, however, we would expect the influence of asset prices to be detectabie mainly in the 19805. Thus, evidence of insta~ bility in the relationship may be interpreted as being consistent with the presence ofa significant supply—side, rather than demand-side, effect.

3" For a review of the theory of the demand for money that elaborates on some of these points, see (e.g. Laidler 0993). For recent. albeit seiective, reviews of the empirical Eiterature, see Goldfeld and Sichel (T990) and Boughton (1992).

35 See Courakis (1988) for an explanation of this effect in the context ofa fully specified anai-
ysis of portfolio decisions.

3" This results from perfect multicollinearity owing to underidentification in the absence ofa
carefully specified model.

48

Whiie the role of wealth as a determinant of the demand for money
has been wideiy noted in the theoretical literature, empirical attempts to
incorporate wealth variables explicitly have been relatively few and have
met with mixed results. The comparative dearth of such efforts relates in
part to the paucity of comprehensive balance-sheet data, particularly for
broader components of wealth, but perhaps also to a perception that
wealth may yield only a marginal improvement over an income term.37

Wealth effects have been found to be significant in a number of coun-
tries, including the United Kingdom and japan, as explanations of changes
in velocity during the 19803. in the United Kingdom, Grice and Bennett
(1984) included a measure of non-bank private sector Wealth.38 The
wealth term was expanded by Hall et al. (1990) to cover physical assets,
largeEy housing. of the personal sector. In accounting for the trend decline
in income velocity in Japan, Corker (1990) emphasised the role played by
the rapid expansion of financial assets of the private, non-financial sectors
while the Bank ofjapan (1992) also included land prices, in both Eevels and
changes, viewed as capturing wealth effects. Several different asset price
variables have also been used in the UK studies: the capital gain on gilts
(Grice and Bennett). stock prices (Hali et al.) and residential property
prices (King (1992)).39 However, in contrast to the results for japan. these
were generally found to have a negative sign and treated as an alternative
rate of return.40

is there any particular group of countries for which a marked influence
of asset prices on the demand for money may be expected? As the rele—
vance of wealth and other portfolio effects on the money stock is beyond

37Judd and Scadding (1982). for instance. reviewing the search for a stable money demand
function. conciuded that. at least for narrow definitions of money "these modifications may
improve the performance of M. demand equations marginally. but [that] the solution probably
does not reside in this area" (p. 1008). After alf, distributed lags in income have often been used
as approximations to "permanent income", itself thought of as a proxy for wealth.

3'3 Grice and Bennett (1984) was the first attempt to incorporate wealth in a conventionally
specified money demand function for the United Kingdom; more detailed and complete models
of household portfolio behaviour had of course already used financial wealth for quite some time
(e.g. Barret et al. (1975)). The estimation by Grice and Bennett was conducted prior to the publi-
cation by the Central Statistical Office of comprehensive national and sectoral balance-sheet
data.

3" There exist a number of earlier attempts in the United States, including Meltzer (i963)
and Brunner and Meltzer (1964). See also Goldfeld (1976) for a review of that literature which is
generally scepticai of the usefulness of weaith. A notable exception, over a more recent sample
period, is B. Friedman (1978). M. Friedman (1988) considers the impact of stock prices. This
work has generaily employed narrow definitions of money.

40 A comparison between the findings of the UK and Japanese papers, however, is not
straightforward, given the significant differences in the variables employed.

49

doubt on theoretical grounds, there is in principle no reason why certain
countries should be singled out. At the same time, in practice it is in those
where the movements in asset prices have been largest that a statistically
significant influence may be more easiiy detected.

A casuai look at the behaviour of broad monetary aggregates during the past two decades is not obviously inconsistent with the potential relevance of the asset price index (Graph 8). The rate of growth of these aggregates generally outstripped that of nominal income during the 19805: the ratio of nominal income to the money stock (the "income veiocity of money") fell considerably in virtually all countries. For some, however. including Germany and Belgium, the decline was clearly the continuation of a trend dating back to the 19703, while for others it marked a clear reversal of the experience in the previous decade. And this latter group comprises most of the countries experiencing the largest asset price increases in comparison with the late 19705, including the United Kingdom, Finland, Norway and Australia. Sweden is a clear exception to this generai pattern, as the velocity of money actually rose sharply during the 19805. This may have reflected the marked shift from domestic to foreign currency denominated deposits by the non-bank public.

The prima facie case for including aggregate asset prices in the demand for money is supported by an examination of a simple bivarEate regression of velocity on real asset prices (Table 14). A negative and statisticaily significant relationship is apparent in almost all countries. The exceptions are the United States and Germany, where the relationship is not statisticaily significant, and Sweden, where it is positive. In the case of Sweden this reflects the unique behaviour of velocity in the 19805. In general, the explanatory pOWer of the asset price variable is quite high. it is highest in Japan and the United Kingdom, where at least 70% of the variance in veiocity is accounted for by real asset price movements. For Australia it is weil in excess of 50%.

Evaluating the contribution of the asset price index to the demand for money calls for the choice ofa benchmark specification. Given the specific objective of the analysis and its cross~country coverage, it seems appro-

priate to choose a very standard formulation and hence to relate the

money stock (M) to the general price levei (P), real GDP (WP) and some

interest rates." Both shortnterm interest rates (RS) and long-term

'13 In particular. the goai of the study is not to obtain the best possible specification for each

country; rather, it is to evaluate the contribution of the aggregate index to standard equations.

50

Graph 8
Income veiocity of broad money

3.5 3.5

France

S'/A\.'\ _ ' .. ._..._ Belgium ""

"' \ _____ Netherlands 30

~ United States w v 'T':"

.. m... Canada

1.0 t _____ Australia e — _ 1,0

llllliililiEEElEEEElEE liiillitlllliilllllii

3.5 3.5

Japan Sweden

_....,_ United Kingdom " .__....._ Finland A

_____ Germany ____.. Norway

3'0 7 T _ .... Denmark — 3'0

_ _ __ A 7

I \\ .'

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N" ,../\

2.0 ~\ "'4 \ _.

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1.5 \ —

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70 75 30 85 90 70 75 80 85 9O

Sources: National data and authors' estimates.

Si

Table 14

Income velocity of money and real asset prices

Y AP

log (file (1 + 0 log (Y)

APIP W SEE DW

Coefficient t—statistic

Australia	(6.15)	0.63	0.15	0.82
Belgium	(6.35)	0.64	0.07	0.64
Canada	(4.36)	0.45	0.22	0.57
Denmark	(5.08)	0.54	0.07	1.22
Finland	(3.99)	0.42	0.2:	0.48
France	(3.76)	0.37	0.08	0.27
Germany	(2.32)	0.17	0.13	0.22
Japan	(13.31)	0.88	0.07	0.57
Netherlands . .	(2.31)	0.17	0.23	0.12
Norway	(4.79)	0.50	0.10	0.45

Sweden ..... (7.43) 0.71 0.13 0.78

United Kingdom (7.37) 0.71 0.18 0.79

United States. . (0.48) ~0.03 0.05 0.75

interest rates (RL) were considered; in some cases the difference

between the two couEd be used as a proxy for the relative yield on money

and fixed income assets. it is to this benchmark that the asset price term

is added, also deflated by the generaE price level (GDP deflator). All vari—

ables except the interest rates are expressed as logarithms. The econo-

metric equation ailows for dynamic effects through the popular error

correction formulatéon, inciuding tagged values of the variables and at least

their contemporaneous first differences.41 The general specification can

then be written as

Alog ME = (x +)3 B, AX;l + Ex, XiH + Biog Mai

where] = 1, 2, 3

xi = log P, log Y/P, RS, RL, log AP/P

The regressions were estimated on annual data, generally available

since 1970.

41 Where it was found appropriate. lagged first differences and a linear trend were also

included.

52

Table 15

Real asset prices and the demand for money

AP/P MAP/P) SEE F? 0.02 Estimation

Coeffi— t-sta- Long Coeffi~ t-sta- Permd

cient tistic run cient tistic

AU. . (6.08) 0.71 — - 0.02 0.71 +0.52 1971—92

CA. , (4.29) 0.44 — m 0.01 0.86 +016 1971492

Fl .. (6.09) 0.24 .. ~ 0.01 0.91 +0.22 1972—92

JP . .. (8.35) 0.29 A ~ 0.01 0.96 +0.14 1969—92

NO . (3.20) 0.06 0.04 (1.77) 0.01 0.95 +0.04 1976—92

GB . (5.63) 0.68 A ~ 0.02 0.74 +0.68 1971432

Note: Statistics based on the regressions reported in Table All|.2.

