ASSET MARKET HANGOVERS AND ECONOMIC GROWTH: THE OECD DURING 1984–93

MATTHEW HIGGINS
CAROL OSLER
Federal Reserve Bank of New York

Asset prices and investment were unusually weak throughout the industrial world during the early 1990s. This paper highlights this stylized fact, and connects it with another: in most of the industrial world, asset markets boomed for several years before collapsing around 1989. The paper suggests that asset market bubbles during the late 1980s may have left the industrial world with an ‘asset market hangover’ in the early 1990s, in the form of sluggish asset markets and investment. Empirical support for this hypothesis is provided based on cross-country data for equity and real estate markets in most industrial countries. We suggest that financial market developments not justified by fundamentals can substantially affect real activity.

I. INTRODUCTION

During the early 1990s, asset prices and investment were unusually weak throughout the industrial world. This paper highlights this stylized fact, and connects it with another: in most of the industrial world, asset markets boomed for several years before collapsing around 1989. The paper suggests that the sluggishness of asset markets and investment in the early 1990s may have been symptoms of an ‘asset market hangover’, that is the lingering effects of speculative bubbles built up in the late 1980s.

The boom–bust pattern in asset prices over 1984–93 was common to nearly all OECD countries. Real prices for equities, houses, and commercial property typically grew at double-digit rates prior to their peaks around 1989. The subsequent drop in these

1 The authors wish to express gratitude to Ben Bernanke and Egon Zakrajsek for insightful comments, and to Anjali Sridhar and Andy Peterson for excellent research assistance. The views expressed in the paper are those of the authors and do not necessarily reflect views at the Federal Reserve Bank of New York or the Federal Reserve System. Any errors or omissions are the responsibility of the authors.
prices during the early 1990s was equally widespread, though generally not quite as dramatic. On the basis of this sharp boom–bust pattern, we conjecture that speculative excesses may have driven asset prices well above their fundamental values during the late 1980s, leading to an offsetting collapse of prices in the early 1990s.

As asset prices collapsed during the early 1990s, investment first tumbled and then remained weak in most OECD countries. Indeed, as documented later, investment growth fell short of cyclical norms across most of the OECD, usually by a substantial margin. This unusual behaviour of investment, combined with the sharp and widespread drop in asset prices, suggests a second conjecture: falling asset prices may have contributed to anaemic investment growth during the early 1990s. They might have discouraged investment by reducing the attractiveness of individual investment projects, by increasing the cost of credit, or by reducing its availability.

After documenting the commonality of these patterns across the OECD, we examine the evidence for the two conjectures listed above. The empirical analysis relies on cross-country data for equity prices, residential property prices, machinery and equipment investment, and investment in residential properties. We attempt throughout to control for the role of other economic forces that affect asset prices and investment. We conclude that an ‘asset market hangover’ may indeed have exacerbated the recessions and impeded the recoveries of the early 1990s.

Numerous policy questions arise if our conjectures prove to be correct. For example, should policymakers attempt to prevent or contain speculative bubbles, as part of their broader effort to stabilize economic activity? If so, which branch of government should undertake this responsibility, and which policy tools would be most appropriate? We return to these questions in the concluding section of our paper.

Section II briefly reviews salient economic events between 1984 and 1993 in the industrial world, highlighting the near universality of the boom–bust pattern in asset prices and investment. Section III turns to our first conjecture, that speculative price bubbles inflated asset prices in the 1980s. The section discusses the concept of a speculative bubble, and provides statistical evidence that the boom–bust pattern described in section II is consistent with the presence of bubbles. Section IV examines our conjecture that asset-price declines may have damped investment during the early 1990s. The section discusses how asset prices affect investment in general, and presents evidence that asset price deflation indeed damped investment during 1989–93. Section IV also asks whether much of this dampening effect might be traced to the collapse of asset market bubbles, consistent with the central, ‘hangover’ hypothesis. Section V discusses how the asset-market hangover hypothesis may help explain why investment was weak in some countries as they recovered from their early 1990s recession, while investment rebounded more strongly in others. Section VI concludes.

II. HISTORICAL OVERVIEW

(i) The Economic Boom of the 1980s

Economic activity grew briskly among industrialized countries during the late 1980s. GDP expanded by an average 3.3 per cent per year during 1984–9 for our sample of 18 industrialized countries (‘the OECD’), easily outpacing the 2.3 per cent annual growth achieved during the previous decade (Figure 1(a)). A pick-up in the growth of gross fixed investment, to an average of over 5.7 per cent, accounted for nearly all this acceleration in GDP growth. Overall, this measure of investment contributed 36 per cent of total output growth during 1984–9, even though it represents barely 20 per cent of total output. Both components of investment—construction as well as machinery and equipment—grew rapidly.

Booming economies brought with them booming asset markets. Inflation adjusted (real) share prices rose by an average of 92 per cent across the OECD during 1984–9, while real residential property prices rose by 24 per cent. Rapid asset price rises occurred in almost every OECD country, though not all asset prices surged in all countries. Real commercial property prices, for example, rose over 150 per cent.
in Sweden, but only a little over 50 per cent in nearby Finland. Although the boom–bust pattern was readily observed in many individual countries, the common nature of the pattern was less widely recognized. To highlight the near universality of these asset price booms, Table 1 shows price rises for equities, residential property (‘housing’), and commercial properties for 10 OECD countries.

(ii) The End of the Economic Boom

Tight monetary conditions spread around the OECD towards the end of the 1980s, as central banks responded to accelerating inflation. Every OECD country entered a recession at some point during 1989–93, with average peak-to-trough GDP declines of 3.2 per cent. A pronounced slide in invest-
M. Higgins and C. Osler

Gross fixed investment was weak not only in absolute terms but also relative to its behaviour during previous business cycles, even though the recessions themselves were not especially severe in most countries. Comparing growth during the early 1990s with the average for all previous business cycles, and defining the cycle as 2 years before to 2 years after the business cycle trough, we find that machinery and equipment investment was unusually weak in 13 of 14 countries, while construction investment was unusually weak in 10 of 14 countries. Indeed, if gross fixed investment had just managed to keep up with its usual (feeble) recessionary performance, the average GDP decline over the 2 years before the cyclical trough would have been 1.7 percentage points less severe. Moreover, GDP would have grown by an additional 1.2 percentage points over the subsequent 2 years.

As economic growth skidded to a halt, share prices plunged (see Figure 2). The peak-to-trough slide in real share prices averaged 28 per cent across the OECD, erasing almost half of their earlier gains. Particularly pronounced equity falls occurred in

