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John R. Graham
Hyunseob Kim

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ABSTRACT

We investigate how the length of the net operating loss carryback period affects corporate liquidity and marginal tax rates. We estimate that extending the carryback period from two to five years, as recently proposed in President Obama's budget blueprint, would provide $19 ($34) billion of additional liquidity to the corporate sector for 2008 (2009). Our calculations imply that the benefits of the extended carryback period would be concentrated in the homebuilding, automobile, and financial industries. Extending the carryback period would increase the marginal tax rate of loss firms by more than 200 basis points on average, which all else equal would lead corporations to use an additional $8 ($10) billion of debt and reduce tax payments by another $1.2 ($1.5) billion in 2008 (2009). Overall, the tax break proposed by the Obama administration would have a significant liquidity effect on corporations suffering large losses in recent years. If the tax proposal were extended to include TARP firms, the liquidity effect would triple in size.

John R. Graham
Duke University
Fuqua School of Business
One Towerview Drive
Durham, NC 27708-0120
and NBER
john.graham@duke.edu

Hyunseob Kim
Duke University
Fuqua School of Business
One Towerview Drive
Durham, NC 27708-0120
hyunseob.kim@duke.edu

Introduction

In January 2009, then-President-elect Barack Obama and congressional Democrats proposed a $300 billion tax cut package. One proposal was to increase the length of the net operating loss (NOL) carryback period from two years to five years for losses realized in 2008 and 2009. The loss carryback feature of the tax code allows corporations to obtain a refund today for taxes paid in the recent past. For example, with a five year carryback period, losses experienced in 2008 could be carried back and used to offset positive income earned during the period 2003 to 2007, and tax payments associated with this offset income would be refunded in 2008. The proposed increase in the carryback period would be particularly helpful for the corporate sector given that many U.S. corporations paid record-level income taxes during the economic boom from 2003 to 2007 but are not expected to be profitable in 2008 and 2009.

The initial proposal was anticipated to apply to businesses of all sizes. However, the final stimulus package (called the "American Recovery and Reinvestment Tax Act of 2009") restricts the extension of the carryback period to businesses with revenues under $15 million a year. Moreover, the bill allows those small businesses to carry back losses that occurred in tax years beginning or ending in calendar year 2008 only, instead of both 2008 and 2009.

At the time of this writing (May 2009), however, the Obama administration is once again considering whether to expand the carryback extension to large firms for both years 2008 and 2009, as laid out in the $3.6 trillion budget blueprint, which includes about $18.5 billion of anticipated tax relief via the extended tax-loss carryback period (Corkery and Drucker, 2009). Given this context, we examine the economic consequences of extending the carryback period to five years. In particular, we study loss carryback effects using two types of evidence. First, we estimate the aggregate amount of liquidity that the federal government would provide to the

corporate sector via additional tax refunds by increasing the carryback period for 2008 and 2009. This exercise also amounts to estimating the cost of the tax cut to the U.S. federal government. Second, we examine the effect of the carryback extension on corporate marginal tax rates (MTRs), and in turn the effect that the change in MTRs would have on the corporate proclivity to use debt financing. Our analyses of large firms and the year 2009 are hypothetical. However, given that an earlier tax cut plan included firms of all sizes and covered both 2008 and 2009, and particularly because this plan can be revived through the federal budget process, we think that our analysis is relevant to corporations and policymakers.

Estimating the liquidity that corporations would receive through extending the length of the carryback period involves developing a complex algorithm to compute taxable income adjustments and tax refunds under various carryback periods. Furthermore, because we do not have access to the corporate tax return data, we are constrained to rely on public data sources (e.g., Compustat) and financial statement data. Therefore, we start by benchmarking our algorithm and estimates of taxable income data by replicating Cooper and Boynton (2004, CB), who look at the effect of the NOL carryback period change for 2001. Importantly, CB have access to actual Internal Revenue Service corporate tax return data via the U.S. Department of the Treasury. Hence, if we are able to approximate the results in CB (2004), it will provide some reassurance that our algorithm and taxable income data sources are reasonable.

Table 1 shows that our approach closely matches CB's analysis of 2001. Even though our sample consists of a smaller number of firms, Panel A shows that aggregate total assets and taxable income in our replication are similar to those of CB. More importantly, our calculation of tax-loss carrybacks and tax refunds under the carryback period of one through five years matches very closely with that in CB. For example, CB show that total tax refunds for the two (five) year

carryback period were about $11.9 ($22.3) billion in 2001, and our computation produces an estimate of $13.3 ($23.5) billion. Overall, the replication results suggest that our approximation of the tax return data and relevant tax code is close to the actual data and algorithm.

Given that our approach seems reasonable, we proceed to analyze the hypothetical effects of a five-year carryback period in 2008 and 2009. The rest of the paper proceeds as follows. In Section 1, we illustrate the economic impact of the extension of the tax-loss carryback period by examining a sample firm, Pulte Homes, for 2008. Section 2 discusses issues related to sample construction and summary statistics for our samples. In Section 3, we discuss the liquidity effect of the tax-loss carryback period change on the corporate sector. In Section 4, we examine changes in corporate marginal tax rates due to the tax break and the consequences for corporate debt usage. Section 5 investigates the implications of excluding the firms aided by the Troubled Asset Relief Program (TARP) from the tax relief. The final section concludes.

