

Ben S Bernanke: Will business investment bounce back?

Speech by Mr Ben S Bernanke, Member of the Board of Governors of the US Federal Reserve System, before the Forecasters Club, New York, 24 April 2003.

The references for the speech can be found on the website of the Board of Governors of the US Federal Reserve System.

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The recession that began in the United States in March 2001 is distinctive in being one of the few business-led - as opposed to household-led - recessions of the post-World War II period. Typically, US recessions have featured downturns in household spending, with housing and consumer durables being the most severely affected, and with business spending on capital goods playing a secondary and generally reactive role. In the recent episode, by contrast, business fixed investment began to weaken well before the official peak of the business cycle, contracting in real terms from the fourth quarter of 2000 through the third quarter of last year. In an arithmetic sense at least, this decline in investment accounted for a very substantial part of the general economic slowdown of the past few years. Meanwhile, completing the role reversal, households maintained their spending remarkably well, particularly on new homes and automobiles.

Although the US economy has managed modest real growth through 2002 and into 2003, most economists agree that a strong and well-balanced recovery will require a greater contribution from the business sector, in the form of increased capital investment and hiring. Today my focus will be on the prospects for capital investment. I will review some of the factors that contributed to the investment boom and bust of the past few years, and then I will turn to the difficult issue of whether we can expect a sufficient rebound in business investment to keep the economy on a recovery path in 2003 and 2004. Along the way I will touch on a few related issues, such as the debate about whether the economy currently faces a "capital overhang" that is inhibiting new investment. Before proceeding, I should note that my comments today reflect my own opinions and not necessarily those of my colleagues on the Board of Governors of the Federal Reserve or the Federal Open Market Committee.¹

How the Federal Reserve Board Staff Forecasts Business Investment Spending

As background for my discussion of the recent and likely future behavior of business investment - and in recognition that my audience consists of the distinguished membership of the Forecasters Club - let me begin with a few words on how the Federal Reserve Board staff forecasts business spending on new capital goods.

For relatively short horizons, say this quarter and next, the forecasting of business fixed investment (like most other macroeconomic variables) is largely an exercise in applied data analysis. As an organizing principle, the Board staff tries to mimic the methodology used by the Bureau of Economic Analysis in creating the National Income and Product Accounts series for real business fixed investment. For example, following the procedures of the BEA, the staff uses detailed data on manufacturers' shipments of nondefense capital goods, published by the Bureau of the Census and other government agencies, to develop monthly estimates of nominal spending on most major types of equipment. Similarly, monthly data on construction put in place are used to estimate nominal investment in commercial buildings and other types of structures. The staff converts these nominal spending figures into real terms using producer price indexes or other appropriate deflators. In addition to this translation of monthly data published in regular government reports, the Board staff follows BEA procedure in estimating investment in aircraft and motor vehicles from information supplied by the manufacturers directly.

Of course, not all the data necessary to replicate the BEA's calculation of business investment for the current quarter are typically available, and virtually none is available for subsequent quarters.

¹ I would like to thank, also without implicating, Jason Cummins and Stacey Tevlin for excellent assistance in preparing this talk.

Estimating investment spending therefore requires projections over the next few months of the various components of shipments, construction put in place, and other relevant data. The staff makes these projections with the help of various statistical techniques, taking into account the predictive power of related quantitative indicators, such as new orders.

In constructing its short-term forecasts, the staff has also found it useful to supplement the available, largely preliminary data on shipments and orders of capital goods with a variety of qualitative information. Examples include material from the Fed's Beige Book, which includes reports about current conditions in the twelve Federal Reserve Districts; the Institute for Supply Management's national surveys of purchasing managers and related regional surveys; various other surveys conducted by both nonprofit groups and private firms; industry reports; and reports and anecdotes from business contacts. Finally, near-term investment projections are assessed for reasonableness relative to the picture presented by broader macroeconomic indicators, such as measures of production, inventories, and hiring.