---

Table 1
The OECD Asset Price Boom–Bust Cycle

<table>
<thead>
<tr>
<th>Country</th>
<th>Real share prices</th>
<th>Real house prices</th>
<th>Real commercial property prices</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Peak year 5 years to peak</td>
<td>Peak to trough</td>
<td>Peak year 5 years to peak</td>
</tr>
<tr>
<td>Australia</td>
<td>'87 179.0 –29.6</td>
<td>'89 26.6 –4.0</td>
<td>'88 76.4 –66.2</td>
</tr>
<tr>
<td>Canada</td>
<td>'89 32.1 –20.5</td>
<td>'89 60.7 –13.1</td>
<td>'89 28.2 –41.6</td>
</tr>
<tr>
<td>Finland</td>
<td>'89 134.3 –62.8</td>
<td>'88 53.1 –50.1</td>
<td>'89 51.9 –46.3</td>
</tr>
<tr>
<td>France</td>
<td>'89 131.7 –16.1</td>
<td>'90 23.0 –6.5</td>
<td>'90 78.0 –47.0</td>
</tr>
<tr>
<td>Germany</td>
<td>'90 43.5 –19.9</td>
<td>No peak around 1989</td>
<td>'91 136.2 –45.5</td>
</tr>
<tr>
<td>Italy</td>
<td>'87 130.0 –40.6</td>
<td>No data</td>
<td>'90 111.0 –52.5</td>
</tr>
<tr>
<td>Japan</td>
<td>'89 203.5 –50.7</td>
<td>'90 75.8 –19.5</td>
<td>'89 174.0 –50.9</td>
</tr>
<tr>
<td>Norway</td>
<td>'90 62.3 –35.7</td>
<td>'87 44.4 –36.6</td>
<td>'87 62.3 –56.8</td>
</tr>
<tr>
<td>Spain</td>
<td>'89 219.3 –35.6</td>
<td>No data</td>
<td>'90 209.3 –71.9</td>
</tr>
<tr>
<td>Sweden</td>
<td>'89 109.9 –40.6</td>
<td>'90 37.2 –26.7</td>
<td>'88 150.5 –66.1</td>
</tr>
<tr>
<td>United Kingdom</td>
<td>'87 144.3 –15.2</td>
<td>'88 66.3 –29.1</td>
<td>'88 65.6 –67.6</td>
</tr>
<tr>
<td>United States</td>
<td>'89 63.1 –3.3</td>
<td>'88 15.0 –7.1</td>
<td>'87 24.5 –44.6</td>
</tr>
</tbody>
</table>

Notes: Annual data. Nominal property values are deflated by the consumer price index (CPI). The price at trough refers to the lowest annual price recorded through 1994. For Canada, where commercial property price data begin in 1985, the price change shown is the 4 years to peak.

---

2 This analysis of investment activity around GDP troughs requires quarterly data, which are available for 16 of our 18 countries for gross fixed investment, and 14 countries for machinery and equipment and construction investment. We also rely on the smaller set of countries with quarterly data for Figure 1(a) and Figure 1(b). Details concerning data sources and variable measurement are found in the Appendix.

3 The figure here is calculated using annual data, for comparability with the available house price data. The average peak-to-trough decline in real equity prices using quarterly data was substantially larger, at 44 per cent.
Japan and the Scandinavian countries, while the US and the UK experiences were fairly mild.4

Real house prices faced the same fate as share prices, tumbling on average 18 per cent from peak to trough. Scandinavian prices suffered the most: real house prices fell 27 per cent in Sweden, 37 per cent in Norway, and an astonishing 50 per cent in Finland (Table 1). This boom–bust episode appears to have been more dramatic than those of previous business cycles: in the three countries for which we have lengthy quarterly house-price series (the USA, UK, and Japan), the peak-to-trough decline in house prices was only 7 per cent on average during previous cycles but exceeded 19 per cent during the post-1989 downturn.5

(iii) Our Thesis

Our review of the 1984–93 boom–bust cycle points to a striking pattern across the OECD: real asset prices and investment grew rapidly during the late 1980s and they generally reversed course in the early 1990s. The sluggishness of investment during the early 1990s was unusual even for recessionary times. These observations lead directly to our central thesis: investment and asset market weakness of the early 1990s may have represented the aftermath of speculative bubbles during the late 1980s.

This thesis can be divided into two separate conjectures:

• The boom–bust cycle in asset prices may have been driven in part by speculative bubbles in many countries.

• Investment weakness during the early 1990s was partly the result of concurrent asset market weakness.

Note that these conjectures are independent of each other—each one could be true even if the other

4 The synchronicity among asset price developments around the OECD is not fully understood. The simultaneous rise of asset prices around the world during the late 1980s may be explained in part by the global character of the economic boom. Some evidence shows that widespread financial market deregulation, which generally eased lending to customers, also contributed to the simultaneous rise in house prices (see Borio et al., 1994). The general fall in asset prices after 1988 (see Table 1) seems likely to have been precipitated in part by the nearly synchronous turn to tighter monetary policies throughout the industrial world. Strong international linkages among equity and commercial real estate markets may also help explain the rough coincidence of declines in these markets.

5 We use countries with quarterly house-price series since these allow a relatively accurate assessment of peak-to-trough price movements.
turns out to be untrue. If both are true, however, the 1984–93 period provides a striking example of how asset market developments, including those unrelated to fundamental economic factors, can affect real economic activity. The following two sections of the paper examine our two conjectures theoretically and empirically.

III. WERE THERE SPECULATIVE BUBBLES IN 1984–93?

A speculative price bubble occurs when asset prices are pushed upward by investors whose demand is based on expectations of continually increasing purchases from other investors, rather than on fundamental economic factors. Although such expectations can be self-fulfilling or even ‘rational’ in the short run, the absence of an anchor in economic fundamentals leaves markets fuelled by such speculation easily deflated and, like hot air balloons, the higher such markets fly, the further they ultimately descend.

After reviewing what is known about speculative bubbles, we provide some evidence supporting their existence in many countries over 1984–93.

(i) Speculative Bubbles: An Overview

As early as 1852, Charles Mackay recorded a number of colourful episodes in his famous book, *Extraordinary Popular Delusions and the Madness of Crowds*. Economists, who began to examine the concept more rigorously a few decades ago, distinguish between rational and irrational speculative bubbles. A rational bubble (Blanchard, 1981) occurs when prices rise above the values justified by fundamentals, with market participants fully cognizant of the potential risks and rewards they face. Speculators who remain in the market recognize the possibility of large losses in a crash. They stay in the market because they rationally calculate that the likelihood of a crash is small, while the likelihood of continued small price increases is substantial. Alternative theories of bubbles rely on the notion that market participants fool themselves into believing the market is correctly priced (see, for example, Kindleberger, 1978). These theories often suggest that new, relatively uninformed investors will enter the market towards the end of the bubble, an observation supported by Rappoport and White (1994). Bubbles of this sort have been generated in experimental markets with fairly high regularity (Smith et al., 1988).

One of the more important, if disheartening, lessons to come from the research is this: one can never prove that a given boom–bust episode was truly a bubble (Hamilton and Whiteman, 1985). Even the most extreme price rise followed by precipitous decline could have been driven by some unobserved fundamental factor. As a result, one should be cautious about accepting any claim that a given asset-price development represents a speculative bubble. This lesson is underscored by the recent emergence of evidence suggesting that some price developments in one of the most notorious ‘bubbles’, the ‘tulip mania’ of 1634–7, may have been justified by fundamentals after all (Garber, 1989).

Even so, the notion that at least some OECD asset markets were held aloft by bubbles during the late 1980s is common in the business press and beyond (see, for example, Sterling, 1989; *The Economist*, 1990; Maloney and Bergsman, 1992). Many studies of individual countries, including one published by the Japanese government, support the view that asset developments in those countries were not fully justified by developments in fundamentals (see Muellbauer and Murphy, 1990, 1996; Economic Planning Agency of Japan, 1993; Schinasi and Hargraves, 1993; Borio et al., 1994; Ito and Iwaisako, 1995; Kahkonen, 1995). In Japan developments were so extreme that the period is generally referred to as ‘the bubble era’. Evidence suggesting the presence of bubbles in regional US housing markets is presented in Poterba (1991), Abraham and Hendershott (1993, 1994) and Higgins and Osler (1997).