1. An Illustration: Pulte Homes, Inc.

To illustrate the economic effects of the proposed tax relief on corporations, we examine the expected tax refund and change in the marginal tax rate for Pulte Homes, Inc., one of the largest home builders in the U.S. Pulte is a good candidate to illustrate the potential impact of the carryback period increase because like most home builders, it paid a record amount of income taxes over the 2003-2006 housing market boom but experienced large losses in 2007 and 2008. Therefore, it would be one of the biggest beneficiaries of the tax cut, if the carryback period were to be increased to the proposed five years. Reports indicate that the 13 largest home builders are expected to recoup about $2.4 billion of tax refunds in 2009 by electing the five-year carryback rule (Corkery and Drucker, 2009).

Table 2 shows that according to our calculations, Pulte Homes recorded about $2.0 billion of tax losses in taxable year 2008 alone. It also recorded about $2.7 billion in losses in 2007 but saw comparable profits in each year from 2003 to 2006 (see Column "Taxable Income" for detailed figures). Therefore, the firm would have carried a large part of the losses in 2007 back to 2005 and 2006 (i.e., exploiting the standard two-year carryback rule) to generate a substantial tax refund. For taxable year 2008, if the tax-loss carryback period remains at the current two years, the company would expect to carry back only $1.1 billion out of a total loss of $2.0 billion, receiving $386 million in a 2008 tax refund. In contrast, if the carryback period is extended to five years, Pulte would be able to carryback all of the current year's losses ($2.0 billion) to offset tax liabilities from an additional three years (2003-2005) when the firm was highly profitable. As a result, the company would be eligible for a tax refund of $695 million, which is an increase of $309 million from the refund based on the standard two-year carryback. Given that this *incremental* tax refund amounts to about one-fifth of Pulte's average after-tax income earned during the 2003-2006 boom years, the liquidity effect of the proposed increase in the carryback period appears substantial, at least in the case of Pulte Homes.

In addition to providing corporations with liquidity, an increase in the length of the carryback period can also affect corporate marginal income tax rates. Recall that a MTR measures the present value tax consequences of earning an extra dollar of income today. As an example, consider a firm that made $1 million annually, each year from 2003 to 2007, and expects to earn $1 million in annual profits from 2009 on. If the company had a $5 million loss in 2008, under standard two-year carryback rules, it would carry back two-fifths of the loss to receive (in 2008) a refund for taxes paid in 2006 and 2007. This company would then carry forward the remaining $3 million loss to shield income in 2009, 2010, and 2011 from taxes. Now

let's determine this company's MTR, assuming a discount rate of 10% and a tax rate of 35%. If this company were to earn an extra dollar of income in 2008, this would mean its loss would be only $4,999,999 in 2008, and the company would have one less dollar of loss to carryforward to shield income in 2011. Therefore, under the two-year carryback rules, this company's MTR on an extra dollar of 2008 income is 26.3% ($=35\%/(1+0.1)^3$). Now, if the carryback period were extended to five years, the company would carry back *all* of its 2008 loss, to receive refunds for taxes paid from 2003 to 2007, and have nothing left to carry forward. To determine this firm's marginal tax rate, we add $1 to 2008 income. Now the firm's tax refund is $0.35 smaller in 2008, so earning an extra dollar in 2008 results in 2008 taxes that are $0.35 higher, or a MTR of 35%. Therefore, in this simple example, the effect of extending the carryback period to five years is an increase in the company's MTR from 26.3% to 35%.

Turning back to Pulte Homes, Panel B of Table 2 shows that the estimate of the marginal tax rate[1] for Pulte Homes in 2008 is only 3.3% in the two-year carryback period scenario. Note that Pulte's MTR is not zero, even though it is not profitable in the current year. This is because in 2008 it can (i) carry a part of current losses back to year 2006 (but not to 2007, because it was a loss year), and (ii) carry forward the remaining losses up to 20 years, shielding some of the taxes that would be paid in future profitable years. The effect is that the marginal tax rate is far lower than the top statutory rate (35%) because the firm experiences large losses, so there is a substantial tax-loss carryforward (pushing the consequences of earning an extra dollar today far into the future). In contrast, if the firm is allowed to carry back losses to the past five years, Pulte is able to carry back *all* losses that occurred in 2008. As a result, tax losses in 2008 are

[1] See Section 4 for a description of the procedure to estimate the marginal tax rate.

completely offset by past profits and the firm's MTR in 2008 equals the top statutory marginal tax rate (35%).

The marginal tax rate affects many corporate decisions, including compensation, hedging, and debt policy. In particular, an increase in the MTR from 3.3% to 35% could lead to non-trivial changes in corporate debt usage because any increase in the marginal tax rate implies an increased tax benefit of incremental debt. We return to this issue in detail for a broad sample of firms in Section 4. Overall, results in this section illustrate how an increase in the length of the NOL carryback period can provide substantial liquidity in the form of a tax refund to a tax-loss firm and also alter its marginal tax rate.

2. Sample Construction and Summary Statistics

We use Compustat data to investigate the implications of increasing the tax-loss carryback period for 2008 and 2009. Before discussing the sample construction procedure, we note several caveats of using Compustat data to compute taxable income and tax-loss carrybacks. First, given that we do not have access to the tax return data, we can only approximate the true taxable income and tax liability of firms using Compustat variables, which are based on financial statement filings. Second, the Compustat-based taxable income measure we construct includes income from operations outside the U.S., which is generally not taxable under the U.S. tax code. Third, for simplicity we ignore some features of the tax code that can affect corporate tax liabilities such as the alternative minimum tax (AMT) and various tax credits. Despite these caveats, as far as we can tell our computations yield results close to those based on actual U.S. tax return data, given that our results from replicating Cooper and Boynton (2004) are consistent with their original results as shown in Table 1.