The "best" resuEts that could be obtained through a search procedure narrowing down the general specification are reported in Appendix lll, Table AllE.2."3 For present purposes, however, Table 15, summarising the information which relates to the asset price term, is more useful. it shows that a statisticaiiy significant relationship between money and asset prices survives in as many as six of the eleven countries identified in the bivariate regressions: Australia. Canada, Finland, Japan, Norway and the United

Kingdom." In all of them the level of asset prices is significant, pointing to the existence of a long-run relationship. in addition, the rate of change has a detectable influence in Norway; the positive sign of this coefficient suggests that scaie effects dominate.

Judged from the size of the coefficients, which captures the percentage point change in the dependent variable associated with a percentage point change in the real asset term ("elasticity"), the responsiveness of the money stock is highest in Australia and the United Kingdom and lowest in Norway.45 The change in the explanatory power of the regression that results from dropping the asset price terms (the "marginal" R2) conveys a similar message.

*3 The regressions were estimated by OLS through a singie'step procedure.

'11 Some, though less robust, evidence of a significant relationship was also found for the Netherlands and France.

45 The considerable cross-country variation in the value of the longerun elasticity may partiy depend on the fact that the asset price term captures a combination of wealth and portfolio composition effects. While the wealth effect is expected to be positive. the portfolio composi» tion effect may be either positive or negative. This depends on whether the assets are comple- ments or substitutes, which in turn is a function of the perceived variances and covariances of the returns on money and the composite asset.

53

The importance of the asset price terms over a specific time period is perhaps best evaluated by purging the path of the money stock of the movement accounted for by the actual variation in the index. As in Section ll, this was done by simulating dynamically the preferred equa- tions, fixing the level of the real asset price index at its value at the begin<

ning of the estimation period. The resulting estimates for the velocity of money Were then compared with the path of fitted and actual velocity; since the equations tracked the historical movements in velocity quite well, however, the actual and fitted values were very ciose (Graph 9).

With the exception of Norway, where the difference is marginal, the behaviour of adjusted velocity is considerably smoother than either the estimated or original series. Moreover, in sharp contrast to the other two series, in three countries adjusted veiocity is basically flat for much of the period. viz. in Australia (1970—90), japan (since the late W705) and the United Kingdom (in the second half of the 19805), Asset prices thus appear to explain much of the observed decline in the last decade.

Do they also help to improve the economic properties of the money demand relationship? On theoretical grounds, the demand for money should be expected to exhibit a unit elasticity with respect to the general price level, at least in the long run (e.g. M. Friedman (1956)). Similarly, its elasticity with respect to real income should not exceed unity, unless income is itself used as a proxy for wealth.46 in empirical work, however, unit price elasticities are often imposed rather than tested and a common but disconcerting finding is real income elasticities well in excess of unity.47 Does the inclusion of the real asset price term make a difference in this regard?

4" Models of the demand for money focusing on the transactions and/or precautionary motive generally produce elasticities below one and never higher (see eg. Baumol (1952), Orr (1970), Miller and Orr (1966) and Akerlof and Milbourne (1980)). Models that view money as one asset in a portfolio stress wealth as a determinant of the demand for money. The implied wealth elasticities range between zero and in excess of unity. depending in particular on the risk preferences of agents (Courakis (1988) and (1989)) The elasticity exceeds unity, for instance, when increasing absolute risk aversion is assumed in a model where money is the safe (riskless) asset. M. Friedman's (1959) classic finding ofan elasticity of around 1.8 (money being a "luxury

good") was obtained in a model where (permanent) income was viewed as proxying wealth. See also Courakis (1984).

"'7 See. for instance, Boughton (1992) and Monticelli and Strauss-Karin (1992), who summarise part of the recent empirical evidence. Fase and Winder (i992) generally find that in EC countries unit elasticities are accepted with respect to income but not to the price level. in which case they are often lower.

54

Graph 9

Income velocity of money simulations: constant asset prices

Actual

Australia

MW..." Fitted

...... Simulated

japan

3.2

2.8

2.4

2.0

illllEllllllEgl'lll

lllllilllililil lElll

United Kingdom

Finland

0.3 MlllllflII'fEIElllll'lEl' Huimumlmmmlu

Canada Norwa

36 y

3.2-"

2.87

2.4w

2.0 talllzllmililwlmIlla» Hillimam['mmmzlil

80 90

55

70 80 90

2.0

0,4

3.2

The answer appears to be yes. Table 16 compares the price and income elasticities of the regressions that include the asset price index with the best regressions that could be obtained excluding it (the "basic" model, fully reported for completeness in Appendix Ill, Table Alll.3). In the "basic" model. a unit elasticity with respect to prices is rejected in the case of Japan and Finland, where it is considerably below unity, and Australia, where it is negative but statistically insignificant.48 The income elasticities are well above unity in five of the six countries considered. In the United Kingdom the restrictions are iointly accepted but individually rejected. Only in Norway are both constraints accepted. By contrast, once asset prices are included, unit elasticities with respect to both income and prices are accepted in all cases and, except for Norway, much more comfortably ("extended modem."50

Are the preferred equations stable? Tests for in-sample constancy of the whole relationship did not detect instability when the sample was split between the "19705 and 19805 or towards the end of the period (Tabie Allll). The behaviour of the real asset price term, conditional on the

48 The pattern is mixed for the seven countries where the asset price term was not found significant (Table Allil). A unit price elasticity was rejected only in two cases (Denmark and the Netherlands) and a unit income elasticity in three (Belgium, the Netherlands and the United States). In two of these three cases (Belgium and the Netherlands) it exceeded unity; the result for Belgium is consistent with jeanfils (1992). For the United States. it was less than one, though a unit elasticity has sometimes been accepted in recent work, albeit over somewhat different samples (see e.g. Hafer and jansen (1991), Bordo and jonung (1992) and Boughton and Tavias (1991) and the estimates by Milier (1991)). The only countries for which unit elasticities were accepted for both prices and income were Germany, France and Sweden; in Sweden, however. this was conditional on the inclusion of a linear trend. The finding for Germany is consistent with Gerlach (1993).

'19 The studies previously cited that include wealth variables generally find income elasticities

beiow unity, which is also consistent with theory. Unit price elasticities are typically imposed rather than tested.

50 A few words about the other properties of the equations are relevant. A significant influ—ence of the interest rate cannot be detected in either Canada or the United Kingdom; the result ior the United Kingdom is consistent with the findings by Hall et al. (1990). As judged by the coefficient on the lagged money stock (equivalent to that on the lagged error correction term) the speeds of adjustment are rather low in some cases, such as the United Kingdom and Canada. Even though not very appealing conceptually, slow adjustment is not an uncommon finding. More importantly, the adiustment is invariably faster in the model that includes the asset price term. in some cases substantially so (e.g, Australia and japan: see Tables Alill and Alli.3). In the specific case of the United Kingdom, in particular, constraining both income and price elasticities to unity in the model without asset prices results in an extremely low adjustment speed. The only equa~tion that actually passes the Dickey—Fuller or augmented Dickey-Fuller test for cointegration is japan; no doubt the few degrees of freedom in the data make it difficult to pass these asymptotic tests. The inclusion of the asset price term, however, tends to improve the cointegration prop-erties of the selected regressions in most countries, even in some for which it was not found to be statistically significant.

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constancy of the rest of the relationship, is considered in more detail in Table 17.51 The evidence supports the hypothesis that the coefficient estimates are stable: the formal tests are comfortably passed and the size of the level coefficients, which determine the long-run elasticities, are generally very similar in the two periods.52 ln Norway they are better determined in the second.

The evidence of stability in the relationship is all the more telling given the major structural changes in the financial system that occurred during the 19805. it also suggests that the effect captured in the equations is not likely to be the supply-side impact of credit expansion. For if it were, then the coefficient estimates would probably have been unstable in the 19805 in most of the countries considered. Rather, the results are more consistent with the standard and theoretically better grounded wealth and portfolio composition effects.

On balance, therefore, the evidence of the anaiysis indicates that the aggregate asset price index may indeed represent a useful addition to the

variables considered in the context of the demand for money. For several countries in the sample it improves not only the statistical but also the economic properties of the relationship.

