An Excerpt from the February 19, 2004 issue of

Macroeconomic Advisers'

ECONOMIC OUTLOOK

What Happens When the Expensing "Bonus" Expires?

A crucial element of our forecast of strong growth of GDP through 2005 is a persistent increase in capital expenditures. For example, this month's forecast shows business purchases of equipment and software (E&S) growing 15.2% over the four quarters of 2004, then a slower yet still robust 10.2% over 2005. Over these two years, investment in E&S accounts for about ¼ of the growth in real GDP, despite comprising less than 10% of the level of nominal output. Already capital expenditures are accelerating. After declining 9.4% in 2001, business spending on E&S eked out a slight 1.6% advance over 2002, then a more impressive 8.9% over 2003. The most recent data seem supportive of our forecast for even better numbers this year. In particular, real manufacturers' orders for "core" capital goods (i.e., for non-defense capital goods excluding aircraft deflated by the PPI for manufacturers' finished capital goods) have risen roughly 11% above the cyclical trough hit in September of 2002. Furthermore, since bottoming out at 72.6% in May of 2003, the capacity utilization rate in manufacturing had risen almost two percentage points to 74.6% by January, the highest level since late 2001.

What's behind this rebound of investment? Certainly some of the gathering strength of investment owes to the usual "accelerator effects" attendant the cyclical recovery of final sales. In addition, as argued frequently in these pages, the excess or "overhang" of fixed capital that accumulated during the late 1990s has been largely worked down, clearing the way for renewed net investment in nonresidential plant and equipment. There is, however, a third factor to consider: tax legislation enacted in 2002 and 2003 included temporary investment incentives now set to expire at the end of this year. Could it be that these incentives temporarily will boost — are <u>already</u> boosting — capital expenditures in 2004 but then, in 2005, when the incentives expire, that investment will slump, perhaps sharply? The issue is important. By the end of this year, stimulus from last year's personal tax cuts will have faded while defense spending, boosted recently by the costs of war in and occupation of Iraq, is projected to top out in fiscal 2004. Furthermore, monetary policy will become increasingly restrictive if, as we expect, the FOMC begins tightening monetary policy in early 2005, if not sooner. As spending decelerates in those sectors that have most benefited from the recent, unusual confluence of fiscal and monetary stimulus, spending in other sectors must remain robust, or even strengthen, in order to minimize any slowing of the expansion. If the demand for capital goods in 2004 is unusually strong owing to temporary tax incentives, and then weakens dramatically in 2005 just as other policy stimulus is dwindling, the downside risks to the expansion might be larger than generally recognized. Indeed, this very possibility could affect (i.e., delay) the timing of the coming monetary tightening.

Temporary Investment Incentives

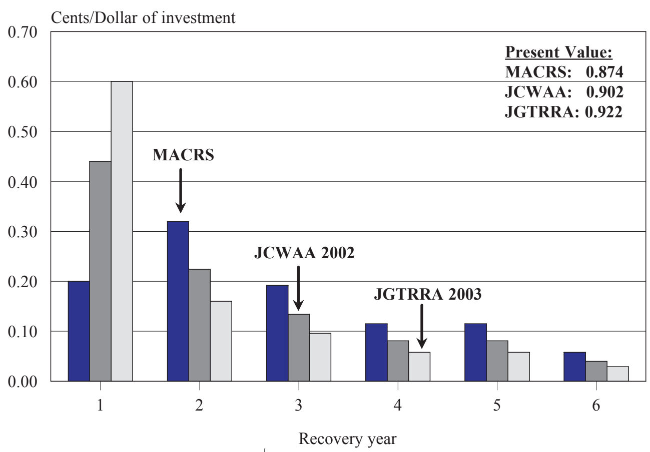
Recent legislation changed many aspects of the income tax code, including the basic rate structure, the differential tax rate on dividends, and the treatment of the Alternative Minimum Tax. In modern investment theory all these changes have a potential impact on the incentive to accumulate fixed capital. Here, however, we focus on a narrower set of changes, namely to the rules governing the depreciation for tax purposes of tangible assets. In this regard, two pieces of legislation are relevant.