We construct our sample from firm-quarter observations in the Compustat quarterly database for taxable years ending in 2008 and 2009. We require that taxable income data are available for *all* of the past five years to compute the five-year tax-loss carryback and that total book assets are at least $1 million to exclude firms that potentially have noisy data. For this sample of firms, we construct annual data for 2008 and 2009 using the Compustat and Standard and Poor's Research Insight databases as described in Appendix A. In particular, the appendix discusses how we fill in missing data for 2008 and forecast data for 2009. Note that in our main analysis, we exclude Fannie Mae, Freddie Mac, and firms that received funds from the Troubled Asset Relief Program (TARP) of the U.S. federal government[2] (hereafter referred to as "TARP firms"), because the original Senate proposal as well as the recently proposed budget blueprint suggests that it would not allow those firms to elect the five-year carryback period. However, in Section 5, we repeat part of the analysis for all firms *including* those bailed out by government funds to examine the potential impact of the tax break if TARP status were not considered in the application of the 5-year carryback extension.

Table 3 presents summary statistics for samples that exclude (Panel A) and include (Panel B) the TARP firms. Both in 2008 and 2009, about one-half of the firms in the samples record net losses. The aggregate return on assets, computed as the ratio of aggregate taxable income to total assets, ranges from -9.0% to -6.1% (from 0.0% to 3.4%) for loss (all) firms across samples and years. Overall, the statistics in this table suggest that the effect of the economic downturn on corporate profitability is severe and many firms in our sample suffer (are expected to suffer) tax losses in 2008 (2009).

[2] Notable firms that have received TARP funds include AIG, Citigroup, and General Motors. The bailout of Fannie Mae and Freddie Mac is separate from the TARP and instead was authorized by the Housing and Economic Recovery Act of 2008, which was passed in July 2008.

3. Liquidity Effect of Increased Carryback Period Length on Corporate Sector

Table 4 presents our estimates of tax-loss carrybacks and tax refunds for the firms in the non-TARP sample in 2008 and 2009. If the carryback period is two years for 2008, about $102 billion (29% of total losses) would be carried back to offset past tax liabilities from the previous two years.[3] Consequently, companies in the sample would generate an aggregate tax refund of $36 billion. Strikingly, if the proposed five-year period is implemented for small and large firms, and thus they can use losses from 2008 to offset the past five years (2003-2007) of taxable income, the total amount of tax-loss carryback would be about $158 billion (45% of total losses incurred during the year). Thus, extending the carryback period increases the carryback amount by 54%. Importantly, the incremental cash infusion to the corporate sector from moving from a two-year to five-year carryback period amounts to $19 billion (and the total tax refund is $55 billion, which equals the $36 billion under the two-year carryback plus an incremental $19 billion if the carryback period is extended).

Our calculations suggest that the change in the carryback period would generate an even larger incremental tax refund in 2009. If firms are allowed to apply their 2009 losses to profits earned during the previous five years, the anticipated 2009 tax refund would almost double from the figure based on the two-year carryback (from $42 billion to $76 billion).[4] This *incremental* tax refund to corporations due to the increased length of the carryback period amounts to 31% of the average aggregate taxable income over the previous five years ($19 billion / $62 billion) for taxable years ending in 2008 and 47% ($34 billion / $73 billion) for taxable years ending in 2009.

[3] Note that all calculations, including this $102 billion, are above and beyond carrybacks and carryforwards that already occurred based on losses from 2007 and earlier.
[4] This is above and beyond carrybacks that would occur with a five year carryback period in 2008.

The flip side of this increase in tax refund is a decrease in federal tax revenue. According to our computation, the proposed tax break would reduce federal tax receipts by $19 billion and $34 billion for taxable years ending in 2008 and 2009, respectively.[5] This is a significant cost for the federal government, particularly compared to the tax revenue reduction of $35 billion for taxable years ending in 2001 and 2002 combined when a similar tax break was applied.

3.1 Who are the Winners?

In this section, we examine by industry the amount of an additional tax refund due to the proposed tax break. Table 5 classifies firms into industries according to their three-digit SIC code and reports the ten industries that are expected to receive the largest tax refund. Unsurprisingly, many industries in the financial sector, such as surety insurance, savings institutions, and commercial banks, represent the top beneficiaries in 2008 and 2009.[6] As mentioned in the media, the home building industry would be one of the top beneficiaries of the tax cut both in 2008 and 2009, with an estimated additional tax refund of $6.4 billion over the two years. One notable pattern in the table is that the top 10 industries account for more than 60% of the tax refunds provided to the corporate sector. Thus, it appears that the benefit of the increased tax-loss carryback period is concentrated in a few industries, including financials and home builders. These are industries with record profits in 2003-2006 and huge losses in recent years.

[5] The Department of the Treasury estimates that the initial revenue cost of the tax cut would be $63.5 billion, which is similar to our estimate of $53 billion for 2008 and 2009 combined. Our estimate is conservative in the sense that we assume that firms would choose to elect the five-year carryback rule for taxable years *ending* in 2008 or 2009, while the federal government is expected to allow firms to choose either taxable years *ending or beginning* in 2008 or 2009 to apply the extended carryback period. This flexibility may explain part of the discrepancy between the two estimates.

[6] Note that the sample *excludes* some of the largest financial institutions that record large losses in 2008 and 2009 because we excluded the firms we were able to identify as having received government funding.