We base our analysis of our first conjecture on an important attribute of speculative bubbles: prices that leave their fundamentals furthest behind during the boom part of a bubble will fall the farthest later on. As a first test of whether events of 1984–93 conform to this prediction, Figures 3(a) and 3(b) compare cumulative real asset price rises (in per cent) over 1984–9 with corresponding real asset
price declines over 1989–93. For both equities and residential property, the hypothesized relationship seems clearly visible. (We focus on equity and housing prices, since the absence of commercial rent data prevents a parallel analysis of commercial property prices.)

These simple comparisons, although suggestive, leave many questions unanswered. Most important, could asset prices simply have been rising and falling along with other dominant forces in their respective countries? If so, what were the other factors driving asset prices over this period? To answer this question we turn first to standard economic theory.

A common model of asset price determination suggests that the fundamental forces driving asset prices are future expected income, current market returns, and risk. More specifically, this theory states that an asset’s current price should equal the asset’s expected future income stream discounted to the present. For equities, this implies...
a relationship commonly known as the ‘dividend discount model’.  

\[
\text{Sharevalue} = \frac{\text{Dividend}^e_{t+1} + \text{Dividend}^e_{t+2}}{1 + r_t} + \frac{\text{Dividend}^e_{t+3}}{(1 + r_t)^2} + \ldots
\]

(Here a superscript ‘e’ indicates that the share price is based on the expected value of future dividends.)

When applied to real estate markets (as in Poterba, 1991; Case and Browne, 1993) a similar expression results, with expected rental income appearing in place of dividends in the numerator. The discount factor, \( r \), depends on both market interest rates and the riskiness of the investment. In sum, this asset price formula says that asset prices should be positively related to expected future income and negatively related to current market returns and risk.

There are two other, non-fundamental factors that could have influenced asset prices during our period of interest, overbuilding and rapid credit growth. The overbuilding hypothesis was suggested frequently by the business press during the early 1990s (see, for example, Rappaport and Halevi, 1992; Radics, 1993; Vail, 1993). It states that excessive investment during the 1980s had left a substantial backlog of spare capacity, with potentially depressing effects on related asset prices. This hypothesis may be related to the bubble hypothesis: just as excessive optimism leads investors to raise asset prices past the levels justified by fundamentals, builders might construct too many new homes and offices, or businesses might install too much new plant and equipment. That is, investment might proceed beyond levels justified by a sober analysis of potential demand growth. Even though overbuilding is not a fundamental factor, it could represent an alternative causal link between 1980s boom and 1990s bust, so we add overbuilding to our list of possible asset price determinants.

Asset prices may also have been inflated by excessive credit growth, which in turn was probably due to widespread financial deregulation in the early 1980s (Cantor and Wenninger, 1992–3; Schinasi and Hargraves, 1993; Borio et al., 1994) combined with expansionary monetary policies in the mid-1980s (Hoffmaister and Schinasi, 1994; Schinasi, 1994). The potential contribution of credit is analysed in a theoretical context by Allen and Gale (1997). Unfortunately, we are unable to evaluate the contribution of credit to asset prices during this period, since sectoral credit data are unavailable for many countries, and are rarely comparable across countries when they do exist. It is important to note, however, that a possible role for credit growth is not incompatible with the bubble hypothesis. A bubble occurs whenever asset prices rise beyond the levels justified by fundamentals; this remains true even if the bubble is accompanied or fuelled by rapid credit growth.

To summarize the analysis thus far, we have seen that there was a very strong, negative relationship between asset price rises in the late 1980s and their subsequent declines over 1989–93. Before concluding that a causal relationship exists, we investigate whether both the early rise and subsequent decline were driven by other factors. The other factors that might have been important have been identified as expected future income, interest rates, risk, and overbuilding. We regress the cumulative decline of asset prices over 1989–93 on asset price rises during 1984–9, along with these four other factors. (The Appendix describes how we measure our explanatory variables, as well as our data sources.)

Before beginning our analysis, we list some caveats. Since adequate data are available for only some of the OECD countries, at its largest our sample includes only 18 countries. This is a small sample by statistical standards, for which reason considerable uncertainty surrounds the precise magnitude of our estimated relationships. The small sample sizes

---

6 See, for example, Copeland and Weston (1988, pp. 20–2), or Brealey and Myers (1981, pp. 44–5). A more sophisticated version of this formula would have each future dividend discounted at a slightly different rate. The dividend to be received in 1 year would be discounted at the current one-period interest rate; the dividend to be received in 2 years would be discounted at the current two-period interest rate, etc.

7 Our sample includes the USA, Japan, Germany, France, the UK, Italy, Canada, Australia, Denmark, Sweden, Norway, Finland, Belgium, The Netherlands, Austria, Spain, Ireland, and Switzerland.
Table 2(a)
Were Asset Price Declines over 1989–93 Driven in Part by Asset Price Rises over 1984–9?
growth in real asset prices, 1989–93

<table>
<thead>
<tr>
<th></th>
<th>Residential</th>
<th></th>
<th>Equity</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>t-Statistic</td>
<td>Coefficient</td>
<td>t-Statistic</td>
</tr>
<tr>
<td>Real asset price growth, 1984–9</td>
<td>–0.79</td>
<td>–2.15</td>
<td>–0.48</td>
<td>–2.40</td>
</tr>
<tr>
<td>Real income growth, 1989–93</td>
<td>0.11</td>
<td>5.4E-2</td>
<td>5.02</td>
<td>1.27</td>
</tr>
<tr>
<td>Change in real interest rate, 1989–93</td>
<td>5.9E-2</td>
<td>0.90</td>
<td>–2.58</td>
<td>–1.42</td>
</tr>
<tr>
<td>Overbuilding, as of 1989</td>
<td>–51.80</td>
<td>–0.34</td>
<td>–49.03</td>
<td>–0.68</td>
</tr>
<tr>
<td>Risk</td>
<td>–32.03</td>
<td>–0.78</td>
<td>15.86</td>
<td>0.89</td>
</tr>
</tbody>
</table>

$R^2$ 0.46 0.50  
$R^2$ 0.07 0.30  
Observations 13 18

Notes: Estimates derived using the MAD procedure. The income variable is growth in real rents for house prices and growth in real business-sector income for equity prices. The interest-rate variable is a real short-term rate. Table 3 contains information concerning the stationarity properties of the data. See the Appendix for additional details as to data sources and measurement.

Our results are reported in Table 2(a). They consistently support the notion that speculative excesses in the 1980s contributed to asset price deflation in the early 1990s, though they are unsuccessful in uncovering a significant relationship between house prices and their supposed fundamental determinants. After allowing for the role of these fundamentals and overbuilding, a negative and statistically significant relationship remains between asset-price run-ups during 1984–9 and asset-price declines during 1989–93. This is true for both housing and equity prices. Not only might there have been bubbles in some of these markets, but the bursting of these bubbles may have been the major factor behind the asset price declines of the early 1990s. According to the regression results, a 10 per cent rise in real residential property prices above the OECD average during 1984–9 was associated with a 1989–93 price decline 8 per cent steeper than average. For equities,

\footnote{An excellent informal discussion of methods for dealing with outliers is provided in Kennedy (1992). A more sophisticated treatment is provided in Davidson and MacKinnon (1993). See also Greene (1993). We use the MAD estimation procedure provided by the statistical software package, RATS.}

\footnote{These results also bear some resemblance to evidence for mean reversion in stock prices presented by Lehmann (1990) and Fama and French (1988). However, Lehmann’s results concern weekly returns, so comparability with our results is quite limited. The results of Fama and French do concern long-horizon returns, consistent with our results, but the credibility of those results has been undermined by subsequent research. Kim \textit{et al.} (1991) showed that ‘mean reversion is entirely a pre-war phenomenon’. Subsequently, McQueen (1992) showed that previous mean reversion results were distorted by statistical procedures.}
the regression results indicate that a 10 per cent rise above the OECD average during 1984–9 was associated with a decline 5 per cent greater than average during 1989–93.10

(iii) An Alternative Statistical View

So far we have focused exclusively on events during 1984–93, and examined cumulative growth rates over periods of several years. This has permitted a direct test of the speculative bubble hypothesis’ implication that there should be a strong, negative relationship between early and late asset price growth rates. However, this approach constrains us to a limited set of observations, a disadvantage that increases the uncertainty surrounding the estimated relationships. We now turn to evidence which comes from a much larger data set. This allows us to derive statistically superior estimates of the contribution of observed fundamentals to asset price growth. However, this advantage comes at the cost of permitting only an indirect test of the bubble hypothesis.