Detailed data analyses of this type are useful in predicting business investment for the current and following quarter. But monetary policymaking requires projections for longer horizons, up to six to eight quarters ahead. To obtain forecasts of investment for those longer horizons, the staff relies on formal econometric models combined with additional statistical and qualitative information. The staff employs a suite of forecasting equations for investment, varying in details of specification. This eclecticism reflects the failure of any single specification to emerge as the clearly "best" model of investment. Indeed, these equations are perpetually works in progress, as forecasting errors are analyzed and performance is compared to alternatives. However, the models which are most heavily used all belong to the same general family, the so-called *neoclassical model of investment*, most closely associated with Professor Dale Jorgenson of Harvard University (Jorgenson, 1963; Hall and Jorgenson, 1967).

According to the neoclassical model, which is based on an analysis of the marginal costs and benefits to a firm of acquiring additional capital goods, investment spending by firms depends primarily on two factors: first, the projected growth in business output, as determined by final demand, and, second, the cost of acquiring and using capital goods, the so-called *user cost of capital*. Higher projected output growth naturally leads firms to expand their capacity to produce by investing in new capital goods. This relationship between the rate of growth of demand and the level of investment spending, dubbed the accelerator effect, is a venerable and empirically well-supported relationship in economics. The fact that investment spending itself is part of final demand, however, leads to a certain circularity in the analysis: If firms decide to invest aggressively, then final demand will be high, justifying the rapid pace of investment; but likewise, weak investment demand can be partly self-justifying (Kiyotaki, 1988). This possibility of self-justifying optimism or pessimism inevitably creates a role for expectations and attitudes in the analysis, a point to which I will return.

The second factor that determines investment spending in the staff model, the user cost of capital, is more precisely defined as the after-tax, per-period cost of using a capital good - it may be thought of as the per-period rental cost of capital. The user cost of capital depends in turn on such factors as the prices of new capital goods, the real interest rate at which firms must borrow to finance their investment spending, the rate at which capital depreciates, and the degree to which the tax code subsidizes or penalizes investment. Not surprisingly, increases in the user cost of capital have been found to reduce business investment, although the size of the effect is less well identified statistically and more controversial among economists than the effect of output growth mentioned previously.

A practical question is whether business investment should be forecast as an aggregate quantity or broken down in some way and forecast component by component. The Board staff have found a significant benefit, in terms of reduced forecasting error both in and out of sample, in modeling investment by asset class - for example, in forecasting investment in computers separately from investment in other types of equipment, or investment in office buildings separately from investment in drilling rigs. I will give a concrete example of the advantages of disaggregated forecasting in a moment.

The Board staff's econometric models of investment have performed well over the years. However, business investment can be highly volatile from quarter to quarter, a fact that makes forecasting misses - sometimes quite large ones - simply inevitable. A major reason that investment can sometimes be hard to predict is the inherently forward-looking and subjective nature of investment decisions. When firm managers are highly optimistic about the potential of a new technology, a new product, or a new market, for example, they are likely to invest aggressively, almost independently of the level of interest rates and similar "fundamentals." But likewise, if beliefs become more pessimistic,

investment can fall significantly, even when financing is easy. Keynes referred to the sometimes rapid changes in mood of business leaders as "animal spirits." Reasonable people can disagree about the importance of this phenomenon in general, but we seem to have seen more of it lately than usual. Recognizing the subjective nature of the investment decision, the staff makes substantial efforts to gather information about management expectations, as reflected for example in analyst earnings projections, surveys, industry reports, interviews, and the like. Particularly at turning points, this type of information may provide important additional insights into the likely course of investment spending.

I close this brief survey of forecasting at the Board by emphasizing that the staff forecast is just that - the staff's. Monetary policy decisions are made by twelve of the nineteen members of the Federal Open Market Committee: the seven members of the Board of Governors, the President of the Federal Reserve Bank of New York, and four of the remaining eleven Reserve Bank presidents, among whom the vote rotates annually. I suspect that, at any given meeting of the FOMC, virtually every member of the Committee disagrees with *some* aspect of the staff's forecast - quite possibly in mutually inconsistent ways. Nevertheless, we take the staff forecast as an informative and highly useful starting point for a productive discussion of the prospects for the economy and the way that policy should respond.