3.2 Are Large Firms Benefited More than Small Firms?

After an increase in the length of the tax-loss carryback period was first proposed, small home builders argued that if the tax break were applied to firms of all sizes, it would greatly benefit large builders and allegedly put small builders at a competitive disadvantage. They argued that if large builders were allowed to use the expanded five-year loss carryback provision, they would take a "big bath" by dumping their properties for artificially low prices to take advantage of the extended loss carryback period (Corkery, 2009). Small builders claimed that if the large builders were to have "asset fire sales," they would suffer large losses because of the depressed property prices, which might even result in many of the small companies going out of business. In fact, this friction between small and large home builders is thought to be one of the key reasons that large corporations were excluded from the tax provision at the last minute.

In this section, we examine whether the extended carryback period would indeed benefit large firms more than small firms if it is implemented equally for both groups. Although our analysis is not directly related to the big bath argument stated by the small home builders, we believe that it sheds light on the broad question of whether the benefit of the tax break varies for different groups of firms. Since the implications from this analysis for 2009 are very similar to those for 2008, we only report results comparing small and large corporations for 2008.

Results in Table 6 imply that by one measure large firms would possibly benefit disproportionally. Among the 1,892 loss firms in the 2008 sample, the largest half of firms (with mean total assets of $5.2 billion) are expected to receive an additional tax refund that amounts to 5.7% of their total losses, while the smallest half of firms (with mean total assets of $42 million) are expected to generate an incremental refund of only 1.3% of total losses. This result is driven by the fact that small firms record larger losses (with an aggregate return on assets of -37%) than

large firms (with an aggregate return on assets of -7%) but they cannot recoup a proportional amount of tax refund by carrying-back the losses because the losses are quite large compared to profits made over the recent two to five years. However, if we scale the tax refunds by total assets, both large and small groups of firms appear to receive similar amounts of tax relief, namely 0.39% to 0.47% of total assets.

In sum, compared to large firms, small firms suffer larger losses but receive tax refunds for a smaller portion of their losses – this occurs not due to larger losses but due to smaller past profits. In this sense, small corporations might be thought of benefiting less than large firms from the carryback tax relief. If large firms were to take a big bath to magnify losses in 2008 or 2009, this would accentuate the benefit to them of the carryback extension (while small firms would benefit less if at all because on average they already have exhausted the ability to fully utilize current losses, even before taking a big bath). Besides noting this carryback effect, we do not take a stand on whether the tax break would provide a competitive advantage to large firms.

4. Expected Changes in Marginal Tax Rate and Debt Usage

One important impact of an increase in the tax-loss carryback period is a change in the corporate marginal tax rate. The marginal tax rate is an input into many corporate decisions such as capital structure, the cost of capital, and capital budgeting. Therefore, any significant change in MTRs may affect corporate policies regarding these decisions. In this section, we examine the extent to which the tax break changes corporate MTRs. Following the extensive literature on marginal tax rates, we measure the economic MTR as the present value tax consequences of earning an extra dollar of income today (Scholes et al., 2008). The current tax code allows firms to carry losses that occur today back in time, or alternatively to carry losses 20 years into the

future. Due to these dynamic features of the tax code, it is necessary to forecast taxable income in the future to determine the current-period economic MTR. In this paper, we employ the random walk model pioneered by Shevlin (1990) and Graham (1996b) to forecast future taxable income.[7] In the interest of brevity, we abstract from the details of the estimation method using random walk simulation and refer interested readers to Shevlin (1990) and Graham (1996b).

Table 7 shows that extending the tax-loss carryback period to five years causes changes in marginal tax rates on the full sample of firms (Panel A) and among loss firms (Panel B) in the sample. As discussed in the introduction, an increase in the carryback period would lead to higher (or at least no change in) MTRs for firms that experience losses. In contrast, MTRs for profitable firms would not change even if the carryback period is extended, because they do not have current losses to apply to past profits.[8] Therefore, we focus our discussion on loss firms in this section. In general, for firms that experience current period losses, the increase in the length of the carryback period is expected to lead to non-trivial changes in MTRs. For 2008 (2009), the mean marginal tax rate would change from 12.5% to 14.9% (from 13.5% to 15.7%). Particularly, the MTR of the loss firms at the 75th percentile in 2008 (2009) would increase from 19% to 27% (from 19% to 34%).

Panel C of Table 7 sorts the loss firms into six MTR groups and shows that there is considerable cross-sectional variation in changes in the MTR conditioning on the original two-year-carryback MTR. For the firms whose two-year-carryback MTR is very close to the top rate, MTRs would not change much even if the carryback period is expanded to five years. However,

[7] Recently, Graham and Kim (2009) show that using an alternative AR(1) income forecasting model can improve the estimation of the MTR. However, the qualitative results for the analysis in this paper, particularly changes in MTRs, are virtually the same whether the random walk or AR(1) model is used for income forecasting. Given the long-standing tradition of using random walk simulation, we present those results here.

[8] We ignore possible corporate behavioral adaptation to an extended carryback period, such as corporations taking big baths in 2008 or 2009.

for the other MTR groups, the marginal tax rate would increase by 1.8% to 4.1% on average due to the tax break. Overall, the results in the table indicate that for many of the loss firms, the proposed change in the tax code would have a material effect on their MTRs.