We expand our sample size not by increasing the number of countries—the relevant data apparently do not exist for other developed countries—but by including more observations across time. Specifically, we draw on annual data spanning 1960 to 1994 for the same countries and sectors considered previously. We approach the possibility of speculative bubbles by asking whether standard fundamental variables seem sufficient to explain asset price behaviour. If much of the 1984–93 asset price boom–bust remains unexplained after accounting for the influence of fundamentals, then additional, non-fundamental factors are presumably involved. If the unexplained portion of asset-price behaviour is not only substantial but also follows the boom–bust pattern characteristic of a bubble, the results of the direct test constructed above will be indirectly corroborated.

We rely on the same model of asset pricing discussed earlier, with two exceptions. First, we exclude both overbuilding and any lagged dependent variable. Second, we take advantage of our enlarged data set and add oil prices as an explanatory variable for share prices (following Chen et al., 1986). The estimated relationships, shown in Table 2(b), are assumed to be the same for each country. The stationarity properties of the data are consistent with our chosen specification, as documented in Table 3. (As earlier, we are unable to establish a clear role for fundamentals in our house price regressions.)

For both housing and equities, real price levels generally rose well above the values predicted by our economic fundamentals during 1984–9, and fell back towards those values during 1990–3 (Figure 4). This is consistent with the pattern that would be expected if speculative bubbles influenced OECD asset-price behaviour. (The chart also highlights a less sustained episode unexplained by fundamentals, the collapse of equity prices in late 1987.)

The panel regression results permit us to estimate the portion of price declines not attributable to observed fundamental forces. For housing, the non-fundamental price decline averaged 13 per cent from 1989 to 1993, close to the actual price decline of 11 per cent. For equities, the numbers are similar: the non-fundamental price decline averaged 19 per cent, somewhat larger than the actual price decline of 15 per cent. This suggests that fundamental forces by themselves were supporting asset prices over the period.

So far we have provided graphical and statistical evidence indicating that speculative price bubbles during the 1980s may have been important sources of asset-price weakness in the 1990s. Though the results suggest that speculative bubbles may have influenced asset prices in some countries during 1984–93, they do not indicate that bubbles were the only factors influencing asset prices, nor that bubbles developed in all markets or all countries under consideration. It could be that unobserved funda-

---

10 For equities, the systematic relationship between boom and bust—which we interpret as indirect evidence of the presence of bubbles—appears to be unique to the recent price cycle. We estimated similar regressions relating growth in equity prices during one period to growth during the previous period, as follows: 1984–9 versus 1979–84, 1979–84 versus 1973–9 and 1973–9 versus 1963–73. No relationship is found for the earlier periods.

We performed a similar experiment for housing, using only the two paired intervals for which data were available: 1984–9 versus 1979–84 and 1979–84 versus 1973–9. We found no relationship between price growth during 1984–9 and 1979–84 periods. We did, however, find a significant negative correlation between house price growth during the 1979–84 and 1973–9 periods.
### Table 2(b)

Panel Regression Estimates of the Determinants of Asset Price Growth
(growth in real asset prices)

<table>
<thead>
<tr>
<th>Panel Regression Estimates</th>
<th>Residential</th>
<th>Equity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>t-Statistic</td>
</tr>
<tr>
<td>Real Income Growth (0–2)</td>
<td>0.43</td>
<td>1.42</td>
</tr>
<tr>
<td>Change in Real Interest Rate (0–2)</td>
<td>-2.1E-3</td>
<td>-0.37</td>
</tr>
<tr>
<td>Risk (0)</td>
<td>-3.0E-2</td>
<td>-1.49</td>
</tr>
<tr>
<td>Growth in Oil Prices (0–2)</td>
<td>-0.206</td>
<td>-3.31</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.03</td>
<td>0.21</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.01</td>
<td>0.19</td>
</tr>
</tbody>
</table>

**Notes:** Reported coefficients represent the sum of coefficients on all lags. The included lags are indicated in parentheses. t-statistics are calculated accordingly. Estimation method: two-stage least squares, using the Newey–West (1987) correction for serial correlation and heteroskedasticity. Instruments for *residential property price* growth include a constant and lags of the following variables: real gross domestic product (1–3), real business sector investment (1–3), real housing investment (1–3), unemployment rate (1–3), real share prices (1–3), the rate of return to business-sector capital (1–4), real long-term and short-term interest rates (1–4), real house prices (1–3), the GDP deflator (1–3), the business investment deflator (1–3), real construction costs (1–4), and sectoral measures of risk (0) and overbuilding (1–2). Instruments for *equity price* growth include a constant and lags of the following variables: real gross domestic product (1–3), real business sector investment (1–3), real consumer expenditure (1–3), unemployment rate (1–3), real share prices (1–3), the rate of return to business-sector capital (1–4), real after-tax business-sector income (1–3), real long-term and short-term interest rates (1–4), the GDP deflator (1–3), the business investment deflator (1–3), the money supply (M2) (1–3), oil prices (1–4) and sectoral measures of risk (0) and overbuilding (1–2).

Our results are best viewed as corroborating substantial existing evidence, both rigorous and anecdotal, suggesting the importance of asset price bubbles in the late 1980s for the OECD bear markets of the early 1990s. They are also consistent with evidence of irrationality in equity markets (De Bondt and Thaler, 1985) and housing markets (Shiller, 1991). In the next section we turn our attention to real activity, and investigate whether the unusually sluggish investment of the early 1990s may have been caused in part by concurrent asset price declines.

