Tax-Loss Carry Forwards and Returns*

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Abstract

Tax loss carry forward (TLCF), the accumulated corporate losses that can be applied to future or past taxable income, form an important but understudied asset in the corporate portfolio. In our sample TCLF was on average equal to 17% of pre-tax income with considerable cross-sectional variation. We show that a firm's TLCF are a complex contingent claim that has a significant non-monotonic affect on the cash flow risk of assets in place. Consistent with this theoretical finding and a calibrated model, we show that TLCF are highly significant in positively forecasting returns, volatility and betas. These results run counter to previous findings of a negative relationship between risk and more general measures of tax shields.

Keywords: tax-loss carry forward, equity returns.

1 Introduction

Corporate taxes are among the most studied financial frictions. Taxes have been related to corporate decisions such as capital structure, dividend policy, real investment and risk management. In contrast to the interest in corporate decisions, however, much less is known about the implications of corporate taxes for return moments. This paper contributes to this area by examining the importance of Net Operating Losses (NOL) and related tax deductions to equity risk and return.

Tax codes do not allow firms to realize negative taxes, i.e. NOLs do not generate payments from the government to the firm. Instead, tax codes allow firms to apply NOLs to prior taxable income (Tax Loss Carry Backs) or forward to future taxable income (Tax Loss Carry Forwards or TLCF). This introduces a convexity in the tax related cash outflows; taxes paid in any period are increasing in income above a threshold set by the existing TLCF but are zero below this threshold.

We show that the relationship between tax shields and risk is non-monotonic, as seen in Figure 2. Risk decreases with additional tax shields at low levels of tax shields (decreasing region) and increases at high levels (increasing region). The decreasing relationship between risk and tax shields has been recently studied by Schiller (2015), though to our best knowledge, we are the first to point out the existence of an increasing region.

The initial decrease in risk comes about because when there are few existing tax shields, every additional dollar of tax shields is likely to be used, and acts like a relatively safe cash flow for the firm. On the other hand, when the firm has a lot of existing tax shields, an additional dollar of tax shields will only be used in good states of the world, when pre-tax cash flows are relatively high. It will be left unused in bad states of the world when pre-tax cash flows are low. Thus, additional tax shields are risky. This intuition is true even in a one period model, and holds for any tax shield: TLCF, depreciation, interest, etc.

It is also important to separate TLCF from other tax shields, for which we must consider a dynamic setting. Suppose a firm has long term debt which provides interest tax shields every year - recurrent tax shields that are not history dependent. A firm will try to use these interest tax shields every year, but if in some year it cannot, it can still use interest tax shields next year, as long as it continues paying interest. On the other hand, because TLCF expire, if a firm is unable to use its TLCF due to low cash flows this year, there is a chance that it will never be able to use its TLCF. In a sense, TLCF are a residual tax shield, used only if there is tax liability after all other (recurrent) tax shields have been used. Thus, in a dynamic setting, TLCF are riskier than other tax shields.

We first study TLCF in a simple one period binomial model where we show the sources of the non-monotonicity of risk in tax shields. We then numerically examine a realistically calibrated multi-period model. In this model, TLCF are positively related to risk and expected return. Empirically we show that, consistent with our model, TLCF are able to forecast future returns, volatility, and betas even when we include a large number of known controls. We also construct a portfolio that is long high TLCF firms and short low TLCF firms; this portfolio is related to size but has a positive α with respect to the Fama and French three factor model.

In addition to being of theoretical interest, we are motivated by the large and growing importance of TLCFs. Between 1964 and 2014, TCLFs were on average equal to 17% of pre-tax income with considerable cross-sectional variation. Moreover, as Figure 1 indicates, TLCFs have increased in importance over time and are at a historical high level.[1]

Our findings that risk increases in TLCF appear to be in contrast with recent work of Schiller (2015) Schiller (2015), who finds that firms with higher tax shields (proxied by low average tax rates) are safer and have lower expected return. However, these opposite results are actually not surprising, considering the non-monotonic relationship described above. If firms have enough total tax shields, then additional tax shields, like TLCF, should increase risk. Furthermore, in a dynamic setting, TLCF are riskier than tax shields that are replenished every year.