231 S. Bemiston
Suite 900
St. Louis, MO 63105
Phone: 314-721-4747
Fax: 314-721-6383
E-Mail:
mail@macroadvisers.com
Visit us on the Web:
www.macroadvisers.com

(1) In March of 2002, President Bush signed into law the Job Creation and Worker Assistance Act of 2002 (JCWAA). Among other things, this "stimulus package" allowed business to "expense" 30% of most E&S purchased between September 11, 2001 and September 10, 2004. The remaining 70% was depreciated under the pre-existing Modified Accelerated Cost Recovery System (MACRS).

(2) In May of 2003, the President enacted the Jobs and Growth Tax Relief and Reconciliation Act of 2003 (JGTRRA). Under JGTRRA, businesses can expense 50% of eligible E&S purchased between May 5, 2003 and December 31, 2004; the other half is depreciated under MACRS. In addition, under JGTRRA, for 2003 through 2005, the limit on "section 179" (or "small business") expensing is increased from $25,000 to $75,000, and the phase-out threshold amount is increased from $100,000 to $400,000. The rationale offered for these changes was that such temporary investment incentives would help jump-start capital spending, which sagged drastically after the stock market collapsed in 2000.

Depreciation Allowances on 5-Year Property



As an example of how the provision of these two Acts affected the rules governing depreciation, consider the nearby chart which, for 5-year depreciable real property that is not written off under section 179, can be used to trace the evolution of depreciation schedules from 2001 through 2005. For example, in the case of eligible E&S acquired under MACRS before September 11, 2001, first-year depreciation charges were 20% of the book value of the investment. Then, for property acquired under JCWAA between September 10, 2001 and May 5, 2003, first-year depreciation rose to 44%. For investments made under JGTRRA between May 5, 2003 and December 31, 2004, first-year depreciation is 60%. Finally, on January 1, 2005, and unless new legislation is enacted, first-year allowances will revert to the 20% prescribed under MACRS. All property acquired during this period is fully depreciated under the rules in place when the property was acquired. Since the entire historical cost of an investment eventually is recaptured in depreciation, the higher the first-year write offs under the various guidelines, the smaller the remaining allowances. This is seen clearly in the chart.

The Analytical Model

Probably the best academic paper applicable to temporary investment incentives is by Alan J. Auerbach and Kevin Hasset, "Tax policy and business fixed investment in the United States," *Journal of Public Economics*, 47 (1992), pp. 141-170. On several past occasions, starting with a proposal, developed during the first Clinton Administration, for a temporary investment tax credit, we have used these authors' analysis to shed light on such issues. We can only hope that with each successive rendering our exposition gets clearer and more insightful!

While the mathematics in the paper by Auerbach and Hasset are complex — involving imaginary roots of quadratic difference equations — their analysis can be reduced to a few simple expressions familiar to most macroeconomists. For example, the optimal flow of gross investment expenditures during period t, I_t , is given by:

$$I_t = (g + \delta)K_{t-1} + \lambda(K^*_{t-1} - K_{t-1}) \quad (1)$$

where g is the trend growth rate of the capital stock, δ is the depreciation rate of fixed capital, K_{t-1} and K^*_{t-1} are, respectively, the actual and desired capital stocks at the beginning of the period, and λ is the proportional speed of adjustment. Expression (1) is just a stock adjustment model of investment, derived by maximizing the value of a firm that is subject to technological constraints imposed by production technology and which faces (quadratic) adjustment costs when endeavoring to change its capital stock relative to the trended value. The speed of adjustment is itself a complicated function of the parameters from the underlying function that determines adjustment costs. The evolution of the capital stock through time is governed by the familiar equation of motion:

$$K_t = I_t + (1 - \delta)K_{t-1} \quad (2)$$

The desired capital stock at the beginning of each period is a function of the weighted average of current and expected future values of the rental-equivalent price of investment, c_s :