The information content of asset prices

There are in principle good reasons to expect asset prices to contain useful information about the future course of inflation and output. As mentioned in Section ll, they help to influence economic activity not only through wealth and yield effects, but also by interacting with credit constraints. Above all, asset prices are "forward—looking", in the sense that they reflect expectations about future income streams. And in comparison with other prices such as the general prlce index or wages, they respond quickly to changes in economic conditions because of the nature of the markets where they are determined. Share prices, for example, react immediately to new information potentially relevant for their yield. Because of the relatively higher transactions costs. real estate

5' Multiplicative dummies were used following a procedure analogous to that employed in Section ll for the relationship between credit and asset prices.

52 Allowing for a differential impact of the first difference term even in those countries where it was insignificant over the whole sample produced broadiy similar results, except for some weak signs of greater significance in the 19805 for Australia and Canada.

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prices are not as responsive, but their adjustment is also comparatively fast.53

in order to investigate the information properties of the asset price index, two types of statistical exercise appear useful. Both of them test whether the index helps to predict future movements in the variable of interest after controlling for other relevant information available at the time the forecasts are made. in the first case, the relevant information is assumed to be the past history of the variable of interest itself and, perhaps, that of a few others ("Granger—causality" tests). Such simple statistical representations of the data are typically found to have good forecasting properties and are the most common test employed in the literature. In the second case the set of information is represented by the forecast made by a well-known international institution, which combines the use of a large-scale econometric model with judgemental modifica-tions. Forecasts of this kind are particularly influential and generally bear a relatively close resemblance to those made by national bodies.

Asset prices and inflation

Little attention has been paid to the signalling properties of either of the main components of the aggregate price index with respect to infla—tion.54 This probably reflects the view that on a priori grounds the rela-tionship between these variables is ambiguous. In theory, whether the (expected) inflation rate is positively or negatively associated with (nominal) asset prices depends on the correlation between inflation and

the income from the asset. At a macro level, this means essentialiy the correlation between inflation, real output and interest rates. In turn, this depends crucialiy on the environment accompanying inflation. if, for instance, the inflation observed over a particular periocl is primariiy the result of an expansionary monetary policy, then output growth will tend to be rapid and interest rates low, at least at the short end of the maturity spectrum. Asset prices would then be more likely to predict inflation. By contrast, if inflation was mainly connected with negative shocks to the

53 The extent to which asset prices can be good leading indicators depends also in part on whether the expectations on which they are based accurately refiect economic fundamentals. There has recently been growing scepticism as to whether asset prices are "informationaily effi- cient" in this sense. For recent reviews of the literature, see Le Roy (1989) and Kupiec (1993). Borio (1988b) also includes a theoretical critique. Kennedy and Andersen (1994) do some simple tests for housing prices with equally sceptical conclusions.

5" One recent exception is Bank of England Quarterly Bulletin (1993).

60

productive potential of the economy (e.g. aggressive wage demands or an oil shock) or with fiscal expansion not accommodated by monetary policy, over that particular time horizon the predictive power of asset prices could be poor.

Such general arguments apply to both equity and real estate prices. On empirical grounds, however, reai estate prices, the main component of the index, have typically proved to be a better hedge against infiation.55 Moreover, the aggregate index is probably a superior proxy for wealth effects on aggregate expenditure than either of its components. And similar ambiguities about the strength of the relationship have not deterred the serious consideration of the predictive power of commodity

prices by both policy-makers and academics in the recent past.56

Table 18 contains the results of time series tests of the predictive content of the aggregate asset price index with respect to inflation where only information about these two variables is taken into account (see Appendix ii for details). Two sub-periods are also considered separateiy in those cases where statistically significant evidence of a break in the rela~ tionship was found (through a standard Chow test). The two sub—periods are labelled 19703 and 19805 for convenience since the break was typically around the end of the eariier decade. Unfortunately, because of data limi-tations, only annual data could be used.

On balance the results are mixed. They indicate that asset price move— ments have contained additional information about the future path of inflation in most countries, but not in all sampie periods. in Australia" a significant relationship emerges only in the 1970s; in the United Kingdom only in the 19805. In Canada, Denmark, Finland, japan and the United States their predictive power survives for the whole period, but appears to derive mainly from either the 19705 or the 19805.58 Only in Norway is there evidence of a ciear and stable relationship. Where the link is statis-tically significant, it is invariabiy positive: faster changes in nominal asset prices herald a future rise in the inflation rate.

55 On the relationship between equity prices and inflation, see Modigliani and Cohn (1979), Gultekin (1983). Solnik (1983) and DeFina (1991). On the relative hedging properties of equities and real estate. see in particuiar Sirmans and Sirmans (1987). On housing prices, see Kennedy and Andersen (1994) and references therein.

55 See, for instance, Angeli (1991). Boughton et al. (1989) and Von zur Muehlen (1990).

57 Using a similar methodology but on quarterly data. Blundeli~Wignail et al. (1992) find no evidence of information content over the whole period (19705-805) and signs of a structural

break in the 19805. This is broadly consistent with the above results.

5" For Denmark and Finland, the significance of asset prices over the whole period derives only from the inciusion of the lagged cointegration residual in the regression.

61

Table 18

Asset prices and inflation: bivariate time series tests

	Significance level1			Break?
	Whole period	19705	i980s	
Australia	15.8	5.1"	45.4	1980
Belgium iiiiii	19.1		26.9	1977
Canada	10.6		81*	1976
Denmark2	78*		70.4	1978
Finland2	83*		584	1980
France	—	—	e	no
Germany	—	—		no
Japan	8.4"?		16.9	1976
Netherlands . . . _	-	—		no
Norway2	7			no
Sweden 111111	—			no

United Kingdom 4.83"" 1979

United Statesl . . 337 1979

' Percentage probability (p-value) of the incorrect reiection of the hypothesis that asset prices have no information content. Vaiues in excess ofx% indicate that the variable is not statistically significant at the x% level, 1 Test regression includes lagged residual from cointegrating regression in Table AILZ. The significance ievel of that residual is shown after the slash.

The same methodology was then extended to consideration of a model that also included money, real output and interest rates (Table 19). The results are broadly similar, in that there is considerable overlap in the groups of countries for which a significant and invariably positive relationship can be found. Now, however, the information content of asset prices does not survive in Australia, the United Kingdom and japan and emerges in Sweden.59

One drawback of the above results is that the methodology is quite sensitive to the iag structures chosen, the inclusion of information about long-term relationships between variables and other technical a5pects of the tests. The plethora of findings on the relationship between money and income, for instance, is a vivid reminder of the limitations of this approach (eig. Feldstein and Stock (1993)). Nor is it clear what the power of the tests is when few, albeit annual, observations are available.

59 Only significant terms for the controlling variables were retained in the equations. As a result. for Denmark. France and Norway the bivariate representations were still valid.

Table 19

Asset prices and inflation: multivariate time series tests1

Significance level2 Break?

Whole period 19705 19805

	Whole period	19705	19805	Break?
Australia	49.4	17.7	54,3	1980
Belgium	39.8	14.1	70.0	1977
Canada	207*	2.14:?		1980
Denmark.3	240/053	70.4	3 978	
Finland	97.8	65.2		1980
France3	89.8	—~	—-	no
Germany _____	77.9	—	—	no
japan	58.6	92.8	67.8	1979
Netherlands . . .	m	e		no
Norway?	—	—		no
Sweden	4.517	~	—	no
United Kingdom	62.7	67.5	24,4	1980
United States. , ,	65*-	——	—	no

' Marginal contribution made by the change in the log of the nominal asset price index lagged

one period to the best fit. regression of the change in consumer price inflation on lagged

changes in money growth. output and interest rates. Only significant terms were retained.

1 Percentage probability (p-value) of the incorrect rejection of the hypothesis that asset prices

have no information content. Vaiues in excess of x% indicate that the variable is not statistically

significant at the X% level. 3 No multivariate representation: the results reported are those of

the bivariate tests.

A complementary test consists in checking whether the inflation fore-

cast errors (FE) of professionais can be partly explained by the asset price

index. For simplicity, the tests here were limited to consideration of the

forecasts of a well—known international organisation (OECD) and to some

of the countries experiencing the most prominent asset price movements.

viz. Australia, Finland, japan. Norway, Sweden and the United Kingdom.