The Investment Boom of the Nineties

With this background, I now review the recent behavior of investment, concentrating on business fixed investment, or investment in nonresidential structures as well as equipment and software. (For now I omit residential investment - that is, investment in housing - and investment in inventory stocks.) The weakness of business fixed investment during the past three years contrasts sharply with the investment boom that was one of the most striking features of the US economy in the 1990s, particularly during the second half of the decade. Growth in real investment averaged close to 10 percent per year between 1995 and early 2000. For comparison, during the strong 1983-87 recovery, real investment grew less than 6 percent per year. The rapid pace of business investment in the nineties was central to the unusually high rates of economic growth, low rates of unemployment, and rapid productivity growth that we observed during that period.

Broadly speaking, the factors that the neoclassical model suggests would be needed to underpin an investment boom were indeed present during the late nineties. Final demand and hence output grew strongly, and the user cost of capital was falling. However, as Tevlin and Whelan (2003) have shown in a recent paper, explaining the *magnitude* of the nineties boom requires modeling the component parts of investment separately, as the Board staff does in practice. In particular, a disproportionate part of the investment boom of the nineties can be attributed to investment in computers, software, and communications equipment, so that an important step toward explaining the overall boom in investment is explaining the surge in these high-tech categories.

In their paper, Tevlin and Whelan identified two factors that gave a strong impetus particularly to investment in computers during this period. First, the costs of computing power fell sharply in the late 1990s, arguably reflecting a pickup in the pace of technological advance as well as an intensification of competition among the major chip makers. As a result, the user cost of capital for computers and related equipment declined even more rapidly than earlier in the decade. Together with strong overall business conditions, these low and falling costs of computing power induced many firms to make major investments in information technologies. Second, generally speaking, computers exhibit high rates of economic depreciation; for example, new applications requiring greater speed or more memory sometimes make existing computers effectively obsolete within a few years. High rates of economic depreciation imply rapid replacement cycles, and hence high rates of gross investment in computers. Tevlin and Whelan showed that these two factors - low and falling prices of computing power and high economic depreciation rates - can explain much of the high rates of gross investment in computers during the nineties; and that these high rates of investment in computers in turn help to explain a substantial part of the overall investment boom.

Although econometric models can do a reasonable job of explaining the investment boom of the late nineties, standard models do not fully capture other factors that boosted investment spending during that period, especially in the high-tech sector. For example, the Telecommunications Act of 1996 was intended to increase competition in the telecom sector. Many firms apparently believed that the dominant market share would go to companies with the biggest networks and the most "cutting-edge" technologies; consequently, investment boomed in the telecom sector. Similarly, deregulation of the electric power grid may have spurred increased investment in power systems. Outside the legislative

arena, rapidly increasing access to the Internet raised the possibility of a huge new on-line demand for products and services, which spurred a wave of new dot-com startup companies hoping to be the first to meet that anticipated demand. Established firms, from booksellers to clothing retailers, responded with their own on-line marketing outlets, which further boosted the demand for servers, software, and other components. In addition, concerns about the potential effects of the Y2K date change led many firms to accelerate their replacement cycles and order new software and computing equipment.

In short, during the latter part of the nineties, strong economic fundamentals conjoined with what, in retrospect in least, seems to have been a less well grounded increase in general optimism about the long-term potential of new technologies. (I say "seems" in all seriousness. We are not in the long run yet.) In any event, given this optimism and the attendant rise in earnings forecasts and the stock market, together with good fundamentals in terms of high demand, falling equipment prices, and moderate financing costs, the late-nineties boom in investment is perhaps not so difficult to understand.

The Investment Bust of 2000-02

In the second half of 2000, business fixed investment began to decline markedly; between the third quarter of 2000 and the third quarter of last year, the level of real investment outlays declined 12 percent. The drop in investment in computer and communications equipment was particularly sharp. As I noted earlier, this decline in investment led the business cycle, an unusual pattern for the post-World War II period.