Our paper builds on the work of Green and Talmor (1985) who explicitly recognize the call option structure of the tax claim on the firm. They use this insight to study investment

[1] See Altshuler, Auerbarch, Cooper, and Knittel (2009) for an in depth discussion of the growth in corprate tax losses.

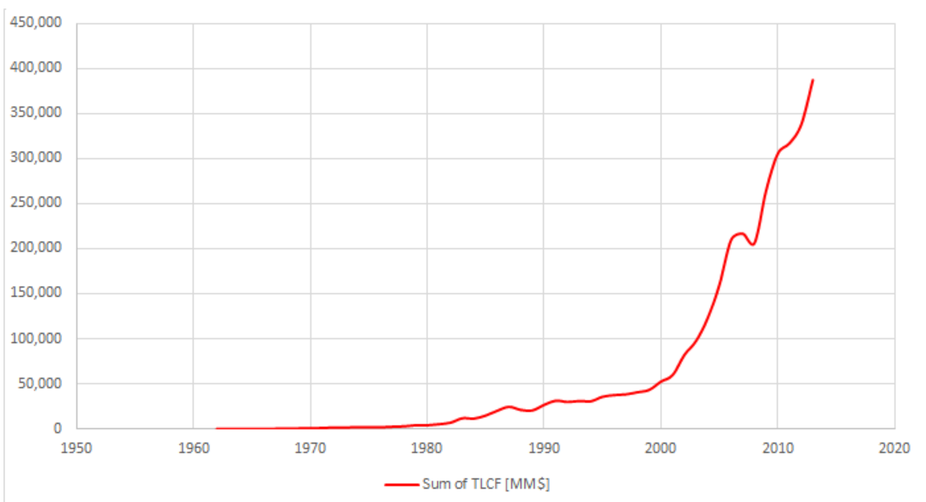

Figure 1: Tax Loss Carry Forward

behavior by firms and the debt-equity conflict of interest. We instead look at the implication on equity risk and return. We know of no other study that has directly looked at the relationship between TLCF and equity returns. Some have, however, indirectly looked at this relationship. Lev and Nissim (2004) consider the ratio of tax to book income as a measure of the quality of accounting information. They show that this ratio, which reflects tax deductions such as TLCF, forecasts firm growth but is not significant in forecasting returns.

2 Model

2.1 Simple Binomial Model

Consider an all equity firm that at t_0 owns a future stochastic cash flow $C_1 \in \left\{C^u, C^d\right\}$, $C^u > C^d$. The corporate tax rate is τ, and the firm is in possession of a non-cash tax deduction of D. D can be thought of as a combination of tax-loss carry forward, depreciation, or any other non cash tax deduction[2].

The value of the all equity firm at t_0, V_E, is equal to the value of the expected pretax cash flows, V_C, minus the value of expected taxes, V_T, i.e.

$$V_E = V_C - V_T. \tag{1}$$

Accordingly, the risk of the equity, β_E, is given by

$$\beta_E = \frac{V_C}{V_C - V_T}\beta_C - \frac{V_T}{V_C - V_T}\beta_T, \tag{2}$$

where β_C is the beta of the pre-tax cash flows and β_T is the beta of the tax payments.

Green and Talmor **?** and Myers and Majd **?** show that the expected tax payments are equivalent to a call option. The underlying asset is the tax payment with full tax offset, τC, and the actual tax payments will be a call on this asset with an exercise price D, i.e.

[2]Investment tax credits (ITCs) would play a similar role.

the tax payment will be

$$max\{\tau(C - D), 0\}.$$

Since the firm is short the tax shield and, as we will show, $\beta^T > 0$, the risk of equity is lower than the risk of the pretax cash flows as long as $D > 0$. Our theoretical contribution is to show that the risk reduction is non-monotonic in D. The relationship we will derive is graphically presented in Figure 2.