For all of them the previous time series tests had detected evidence of a

predictive content of asset prices in at least one sample period.

As before, only annual observations were used. The percentage (or

percentage point) errors in the one-year—ahead inflation forecasts were

regressed on the percentage change in the nominal asset price index in

the previous year.60 Dummies were added to some of the equations to

50 The forecasts were those published in the various OECD Economic Outlook issues and

went back to 1971. They were then compared with the actual series contained in the BIS data

base.

Table 20

Asset prices and inflation: analysis of forecast errors[1]

$$FEK = u + [5 A \log AP''$$

	Coefficient t-statistic	AW
Australia[2-3] 10.2	(1.7)	0.06
Finland[2]	(2.2)	0.19
lapanzi[3]	(0.3)	—0.02
Norway"	(2.7)	0.02
Swedenl-S	(2.4)	0.25
United Kingdom[2]	(2.1)6	0.34

[3] Regression of the percentage point error in the OECD one-yeanahead forecast of the GDP deflator (actual minus forecast) divided by the forecast of the change in the log of the nominal asset price index iagged one period. [1] Regression includes dummy for oil shock in the eariy 19705. [3] The forecast error is not divided by the forecast level because the level is at times zero or negative. " Regression includes dummy for 1986 and 1989. two large outliers. [5] Second lag also significant at 5% level. [6] Second lag.

account for the large forecasting errors that occurred around the time of the first oil shock."[1]

The results reinforce the view that the aggregate asset price index may indeed contain useful information (Table 20). The coefficient was statistically significant in all cases except Australia, where it was aimost so, and Japan. invariably, the coefficient on the asset price was positive: above average increases in the index were associated with underprediction of the inflation rate.

Asset prices and output

The predictive content of asset prices with respect to real output has received rather more attention. In particular, the information value of equity prices has long been recognised.62 Share prices are a component of statistical leading indicators of economic activity in several countries. On a priori grounds, real estate prices should also be relevant. However, data iimitations have militated against their active use.

5' In addition, for Norway there were large forecast errors in two years in the i9805 for reasons that appear to involve large ex post revisions to the data. These were also dummied out.

5? For evidence on US data, see eg. Fama (1981) and Fischer and Merton (1984). Stock and Watson (198%), however, argue that their additional explanatory power is limited in the context of their preferred leading indicator.

64

Table 2i

Asset prices and real GDP: bivariate time series tests

	Significance level[1]			Break?
	Whole period	1970s	1980s	
Australia	1.2"	7	7	no
Belgium	11.0	6.1	'5'	1977
Canada	18.4	7		no
Denmark	E33			1982
Finland	0.2	"i		1981
France	48.3			1979
Germany	7			no
Japan	42.6			1974
Netherlands	23"			1977
Norway	61.2			1981
Sweden	7			no
United Kingdom	-~			no
United States	2 . . m			no

[1] Percentage probability (p-vaiue) of the incorrect rejection of the hypothesis that asset prices have no information content. Values in excess of x% indicate that the variable is not statisticaliy significant at the x% level. 1 Test regression includes lagged residual from cointegrating regression in Table All.3. The significant level of that residual is shown after the slash.

The procedure followed to test for the predictive power of asset

prices in the bivariate representations of output growth is analogous to

that employed for the infiation rate."3 The main difference is that real, as

opposed to nominal, aSset prices are used as predictors.

The results confirm the existence of a statistically significant relation-

ship in most countries, though not necessarily in all periods (Table 21).

Among the countries experiencing the most prominent asset price move—

ments, there is clear evidence that asset prices have information content

in the United Kingdom, Finland and Austraiia. Norway, Sweden and Japan,

however, did not belong to this group. Consistently with theory, the

significant relationships detected were aEways positive, with faster changes

in the real asset price index heraiding higher output growth.

The predictive power of the asset price index appears more general

when iudged from an examination of the OECD forecast errors regarding

output growth (Table 22). In four of six countries on which the test was

53 See Appendix ll for details.

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Table 22

Asset prices and real output: analysis of forecast errors1

FEt = (x + B A log (g)

(vi

	Coefficient	t-statistic	ARI
Australia	6.6	(1.3)	0.02
Finlandl	82*	(2.1)	0.15
Japan3	12*	(17)"	0.07
Norway2	3.5	(0.8)	0.01
Sweden2	48*	(1.8)	0.10
United Kingdom2		(3.2)	0.32

1 Regression of the percentage point error in the OECD one-year~ahead forecast of real GDP growth (actual minus forecast) divided by the change in the log of the real asset price index lagged one period. 1 The forecast error is not divided by the forecast level because the level is at times zero or negative. 3Regression includes dummy for Oil shock in the early 19705. 4 Second lag.

performed. there is evidence of a statistically significant, always positive effect. Now some information content can also be detected in japan and Sweden, but none in Australia. Confirming the findings of the time series analysis, the explanatory power is highest in the United Kingdom.

in sum, the statistical evidence indicates that the aggregate asset price index does contain information about future movements in inflation and output. The strength and regularity of the relationship, however, are open to question. The evidence is encouraging if interpreted as highlighting a comparatively neglected field where careful further work could prove

useful. It is a healthy reminder. though, that while it may be unwise to negEect the information contained in asset prices. it is also very difficult to read it correctly. Hard and fast rules are clearly inappropriatef"1 consider- able judgement is called for.

6" Such a rule appears to have been recently advocated by Goodhart (1993), who argues that it would be conceptually appropriate to redefine the inflation price index on which central banks focus to include asset prices. See also the original idea developed by Alchian and Klein (1973).

Conclusion

This study has argued that a distinguishing feature of the pronounced medium-term asset price fluctuations observed since the early 19805 has been the role of credit. The major expansion of credit in the wake of a substantial heightening of competitive pressures in the financial industry appears to have been a significant factor in facilitating and sustaining the upswing. it may also have exacerbated the downswing. In comparison with the experience of the early 19705, the contribution of easy monetary policy, as judged by traditional standards, has been generally smaller

This conclusion is supported by a broad range of evidence. in comparu ison with the episode of large asset price swings in the 19705, for severai countries it is not easy to explain the aggregate asset price increases of the 19805 exclusively on the basis of traditional benchmarks for assessing asset vaiues, notably output growth, income to capital (including real estate) and the level of inflation-adiusted interest rates. This appears to be true at least for those countries experiencing the largest asset price swings (Finland, Sweden, Norway, the United Kingdom and Japan) and for those where such swings have caused considerable concern (Australia and the United States). The behaviour of credit appears to contribute signifi—

cantly to completing the explanation, as confirmed by multivariate regres—
sions where the impact of other factors is controiled for.

The reiaxation of credit constraints has reflected in part the operation
of market forces and, in some countries, a relatively accommodating
monetary policy. But a maior force has been the deregulatory process that
gathered momentum in the iast decade, most notably in the Nordic coun—
tries, Australia and the United Kingdom. The ensuing difficulties of adiust~
ment faced by market participants and policymakers tended to exacer—
bate the natural mutually reinforcing process between greater credit
availability and higher asset prices.

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To the extent that the especially Earge asset price fluctuations of the
i9803 reflected the costs of adjustment to a liberaiised, much more
competitive financiai environment, they are not iikely to recur. While the
picture is not uniform across countries, much of the deregulatory process
has run its course. At the same time, advances in the eiaboration and
dissemination of information are bound to continue. And a iiberalised
financial environment is also one in which credit demands can be more
easily accommodated. By the same token, so can speculative pressures.
Therefore. the likeiihood of further crediu'asset price spirals shouid not
be underestimated. it is thus especially important for central banks to
learn how to take asset prices into account when setting policy. As uEti—
mate guarantors of the integrity of the financial system, it is equaily impor-
tant for them to understand how to iimit the risk of large, unsustainable
asset price movements that may Eead to financial distress. Recent experi—
ence in several countries has been a painful reminder of their disruptive
potential.

Historicaily, the best safeguard against instability in asset prices has

been a firm long-term commitment to fighting inflation. Easy monetary conditions can provide fertile ground for both financial excesses in asset markets and general inflation in the markets for goods and services. They also typically set the stage for higher and more volatile interest rates, an important source of instability.65 The recent experience of the Nordic countries that have faced a banking crisis is a good case in point. So are the crises in the US thrift industry and in lending to highly indebted developing countries in the early 1980s. both triggered by a sharp increase in the level and volatility of interest rates connected with anti-inflation efforts. The same could also be said of the difficulties encountered by financial institutions in several countries following the asset price boom in the early 1970s, most notably in the United Kingdom.