$$K^*_{t-1} = F'^{-1}\left(\sum_{s \geq t} w_{s-t+1} E_t(c_s)\right) \quad (3)$$

where F is a neo-classical production function in capital and labor, and E_t is the expectations operator. This expression simply states that the optimal capital stock is the one that equates the marginal product of capital to a forward-looking average of expected rental prices. The rental price itself is defined:

$$c_s = \frac{p\tilde{A}_s\left(\rho - \pi + \delta - \frac{\tilde{A}_{s+1} - \tilde{A}_s}{\tilde{A}_s}\right)}{1 - \tau} \qquad \tilde{A}_s = 1 - \tau z_s \quad (4)$$

where p is the relative price of investment goods, τ is the corporate rate, ρ is the nominal after-tax rate of return, π is the expected inflation rate on capital goods, and z_s is the present value of depreciation allowances per dollar of nominal investment. Since our focus here is on temporary changes in depreciation rules, z_s is a function of time, but all other variables and parameters in expression (4) for the rental price are assumed fixed. Finally, the weights assigned to current and anticipated values of the rental price are:

$$w_s = \frac{\rho - \pi + \delta}{(1 + \rho - \pi + \delta)^{s-t+1}} \quad (5)$$

Given the depreciation rate, and for a fixed real rate of return, these weights decline geometrically into the future.

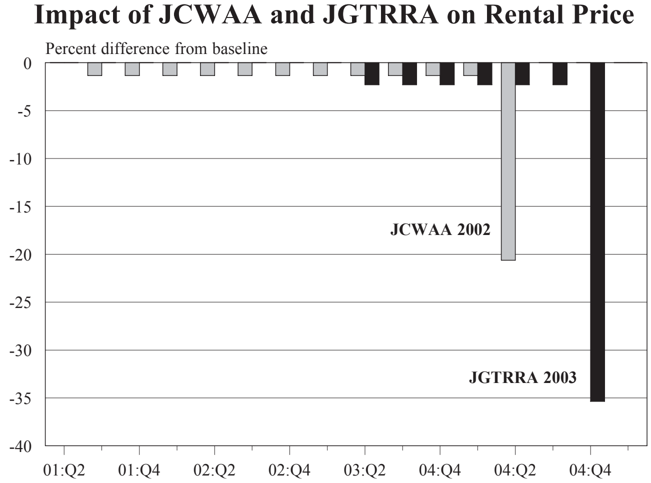
Insights from the Model

This model, while relatively simple, is actually quite rich with insights. For one thing, and to state the obvious, current investment, through the desired capital stock, depends not only on the current rules that govern depreciation, but also on the rules anticipated in the future. Hence, the expected expiration of the expensing provision at the end of this year has the potential to influence investment spending before the expiration occurs.

Another key insight is that the rate of decay in the weights associated with anticipated values of the rental price depends on the durability of capital. The less durable is capital, the larger is δ, the faster the weights decay, and the less important are future rules governing depreciation in determining current investment. Thus, if the economic life of capital is much shorter than the duration of a newly introduced incentive, the fact that the incentive is temporary is unimportant, at least initially. The logic of this is easy to fathom. If capital wears out quickly, the eventual rescission of an investment incentive several replacement cycles hence should have little bearing on current investment decisions. Instead, the immediate reaction of investment to the introduction of a temporary incentive won't differ much from the reaction to a permanent incentive. However, if capital is relatively long-lived, so that the incentive expires during the life of the capital purchased under the incentive, the initial distinction between a temporary and permanent incentive might be important.