Three cases are apparent in Figure 1: Case 1, $0 \leq D \leq C^d$; Case 2, $C^d < D < C^u$; Case 3, $D \geq C^u$.

2.1.1 Case 1: $0 \leq D \leq C^d$. This case applies to firms that have taxable income but little or no tax deductions. As a result, the available tax shields D are used with certainty making the tax savings risk free. Hence, the value of the tax shield is

$$V_T = \tau V_C - \tau V_D. \tag{3}$$

Using (3) in the value of the equity claim (1) gives:

$$V_E = (1 - \tau)V_C + \tau V_D$$

In terms of the risk of the equity, the after tax cash flow and pretax cash flow have the same beta while the value of the tax shield from D is riskless. That is, the firm has effectively

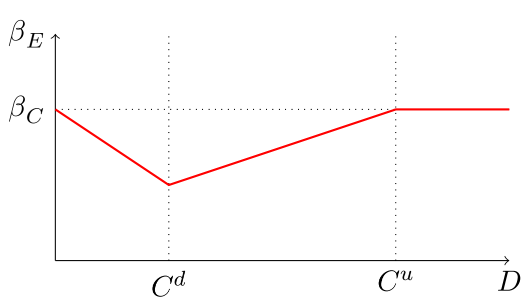

Figure 2: Firm Risk and Tax Loss Carry Forward

sold an equity claim to the government but has received a risk free bond in return resulting in the following equity risk.

$$\beta_E = \frac{(1-\tau)V_C}{(1-\tau)V_C + \tau V_D}\beta_C. \tag{4}$$

As D increases the value of the risk free bond, V_D, increases and the overall equity risk decreases.

2.1.2 Case 2: $C^d \geq D < C^u$. In this region the tax payment depends on the state.

$$Tax = \begin{cases} \tau\left(C^u - D\right) \\ 0 \end{cases} \tag{5}$$

The t_0 value of the tax payment V^T is the value of the replicating portfolio, a levered long position in the underlying tax claim, τV^C.

$$V^T = \Delta\tau V_C - \Delta\tau\frac{C^d}{(1+r_f)},$$

where Δ is

$$\Delta = \frac{C^u - D}{C^u - C^d} < 1. \tag{6}$$

Using (6) in (1) gives the equity value

$$V_E = (1-\Delta\tau)V_C + \frac{\Delta\tau C^d}{(1+r_f)}, \tag{7}$$

which implies that the firm risk will be

$$\beta_E = \frac{(1-\Delta\tau)V_C\beta_C}{V_C - V_D}. \tag{8}$$

The tax deduction D affects β_E through its impact on Δ and $V_E = V_C - V_D$. The net result can be shown to be strictly increasing in D in this range since

$$\frac{\partial \beta_E}{\partial D} = \frac{\tau V_C \beta_C C^d}{V_E^2 (C^u - C^d)(1 + r_f)} \tag{9}$$

is positive.

2.1.3 Case 3: $D \geq C^u$.

Since deductions are larger than the maximum taxable income the firm will not pay taxes with certainty. Hence $V_T = 0$ and

$$V_E = V_C. \tag{10}$$

As a result, $\beta_E = \beta_C$ for any level of D in this range.

This simple model demonstrates our contribution to the literature. Prior studies (for example Shiller (2015)) have shown that firm risk is lower as a result of the asymmetric taxation of corporate earnings relative to losses. To this we add an understanding of how risk changes through the range of possible values of D relative to taxable income. For low levels of D risk is decreasing until C^d, at which point risk begins to increase up to a point where the firm pays no taxes, after which firm risk is constant as D increases.