To gauge the economic importance of these changes in MTRs, we study corporate debt policy. In particular, we determine the amount by which corporations' incremental debt usage may increase, once the carryback period increases to five years, based on the estimated change in corporate MTRs. Graham (1996a) estimates that *ceteris paribus* a firm would increase its debt-to-value ratio by 0.069% when its MTR goes up by 100 basis points. We apply Graham's (1996a) result to estimate an increase in corporate debt usage responding to the change in the marginal tax rate due to the increased carryback period. Using his estimate, we find that the average loss firm in our 2008 sample would increase its debt-to-value ratio by 0.17% (2.4% × 0.069%) when the tax cut is implemented. This increase in the debt ratio amounts to additional debt raised by corporations in the sample of approximately $8 billion (0.17% × $5,004 billion) if we proxy firm value with book value of assets. A similar calculation shows that the incremental debt usage by loss firms in 2009 would be about $10 billion.[9] This $8 ($10) billion increase in "debt capacity" for corporations in 2008 (2009), on top of the liquidity provided by the tax refund of $19 ($34) billion, would significantly improve financial flexibility for some of the loss firms. Furthermore, for 2008 and 2009, the increase in debt usage would provide those corporations with an additional tax savings of $1.2 billion (14.9% × $8 billion, which is MTR ×

[9] One could argue that the effective cost of debt has risen in 2008 and 2009 due to an increased probability of bankruptcy during the severe recession, and therefore, does it even make sense to consider incremental debt usage due to increased MTRs? Yes it does. Even if a perceived increase in the cost of debt has an overall dampening effect on corporate debt usage, the increased MTRs provide an offsetting benefit to debt usage which will attenuate any effects from increased costs. Thus, our estimates can be interpreted as either an increase in net debt usage, or a smaller decrease in net debt.

incremental debt usage) and $1.5 billion (15.6% × $10 billion), respectively, through increased interest tax shields, which increases the lost tax revenue for the federal government.

5. Impact of Including TARP Firms

The Obama administration's current budget plan suggests that it would exclude Fannie Mae, Freddie Mac, and corporations that received funds from the Troubled Asset Relief Program from electing the extended NOL carryback period. In this section, we examine the hypothetical impact of expanding the tax provision to those firms in terms of their liquidity position and federal tax receipts. Table 8 repeats the analysis in Table 4 using an extended sample including the TARP firms. Note that since the TARP firms include some of the largest U.S. corporations, the aggregate book assets in the sample increase by more than 70% with their inclusion, even though the number of TARP firms in the 2008 (2009) sample is only 52 (50).

The implications of including TARP firms are quite striking. If the increase in the carryback period applies to TARP firms as well as other firms, the total incremental tax refund to the corporate sector in 2008 (2009) would be $72 ($64) billion. That is, the additional tax cost to the federal government of providing liquidity to the small number of TARP firms in 2008 (2009) would be $53 ($29) billion. Another important implication of the analysis relates to the additional use of debt by loss firms. Although the increase in the average MTR is similar (about 2.4%) whether we include or exclude TARP firms in the sample, the inclusion of those firms increases the total book value of loss firms from $5,004 to $12,256 billion for 2008. This increase makes the incremental debt usage by the corporate sector $21 billion (0.17% × $12,256 billion), which is more than double the figure when excluding TARP firms ($8 billion). In sum,

including the corporations recently bailed out by the government would entail a large reduction in tax revenue, and a large increase in aggregate corporate liquidity, even though the number of TARP firms is small.

6. Conclusions

The net operating loss carryback feature of tax code is an effective mechanism through which the federal government provides liquidity to corporations exactly when they need it (e.g., during loss years or perhaps during a credit crunch or recession). In this paper, we examine the economic impact of the temporary change in the length of the carryback period from two to five years on corporate liquidity, federal tax receipts, and corporate marginal tax rates.

We estimate that the proposed tax cut would inject about $19 billion of cash into the corporate sector for 2008 and an even larger $34 billion for 2009, which are significant amounts of liquidity for firms currently suffering losses. This tax break would be particularly valuable given that the marginal value of liquidity is much greater during a recession compared to "good" times. We also document that the tax cut would increase the marginal income tax rate for firms experiencing current operating losses. Importantly, this increase in the MTR would give the firms a greater incentive to use debt and also affect other tax-driven corporate decisions.

Overall, our analysis indicates that the proposed increase in the tax-loss carryback period would provide significant liquidity to unprofitable corporations through tax refunds and increased debt capacity. Future research may examine the extent to which the liquidity provided by tax-loss carryback encourages firms to invest in profitable projects and stimulate the economy.

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Appendix A – Data Construction for 2008 and 2009

We define taxable income using Compustat data as follows:

Taxable Income = Operating Income after Depreciation [Data178] + Non-operating Income [Data61] - Interest Expense [Data15] - Deferred Taxes on Income Statement [Data50] / (top income tax rate) + Extraordinary Items and Discontinued Operations [Data48] / (1 - top income tax rate) + Special Items [Data17]. (A1)

Since annual data for taxable year 2008 are not available for most of the Compustat firms at the time of writing (May 2009), we construct our annual 2008 data in the following steps. First, we create the taxable income measure in Equation (A1) using available quarterly financial statement data from the Compustat and Standard and Poor's Research Insight databases.[10] Second, for each firm that has non-missing first through fourth quarter data, we add up quarterly taxable income (i.e., from Q1 to Q4) to create annual taxable income. Third, for firms having missing third or fourth-quarter data from the Compustat and S&P Research Insight databases, we impute the missing values of taxable income using the industry mean change in return on assets.[11] Specifically, using the annual data that we construct in step 2, we compute the aggregate change in return of assets (sum of taxable income / sum of total assets) at the three-digit SIC industry level[12] (i) from the first half to the second half (i.e., from Q1 + Q2 to Q3 + Q4), or (ii) from the first three quarters to the fourth quarter of 2008. Then, we impute the missing second half or fourth quarter taxable income data assuming that each firm's change in return on assets is

[10] S&P Research Insight provides daily updates on many Compustat data items.
[11] We drop firm observations that have only first-quarter 2008 data because imputing the remaining three quarters may lead to an extremely noisy approximation.
[12] For firms with missing SIC code, we impute changes in profitability using *all* firms in the sample.

equal to its industry average. This procedure leaves us with actual data for about 77% of firms in the 2008 sample and estimated data for the remaining 23% of the firms.[13]

Constructing annual data for taxable year 2009 is even more challenging given that virtually no firm in the sample has filed its first-quarter results. Therefore, we take an intuitive but heuristic approach to forecast the taxable income data for 2009. We begin by assuming that the industry-level change in corporate profitability from 2008 to 2009 is similar to that from 2001 to 2002, the most recent period of recession.[14] Specifically, for each industry we assume that the change in return on assets (sum of taxable income / sum of total assets) from 2008 to 2009 is the same as from 2001 to 2002. Then, using the forecasted industry-level change in return on assets and 2008 data, we impute taxable income for 2009.