Next, note that expression (4) for the rental price of investment includes the expected rate of change in the wedge, $\tilde{A}_s$, in a manner analogous to the inclusion in (4) of the expected rate of change in the nominal price of investment goods. Indeed, $\tilde{A}_s$ can be interpreted as converting the notional price of investment goods into an effective (i.e., allowing for the tax advantages of depreciation) price; hence the parallel treatment of π and $\tilde{A}_s$ in (4). Usually the expected rate of change in $\tilde{A}_s$ is missing from the textbook exposition in which it typically is assumed that either: (a) future depreciation schedules are fixed; or (b) expectations of depreciation rules are myopic. If the issuance of new guidelines governing depreciation is either a complete surprise or is made retroactive to a time that pre-dates serious speculation about the possibility of new rules, this term is inoperative. However, when a pending change in rules is anticipated, the term becomes extremely important because through it an increase (decrease) in the present value of depreciation allowances temporarily increases (decreases) the rental price one-period earlier than the new rules are implemented. Furthermore, the effect, although brief, can be really large.

Impact of JCWAA and JGTRRA on Rental Price



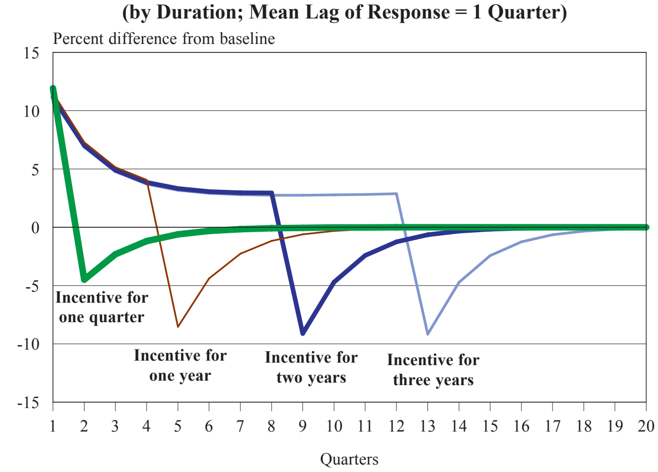
To understand this, consider the nearby chart, which shows, for newly-acquired 5-year property, the impact on the contemporaneous value of the rental price, from the second quarter of 2001 through the first quarter of 2005, of changes in depreciation rules implemented under both JCWAA and JGTRRA. These calculations assume fixed representative values for the real after-tax rate of return (= 7.7%), the effective corporate (including state and local) tax rate (=33.8%), an economic depreciation rate of 20%, and the same path for the present value of depreciation shown in the earlier chart. In addition, it is assumed that because the new depreciation rules outlined in both Acts were either retroactive to an earlier date or largely unanticipated, the expected rate of change in $\tilde{A}_s$ in (4) was inoperative when these two pieces of legislation were enacted. The light gray bars show the impact that JCWAA would have had were it not later superceded by JGTRRA. The effect would have been to reduce the rental price by about 1.3% from the third quarter of 2001 through the first quarter of 2004 and then, in the second quarter of 2004 — one quarter before the incentive was scheduled to expire — by a whopping 20.6%. When JGTRRA (the black bars in the chart) was implemented in the second quarter of 2003, one effect was to reduce the contemporaneous rental price by 2.3% relative to the baseline, compared to the 1.3% under JCWAA; this is the difference between a 50% expensing bonus as opposed to a 30% bonus. In addition, JGTRRA delayed by half a year, until the fourth quarter of 2004, an even bigger 35.4% temporary reduction of the rental price.

In the Auerbach-Hasset model, as the these sharp changes in rental prices approach, their weight in raising the desired capital stock increases, with a growing potential to encourage an optimizing firm to pull some investment forward from after the expiration of the incentive to before it. The presence of these spikes, however, does <u>not</u> guarantee that investment necessarily spurts immediately before the expiration of the incentives, and then "craters" after it, for two reasons. First, after the incentive expires, the anticipated rental price is <u>higher</u> than beforehand — forever. As mentioned above, especially for long-lived capital, forever gets a high weight. Furthermore, whether investment responds much to the approaching spike depends partly on adjustment costs faced by the firm. If adjustment costs are very high, then   is very small in equation (1) and investment may respond very little, even to a sizable, albeit temporary, decline in the rental price. In summary, the response of investment over time to a temporary incentive results from a complicated interaction between the value of the incentive, its anticipated duration, the durability of capital in question, and the speed of adjustment of the actual towards the desired capital stock. This response is far more complex than one might think from reading press accounts suggesting that investment necessarily must peak dramatically this year before then falling off a cliff early next year.