In reality the relationship of risk with tax deductions is much more complex. A multi-period setting implies that tax deductions not used in one period can be carried forward. Tax-loss carry forwards compete with period deductions such as depreciation and interest as well as with investment tax credits. The tax loss carryforward is made up of operating losses over various periods and each of these has a finite maturity. Insights from a more complete model are not analytically available but, we do show that the relationship described in this section exists in a carefully calibrated, dynamic model of a firm.

2.2 Numerical Model

The model is solved in discrete time. Each period the firm receives a pre-tax cash flow $\Pi(K_t, A_t)$, which is a function of the firm's capital K_t and an exogenous productivity shock A_t. Π should be thought of as EBITDA. The firm's dividend is equal to the pre-tax cash flow, minus its tax bill T_t, minus any capital expenditure costs that it incurs I_t:

$$D_t = \Pi(K_t, A_t) - T_t - I_t$$

The firm makes no decisions and the firm's level of capital is fixed at $K_t = 1$. The firm pays a maintenance cost to replace depreciated capital, this cost is $I_t = \delta^K K_t$. The firm's value is equal to the present value of its dividends, discounted by an exogenously specified stochastic discount factor M_{t+1}.

The firm pays taxes at a rate τ on taxable income $\Pi(K_t, A_t)$ minus any tax shields Φ_t. We also assume that the tax paid cannot be negative, thus the total tax paid is:

$$T_t = \tau \max(0, \Pi(K_t, A_t) - \Phi_t)$$

We assume that the firm has three types of tax-shields. First, non-depreciation and non-TLCF tax shields Φ_t^0. The real world analog of Φ_t^0 are interest tax shields (although we abstract from financial leverage), R&D tax shields, and any other general tax-shields. Second, depreciation tax shields $\Phi_t^\delta = \delta^K K_t$. Third, tax-loss carry-forwards (TLCF) Φ_t^{TLCF}, which will be described below. The firm's total tax shields are $\Phi_t = \Phi^0 + \Phi_t^\delta + \Phi_t^{TLCF}$.

We assume that the firm always uses as much TLCF as possible to reduce current tax liability. Define the firm's tax liability, before using the TLCF, as $\widetilde{T}_t = \Pi_t - \Phi^0 - \Phi_t^\delta$. If $\widetilde{T}_t < 0$, then the firm pays zero tax and no TLCF are used; furthermore, the stock of TLCF increases by $-\widetilde{T}_t$. If $0 < \widetilde{T}_t < \Phi_t^{TLCF}$, then TLCF fully reduce the firm's tax liability to zero, and the amount of TLCF remaining is $\Phi_t^{TLCF} - \widetilde{T}_t$. If $0 < \Phi_t^{TLCF} < \widetilde{T}_t$, then all of the TLCF are used and zero remain; in this case, the firm's tax liability is $T_t = \widetilde{T}_t - \Phi_t^{TLCF} > 0$. We also assume that TLCF's expire at a rate δ^τ so that:

$$\Phi_{t+1}^{TLCF} = (1 - \delta^\tau) \max\left(0, \Phi_t^{TLCF} - (\Pi_t - \Phi^0 - \Phi_t^\delta)\right)$$

We can now formally write down the firm's problem of valuing the firm:

$$
\begin{aligned}
&V(A_t, \Phi_t^{TLCF}) = D_t + E_t[M_{t+1} V(A_{t+1}, \Phi_{t+1}^{TLCF})] \text{ s.t.} \\
&K_t = 1 \\
&D_t = \Pi(A_t) - T_t - I_t \\
&I_t = \delta^K K_t \\
&T_t = \tau \max\left(0, \Pi(A_t) - (\Phi_t^0 + \Phi_t^\delta + \Phi_t^{TLCF})\right) \\
&\Phi_t^\delta = \delta^K K_t \\
&\Phi_{t+1}^{TLCF} = (1 - \delta^\tau) \max\left(0, \Phi_t^{TLCF} - (\Pi_t - \Phi^0 - \Phi_t^\delta)\right)
\end{aligned} \tag{11}
$$

2.2.1 Calibration. We assume that EBITDA is linear in a multiple of capital and productivity: $\Pi(A_t) = \psi A_t K_t$ and we set $K_t = 1$.