At the same time, recent experience has indicated that a firm anti—inflation policy may not be sufficient. Not all disruptive booms have their root cause in monetary policy. And those activities driven by expectations of large capital gains, where the gap between anticipated returns and the cost of finance is largest, are likely to be relatively less responsive to a tightening in overall monetary conditions.

55 For a cogent exposition of this view, see Schwartz (1988).

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The difference in the responsiveness of asset prices and the inflation rate to credit conditions can pose a serious dilemma for the monetary authorities. The tightening consistent with stability in the asset markets may risk excessive deflation in the product markets and hence in the real economy. Dilemmas such as these were faced by the monetary authorities of many of the countries experiencing the sharpest asset price increases in the 1980s. This was most obvious in japan, where evident signs of spec—ulative excesses coexisted with low inflation.

Admittedly, a particulariy vigilant and enlightened monetary authority may in principle be able to mitigate such a risk by quickly adjusting the monetary policy stance so as to nip speculative excesses in the bud. With hindsight, it may appear deceptively easy to recognise such excesses. it is, however, extraordinarily difficult to do so as they develop, especially in their early stages. Considerable judgement is called for, Even then, their identification may typically come too late to prevent tension between different poiicy goals.

The conflict between poiicy objectives can be alleviated by appmpriate action at the micro levei. One possibility is to alter those tax provisions that tend to encourage indebtedness. Another, more fundamentai one, is to strengthen prudential regulation and supervision. Looking back at the events of the past decade one lesson in particular stands out: prudential safeguards should be considerably strengthened in a deregulated, more competitive environment so as to Eimit the risk of the emergence of finan-cial distress.66 The banking crises in some of the Nordic countries and, earlier. in the US thrift sector are clear illustrations of this proposition. Prudential regulation and supervision cannot necessarily be counted on to prevent speculative excesses, for much the same reasons that numb the effectiveness of monetary policy. It can, however, be trusted to mitigate those excesses and to make the financial system more capable of with-standing them. Consistent action at the micro level. therefore, can heip to relieve the demands on the monetary authorities. Internationally, the strengthening of capital standards since the late "E9805 is a step in this direction. Nationally, ali the countries where financial distress has emerged have taken action to upgrade their prudential safeguards.

The existence, under certain circumstances, of a potentiai conflict between the needs of price and financial stability does not necessarily

5" On this, see BIS ((1991), (1992), and (1993)) and Lamfalussy (1992). For an overview of the theoretical and empirical iiterature, see Davis (1992).

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deprive asset prices of a role to play in the pursuit of the traditional macroeconomic goals of monetary policy. In fact, this study indicates that aggregate asset price indices could represent a welcome addition to the set of variables considered in its formulation.

The most useful role of aggregate asset prices is unlikely to be that of leading indicators. There is indeed evidence that the asset price index contains information about future movements in inflation and output. The strength and reguiarity of this relationship, however, are open to question. While the findings may be interpreted as pointing to the desirability of further work in this neglected area, they underscore the difficulties in reading the movements in asset prices correctly and hence in devising a proper policy response.

It is in the context of the demand for money that the asset price index appears to be most useful. During the past decade the setting of monetary policy has been complicated by the "breakdown" of traditional money demand functions, relating monetary aggregates to the price level, reai income and interest rates. The inclusion of the asset price index helps to soive the mystery: for several countries it improves significantly the stability and economic properties of the reiationship, which survives the major structural changes taking place in the financiai system. Indeed, in the cases of Australia, Japan and the United Kingdom, while the ratio of money to nominal income ("velocity") falls sharply during the 1980s, the same ratio adjusted for the effect of the asset price index remains flat for much of the period. From this perspective, the asset price index can best be regarded as capturing wealth and portfolio composition effects.

Looking ahead, more work is ciearly necessary to estabiish the actual poiicy usefuiness of an aggregate asset price index; the present analysis is simpiy intended to point towards a new line of enquiry. The construction of the index, especially the weights, can be refined. The quaiity of the underlying data may be improved, at least as regards real estate prices. Above ali, the frequency of the statistics could be increased: in many countries the data are only annual and may become available with a considerable lag. This drawback is not so important when evaluating past events, although it clearly reduces the statistical power of the tests; but it is damaging when assessing current and prospective economic develop-ments. No doubt these statistical deficiencies result in part from a certain neglect bred by an underestimation of the potential policy significance of the data. If so, there is hope that they may be corrected in the future.

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Appendix I

The construction of the aggregate asset price indices

The starting-point of this paper is the construction of a summary measure of movements in asset prices over time for thirteen countries. The objec-tive is to identify the key characteristics of broad swings in asset prices that may be masked by differences in the behaviour of individual prices so as to highlight their relationship to macroeconomic performance and monetary policy. Owing to data limitations, constructing any such index for a single country, iet alone for several, involves difficult choices regarding scope and methods of estimation. This appendix describes in some detail the methodology followed and, where possible, assesses the sensitivity of the statistical properties of the resulting inciex to the esti—mates made. On balance, it would appear that the comparative time series behaviour of the aggregate asset price indices is fairly robust. The

resulting indices and the individual components are shown in Graph AH.

Scope and conceptual issues

The two basic criteria for selecting the assets included in the index were, firstly, that they should make up a sizable proportion of private sector wealth and, secondly, that they should be traded with some frequency on well-organised markets. A sizable share of total wealth guarantees a good coverage; trading in a secondary market provides some comfort about the quality of the price data.

Private sector wealth is composed of numerous assets. However, a feature common to many countries is that the Eion's share is made up of three asset classes, viz. residential property, non-rural commercial prop- erty and non-rural business assets (equipment and inventories). For those countries covered in this study for which comprehensive balance-sheet information is avaiiable (United States, United Kingdom, Japan, Canada

71

Graph NJ

Real asset prices: aggregate and components

1980 = 100; semi—logarithmic scales

Aggregate price index _ _ _. Residential real estate component

Equity component _____ Commercial real estate component

Germany France

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Belgium Netherlands

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Index not shown for the above countries and Norway in the 19703 as it is proprietary information.

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Graph All (cont)

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Canada '

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» 500

400

Sgililiiiiiiiiiilillill 300

Australia

200 200

150

100 .

100

E |,, E.

Soili'illiliiiiiiiiiil lliliilliliiiiillii=i150

70 75 80 85 90 70 75 80 85 90

73

350

300

250

200

150

100

50

500

400

300

200

100

O

570

Graph AH (cont)

Denmark

Norway

iiiiiiiiiliilililiill

lliliiiiliiil

Sweden

Finland

lllliiiiiiiiilliiiilili

iiiiilllliiiiiiiilllill

80

75 85 9O

70 75 8O 85 90

74

350

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100

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500

400

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200

100

50

and Australia), the data indicate that the share of these asset classes in total wealth is of the order of 85—90%. The remainder is generally composed of rural assets, household durable goods, notes and coin in circulation, net assets held abroad and non—official holdings of government fixed income securities,"

The coverage of the index was restricted to the three main asset classes; the others account for a relatively small share of private sector wealth and are in most cases not traded in well—organised markets.68 Secondary markets for commercial and residential property are quite developed and trading is significant. Business equipment and inventories, of course, are not traded directly; but claims on them, in the form of equity shares of listed companies, have very active liquid markets.

The asset price index is a simple weighted average of the form:

$$AP(t) = 23'w(i,s)\,p(i,t)$$

where $p(i,t)$ is the price index of asset i at time t and $w(i,s)$ is the corresponding weight. The weights are allowed to vary somewhat over time, 5

(approximately every five years),69 so as to capture the main changes in the composition of the portfolio.

There are at least two possible ways of defining and constructing the index. One is to define the asset price index as a measure of the values of the underlying assets. This is, for example, the method used by Callen (1991) in developing the index for Australia. in this case, the weights to be attached to the components should reflect the relative shares of private sector holdings of residential and commerciai property and non-property business assets.

Constructing the index in this manner, however, creates a serious complication. In contrast to residential and commercial property, for which indices exist, the value of business assets cannot be measured directly. It can only be estimated on the basis of the equity price index. But then the fact that business assets are only partly backed by equity, i.e. that they are "leveraged", introduces a bias. An exampie makes this clear.