Some Examples of How Parameters Matter

It is possible, however, to concoct cases in which the Auerbach-Hasset model does, in fact, produce this sort of result. For example, the nearby chart shows, relative to a no-incentive baseline, the impact of introducing over different durations a temporary 50% expensing bonus on purchases of short-lived computers and software assuming a very fast speed of adjustment. In these simulations, the investments are assumed to have a 5-year service life while the economic depreciation rate, taken from our econometric model, is about 33% per year. The relative price of capital is assumed to fall about 1.5% per quarter, while the nominal rate of return and the corporate tax rate are fixed at recently observed values. In each case, the introduction

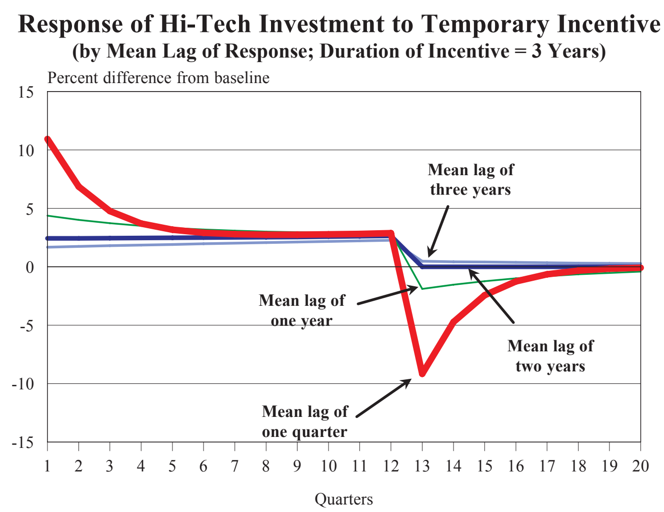
Response of Hi-Tech Investment to Temporary Incentive
(by Duration; Mean Lag of Response = 1 Quarter)



of the incentive is treated as a surprise, but the duration of the incentive is then considered to be known with certainty. The mean lag of the assumed adjustment process is just one quarter.

For example, if the incentive is expected to last just one quarter, the effect is to boost investment by roughly 12% when the incentive is introduced, and then reduce it almost 5% when the incentive is rescinded — a swing of nearly 18%! The other three lines on the previous chart show the cases in which the incentive is enacted for one year, two years, and three years. Note that in each case, the biggest effect on investment is not in the quarter before the incentive *expires*, but in the quarter the incentive is *introduced*. Indeed, in these examples, there is a tendency for investment to be weakening as the expiration approaches. When the incentive does expire, investment undershoots the baseline by 5% to 10%. This decline permits the capital that, after the incentive expires is no longer desired, to be worked off at an optimal pace. Eventually investment rises back towards the baseline. Hence, at least with a fast speed of adjustment, there is an inter-temporal shift of gross investment from after the expiration of the incentive to the time of its introduction.

However, the speed of adjustment is critical in shaping this profile. To demonstrate this, we ran a second series of simulations in which, for the same high-tech capital, the duration of the incentive was held constant (at three years) while the mean lag of the response was raised from one quarter, to one year, then to two years, and finally to three years. The effect is dramatic, as seen in the nearby chart. The slower the partial adjustment process, the smaller is both the initial increase in investment and the decline that occurs as the incentive expires. For relatively slow adjustment, there is no undershooting of investment after the incentive expires. When the speed of adjustment falls low enough relative to the depreciation rate, there is a tendency, albeit only a slight one, for the effect of the incentive to rise monotonically as the date of expiration approaches. Nevertheless, the biggest quarterly increase occurs when the incentive is introduced, not immediately before it expires.