Standard investment models can explain a portion of the sudden weakening of investment spending in mid-2000. For example, the user cost of equipment and software is estimated to have increased in 1999, the first such increase since 1994. Among the factors contributing to the rising user cost was a much less rapid decline in the relative price of computing power, perhaps reflecting a slowdown in the pace of technological advance, and a policy tightening by the Fed (in part, an unwinding of the easing that took place during the Russian debt crisis). Some weakening also occurred in the demand for business output, including most notably a mild deceleration of personal consumption expenditures early in 2000. The strength of the dollar hurt demand as well, particularly in the manufacturing sector. One should also keep in mind that, besides the modest weakening in fundamentals, investment booms are naturally followed by some slowdown as firms reach their desired level of capital.

However, even taking all these factors into account, the fact is that standard investment models missed much of the drop in investment that began in 2000. The importance of disaggregation was illustrated once again, as most of the miss was accounted for by overprediction of investment in high-tech equipment and software. Clearly, factors other than those in the standard model must have been at work in that sector. The most promising place to look for explanations is in the expectations and attitudes of the managers entrusted with making investment decisions.

As we can see, in retrospect at least, the year 2000 was one of re-evaluation, particularly for high-tech investment. Though the evidence is strong that high-tech investments have greatly enhanced productivity in the economy, by 2000 many managers had apparently become concerned that the long-term profit potential of their investments in computers and communications equipment was smaller than they had expected. In some cases the difficulties were technological, sometimes (as in the case of on-line retailing) the expected level of consumer demand did not materialize, sometimes the business plans were faulty, sometimes economic or regulatory conditions were not as had been expected, and sometimes the productivity enhancements were less than anticipated. This shift in expectations can be seen clearly in the downward revisions to analysts' long-term earnings expectations (which mirrored declines in equity prices) beginning in the second half of 2000. Analysts' forecasts of long-term earnings growth for the Standard & Poor's 500 companies index declined from about 15 percent per year at their peak in 2000 to less than 12 percent recently (still a historically high level, however). Indeed for this period, augmenting the Tevlin-Whelan model of investment with analysts' long-term expectations substantially improves the fit - although it by no means eliminates all or even most of the puzzle in investment spending during this period.²

² Using panel data, Cummins et al. (2002) show that analysts' earnings expectations provide useful information in investment equations.

As management expectations changed, so did the economic environment and firms' investment behavior. Replacement cycles for high-tech equipment apparently slowed, as firms became more skeptical of the business case for next-generation computers and software - particularly since they had just upgraded their information technology in preparation for the Y2K date change. Moreover no "killer apps" that required further system upgrades seemed to be on the horizon. The failures of scores of dot-coms and telecom startups reduced competitive pressure and the perceived urgency of maintaining technological leadership. Both financial markets and the general economy were becoming decidedly less hospitable to firms oriented toward new technologies. In short, a major shift in management expectations about the profit potential of new investments, particularly high-tech investments, is key to explaining the investment bust of 2000-02.

A Capital Overhang?

The factors just discussed, including the re-evaluation of the long-term profitability of high-tech investments, go a long way toward explaining the decline in investment spending that began in the latter part of 2000. However, some observers have suggested that the problem is deeper and has longer-term consequences than I have suggested so far. Specifically, they have argued that investment during the late 1990s was so great that actual capital stocks rose substantially above long-run desired levels, creating a "capital overhang." Barring a major increase in the desired level of capital, a true capital overhang would imply little or no investment in that particular type of capital for possibly quite a long time, until excess capital has been depreciated away.

Is there a capital overhang in the US economy? I believe that this description was a reasonable one for certain sectors during the early stages of the downturn. Telecommunications companies no doubt invested too much in long-haul fiber networks, as firms competed to establish the largest and most complete networks. (I note, however, that economies of scale in laying fiber together with a low in-ground rate of physical depreciation imply that once a trench is dug, more fiber should be laid than will be needed for quite a while.) Too many startup Internet companies bought too many servers and routers, and the failure of large numbers of high-tech companies contributed to a glut in office space, which is particularly evident in technology centers like San Francisco and Seattle. Undoubtedly the current supply of commercial aircraft is excessive, though arguably much of this sector's overcapacity results from September 11 and structural problems specific to the airline industry rather than from a period of extensive overbuilding.