**IV. WAS INVESTMENT IN THE EARLY 1990S DAMPENED BY WEAK ASSET PRICES?**

Our second conjecture is that falling asset prices during the early 1990s could have been a source of the early 1990s investment slump. This conjecture could be true even if our previous conjecture was false: that is, falling asset prices could have depressed investment regardless of why those prices declined. After discussing various mechanisms through which asset-price movements affect invest-
Table 3
Unit Root Tests: Rejections of the Unit-root Null

<table>
<thead>
<tr>
<th>Variable measured in levels</th>
<th>Variable measured in first differences</th>
<th>Number of countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>MEQ investment</td>
<td>0</td>
<td>16</td>
</tr>
<tr>
<td>MEQ investment share in GDP</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>MEQ capital stock</td>
<td>0</td>
<td>9</td>
</tr>
<tr>
<td>MEQ overbuilding</td>
<td>11</td>
<td>17</td>
</tr>
<tr>
<td>Residential investment</td>
<td>3</td>
<td>10</td>
</tr>
<tr>
<td>Residential investment share in GDP</td>
<td>2</td>
<td>12</td>
</tr>
<tr>
<td>Residential overbuilding</td>
<td>8</td>
<td>13</td>
</tr>
<tr>
<td>Real share prices</td>
<td>0</td>
<td>17</td>
</tr>
<tr>
<td>Real house prices</td>
<td>3</td>
<td>8</td>
</tr>
<tr>
<td>Real business-sector income</td>
<td>1</td>
<td>15</td>
</tr>
<tr>
<td>Real house rents</td>
<td>0</td>
<td>10</td>
</tr>
<tr>
<td>User cost of business capital</td>
<td>3</td>
<td>18</td>
</tr>
<tr>
<td>User cost of residential capital</td>
<td>2</td>
<td>13</td>
</tr>
<tr>
<td>Real short-term interest rate</td>
<td>5</td>
<td>18</td>
</tr>
<tr>
<td>Real long-term interest rate</td>
<td>2</td>
<td>16</td>
</tr>
</tbody>
</table>

Notes: Number of rejections of the unit null hypothesis at the 5 per cent significance level based on augmented Dickey–Fuller tests. We find little evidence of stationarity in levels, except for the overbuilding variable. For all variables, given the moderate power of the test, there is strong evidence of stationarity in first differences. Critical values vary with the number of observations. Approximate critical value is –3.00. Variables are measured in logs, except for the user cost of capital and real interest rate.

Figure 4
Unexplained Component of Asset Prices, 1984–93

Note: Cumulative unexplained growth in asset prices averages across countries (19 for equities and 13 for housing).
ment, this section provides evidence focused narrowly on asset price-investment connections during 1984–93.

(i) Asset Prices and Investment: An Overview

A number of theories suggest that asset prices should influence investment. We begin by discussing Tobin’s ‘q’ theory, which implies a direct effect, and then consider other theories which imply that asset prices could influence investment indirectly, through channels involving net worth and credit markets.

According to Tobin’s ‘q’ theory (Tobin, 1969; anticipated in Keynes, 1936), investment is strong whenever the market value of business or residential capital exceeds its replacement cost. For example, a firm will have an incentive to expand when it can raise its equity value by $1 by adding capacity which costs only 80¢ to build. Of course, the link also operates in the other direction: no sensible firm would choose to invest when it costs 80¢ to build a new factory that would only be valued at 50¢ by the market. Thus, when equity prices fall, the number of firms for which asset value exceeds asset replacement costs will also fall, and investment should decline. Unfortunately, the many empirical studies of ‘q’ theory have found scant supporting evidence (see, for example, Chirinko, 1986; Oliner et al., 1995).

Several recent theories suggest that the chain of causation between asset prices and investment could be less direct. Specifically, asset-price declines lower the net worth of borrowers and lenders; lower net worth leads in turn to a contraction in the supply of credit; finally, lower credit leads to lower investment. We consider first how lower lender net worth might lessen the availability of credit.

Declining asset prices can diminish lender net worth either directly, by reducing the value of their securities portfolios, or indirectly, by increasing borrower default rates. Reduced lender net worth can also affect creditors’ ability or willingness to lend: for example, banks whose capital cushion falls below statutory minimum levels may shrink their balance sheets. This type of ‘credit crunch’ appears to have hit some areas of the United States during the late 1980s (Bernanke and Lown, 1992; Federal Reserve Bank of New York, 1994). Capital constraints due to high loan losses may also have depressed Japanese banks’ lending in the USA (Peek and Rosengren, 1996).

With respect to borrowers, a decline in house or equity values lowers household net worth directly, and declining equity values can reduce firm net worth by lowering the value of shares held in other firms. A decline in borrower net worth may bring a fall in investment for two reasons: first, investors may prove unwilling to undertake new projects (Chamberlain and Gordon, 1989); second, potential investors may be viewed as insufficiently creditworthy by potential lenders.\footnote{This discussion condenses and, inevitably, simplifies an enormous literature on the subject of asymmetric information and the role of credit in business cycles. Surveys can be found in Bernanke et al. (1996), Kashyap and Stein (1995), Bernanke (1992–3), and Gertler (1988).}

The discussion above has identified several channels through which asset prices may affect investment. Whether the channels are direct or indirect, they all support the second of our two main conjectures: declining asset prices in the early 1990s may have contributed to the early 1990s’ investment slump.

(ii) Asset Prices and Investment During 1989–93: Empirical Tests

This section provides empirical evidence for our conjecture that widespread asset market weakness in the early 1990s contributed to the concurrent weakness of investment. Our approach relies on the observation that, if asset-price deflation (whether due to bursting bubbles or to other factors) depressed investment activity, the countries with the biggest asset-price busts should generally have suffered the biggest investment declines. Note that our analysis is not designed to assess how asset prices depressed investment. While such an investigation would be illuminating, data limitations (such as the inability to measure ‘q’ and the paucity of sectoral credit data) preclude such an assessment in a multi-country context.

As before, we begin with a brief visual examination of the data. Real asset price growth during 1989–93
To select the central variables to include in our statistical analysis, we take the neoclassical theory of business investment as our starting point (Jorgenson, 1971; Clark, 1979). This theory suggests that the crucial determinants of net business investment are a project’s expected cost, referred to as the ‘user cost of capital,’ its expected contribution to revenues, and the amount of capital already in place. Following Poterba (1991) and others, we apply essentially the same theoretical framework to housing investment. There is one exception.
to our application of this model to investment in the present context. The lagged capital stock in the standard model is intended to capture the positive effect of capital depreciation on gross investment, though it could also capture any negative effect of overbuilding on net investment, the potential importance of which is examined in Gilchrist and Williams (1996). However, even though capital stock data are available to us, it is difficult to identify an appropriate year (or years) at which to measure the capital stock in the context of our multi-year variables. We do not, therefore, include a capital stock measure at all, and we attempt to capture overbuilding using the same three measures discussed in section III.

Recent theoretical work suggests that cash flow may also be a crucial determinant of investment. Higher cash flow could lead to higher investment for a number of reasons. First, when firm managers or individuals can finance investment out of cash flow, they can avoid debt and its associated danger of bankruptcy (Chamberlain and Gordon, 1989). Moreover, higher cash flow may also provide managers interested in self-aggrandizement with the opportunity to increase their command over economic resources (Jensen, 1986). Finally, the importance of cash flow may reflect the presence of information imperfections in the market for credit, which drive the cost of debt or equity to exceed the cost of internally generated funds. Put simply, when potential creditors are imperfectly informed about a firm’s or individual’s financial health, and cannot fully collateralize a loan, they may demand a premium to extend loans or purchase equity (Myers and Majluf, 1984). The higher the cost of external funds relative to internal funds, the stronger the incentive for firms or individuals to rely on the latter.

With this background, our list of investment determinants beyond asset prices will be: the cost of capital services (measured as described in Box 1), profits—to capture expected future profits as well as cash flow—the lagged capital stock, and overbuilding. Since investment projects typically take some time to materialize, we lag the determining variables by 2 years (our central results are not sensitive to this choice). Because profits are used as proxies for both expected future income and current cash flow, our empirical model cannot distinguish between the effects of these variables. Fortunately this limitation does not affect our ability to examine whether investment is affected by asset prices.