[13] We impute third or fourth quarter data only for December fiscal year-ending firms in 2008, because (i) estimating changes in profitability could be very noisy for some other year-ending months (e.g., November 2008) given that only small numbers of firms exist in those month groups, and (ii) the estimation is simply infeasible for the other year-ending months (e.g., March 2009) as no firm in the groups has filed fourth-quarter data.

[14] The previous recession started in March 2001 and ended in November 2001. Recently, the economic cycle peaked in the second half of 2007 but the current recession (i.e., from peak to trough) is expected to last longer than the previous one, possibly extending to 2010. Therefore, our analysis for 2009 is probably conservative in that it may underestimate losses, and hence the effect of a five-year carryback period for 2009.

Figure 1
Impact of Tax-loss Carryback Period Increase on Pulte Homes in 2008
This figure compares tax-loss carryback and tax refund for Pulte Homes in 2008 for the carryback period of two years and five years.

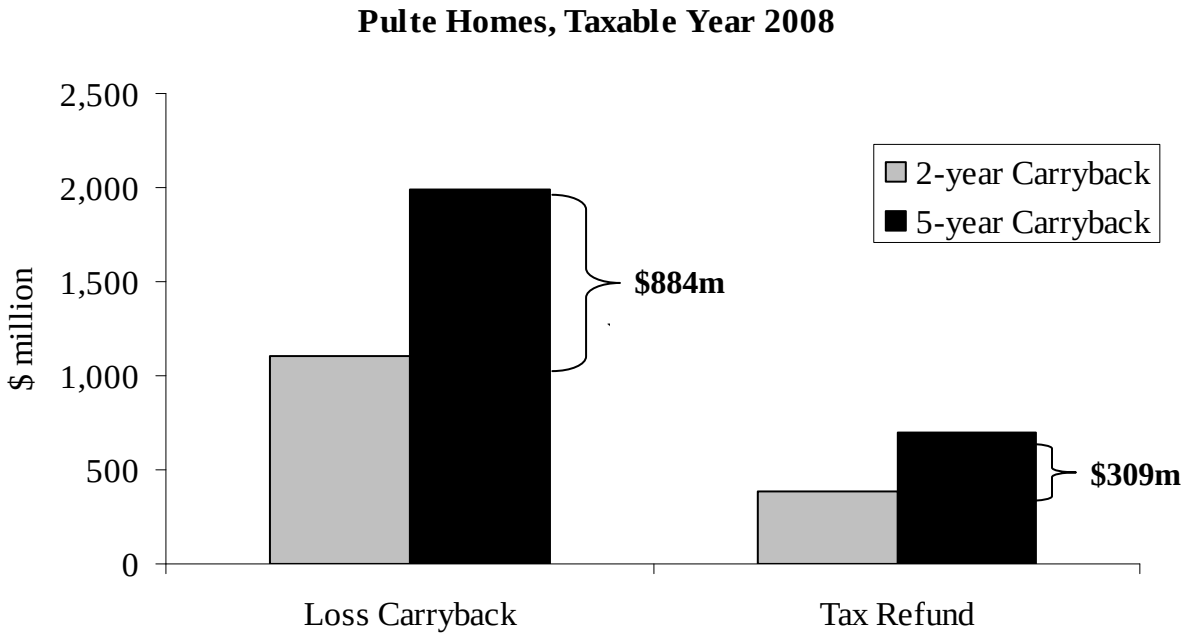

Table 1
Replication of Cooper and Boynton (2004)
This table replicates key results in Cooper and Boynton (2004), who estimate tax liability adjustment and tax refund due to hypothetical changes in the NOL carryback period for taxable year 2001. Panel A presents summary statistics for the sample and Panel B presents tax-loss carryback and tax refund for differing lengths of carryback period. Cooper and Boynton (2004) use federal tax return data from the IRS, while we approximate their study using Compustat data.

Panel A: Summary Statistics

Statistics	Our Replication		Cooper and Boynton (2004)	
	All Firms	Loss Firms	All Firms	Loss Firms
N	5,150	2,188	27,384	9,088
Total Assets (millions)	23,342,043	2,956,447	26,100,649	4,303,409
Taxable Income (millions)	485,885	-226,858	442,705	-159,907
Net Income (millions)	227,608	-218,827	322,621	-159,907

Panel B: Tax-loss Carryback and Tax Refund

Carryback Period	Our Replication		Cooper and Boynton (2004)	
	Loss Carryback (millions)	Tax Refund (millions)	Loss Carryback (millions)	Tax Refund (millions)
1-year	20,757	7,257	26,989	7,403
2-year	37,931	13,264	44,678	11,930
3-year	46,424	16,232	55,238	15,056
4-year	57,836	20,220	66,378	19,319
5-year	67,359	23,547	74,999	22,283
Diff [5-year - 2-year]	**29,428**	**10,283**	**30,321**	**10,353**

Table 2

Impact of a Five-year Carryback Period on Pulte Homes, Inc.