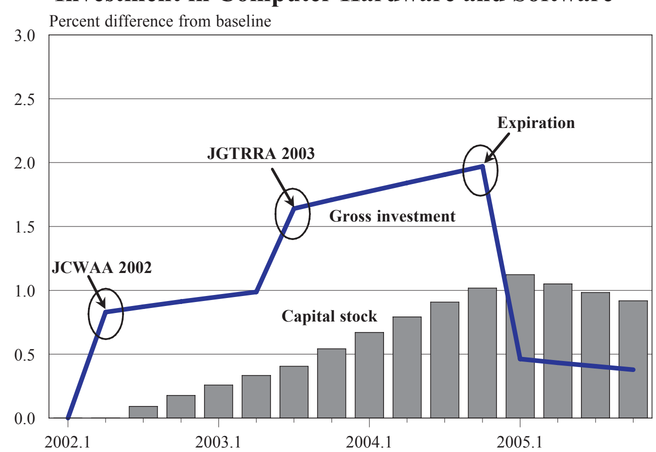
Using the Model to Simulate the Expensing Bonuses

The model can be used to assess the impact on investment of the expensing bonuses in JCWAA and JGTRRA. To do so, however, requires us both to make some assumptions and to parameterize the model as best we can. The key assumptions have to do with what firms anticipated before and after the enactment of both JCWAA and then, later, JGTRRA. Because JCWAA was signed into law in March of 2002 with investment provisions retroactive to September 10, and because there was little or no speculation beforehand regarding the expensing provision, we think it is sensible here to treat those provisions as a "surprise" in the second quarter of 2002. A more complex question is what expectations the legislation engendered. In particular, did firms anticipate that the provisions would expire in September of 2003 as originally written in the legislation, or did they assume instead that the provisions might be extended — as they later were under JGTRRA — or even made permanent? The latter possibility cannot be dismissed casually since earlier, with the enactment of the Economic Growth and Tax Relief Reconciliation Act of 2001 (EGTRRA), the Administration established a precedent of introducing "temporary" changes in the tax code even as it argued its intent to make them permanent later on. Nevertheless, we've decided to assume that firms anticipated that the 30% expensing bonus incorporated into JCWAA would expire as initially scheduled, and then were surprised a second time in May of 2003 when JGTRRA upped the bonus to 50% and extended the provision through the end of 2004.

In our econometric model we disaggregate purchases of equipment and software into two components. The first combines computer hardware, peripherals, and software, while the second comprises all other equipment. The depreciation rate on the former is 33% per year and, on the latter, 13% per year. The adjustment speeds that we have estimated are quite slow because we've found that the investment equations that fit the historical data best are ones that assume capital is "putty-clay" in nature. Hence, the speed of adjustment for computers and software is roughly 28% per year, and for other equipment about 10% per year. (These may seem slow but, in fact, are actually faster than the range, 6.6%-9.0%, estimated by Auerbach and Hasset.) The nominal rate of return, the corporate tax rate, and the relevant inflation rate were assumed constant at recent representative values.

The results for computers and software are shown in the nearby chart. The model suggests that with the implementation of JCWAA, gross investment rose initially by about 0.8 percent relative to a baseline without incentives, and then about another 0.7 percent with the passage of JGTRRA. There is a gradual increase in the impact of the incentive as the (final) expiration dates approaches, so that by the end of this year the effect will rise to almost 2% above the baseline. Then, with the expiration of the incentive, investment drops by about 1.5%, before then drifting gradually lower. The impact on the stock of computers and software rises to a peak slightly greater than 1%, and then starts to fade gradually. The chart implies that the temporary incentive contributed about 0.9 percentage point to the growth of EPDC over the four quarters of 2002, and 0.8 percentage points over 2003, and will contribute about ¼ percentage points this year before then subtracting 1.6 percentage points over 2005. The corresponding figures for other equipment (see the nearby chart) are 1.3 percentage points over 2002, 1.1 over 2003, 0.1 over 2004, and -2.2 points over 2005. Measurable, to be sure, but really pretty moderate on the economic Richter scale!