As shown in Table 4(a), the relationship between asset prices and investment implied by our second thesis stands up well to this statistical scrutiny. After expanding the model to include fundamental forces, we find the expected positive relationship between asset prices and investment to be significant at the 1 per cent level. The measured relationship is strongest for housing, where every extra 10 per cent decline in property values was associated with an additional 8 percentage-point decline for housing construction. In OECD stock markets, an additional 10 per cent decline in real prices beyond the OECD average was associated with an additional 6 per cent decline in machinery and equipment investment.

12 Schiantarelli (1995) summarizes other potential sources of the premium on outside funds, and thus the importance of cash flow for investment.

13 Although there is little consensus as to the precise mechanism linking cash flow to investment, the empirical importance of cash flow for investment is well established. The standard empirical approach to this issue is to investigate whether cash flow continues to help explain the behaviour of investment after controlling for standard fundamental variables. Kopke (1985) and Chamberlain and Gordon (1989) show that models including cash flow outperform many other models. Fazzari et al. (1988) and Hubbard and Calomiris (1995) find a strong influence of cash flow on investment, especially for firms which might be expected to have difficulty obtaining external funds.

14 The credit channel hypothesis regarding the effects of monetary policy suggests that nominal interest rates affect investment through their influence on asset prices and cash flow. Nominal interest rates are not included as explanatory variables since both cash flow and asset prices are already included. Unreported results show that adding nominal interest rates to our specification does not affect our central conclusions.

15 In assessing these results, we must consider the possibility that our estimated relationships are biased. As is shown below, however, any such feedback effect would bias the price coefficient of the housing investment regression towards zero. Since our estimated coefficients are already economically large and statistically significant, eliminating the simultaneity bias should only make them larger. This potential problem of simultaneity bias stems from the reciprocal nature of the causal relationships between asset prices and investment. Asset prices may affect investment—for example, by raising expected capital gains—but investment can also affect asset prices. In the residential property market, most importantly, more building, by increasing the total stock of buildings, can lead to lower prices even while lower prices would tend to lead to less building. Though the effect of 1 year’s construction on asset prices that same year is probably negligible, over the 4- and 5-year intervals considered here the effect could well be substantial.

16 Our basic results remain unaffected if we use alternative measures of overbuilding.
The cost of capital associated with the neoclassical model of business investment typically conforms to an expression of the following form:

\[ C_t = p_t \left( r_t + \delta \right) \left( 1 - k + \tau z \right) \frac{1}{1 - \tau} \]

where \( p \) represents the price of capital relative to the price of output, \( r \) represents the after-tax financial cost of capital, \( \delta \) represents the rate of capital depreciation, \( k \) represents the rate of investment tax credit, \( z \) represents the discounted value of tax depreciation allowances, and \( \tau \) represents the relevant income tax rate. Of these variables, the ones available to us for both sectors and for our full sample of countries are \( p, r, \) and \( \delta \). In addition, we approximate the corporate income tax rate for all countries, \( \tau \), as the ratio of direct business taxes to total business income: this is relevant for machinery and equipment investment.

We take the depreciation rate for machinery and equipment investment to be 14 per cent and the rate for houses to be 3.5 per cent, following the convention described in Summers et al. (1995b).

For business investment, the financial cost of capital should be a weighted average of the cost of short-term debt, long-term debt, and equity. We measure short-term real interest rates as nominal short-term rates less expected inflation for the coming year. Long-term real interest rates are measured as nominal long-term rates less average expected inflation for the coming 5 years. (Our measure of expected inflation is described in the Appendix.) We are able to measure the cost of equity as the dividend/price ratio (following Ford and Poret, 1991, among others), but only for a subset of the countries in our sample. The reported results use the full sample of countries, measuring \( r \) simply as the (unweighted) average of short-term and long-term interest rates. Unreported results show that our central conclusions are unchanged if we restrict ourselves to the smaller sample and use the more complete measure of the financial cost of capital.

As for housing, the financial cost of capital, \( r \), is best measured by the cost of long-term debt, as fixed rate mortgage financing generally dominates in this sector. We rely on real rents as our measure of the earnings potential of residential investment. It should be noted that most of the previous literature uses demographic factors and real income growth to proxy for expected rents. Adopting such a specification does not materially alter the link found here between house prices and housing investment.

(iii) A More Sophisticated Statistical View

We can refine our analysis of the connections between asset prices and investment by turning to the annual data described earlier. This panel data set permits a superior direct test of our conjecture that investment weakness in the early 1990s was partly caused by concurrent asset market weakness. (Recall that the panel data permitted only an indirect test of our first conjecture.)

The model we use to examine this data set, explained in detail in Box 2, is based on the conceptual framework already outlined. Since we are using annual data, however, we can explicitly include changes in the lagged capital stock in order to capture the potential influences of capital depreciation and/or overbuilding. Of course, it would be possible to develop a better model of investment for a single country with abundant data. However, since our goal is to highlight a common OECD pattern during the past decade, we continue to limit our empirical model to variables available for many OECD countries.

The results, presented in Table 4(b), support our earlier evidence suggesting an independent effect...
Table 4(a)
Was Investment Weakness during 1989–93 Driven in Part by Concurrent Asset Price Declines?
(investment growth, 1989–93)

<table>
<thead>
<tr>
<th></th>
<th>Residential construction</th>
<th>Machinery and equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Coefficient</td>
<td>t-Statistic</td>
</tr>
<tr>
<td>Real asset price growth, 1989–93</td>
<td>0.77</td>
<td>6.04</td>
</tr>
<tr>
<td>Real income growth, 1987–91</td>
<td>0.31</td>
<td>0.44</td>
</tr>
<tr>
<td>Change in user cost, 1987–91</td>
<td>3.7E-2</td>
<td>2.98</td>
</tr>
<tr>
<td>Overbuilding, as of 1989</td>
<td>2.84</td>
<td>4.8E-2</td>
</tr>
<tr>
<td>$R^2$</td>
<td>0.71</td>
<td></td>
</tr>
<tr>
<td>$R_{\bar{2}}^2$</td>
<td>0.57</td>
<td></td>
</tr>
<tr>
<td>Observations</td>
<td>13</td>
<td></td>
</tr>
</tbody>
</table>

Notes: Estimates derived using the MAD procedure. Investment and income variables both scaled by capital stocks. The income variable is growth in real rents for residential investment and growth in real business-sector income for machinery and equipment investment. Table 3 contains information concerning the stationarity properties of the data. See the Appendix for additional details of data sources and measurement.

Box 2
Derivation of the Investment Equations for Panel Regressions

We assume that investment in a given country ($i$) in a given year ($t$) is determined by expected profits, current profits as a measure of cash flow, the cost of capital services, lagged capital stocks, and asset prices. We also allow for country- and time-specific effects. Because investments projects take time to plan and execute, we include additional lags of the various variables, as well as lags of investment itself (which may also help to capture unobserved fundamentals). If we take expected income to be a linear function of current income and lagged income plus the other right-hand-side variables, then expected income can be deleted from the variable list, giving the following expression:

$$I_t = \sum_{j=1}^{n} \alpha_j I_{t-j} + \sum_{j=0}^{n} \beta_j Y_{t-j} + \sum_{j=0}^{n} \gamma_j c_{t-j} + \sum_{j=0}^{n} \mu_j K_{t-j} + f_i + \lambda_t + \epsilon_t.$$ 

Here $Y_t$ represents income, $c_t$ represents the cost of capital, $K_t$ represents the actual capital stock, $f_i$ represents the country-specific effect for country $i$, and $\lambda_t$ represents the time-specific effect for time $t$ (that is common across countries).