The target moments, as well as some additional moments, for both model and data are presented in Panel A of Table 1. We first compute each moment, for each firm, using its time-series data. We then compute the average and median of each moment across all firms.

The productivity shock $A_t = A_t^a A_t^i$ consists of an aggregate and an idiosyncratic component, which are uncorrelated. A_t^a is a 3-state Markov chain with possible realizations $(0.89, 1.00, 1.11)$ and an autocorrelation of 0.4. A_t^i is a 3-state Markov chain with possible realizations $(0.40, 1.00, 1.60)$ and an autocorrelation of 0.75. We choose the volatilities of the aggregate and idiosyncratic components to match the volatilities of these components in the variation of the EBITDA-to-Total assets ratio.[3] We choose the persistence of the aggregate component to match the persistence of HP-filtered GDP. We set the persistence of the idiosyncratic component to 0.75 in order to match the level of the TLCF-to-EBITDA ratio in the data. This persistence is somewhat higher than the 0.59 in the data.[4]

We set $\beta = 0.95$ and assume that the stochastic discount factor takes the form: $M_{t+1} = \beta \left(\frac{A_{t+1}}{A_t}\right)^{-\gamma}$ where $\gamma = 5$. These preference parameters imply a CRRA utility function with

[3]We use the EBITDA-to-Total assets ratio instead of just EBITDA because in the data EBITDA is non-stationary and takes on negative values, therefore we scale it by a non-negative, cointegrated series. Note that Total assets is slower moving that EBITDA, thus EBITDA-to-Total assets still captures the key variation in EBITDA.

[4]We separate the volatility of EBITDA-to-Total assets into aggregate and idiosyncratic components by the following procedure. We first regress it on HP-filtered GDP: $\frac{EBITDA}{TotalAssets} = \gamma_0 + \gamma_{GDP} GDP + \epsilon$. We then define the volatilities of the aggregate and idiosyncratic components, respectively, as $\sigma(\gamma_{GDP} GDP)$ and $\sigma(\epsilon)$.

relatively standard time preference and risk aversion.

We set $\psi = 0.14$ to match the average EBITDA-to-Total assets ratio, $\delta^K = 0.046$ to match the average Depreciation-to-EBITDA ratio, and $\Phi^0 = 0.023$ to match the average Interest-to-EBITDA ratio. We set the TLCF depreciation rate $\delta^\tau = 0.05$ because the U.S. tax code allows a firm to keep TLCF for 20 years before they expire.

2.2.2 Model results. We present the model results in Table 1. As discussed earlier, Panel A presents various moments from the model and data. These include the earnings-to-assets, the depreciation-to-earnings, interest-to-earnings, and TLCF-to-earnings ratios; the volatilty of earnings-to-assets as well as the volatilities and autocorrelations of its aggregate and idiosyncratic components; the mean of equity returns, and the volatility of equity returns. The model is relatively close to the data along all of these dimensions.

In Panels B, C, and D we perform empirical exercises analogous to what we do with actual data in the next section. In particular, we regress the realized return (B), volatility (C), or beta (D) on the TLCF-to-Assets ratio. As explained earlier, the relationships are all positive because TLCF are used to increase after-tax cash flow in good states, but will be more likely to expire in bad states. We also include a control for firm size; the TLCF versus risk relationship is still positive, although the magnitude is reduced. Note that in this simple model, capital is equal to one so there is no difference between controlling for size or book-to-market. In the next section, with actual data, we include many additional controls.

3 Empirical Results

Our primary interest is the relationship between TLCF and future equity returns, volatility and betas. Our theory predicts that in general, the relationship between tax shields and risk is non-monotonic, initially decreasing and then increasing. Our calibrated model predicts a positive relationship between TLCF and measures of risk because unlike most other tax shields, TLCF can expire.