57 There are, of course, arguments against classifying government securities as net wealth. See Barro (1974).

53 Moreover, while government securities are traded assets, there are no reliable price, as opposed to yield, data.

59 This was carried as far back as possible. For Sweden, however, only the weights for one year (1983) were available, See Table Al.2.

75

If the ratio of equity to assets is 50%, a 10% increase in the vaiue of busi- ness assets would, ceteris paribus, be associated with a rise in the equity index which is twice as large, or 20%:70 since equity reflects the full abso

lute increase in the value of the underiying assets, the percentage increase cannot be the same when the company is partly ieveraged.71 Thus, the equity price index would have to be adjusted for the aggregate debt/asset ratio so as to measure correctiy the rate of change in the value of the underlying business assets. Statistics of this kind do not exist for ali thir—teen countries and those that are available are subject to sizable measure-ment error.

An aiternative possibility is to define the asset price index as a measure of the change in the value of real estate and corporate equities them-seives. This is the approach followed here. There is some independent justification for defining the index in this manner. The equity market is arguabiy a country's most visible and important asset market. Partly for this reason, wealth effects are typically viewed as working primarily through the vaiue of equities rather than through that of the underiying business assets, at least for the household sector. Banks often iend on the basis of equity. not on that of non-property business asset values. And the equity market is the most obvious candidate for experiencing speculative booms and busts. Finally, data on private sector holdings of corporate equities, which serve as the basis for the corresponding weight in the index, are more readily available and subject to less measurement error.

Construction
Price indices

Table AIJ shows the asset price indices for listed corporate equities, residential property and urban commercial real estate coliected for each country and their sources. Generally, indices for all the components could be obtained going back to at least i970—71. Exceptions were the commer-cial property indices for the United Kingdom, the United States and Canada, which begin in 1976, i977 and 1984 respectively.72 The aggregate

7" This assumes, for simplicity. that the source of the rise does not affect the market value of such an adjustment.

7' Callen (1991] makes no such adjustment.

72 The countrynwide residentiai property index for France was partiy estimated. See Kennedy and Andersen (1994).

76

Table Al.'l

Data sources for price indices

Country	Residential property	Commercial property	Equities
Australia	Index of median dwelling prices Source: Central bank	Sydney CBD capital value index Source: Central bank	All industries index
Belgium	Weighted sales prices of small and medium-sized dweilings Source: Anhyp SA	Capital value price index for Brussels Source: Jones tang Wootton (JLW)	Total share index
Canada	Multiple listing service price index of existing homes Source: Central bank	n.a.	Toronto stock exchange 300 composite index
Denmark	Price index for residential houses Source: Central bank	Cash price index for productionlstorage commercial property Source: Central bank	Industrials index
Finland	National house price index	Price Index for Prime Office Space in Helsinki	Ali—share UNITAS index (linked with

CBD HEX index in

Source: Central bank Source: Central bank February 1991)

France Kennedy and Andersen Capital vaiue price index iNSEE index

(1994) for Paris

Source: JLW

Germany Average sales prices of Capital value price index Overall index of

owner-occupied dweiiings for Frankfurt. Munich, share prices

in Frankfurt, Munich, Hamburg and Berlin

Hamburg and Berlin

Source: Ring Deutscher Source:JLW

Makler

Japan National average of resi- National average com» Tokyo stock price

dential housing prices mercial property index index (TOPIX)

Source: Central bank Source: Central bank

Netheriands Prices of residential Capital value price index All share

buildings for Amsterdam price index

Source: Central bureau Source:JLW

of Statistics

Norway Secondary market Capital value price index Oslo stock

national house price index for Oslo exchange industrials

Source: Central bank Source: iLW index

Sweden "Purchase coefficient" Index of commercial Overall share

of house prices

Source: Central bank

buildings

Source: Central bank

price index

United Kingdom

index of house prices
(all dwellings)

Source: Department of
the Environment

Office capital value index

Source: Richard Ellis

FT 750 ordinary
share index

United States

Median sales price of
existing single-family
homes

Source: National

Association of Realtors

Russell-NCREIF

Commercial property

index

Source: NCREIF

Standard & Poor's

500 composite

index

asset price indices for the United Kingdom and the United States were

therefore calculated excluding commercial property prices over the

period for which no data was available; that for Canada, given the few

observations available, excluded these prices altogether. This exclusion,

however, is unlikely to have resulted in a significant bias in the overall

indices, given the relatively small weight that commercial property carries

in these three countries (less than 10%, see below).

As the focus of the paper is on movements in asset prices for the

whole economy, country—wide indices were used whenever possible. In a

few cases, however, property price indices relating to one or more major

cities had to be employed. Since the prices in major cities are apt to be

more voiatlle than national averages, these differences should be borne in mind when interpreting the movements in the aggregate index.

Fortunately, country-wide indices for residential real estate were available for all countries except Germany, where they are the average of four cities (Berlin, Frankfurt, Munich and Hamburg). Data limitations were more severe in the case of the less significant commercial real estate component: the corresponding index covered the same four cities in the case of Germany73 and only the largest city in Finland, Norway, Belgium, the Netherlands, France and Australia. By contrast, the coverage of the equity indices is invariably nationwide. When a choice had to be made (the Netheriands and Finland), the index relating only to domestic companies was selected.

In comparison with the indices of equity prices, those of real estate prices are inevitably more heterogeneous, and not just in terms of geographical coverage. Differences exist with respect to the assets considered and their quality, In particular, some commercial property indices cover only offices, others include retail property as well as prop—erty used for production and storage.74 Differences also relate to more technical aspects. These include the particular way in which the sample is collected (e.g. how the weights are constructed to combine different localities and qualities of property) and the method of calculation (e.g. whether the mean or median price in the sample is chosen). Overall, it is hardly possible to gauge the combined importance of these differences. However, there is some comfort in the fact that they are especially

'1 These data limitations in the case of Germany imply that the fluctuations in the aggregate index are Sikely to have been overstated in comparison with other countries.
7" The Danish index covers only property in the latter category.

significant for commercial property, generaily the asset class with the smallest weight in the aggregate index. Moreover, to the extent that they are constant over the sample period, they have iess of an effect on the comparative time series behaviour of the index.

Balance—sheet weights

That commercial property is the least significant of the three asset ciasses is confirmed by a look at Table ALZ, which presents the weights used for each country. For all countries residentiai property is by far the most important component of the index; the corresponding weight typi—cally ranges between 60 and 75%. Equities are generalEy the second most important category. in countries with comparatively more developed stock exchanges, their weight is of the order of 20—35%; in the others, it has been between i0 and 25% since the mid-19805. The weight of commercial property exceeds that of equities only in Finland and Germany,75 marginaily in the more recent subuperiod. As equity markets have become more developed over time, their weight has tended to rise at the expense of those of residential and commercial property. This pattern appears to be particularly pronounced in Japan, Finland and Germany.

The calculation of these weights involved two steps. The first. and by far most important, is the estimation of the proportions of the three basic asset categories that make up private sector wealth ("gross" weights). The second, fine-tuning step is to eliminate any double-counting that may arise from the fact that listed companies may themselves own commercial real estate ("net" weights). in this case, to include both the change in the price of reai estate and that in the equity index would amount to double counting.