Our choice of functional form is informed by the fact that panel estimates which include a lagged dependent variable along with country-specific effects are biased, especially when the time dimension of the panel is small or moderate. Unbiased estimators have been developed by Anderson and Hsiao (1981) and Arellano (1989) which apply IV methods to differenced variables, using appropriate lags as instruments. Since $\Delta f = 0$, the country dummies drop from the equation; the time dummies are conceptually unaffected by differencing. Our estimating equation is then given by:

$$\Delta I_t = \sum_{j=0}^{n} \alpha_j \Delta I_{t-j} + \sum_{j=0}^{n} \beta_j \Delta Y_{t-j} + \sum_{j=0}^{n} \gamma_j \Delta c_{t-j} + \sum_{j=0}^{n} \mu_j \Delta K_{t-j} + \lambda_t + \Delta \epsilon_t.$$ 

Standard augmented Dickey–Fuller tests, applied country-by-country, confirm that the regression is balanced, with all variables likely to be I(0) (see Table 3).

18 Our empirical specification is similar to that used by Barro (1989), who found strong stock-market effects on US and Canadian investment. For a recent discussion of empirical investment models, see Chirinko (1993).

19 Consistent estimation requires that the dependent variable be lagged twice before inclusion as an instrument. Differencing the original investment equation, as we do in moving from the expression for $I_t$ to that for $\Delta I_t$, produces a moving-average error term correlated with $I_{t-s}$. For this reason, $I_{t-s}$ was the most recent lag of investment used as an instrument, and we used techniques described in Newey and West (1987) to control for the moving average component of the error term.
of asset price growth on investment activity. The estimated short-run and long-run effects are both economically and statistically significant. For example, our results suggest that a 10 percentage-point increase in house-price growth is associated with an additional 6 per cent growth in housing investment over the short run and 8 per cent over the long run. Likewise, if the growth rate of share prices is raised 10 percentage points in a given year, the growth rate of machinery and equipment investment 1 year later will be 1 percentage point higher. A sustained 10 percentage-point rise in the rate of share-price growth would ultimately lead to a sustained rise in the growth of machinery and equipment investment of 2.6 percentage points.

On average, across the countries for which we have complete data, housing investment declined by about 17 per cent over 1989–93. Of this, according to these panel regressions, 4 percentage points can be explained by the concurrent decline in housing prices. Likewise, machinery and equipment investment...
ment declined by about 15 per cent, of which, according to our regressions, some 5 per cent is explained by declining share prices. These results support our second conjecture: falling asset prices may have substantially reduced investment growth during the early 1990s.

The evidence considered thus far suggests the following: consistent with our first conjecture, speculative excesses of the 1980s may have led to the sagging asset markets in the early 1990s. In turn, asset-price deflation seems to have depressed investment, consistent with our second conjecture. These two strands of evidence are consistent with our thesis that tumbling asset prices and anaemic investment in the early 1990s may have been symptoms of a ‘hangover’ from speculative bubbles in the late 1980s.

The regression results allow us to estimate the impact on investment of bubble-related asset price declines. The estimates of bubble-associated declines in investment are similar in magnitude to the estimates of the overall price-induced declines. Using the panel estimates in each case, we find that 6 percentage points of the average 17 per cent decline in housing investment over 1989–93 can be attributed to house-price declines not explained by fundamentals. Likewise, 5 percentage points of the average 15 per cent decline in machinery and equipment investment over 1989–93 can be attributed to non-fundamental equity price declines. These results indicate that the effect on investment of non-fundamental changes in asset prices may be substantial.

V. ASSET PRICES AND THE TIMING OF ECONOMIC RECOVERY

If we accept the hypothesis that asset-price declines contributed to the investment slump of the early 1990s, we can build on this insight. In particular, the timing of the investment recoveries could well be explained with reference to asset price developments. In some countries, investment remained on its sick bed well after the rest of the economy was up and walking; in others, investment and GDP returned to health roughly concurrently. This difference may stem from corresponding differences in the timing of countries’ recessions relative to the asset price bust.

Property and equity prices all began to fall around 1989, and property prices, in particular, continued dropping well into the 1990s. In countries where recession began relatively early, such as the USA, the UK, Australia, and Canada, investment remained weak even as GDP recovered. Our evidence suggests that this continued weakness stemmed in part from concurrent asset price weakness. This conclusion is supported by graphical evidence presented in Figure 6, where it can be seen that in these Anglophone countries both investment and share prices rebounded unusually weakly from the early 1990s recession.

In Continental Europe, by contrast, the recession took hold somewhat later, around 1993, by which time the asset-price bust was largely over. The stronger recoveries in these countries were better supported by investment. In fact, as shown in Figure 7, both investment and share prices rebounded unusually strongly from this cycle in Continental Europe.

VI. SUMMARY AND CONCLUSIONS

This paper uses cross-country data to document a striking pattern in recent OECD economic history: in country after country, asset-price booms during the go-go years of the 1980s collapsed around 1989, and investment came down with them. Across the OECD, investment declines in the early 1990s either intensified countries’ recessions or were a drag on economic recovery.

Based on our statistical analysis of the period we draw two tentative conclusions. First, we conclude that housing and equity prices may have been inflated by speculative price bubbles in many countries, and that asset-price declines of the early 1990s may thus represent a ‘hangover’ from these earlier bubbles. We base this conclusion on our observation that countries whose asset prices rose the furthest in the late 1980s found their asset prices falling the furthest later on, a result which remains true even when we account for the influence of economic fundamentals.
Figure 6
Anglophone/Early Trough Countries: Investment and Share Prices in the Early 1990s

(a) Investment
(b) Share prices

Note: Anglophone nations are Australia, Canada, the UK, and the USA. 1991Q1 trough date for Canada and the USA, 1991Q2 for Australia, and 1992Q1 for the UK.

Figure 7
Continental Europe/Late Trough Countries: Investment and Share Prices in the Early 1990s

(a) Investment
(b) Share prices

Note: Continental European nations are Austria, France, Germany, Italy, and The Netherlands. Trough date for Austria, France, Germany, and The Netherlands is 1993Q1, and for Italy, 1993Q3.
Our second conclusion is that the asset price declines of the early 1990s may help explain the puzzling concurrent sluggishness of investment. Other potential sources of investment weakness, such as overbuilding and interest-rate developments, provide little help in explaining the cross-country pattern of investment during this period. Together, our two conclusions imply our third and central conclusion: the late 1980s asset-market excesses may have contributed to the unusual weakness of investment during the early 1990s.

None of our analysis should be viewed as conclusive. As noted earlier, our statistical treatment of the 1984–9 and 1989–93 periods is constrained by the limited number of observations—there are fewer than 30 countries in the OECD, and only some of these have adequate data. Although our more detailed analysis of annual data provides a helpful consistency check and enhanced statistical rigour, it represents only a preliminary investigation of the possible connections between asset-price bubbles and investment. The use of more disaggregated data, where available, would be a natural way to increase analytical rigour, though at some cost in terms of generality. For example, Higgins and Osler (1997) examine a panel of state-level data from the USA and find that housing investment may have been substantially affected by departures of house prices from fundamentals during the early 1990s. For machinery and equipment investment, our central thesis might be examined using firm-level data.

The idea that asset-market behaviour could have substantial effects on real economic activity is not new: as early as 1933 Irving Fisher claimed that debt deflation contributed importantly to the great depression (Fisher, 1933). More recently, economists have fleshed out our theoretical understanding of these real–financial linkages, and much evidence has accumulated suggesting the importance of such linkages in earlier historical episodes. Our results support the idea that financial market developments—whether or not justified by fundamentals—continue to affect real activity.