We collected stock market data from CRSP and accounting data from Compustat. The sample includes firm observations from 1971 to 2014. We choose 1971 because in every year after 1971 (inclusive) at least 10% of all firms had positive TLCF. Extending to earlier time periods did not significantly change our results. Stock market data is measured at a monthly frequency and accounting data at an annual frequency. As in Fama and French (1992), we exclude firms in the financial sector, and firms with negative book equity and negative total assets.

In Table 2 we report summary statistics for various variables of interest.

For each firm-year observation in Compustat we computed the 12 month backward, 12 month forward, 60 month backward, and 60 month forward market beta, SMB beta, and HML beta using time-series regressions; we also compute the backward and forward sum log return and return volatility. In the second stage, we run Fama and MacBeth (1973) regressions. In the second stage, the backward looking variables are used as controls, while the forward looking variables are to be explained.

Our key explanatory variable is TLCF standardized by total assets - the TLCF-to-Assets ratio. In unreported results, we have also standardized by Size, Book Assets, Book Debt plus Size, and Revenues. All other non-stationary controls were standardized by the same variable as TLCF.

Table 3 reports the results of Fama and MacBeth (1973) regressions of realized stock returns on TLCF-to-Assets and various controls. TLCF forecasts future returns positively and significantly in all specifications. In particular, it predicts both 12 month and 60 month returns, with t-statistics of around 4. The predictive power of TLCF is little changed when controlling for size, book-to-market, profitability, investment, past market, SMB, and HML betas, past return, and past volatility.

We redo exactly the same experiment but with realized volatility (Table 4), market beta (Table 5), SMB beta (Table 6), or HML beta (Table 6) as the left hand side variables instead of realized returns. The results are even stronger for predicting volatility, with t-statistics of around 7. The results are mostly significant for predicting SMB beta, although become insignificant in some of the specifications for predicting market and HML beta.[5] These

[5]There is no agreement on what exactly is the right stochastic discount factor. The model implies that

results strongly suggest that TLCF are related to a firm's underlying risk.

We also ran regressions (unreported) that included firm fixed effects, time fixed effects, and industry fixed effects. In all cases the tax loss carry forward coefficients have the same sign and significance as reported above, indicating that the forecasting power of the tax losses is not related to non observed firm, industry or time characteristics. Regresions including the Fama-French 5 Factor Model betas, and Hou-Xue-Zhang 4-factor q-factor model betas where also performed, but in all cases the reported results also hold.

In Table 8 we sort portfolios based on TLCF-to-Assets. Panel A of the table reports portfolio sorts where Portolio 0 contains firms with zero TLCF, and Portfolios 1, 2, and 3 contain equal numbers of firms with increasingly larger TLCF. As suggested by the model, the relationship between expected return and TLCF is non-monotonic, falling from 1.40% per month to 1.27% per month between Portfolio 0 and Portfolio 1, and then rising to 1.46% per month in Portfolio 2 and 1.98% per month in Portfolio 3. We also double sort portfolios based on TLCF-to-Assets and market equity (size) for a total of 12 portfolios. The double sort reveals that the TLCF-risk relationship is not subsumed by size, although it is mostly present among the smallest 1/3 of firms.

In our model, TLCF is a characteristic that summarizes a firm's loading on risk, therefore, according to the model TLCF is not an anomaly. However, following the literature, we construct a TLCF factor by differencing the return of high and low TLCF firms. In the first row of Panel B, we report pricing error related statistics of various portfolios with respect to the Fama and French three factor model (FF3). In the third row we report the same statistics with respect to an alternative three factor model; the alternative model is identical to the Fama and French model, but replaces SMB with the TLCF factor (TLCF3).