This table examines changes in tax-loss carryback, tax refund (Panel A), and the marginal tax rate (Panel B) due to a hypothetical increase in net operating loss (NOL) carryback period from two to five years for Pulte Homes in taxable year 2008. Note that this table shows the carryback of the 2008 losses only. We assume that the 2007 losses would be carried back to fully cover the $2,248 taxable profits in 2005 and $429 of the profits in 2006, leaving taxes paid on $1,102 of 2006 profits not refunded.

Panel A: Tax-loss Carryback and Tax Refund for 2008

Taxable Year	Taxable Income (millions)	2-year Carryback		5-year Carryback		Difference [2-year - 5-year]	
		Loss Carryback (millions)	Tax Refund (millions)	Loss Carryback (millions)	Tax Refund (millions)	Loss Carryback (millions)	Tax Refund (millions)
2003	952	0	0	952	333	952	333
2004	1,655	0	0	1,033	362	1,033	362
2005	2,248	0	0	0	0	0	0
2006	1,530	1,102	386	0	0	-1,102	-386
2007	-2,677	0	0	0	0	0	0
2008	-1,985	-	-	-	-	-	-
Total	**-**	**1,102**	**386**	**1,985**	**695**	**884**	**309**

Panel B: Marginal Tax Rate in 2008

With the two-year carryback period, not all of the losses in 2008 are carried back, leaving some of the losses to be carried forward, which in turn reduces the MTR to 3.3%. In contrast, for the five-year carryback period case, the 2008 losses are all carried back, and thus the MTR is 35%. See text for details.

Carryback Period	MTR in 2008
2 year	3.3%
5 year	35.0%

Table 3
Summary Statistics
This table presents key summary statistics for taxable years ending in 2008 and 2009. Panel A presents statistics for the main sample and Panel B presents statistics for an extended sample that also includes Fannie Mae, Freddie Mac, and firms that received funds from the Troubled Asset Relief Program. "Loss Firms" represent those that record net operating losses for a given year. Taxable income is defined in Appendix A, and return on assets is a ratio of aggregate taxable income to aggregate total assets. The number of firms decreases for taxable years ending in 2009 compared to 2008 because limitations in data do not permit the imputation of taxable income for taxable years ending between January and June of 2009. See footnote 13 in Appendix A for details.

Panel A: Sample excluding TARP Firms

Statistic	2008		2009	
	All Firms	Loss Firms	All Firms	Loss Firms
N	4,432	1,892	4,106	1,984
Total Assets (millions)	20,635,459	5,004,103	20,341,032	6,570,243
Taxable Income (millions)	703,301	-351,689	342,224	-593,044
Return on Assets	3.4%	-7.0%	1.7%	-9.0%

Panel B: Sample including TARP Firms

Statistic	2008		2009	
	All Firms	Loss Firms	All Firms	Loss Firms
N	4,484	1,920	4,156	2,013
Total Assets (millions)	36,484,343	12,256,344	34,217,670	13,565,936
Taxable Income (millions)	351,696	-749,657	102,344	-882,996
Return on Assets	1.0%	-6.1%	0.0%	-6.4%

Table 4
Liquidity Effect of Different Length of Carryback Periods

This table presents aggregate amounts of total net operating loss carryback and tax refunds, if the length of the carryback period hypothetically ranges from one to five years. Columns "Loss Carryback" present aggregate current tax losses that are carried back to all appropriate past years. For example, when the carryback period is three years, "Loss Carryback" represents a sum of losses in time t that are carried back to times t-1, t-2, and t-3. Similarly, columns "Tax Refund" present aggregate taxes refunded to corporations by carrying back current losses to all appropriate past years. As shown in Panel A of Table 3, the estimated total losses for firms in the sample are $352 ($593) billion in 2008 (2009).

Carryback Period	2008		2009	
	Loss Carryback (millions)	Tax Refund (millions)	Loss Carryback (millions)	Tax Refund (millions)
1-year	54,115	18,934	41,363	14,474
2-year	102,250	35,774	119,088	41,677
3-year	126,302	44,191	140,051	49,011
4-year	144,450	50,538	189,006	66,140
5-year	157,571	55,125	216,857	75,880
Diff [5-year - 2-year]	**55,321**	**19,350**	**97,769**	**34,203**

Table 5

By-industry Analysis of the Benefit of Tax-Loss Carryback

We classify industries based on three-digit SIC codes and compute aggregate tax refund due to NOL carryback by industry. For each industry, we compare tax refunds when the carryback period is two versus five years. Panel A (Panel B) presents the 10 industries that are expected to receive the largest tax refunds from the tax relief in 2008 (2009).

Panel A: Top 10 most benefited Industries in 2008

Industry	Three-digit SIC	N	2-year Tax Refunds (millions)	5-year Tax Refunds (millions)	Difference [5 year - 2 year] (millions)
Operative Builders	153	17	4,147	6,773	2,626
Motor Vehicles and Equipment	371	26	668	2,725	2,057
Surety Insurance	635	6	1,118	2,979	1,861
Communications Equipment	366	56	1,758	2,859	1,101
Miscellaneous Investing	679	57	1,181	2,278	1,097
Newspapers	271	8	1,269	2,165	897
Savings Institutions	603	43	491	1,348	856
Commercial Banks	602	120	3,568	4,363	795
Computer And Office Equipment	357	43	384	916	532
Women's, Misses', and Juniors' Outerwear	233	3	268	790	522
Sum - Top 10	**-**	**379**	**14,853**	**27,196**	**12,343**
Total - All Industries	**-**	**3,818**	**35,774**	**55,125**	**19,350**