As regards the calculation of the gross weights, three groups of countries can be identified. For the first group (the United States, the United Kingdom, Canada, japan and Australia)75 the source of information was the private sector baiance sheets published in the national flow-of—funds accounts. These are the most compiete source, containing information on the value of buildings, the underlying land and corporate shares For the second group (Germany, Sweden and Finland), data on the stocks of

75 It does so in)apan too in the 39705.
7" For Australia, the weights are those estimated by Callen (1991).

79

Table ALZ

Weights used in the aggregate asset price indices

	Residential property	Commercial property	Equities
Based on flow'of—funds accounts:			
Australia			
1970432	0.77	0.06	0.17
1983*87	0.75	0,06	0.19
1988—92	0.71	0.08	0.21
Canada			
1970—82	0.71	0	0.29
1983437	0.66	O	0.34
1988—92	0.70	0	0.30
Japan			

1960—77 .... 0.74 0.21 0.05

1978782 .... 0.76 0.20 0.04

1983—87 .... 0.62 0.16 0.21

198892 .... 0.56 0.13 0.31

United Kingdom

1968—76 .... 0.70 0 0.30

1977—84 .... 0.63 0.10 0.27

1985m92 .... 0.59 0.07 0.34

United States

196846 .... 0.73 0 0.27

1977—82 .... 0.68 0.07 0.25

1983~87 .... 0.65 0.08 0.27

1988w92 .... 0.61 0.08 0.31

Based on UN Standardised National Accounts:

Finland

1970—82 .... 0.73 0,22 0.05

1983—87 .... 0.71 0.20 0.09

1988—92 .... 0.68 0.17 0.15

Germany

1970—78 .... 0.71 0.20 0.09

1979—82 .... 0.75 0.17 0.08

1983m87 .... 0.72 0.15 0.13

1988—92 .... 0.69 0.16 0.15

Sweden

i970—92 .... 0.58 0.18 0.24

Based on weights for other countries:

Denmark .... as Sweden

Norway .... "

Belgium .... as Germany

France .... "

Netherlands .... "

residential and commercial buildings from the UN Standardised National Accounts (Table 2.13) were combined with figures on private sector holdings of corporate equities from the OECD Financial Statistics (Part 2). For the third group (France, Belgium, the Netherlands, Denmark and Norway), neither national flow-of—funds nor UN SNA data were available to calcu— late estimates of the weights to be attached to property but the OECD Financial Statistics contained data on holdings of corporate equities.

For those countries for which nationai flow-of-funds account balance sheets were availabte. the following procedure was used to caiculate the weights of the three price indices. First, the mud value of wealth heid by the private sector in the two types of tangible assets, residential dwellings and commercial property, was determined. Where the breakdown was not provided in the balance—sheet accounts, an estimate was made of the value of the iand underlying the buildings in the two separate asset classes." Finaliy, the value of total private sector holdings of corporate equities78 was used in conjunction with those of residentiai and commer— cial property to derive the weights to be attached to the three indices.

For those countries for which the UN SNA accounts served as the basis for the estimation of private sector holdings of residential and commercial property (Germany, Sweden and Finland), the problem was that the information covered only holdings of reproducibie fixed assets; it did not include the value of the land on which the buildings stood. Excluding land from the estimates would of course bias downwards the proportion of residentiai and commercial property held by the private sector. US and UK national baiance sheets revealed that the building—to— land ratio for the private sector was 2:1. It was therefore assumed that

this ratio held for the three countries for which onEy UN accounts were

avaiiable.

For those countries for which neither national balance sheets nor UN

SNA accounts were available, some rather arbitrary assumptions had to

77 Only the UK accounts present a breakdown of the value of the underlying land and build—

ings by different categories of property and sectors of the economy (households. non'financiai

and financial sectors); for the United States. Japan and Canada only overali figures are available.

For each of these three countries, therefore, it was assumed that the building-to-land ratio was

the same for both residential and commercial property. In addition, for the United States and

Japan it was assumed that the household sector held only residential property.

'8 For the United States, private sector holdings are reported net of intermorporate hold-

ings. The ratio of total dividends received [0 those paid by the corporate sector was used to

proxy the percentage of ourstanding corporate equity held by the corporate sector. See French

and Poterba (1991).

81

be made, It was assumed that the proportions of the three asset classes

held by the private sector in Denmark and Norway was the same as in

Sweden; and those in France, Belgium and the Netheriands the same as in

Germany.

in moving from gross to net weights, some notion of the proportion of

total commercial property heEd by listed companies for each country was

needed (henceforth this ratio wiEi be denoted by a for short). For most

countries it is difficult to obtain reliable estimates of or In constructing the

aggregate asset price index for Austrafia, Callen (1991) estimated that this

ratio was approximately 0.6. The US flow-of-funds accounts also provide

some guidance: they indicate that the proportion of total business sector

equity accounted for by listed companies was 68% in 1991. in the absence of any other data it was assumed that 0: was equal to this ratio. The value of or for the United Kingdom was assumed to be equal to that for the United States. For Japan, or was assumed to be the same as for Australia. For the other countries, it was reasoned that their rather less capitalised stock markets implied that 0L would be somewhat IOWer, at 50%.

Sensitivity analysis

Since several assumptions are typically needed to construct an aggregate price index, it is worth examining the robustness of the final outcome to changes in the methods of construction. The following paragraphs consider the sensitivity of the time series behaviour of the overall index to three different factors, viz. the choice of asset classes (corporate equities against underlying business assets), the source of information (flow of funds, UN Standardised National Accounts, neither) and different values of Cl.

Corporate equities against underlying business assets

As discussed earlier, there are significant conceptual and measurement problems in trying to estimate changes in the value of business assets rather than in the equity component. Nevertheless, as a purely practical matter, it would be of interest to know whether the differences in methodology produce substantial differences in the implied behaviour of the aggregate index over time.

To examine this question, an asset price index based on Callen's (i991) methodology was calculated for ten of the thirteen countries under study and the resuiting series were then compared with those used in the

Table A|.3

Sensitivity of the aggregate index:

corporate equities against business assets

	Correlation coefficient*			Correlation coefficient*
Australia	0.90	Japan		0,98
Canada	0.95	Norway		089
Denmark	093	Sweden		0.99
Finland	0.95	United Kingdom		0.96
Germany	0.84	United States		0.95

' Correlation coefficient between original and alternative series.

present paper."3 As might be expected, because of the comparatively larger weight of the equity price index that they imply, the indices that attempt to capture the changes in value of the underlying assets without adjusting for leverage were more volatile. Nevertheless, the movements over time of the two types of index are substantially simiiar (Table A|.3): with the exception of Germany, the correiation coefficient between the two is of the order of 0.90 or higher, and at least 0.95 in a majority of countries, including those experiencing the largest asset price move-

ments. Thus, despite the conceptual differences between the two methodologies, in practice the impact on the time series behaviour of the resulting indices does not appear to be so great.

Basic sources of information for the weights

As mentioned previousiy, the weights for the United States, the United Kingdom, Japan, Canada and Australia were calculated on the basis of national flow-of—funds balance sheets; for Germany, Sweden and Finland, UN SNA accounts were used instead. Differences in the methodoiogy behind the preparation of these accounts couid introduce biases in the final constellation of weights. On first inspection of the final weights in Table Al.2 this does not appear to be the case. There seem to be no systematic differences between the weights calculated for the two groups of countries. As a further check the weights for two countries for which flow—of—funds accounts were available, the United States and the United

79 Asset price indices so calculated can be found in BIS (1993).

83

Table Al.4
Sensitivity of the aggregate index: alternative data sources*

Balance-sheet weights

National flow-of-funds UN Standardised
accounts _ ' National Accounts

	Residential property	Commercial property	Corporate equities	Residential property	Commercial property	Corporate equities
United Kingdom						
1982	0.51	0.27	0.22	0.48	0.32	0.20
1987	0.50	0.21	0.29	0.47	0.24	0.29
United States						
1980	0.58	0.21	0.21	0.61	0.21	0.18
1985	0.55	0.21	0.23	0.57	0.23	0.20
1989	0.52	0.2i	0.27	0,55	0.21	0.24

>""l'he weights shown are before adjustment for the proportion of commercial property held by listed companies. They are therefore not directly comparable with those shown in Table All.

Kingdom,80 were recalculated on the basis of the UN SNA accounts and compared with the original ones. The resulting differences were minor (Table Al.4).

To examine the sensitivity of the asset price index for France, Belgium and the Netherlands to the choice of the German configuration of

weights, their asset price indices were re-estimated on the basis of those for the United Kingdom. Aithough the overall pattern of weights across countries is generally quite similar, the differences between Germany and the United Kingdom appear to be the largest. A similar exercise was performed for Norway and Denmark (the weights had been assumed to be the same as those for Sweden), recalculating the asset price indices on the basis of the configuration for Germany Once again, the different methods of calculation diti not generate substantial differences in the movements in the asset price indices, as the correlation coefficient is generally at least equal to 0.90 (Table A|.5). The oniy exception is the Netherlands, for which it is lower.

8" Such an exercise was not possible for Canada since the relevant UN SNA table was not available. it was also felt inappropriate to perform it forjapan, given the vastly different land-to-building ratio in that Country.

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Table AI.5

Sensitivity of the aggregate index: balance-sheet weights

Correlation Correlation

coefficient1 coefficient'

Belgium2 .... 0.927 Netheriands2 0738

Denmark3 .... 0.900 Norway3 .... 0.940

FranceZ 0.979

lCorrelation coefficient between original and alternative series. 1DE weights (this study) and GB weights (alternative): 1977—92. 3 SE weights (this study) and DE weights (alternative): 1970—92.