In the first column, we report the α of the TLCF factor with respect to the two pricing models. The α with respect to the FF3 is positive and significant; the α with respect to the TLCF3 is zero by construction. In the second column, we report the α of SMB with respect to the two pricing models. The α with respect to the FF3 is zero by construction;

high TLCF firms should have a positive beta with respect to the true SDF. However, if the true SDF consists of multiple factors, the model is silent as to the loadings on individual factors.

the α with respect to the TLCF3 is only -0.03 and insignificant from zero. Thus, at leat within this data, the TLCF factor appears to explain the size effect, while the size effect does not explain TLCF. While our goal is not to supplant size as a factor, it does appear that TLCF provides a fundamental, cash flow based story to explain at least part of the size effect.

Finally, in the remaining columns of Panel B, we report the root mean square errors of several standard portfolios with respect to either the FF3 or the TLCF3. In all cases, the pricing errors are very similar.

4 Conclusion

This paper examines the implications of TLCF for equity return moments. Although it is known that the government's tax claim on the firm reduces a firm's risk, we add to this by showing that the risk reduction is non-monotonic. Risk decreases with additional tax shields for low levels of tax shields, but increases if tax shields are above a critical range.

Empirically, we show a clear relationship between TLCF and future returns, volatiltiy, and risk loadings. The relationship is generally positive and significant.

Overall, our results suggest that TLCF and other tax management assets are important determinants of risk and return. A more complete understanding of the complex tax management task that firm's faces will be the subject of future research.

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Table 1: Model results

This table reports results from the model. To compute the summary statistics in Panel A, we compute each statistic for each firm individually as a time-series average or standard deviation; we then report the average or median of each statistic across all firms. The reported statistics are: EBITDA as a share of total assets, depreciation, interest expenses, and TLCF all as a share of EBITDA, the volatility of the EBITDA to total assets ratio, the volatility of its systematic component, the volatility of its idiosyncratic component, the autocorrelation of the systematic component, the autocorrelation of the idiosyncratic component, the average excess stock return, and the volatility of the excess stock return. Panel B reports the results of Fama MacBeth Fama and MacBeth (1973) regressions of future realized stock returns on firm characteristics. The key characteristic in our results is the ratio of TLCF to total assets and each firm's size (market value) is used as a control. We report results for one period, and five period ahead returns. In Panels C and D we repeat the same exercise as in Panel B, but use volatility, and the asset's beta with the negative of the stochastic discount factor as variables to be explained.

Panel A: Model and data accounting moments

	$\frac{E}{TA}$	$\frac{DEPR}{E}$	$\frac{INT}{E}$	$\frac{TLCF}{E}$	$\sigma(\frac{E}{TA})$	$\sigma(\gamma_X X)$	$\sigma(\epsilon)$	$AC(X)$	$AC(\epsilon)$	$E[R^{i,e}]$	$\sigma[R^{i,e}]$
Data (Avg)	0.138	0.319	0.177	0.236	0.535	0.118	0.511	0.440	0.518	17.16	45.48
Data (Med)	0.140	0.298	0.133	0.087	0.427	0.072	0.407	0.440	0.588	16.92	42.16
Model	0.140	0.329	0.164	0.110	0.463	0.086	0.455	0.410	0.750	10.04	37.72

Panel B: TLCF and future return

	$k = 1y$		$k = 5y$	
$\frac{TLCF}{TA}$	0.0482	0.0024	0.1510	0.0057
ME		-0.0162		-0.0466

Panel C: TLCF and future volatility

	$k = 1y$		$k = 5y$	
$\frac{TLCF}{TA}$	0.2304	0.0343	0.1313	0.0212
ME		-0.0650		-0.0367

Panel D: TLCF and future beta

	$k = 1y$		$k = 5y$	
$\frac{TLCF}{TA}$	0.0483	0.0023	0.2171	0.0033
ME		-0.0146		-0.0759

Table 2: Summary statistics

This table reports summary statistics and correlations for some of the variables used in our analysis. In each period we compute each statistic for each firm, we then compute the equal weighted average, value weighted average, and standard deviation of the statistic for this period. We report the time-series average of each of these computations.