Our evidence suggests an important policy question, which we introduce here without taking a stand on its resolution. Should governments try to contain or prevent speculative asset price bubbles? In considering this question, governments could choose among policy alternatives including monetary policy, tax policies, or regulation.

Monetary policy could be tightened in response to excessive speculative activity: higher interest rates, and the associated decline in the value of assets used as collateral, would discourage the heavy borrowing typically associated with speculation. Although this policy is fairly certain to have the desired effect on asset prices if pursued with sufficient vigour, it has numerous drawbacks. First, monetary policies intended to deflate bubbles would also dampen economic activity not fuelled by bubbles. Second, identifying when to intervene would be difficult: for example, though it is by now widely accepted that Japan’s stock and property markets were inflated by speculative bubbles in the late 1980s, there was no such agreement at the time. In fact, our best statistical methodologies even have difficulty identifying bubbles in past episodes. One possible solution to this difficulty would be to focus on rapid asset-price rises only when they are accompanied by rapid credit growth (see Schinasi and Hargraves, 1993, for a detailed discussion). Finally, adding speculative asset-price movements to the already long list of intermediate targets for monetary policy could make policy shifts even more opaque to the public. One alternative would be for monetary authorities to alert markets to the possibility that asset prices exceed their fundamental values, without actually changing interest rates, a practice commonly referred to as ‘jawboning’.

Tax policies or regulation could provide more carefully targeted attacks on speculative bubbles. As an example of tax policies, note that capital gains taxes in some countries already attempt to discourage speculative turnover by promoting long-term ownership of investment assets. Requiring hefty minimum down-payments on mortgages could also discourage speculative activity. Other regulations could actually prohibit speculative activity, as in some central European countries, where banks have historically been barred from financing commercial

23 For recent reviews on this topic, see Bernanke and Gertler (1995) or Bernanke et al. (1996). For additional empirical evidence, see Hubbard (1994).
building construction until future occupancy is fully committed. Tax policies and regulation could be applied permanently or only when the danger from bubbles appears imminent, much as the Japanese government limited banks’ real estate lending during 1990. This, of course, brings back into focus the difficulty of identifying bubbles as they arise.

In short, in deciding whether to attempt to contain or prevent bubbles, governments must first decide whether there is sufficient information on which to base any policy change. If intervention appears appropriate, governments must then choose whether the policies should be implemented by the monetary, tax, or regulatory authorities; and they must choose between permanent measures and those adopted as speculative pressures appear to build.

Even if one accepts our suggested conclusions about the potential for asset-market distortions to affect real economic activity, many questions remain. If there were speculative bubbles in many OECD countries during the late 1980s, what triggered them? Why were they roughly coincident? If asset prices contributed to later investment weakness, what were the critical causal mechanisms? Were credit markets among those mechanisms? These represent important questions for future research.

APPENDIX:
DATA SOURCES AND METHODS

(i) Data Sources

Our data set includes the 18 following countries: Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, The Netherlands, Norway, Spain, Sweden, Switzerland, the UK, and the USA.

Investment and other national accounts data were taken from the OECD database wherever possible. However, machinery and equipment investment data were taken from Penn World Tables, Mark 5.6 (Summers et al., 1995b) when they were not available from the OECD. This applied to Japan for all years and to Belgium, Ireland, and Switzerland for the period before 1978. Capital stock data were also taken from the Penn World Tables. As this series ends in 1992, the capital stock series were updated using investment data from the OECD database and applying the depreciation conventions used by the Penn World Tables.

Interest rate, share price, rent, business income, and price data were also taken from the OECD database. Long-term interest rates generally refer to yields on government bonds with 5 years or more to maturity. (For a few countries, this series was taken from the International Financial Statistics of the IMF: line 61, ‘government bond yields’.)

Short-term interest rates refer to what the OECD considers to be the benchmark market-determined 3-month rate. These are generally inter-bank or government bill rates.

House price data come from the authors of Borio et al. (1994), who supplied data extending from 1970 to 1992. The data have been extended by those authors and published in recent Bank for International Settlements Annual Reports. No house-price data were available for the following countries: Austria, Ireland, Italy, Spain, and Switzerland.

Certain statements and graphs concerning peak-to-trough changes in investment or GDP rely on quarterly data, which are available for a somewhat smaller set of countries. Quarterly data concerning GDP and gross fixed capital formation were unavailable for two countries, Belgium and Ireland. Quarterly data concerning construction and machinery and equipment investment were unavailable for Belgium, Ireland, Japan, and Switzerland.

For the USA and Japan, we rely on official business-cycle trough dates set, respectively, by the National Bureau of Economic Research and the Economic Planning Agency. For the remaining 12 countries with quarterly data, we chose as business-cycle troughs the most recent of two or more consecutive quarters of negative real GDP growth, if followed by at least two consecutive quarters of positive growth.
(ii) Variable Measurement

Cost of capital. See Box 1.

Income. For equity prices we would ideally have used future dividend income by country. However, dividends figures are unavailable for some countries and cover a short time span for others; as a result, we use current real business income as a proxy. More specifically, we take the national accounts measure of after-tax business income divided by the GDP deflator. To measure expected real ‘house rents’ we take the current CPI for rents divided by the aggregate CPI.

Overbuilding. Our benchmark measure of overbuilding is the deviation of the capital–output ratio from its country-specific trend for each of the two sectors. This approach implicitly assumes that the country-specific trends capture the evolution of the equilibrium capital–output ratios. Because it is not clear whether this assumption is valid, we experimented with alternative measures of overbuilding, including growth in the capital–output ratio over 1984–9 and growth in the investment–output ratio over the same period. For brevity we only report results using the first measure; estimation with the other two measures has little effect on our central results.

Real interest rates. The short-term real interest rate is measured as the annual average short-term nominal rate less expected CPI inflation for the concurrent year. Expected inflation is derived from an autoregression on two previous years’ inflation. The long-term real interest rate is measured as the annual average long-term nominal rate less expected CPI inflation over a 5-year horizon. Expected inflation over this horizon is derived via a forward projection of the AR(2) regression.

Risk. Our measures of risk are based on the principle that only non-diversifiable risk will be rewarded in the market place. We begin by measuring annual equity returns in each country in terms of a common currency (the US dollar). We then construct an index of world-wide equity market returns as the GDP-weighted average (per cent) change in these share prices over 1970–89. We then take a GDP-weighted average of short-term nominal interest rates, which we use as a measure of risk-free returns. The difference between these two measures we interpret as a (crude) measure of non-diversifiable excess returns to the world market portfolio of equities.

To measure an individual country’s equity market risk we regress that country’s annual share returns against this measure of the world market excess returns. (This is analogous to the common approach to measuring an individual firm’s ‘beta’ by regressing returns to owning that firm’s shares on country-wide excess equity returns.) Measuring an individual country’s housing market risk is conceptually more involved, since housing is not very actively traded across countries. If we view investors within a country as choosing between local housing, local equities, and foreign equities, then a relationship between world equity market returns and domestic housing returns should be established indirectly. With this in mind, we measure a country’s housing-price risk by regressing that country’s annual real house-price changes against our measure of the world market excess returns to equities.

Levels versus changes. Changes in variables other than interest rates are measured as the cumulative change in the natural log. For interest rates, we rely on the simple difference between the end-of-period values.

REFERENCES