Table Al.6

Sensitivity of the aggregate index: values of Oil

Correlation Correlation

coefficient2 coefficient2

Australia3	0.998	Japan"	0.998
Belgium3	0.978	Netherlands3	0.985
DenmarkS	0.984	Norway3	0.995
Finland3	0.998	Sweden3	0997
France3	0.997	United Kingdom" . . ,	0999
Germany5	0.993	United States6	0.999

1 a = 0.3 rather than the values used in the study. 1Correiation coefficient between original and alternative series. 3Calculated for 1970—92. 4Calculated for 1961-«92. 5 Calculated for 1971 —-92. 5 Calculated for 1977—92.

On balance. therefore. the evidence suggests that different data sources are unlikely to introduce large and systematic biases into the aggregate index.

Proportion of total commercial property held by listed companies (a)

Private sector holdings of commercial property as a proportion of total holdings of residential and commercial property and corporate equities vary from 20 to 40% in the sample of countries considered in the paper. This means that changing 01 from. say, 70 to 50% raises the weight of the commercial property price index by 4—7 percentage points.

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reducing those for equity and residential property price indices correspondingly. As Table A|.6 shows, choosing even a substantially different value of 0L from those used in the basic indices (0.3 rather than 07—05) results in only negligibie changes in the time series properties of the aggregate index: the correlations with the original series are 0.98% or higher.

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Appendix El

Time series analysis of asset prices, inflation and output

Granger-causality tests have become a popular tool in the econometrics armoury since the seminai papers by Granger (1969) and Sims ((1972) and (1980)). The originai intention of the tests, as their very name indicates, was to detect causal relationships among different variables. As the subsequent heated debate has made clear, however, it is better to consider

these exercises as attempts to establish the information content of certain variables (the "causing" factors) after proper allowance for the information already contained in others (including the "caused" variable), without specific claims regarding causality.81

The strength of the analysis lies in its comparative simplicity and in the generally good forecasting performance of time series representation of economic variables in comparison with more articulated econometric models. One weakness is that the results are typically quite sensitive to the specification of the tests. Recent work has paid particular attention to the dependency of the asymptotic properties of standard F-tests on the deterministic trends and stochastic orders of integration of the variables (Stock and Watson (1989b), Sims et al. (1990)). The general conclusion is that unless these are properly identified, the results of the tests may be vitiated. There is also some scepticism about the power of existing tools to detect correctly such time series characteristics, and about the relevance of these results in relatively small samples (e.g. Cochrane (1991)). Consequently, the findings of an analysis of this type should be interpreted with caution.

The general procedure to test for Granger—causaiity adopted in the paper was the following. Firstly, the orders of integration of the individual

3' See, for example. Tobin (1970) Zellner (1979) and, more recently, Engle et al. (1983) and Hoover (1991).

series were tested for so as to limit the risk of introducing non-stationary regressors in the Granger-causality representations of the data. Dickey-Fuiier and augmented Dickey-Fuller tests, incluiding also a linear trend, were employed for that purpose. Secondly, the presence of cointegration

between the variables in question was examined through an analogous procedure. As shown by Granger (1988), the existence of cointegration between two variabies implies Granger—causality in at least one direction. This suggests including the (lagged) residual from the cointegrating reia—tionship as an additional regressor (e.g. Feldstein and Stock (1993)). Intu-itiveiy, since two cointegrated variables cannot deviate from one another without bounds in the iong run. the residual can contain useful informa—tion about the future movement of the variable to be predicted. Finally, the transformed (stationary) series were included in the standard Granger—causality regression. Each dependent variable (y) was regressed on its own history, past values of the variable whose predictive power was tested for (x) and, where appropriate, the lagged residual of the cointe-grating relationship (Em), a iinear trend (T) and other controlling variables (2.). Up to two lags were tested for but the results with one lag proved generally superior. The general specification thus was:

Y: 2 0i 11% Bi Xvi + £1 Xi Yt-vi + 8T + (DEM + gamiZt—i

The final outcome of the tests is included in the main text. The foiiowing paragraphs give more information on the preiiminary steps.

Unit root tests indicated that the general price ievel82 was integrated of order 2 (i(2)); output and the nominal as well as reai aggregate asset price index were found to be |(1) (Table All.1). No significant differences emerged across countries. These findings for output and prices are broadly consistent with the existing literature, The behaviour of the asset price index also parallels the time series properties of commodity prices as identified by Boughton et al. (1989).

As regards the long—run relationship between asset prices and infla—tion, given the different orders of integration and economic theory, the possibility of cointegration between the level of asset prices and the infia—

tion rate was tested for (Tabie All.2). A statistically significant cointe-

grating vector was identified in four countries, viz. Denmark, Finland,

31 Measured by the consumer price index.

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Table Ail.1

Unit root tests1

Form and statistical significance of integrating relationship

P W? AP AP/F'

l(2)2 i(1)2 l(l)2 l(1)2

(T,0)

(90}

Australia ......

Beigium ....

Canada ....

Denmark ......

Finland ....

France ....

Germany ......

Japan ....

Netherlands. . . .

Norway ....

Sweden ....

United Kingdom .

United States . . .

(c0)***

1The table reports the statistical significance and the form of the integrating reiationship. The symbols (x, y) describe the form of the integrating relationship: x = c (constant), T (time trend), n (no constant, no time trend) refers to the presence ofa constant or time trend in the cointegrating regression. y refers to the presence (y "—" 1) or absence (y = O) of a first difference error term in the test regression. Asterisks indicate as usual the level of significance.
2 Uniform across all countries.

Norway and the United States; the corresponding (lagged) residual of the cointegration regression was thus added to the general regression testing for the information content of the asset price index. The ADF statistic was almost significant at the 10% level in the case of the United Kingdom. Similar cointegration tests were then run between reai asset prices and real GDP (Table Ail.3). Statistically significant evidence of cointegration was found only for the United States and the Granger-causality regression for this country was modified accordingly.

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Table All.2

Cointegration tests: inflation rate and asset prices

Cointegrating equation: Alog Pt = at + B log APl + e:

Augmented Augmented

Dickey—Fuller Dickey—Fuller

test statistic1 test statistic'

Australia .... ~29 japan .... ~17

Belgium .... —3.2 Netherlands 72.0

Canada .... "2.4 Norway2 .... —3.3*

Denmark2 .... 4?. Sweden .... ~29

Finland .... ~4. ' United Kingdom . . . . -3.2

France .... —2.2 United States ...... —4.0 1'

Germany .... ~14

' Unless otherwise indicated. t~statist€c on [3 in the regression:

do = [3m + Berm + up

2t-statistic on B in the regression: A6: = [5 at. + u."

Table AII.3

Cointegration tests: real output and asset prices

Cointegrating equation: iog (Y/P)(= a + 3 log AP/P[+ Et

Dickey-Fuller Dickey—Fuiler

test statistic' test statistic'

Australia .... —1.6 japan .... M1 .3

Belgium .... 4 .9 Netherlands .... m1 .2

Canada .... ml .6 Norway .... —l .7

Denmark .... —l.5 Sweden .... ~2.7

Finland .... —'l.3 United Kingdom _ . . . '16

France .... ~22 United States ...... 447"“

Germany .... —Z.8

' t-statistic on B in the regression:

[361 = {3 cm + up

9O

Appendix III

Detailed econometric resuits

.A EVIU I gfimemfi 25 .2; II;

mcfiziE «Eu 8 a: Emu S .mnum vacuum 9t nan .Lmamwewfi EmN mam E2 MEASUE tam B a: mac 9 "33 at: 05 5&9... "snub mg» 8 332" Em;

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Basic model results

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R2 0.57 0.84 0.82 0.92 0.91 0.59 0.54

SEE (%) 2.83 1.54 1.75 0.93 2.26 2.38

DW 2.14 1.94 2.15 1.55 1.65 1.50

LM(1) 73.9 81.9 73.6 55.1 26,2 19.5

CH(80) 60.0 53.3 59* 7 32* 71.7

CH(88) 11,6 31.7 60* 2. "'5: 45.4 63.9 31.9

Period 1971792 1973792 1972792 1969792 1976792 1971792 1971792

Note: The closed parenthesis indicates the difference between the own and long-term rate.

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