Panel B: Top 10 most benefited Industries in 2009

Industry	Three-digit SIC	N	2-year Tax Refunds (millions)	5-year Tax Refunds (millions)	Difference [5 year - 2 year] (millions)
Combination Electric, Gas, and Other Utility	493	53	5,879	9,737	3,858
Operative Builders	153	16	36	3,841	3,806
Commercial Banks	602	112	453	3,126	2,673
Cable and Other Pay Television Services	484	14	2,515	4,644	2,130
Personal Credit Institutions	614	5	68	1,708	1,640
Communications Equipment	366	67	102	1,663	1,560
Miscellaneous Fabricated Metal Products	349	10	1,078	2,576	1,498
Motor Vehicles and Equipment	371	22	9	1,315	1,306
Newspapers	271	8	19	1,029	1,010
Surety Insurance	635	5	0	991	991
Sum - Top 10	**-**	**312**	**10,159**	**30,630**	**20,471**
Total - All Industries	**-**	**4,106**	**41,677**	**75,880**	**34,203**

Table 6
Tax Benefits for Small vs. Large Firms
This table compares tax benefits from the increased carryback period for loss firms in 2008. We categorize a firm as large (small) if it has total assets bigger than (smaller than or equal to) median total assets among loss firms. The column "% Losses" ("% Assets") presents the incremental aggregate tax refund due to the tax break divided by aggregate current losses (total assets) and the column "ROA" shows aggregate current taxable income divided by aggregate total assets.

	N	Mean Assets (millions)	Additional Refunds due to 5-year Carryback (millions)	% Losses	% Assets	ROA
Large firms	946	5,248	19,164	5.7%	0.39%	-7%
Small firms	946	42	187	1.3%	0.47%	-37%
Total	**1,892**	**2,645**	**19,350**	**-5.5%**	**0.39%**	**-7%**

Table 7
Changes in Marginal Tax Rates
Taxable income is simulated using Graham's (1996b) method except that we ignore the AMT, and the marginal tax rate is computed based on the simulated income. For each observation, this procedure is repeated 50 times to incorporate uncertainty in income simulation, and the average of the computed MTRs is taken as the estimate of the MTR. Panel A compares the distribution of MTRs when the carryback period is two and five years for all firms in the sample. Panel B compares the MTR distribution only for firms that experience losses in a given year. Panel C sorts the loss firms in Panel B into six MTR groups and presents average changes in the MTR when the period is extended from two years to five years.

Panel A: Changes in MTR Distribution for All Firms

	2008		2009	
	2 year	**5 year**	**2 year**	**5 year**
N	4,432	4,432	4,106	4,106
Mean	23.0%	24.0%	22.8%	23.9%
Std Dev	12.9%	12.7%	12.7%	12.6%

Panel B: Changes in MTR Distribution for Loss Firms

	2008		2009	
	2 year	**5 year**	**2 year**	**5 year**
N	1,892	1,892	1,984	1,984
Mean	12.5%	14.9%	13.5%	15.7%
Std Dev	11.5%	12.9%	11.5%	12.7%
Percentile				
0^{th}	0%	0%	0%	0%
1^{th}	0%	0%	0%	0%
5^{th}	0%	0%	1%	1%
10^{th}	0%	1%	2%	2%
25^{th}	3%	4%	5%	5%
35^{th}	5%	6%	6%	7%
50^{th}	9%	11%	10%	11%
65^{th}	14%	17%	14%	17%
75^{th}	19%	27%	19%	34%
90^{th}	34%	35%	35%	35%
95^{th}	35%	35%	35%	35%
99^{th}	35%	38%	38%	38%
100^{th}	39%	39%	39%	39%

Panel C: Changes in Average MTR by MTR Group

MTR (based on 2-year carryback)	2008				2009			
	N	2-yr MTR	5-yr MTR	Change	N	2-yr MTR	5-yr MTR	Change
0-1%	267	0.2%	2.6%	2.4%	130	0.4%	2.8%	2.4%
1-5%	397	2.9%	7.0%	4.1%	404	2.9%	5.8%	2.9%
5-10%	334	7.5%	10.5%	3.1%	471	7.4%	10.1%	2.7%
10-20%	457	14.0%	15.9%	1.8%	501	13.9%	16.4%	2.5%
20-30%	158	24.0%	26.5%	2.5%	141	23.8%	26.2%	2.4%
30-39%	279	34.7%	35.0%	0.3%	337	34.9%	35.2%	0.3%
Total	**1,892**	**12.5%**	**14.9%**	**2.4%**	**1,984**	**13.5%**	**15.7%**	**2.2%**

Table 8

Liquidity Effect of Carryback Period Change for Sample including TARP Firms

This table is a re-do of Table 4 (which excludes TARP firms) except that TARP firms are included. For the expanded sample that includes the firms that received the TARP fund, this table computes aggregate tax-loss carryback and tax refund for differing carryback periods.

Carryback Period	2008		2009	
	Loss Carryback (millions)	Tax Refund (millions)	Loss Carryback (millions)	Tax Refund (millions)
1-year	105,615	36,959	43,536	15,235
2-year	213,778	74,809	136,707	47,844
3-year	292,243	102,270	158,132	55,339
4-year	361,302	126,436	249,577	87,339
5-year	420,864	147,277	318,614	111,495
Diff [5-year - 2-year] Including TARP	**207,086**	**72,468**	**181,907**	**63,651**
Diff [5-year - 2-year] Excluding TARP	**50,562**	**19,350**	**91,882**	**34,203**