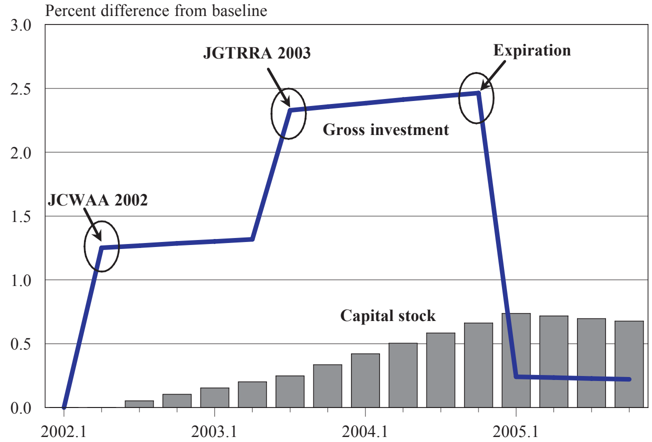
Impact of Temporary Expensing Bonuses on Investment in Computer Hardware and Software



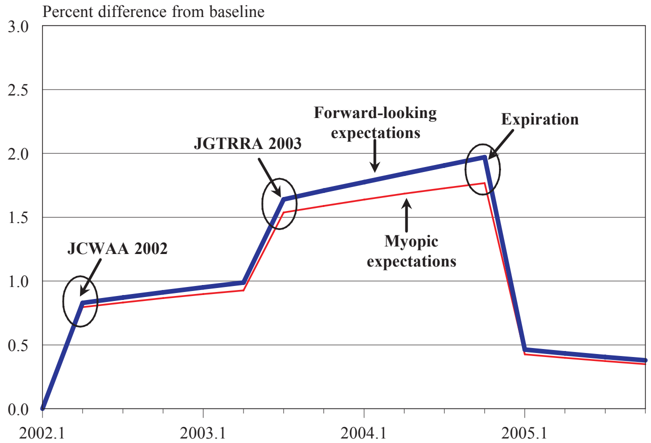
Expensing and Investment in the Forecast

MA's commercial econometric model does not incorporate the forward-looking elements found in the Auerbach-Hasset model. In essence, we simulate the expensing provisions as if businesses myopically viewed the incentive as permanent upon implementation, and con-

Impact of Temporary Expensing Bonuses on Investment in "Other" Equipment



Impact of Temporary Expensing Bonuses on Investment in Computer Hardware and Software



tinue to do so until the day the incentive expires. This may sound like an egregious mistake. However, in the Auerbach-Hasset model, as a result of two offsetting factors, the response of investment to a temporary incentive under forward-looking expectations is practically identical to the response of investment under myopic expectations when the incentive initially is viewed as permanent but then later expires. On the one hand, under myopic expectations the change term in (4) disappears, and its absence reduces the response of investment to an incentive while it is in effect. On the other hand, if businesses respond as if the incentive will last forever, the effect is to magnify the response of investment. These two factors roughly cancel each other out! This is seen in the nearby chart, which shows, given our calibration of the Auerbach-Hasset model, the response of investment in computers and software to the temporary expensing provisions under the different assumptions regarding expectations. With forward-looking expectations, the impact peaks slightly higher immediately before the incentive expires, but the difference is slight. Really, there's not much to differentiate these two paths.

This result leaves us feeling comfortable with the manner in which we're implementing the temporary incentives in the forecast, despite our own "shortsighted" modeling of expectations. The expensing provisions have been boosting the level capital expenditures modestly since late in 2001. When the incentive expires at the beginning of next year, the rental price of equipment and software will rise, restraining the growth of investment demand. Simulations with our econometric model suggest that the expiration of the incentive will trim about 2 percentage points from the growth of spending on E&S over the four quarters of 2005, and only about 0.1 percentage point from growth in GDP. This is really quite small compared to the impact on growth late in 2005 from the fading stimulus of tax cuts and deceleration in federal discretionary spending we anticipate.