However, the more pressing question is, how many of these putative sectoral overhangs remain relevant today? For high-technology equipment, in my view, overhang effects are probably by this time not of great quantitative importance. In communications, for example, though little additional long-haul fiber is needed at this point, there is probably scope for investment in the sophisticated equipment that transmits signals over the fiber, in the "last mile" of fiber network to customers' doorsteps, and in new wireless technologies and their applications. In the quantitatively important computers and software sector, a key factor is the relatively high rate of economic depreciation to which I alluded earlier. Computer equipment purchased before the millennium date change is now four to five years old and may now or soon be in need of replacement. Indeed, investment in high-tech equipment grew at more than 8 percent in real terms in 2002; investments in computers and software led this gain, but even investment in communications contributed a small part. Continued growth in the high-tech equipment sector will be important in any investment recovery.

In all likelihood, a continuing overhang exists in nonresidential structures, including some types of industrial structures as well as office buildings. (Prospects for other types of construction, including institutional buildings, utilities, and mining and drilling, appear somewhat better.) Vacancy rates in office buildings remain quite high in most cities, for example, and rents for many types of buildings have been falling. As a result, investment in these types of structures has been declining. Two silver linings to this cloud, though faint and of little comfort to the heavy construction industry, are nevertheless worth pointing out. First, in large part because of improved risk management practices, weakness in the nonresidential real estate sector has not led to increased incidence of nonperforming loans and capital shortages among financial intermediaries, as was the case in some regions in the 1990-91 "capital crunch" episode. Second, relative to real investment in equipment and software, real investment in nonresidential structures has become significantly less important over the past several decades, a development that has reduced the relative importance of fluctuations in this component of investment for changes in real GDP. Investment in commercial aircraft will likely remain highly

dependent on the rate at which the airline industry can work out its problems, as well as on potential new risk factors like SARS.

Some analysts have pointed to the historically low capacity utilization rates in manufacturing seen in recent years in support of the view that a capital overhang remains an important factor. The importance of these data in projecting economy-wide investment should not be overstated, however. The manufacturing sector accounts for only about 20 percent of aggregate investment, and trend growth in manufacturing investment, moreover, is well below that of aggregate investment; hence, low capacity utilization in manufacturing is not inconsistent with reasonably robust rates of aggregate investment. Indeed, I doubt that a true capital overhang exists or has existed in non-high-tech manufacturing, in the sense of a period of over-investment and misallocation of capital. Low capacity utilization rates in those sectors primarily reflect not an earlier period of over-investment but rather weak current *demand* for manufacturing output, the product of a variety of cyclical and secular factors, including a strong dollar and weak conditions abroad. Final demand is already taken into account, for example, in the standard neoclassical model of investment, through projections of business output. Indeed, augmenting a standard investment equation to take account of capacity utilization in addition to aggregate output has essentially no effect on the accuracy of the projections from that model. More generally, historically the value of capacity utilization as a predictor of investment has been modest at best.

Prospects for 2003 and 2004

So, to return finally to the question posed by the title of this talk: Will business investment bounce back this year and next?

My review of investment-forecasting methodology suggests several complementary ways to go about answering that question. First, one should consider the "fundamental" determinants of investment, the macroeconomic factors that determine the user cost of capital and the demand for business output. Second, one can take a more disaggregated approach and look at various sectors and types of capital to assess their potential for growth. Finally, a complete analysis requires some evidence on the views of managers and analysts about the expected profitability of new investment. Putting these pieces together, though no late-nineties type of boom seems likely, most factors point to a moderate pickup in business investment and economic growth in the second half of 2003 and in 2004. However, even putting aside the possibility of unexpected developments on the geopolitical front or elsewhere, the state of expectations among corporate leaders is an important wild card that must always be considered when forecasting investment.

The fundamental factors affecting investment are, as I have indicated, broadly supportive of continuing recovery. The user cost of capital is low and, dominated by continuing reductions in the quality-adjusted prices of high-tech equipment and historically low interest rates, will likely continue to decline. The partial expensing provision passed by the Congress in 2001 provides a significant incentive for firms to purchase equipment and certain types of software before the provision expires in the third quarter of 2004.³ Under the general heading of financing conditions, favorable factors include the good financial condition of the banking system, improvements in corporate liquidity, and the substantial narrowing of risk spreads in corporate bond markets (though these remain somewhat elevated by historical standards).⁴

Potentially favorable, or at least improving, conditions prevail on the output or final demand side of the equation as well. Although many forecasters have marked down their estimates of GDP growth for the full year 2003, most still expect a pickup in the second half of the year and further acceleration in 2004. High productivity, lower oil prices, reduced geopolitical uncertainty, the waning effects of the stock market decline, and stimulative monetary and fiscal policies should all support spending, providing reasonable growth in final demand. However, a negative factor is weak growth abroad.

When we disaggregate investment to the sectoral level, what do we find? To begin, I mention the two parts of investment that so far have been omitted from this talk: residential investment and inventory

³ The President's proposed tax package contains additional expensing provisions for some types of equipment investment by small businesses.

⁴ Bernanke (2003) discusses the relationship between balance sheet conditions and the economic recovery.

investment. Residential investment was an important engine of growth in 2002, and most forecasters (as evidenced by the Blue Chip survey, for example) expect that it will continue strong in 2003. Inventory investment, by contrast, is generally expected to contribute little in 2003, in contrast to 2002, when this component made a significant net contribution to GDP growth. The risk here is clearly both downside and upside: On the downside, conceivably housing demand may weaken, but on the upside, firms may increase their inventories more than expected if they grow more optimistic about future sales.

With respect to the components of business fixed investment, the chance of a quick rebound in investment in nonresidential structures, particularly office buildings and industrial structures, seems slight. However, given the relatively small contribution of this sector to GDP, even continued (but slower) declines in structures investment would be consistent with an overall recovery in investment and GDP. The more critical sector - because of its size - is investment in equipment and software, particularly high-tech equipment. I have noted some grounds for modest optimism, as the high-tech sector already showed growth in 2002. Moderately improved performance for 2003 in high-tech investment, concentrated in a pickup in the second half of the year, seems feasible and consistent with fundamentals, particularly the continued decline in relative prices and growing replacement demand. Finally, some growth later in the year in non-high-tech equipment, excluding perhaps the relatively small aircraft component, is plausible and consistent with a scenario of strengthening overall investment. In short, a sectoral approach suggests that an investment bounceback of moderate proportions is a reasonable expectation.

Finally, what about investor and analyst expectations and attitudes? I noted earlier that adding analyst expectations to standard investment equations helps to explain the 2000-02 investment bust, as analysts (presumably reflecting what managers told them) became suddenly more pessimistic in 2000. It is interesting that the same exercise has little effect on projections of these augmented equations for 2003-04. In particular, long-term analysts' earning projections appear to be bottoming out, and short-term forecasts are brightening. These trends, if they continue, are consistent with an upturn in investment beginning in the second half of this year.

However, when we talk to managers themselves - or talk to the people who talk to the managers - we sometimes get a different story. Clearly, an undercurrent of pessimism has persisted among business leaders for some time now, more so than can be accounted for by what seem to be the generally good fundamentals of the US economy. For policymakers, the most troubling aspect of this pessimism is our inability to ascertain its cause (or causes): Is it geopolitical uncertainty? The aftermath of the accounting scandals of last summer? Concerns about the ultimate profitability of new technologies and products? The depressive side of Keynesian animal spirits? This pessimism does matter, if for no other reason than because it has the potential to become self-fulfilling. For example, high-tech equipment and software will have to play an important part in any investment recovery this year; and as we have seen, this category may be particularly sensitive to management beliefs and expectations.

Time will tell how pervasive these downbeat attitudes are and what effects, if any, they will have on investment and the economy. In any case, the clear lesson of recent experience is that forecasting investment requires close attention to the expectations of those responsible for making capital expenditures. Understanding these expectations and their implications is yet another challenge that policymakers must face as we do our best to help the economy toward full recovery.