Panel A: Summary statistics

	$\frac{ME}{AvgME}$	$\frac{BE}{ME}$	$\frac{TLCF}{AT}$	$\frac{PROF}{AT}$	$\frac{EBITDA}{AT}$	$\frac{DEPR}{AT}$	$\frac{INT}{AT}$	$\frac{ITC}{AT}$
$E_{EW}[x]$	1.000	0.850	0.107	0.082	0.140	0.043	0.019	0.029
$E_{VW}[x]$	1.000	0.647	0.026	0.113	0.168	0.044	0.019	0.049
$\sigma[x]$	4.141	0.722	0.517	0.134	0.116	0.023	0.015	0.038

Panel B: Correlations

	$\frac{BE}{ME}$	$\frac{TLCF}{AT}$	$\frac{PROF}{AT}$	$\frac{EBITDA}{AT}$	$\frac{DEPR}{AT}$	$\frac{INT}{AT}$	$\frac{ITC}{AT}$
$\frac{ME}{AvgME}$	-0.065	-0.041	0.055	0.062	0.020	-0.006	0.130
$\frac{BE}{ME}$		-0.050	-0.273	-0.279	-0.003	0.160	0.098
$\frac{TLCF}{AT}$			-0.407	-0.422	0.066	0.091	-0.118
$\frac{PROF}{AT}$				0.862	-0.124	-0.310	0.045
$\frac{EBITDA}{AT}$					0.155	-0.163	0.092
$\frac{DEPR}{AT}$						0.094	0.207
$\frac{INT}{AT}$							0.044

Table 3: TLCF and future return

This table reports the results of Fama MacBeth Fama and MacBeth (1973) regressions of future realized stock returns on firm characteristics. The key characteristic in our results is the ratio of TLCF to total assets. The controls are size, book-to-market, profitability, past market, SMB, and HML betas, past stock return, and past volatility. We use annual accounting variables from Compustat. Accounting variables in year t are used to forecast the sum of log monthly returns from January to December in year $t+1$ ($k=12$) or in years $t+1$ to $t+5$ ($k=60$). Backward looking variables are computed with the same k as the forward looking returns, i.e. when $k=12$, then we use monthly returns in year t to compute the betas, average return, and volatility which are used to forecast returns for year $t+1$.

	$k=12$							$k=60$						
$\frac{TLCF}{TA}$	0.08	0.07	0.08	0.08	0.08	0.09	0.08	0.36	0.30	0.36	0.36	0.27	0.28	0.25
t-stat	(3.45)	(3.20)	(4.10)	(3.88)	(3.85)	(3.80)	(3.87)	(4.02)	(3.60)	(4.51)	(4.67)	(4.37)	(4.88)	(4.54)
$\frac{ITC}{TA}$		−0.25					−0.15		−1.58					−0.94
t-stat		(−1.83)					(−1.79)		(−5.10)					(−4.17)
$\frac{ITC}{TA} \times \frac{TLCF}{TA}$		0.79					−1.16		12.81					3.70
t-stat		(0.56)					(−0.78)		(2.63)					(1.02)
ME			−0.01			−0.01	−0.01			−0.07			−0.04	−0.04
t-stat			(−1.27)			(−2.21)	(−2.07)			(−2.85)			(−2.56)	(−2.41)
BE/ME			0.05			0.04	0.04			0.16			0.12	0.12
t-stat			(4.15)			(4.11)	(4.10)			(7.32)			(5.88)	(5.52)
$PROF/ME$			0.01			0.01	0.02			−0.00			0.03	0.03
t-stat			(0.88)			(1.91)	(2.16)			(−0.17)			(2.37)	(2.31)
INV/TA			−0.12			−0.13	−0.11			−0.09			−0.05	0.04
t-stat			(−1.66)			(−1.88)	(−1.61)			(−0.52)			(−0.33)	(0.22)
$\beta^{MKT}_{t-k,t}$				−0.01		−0.01	−0.01				−0.04		−0.08	−0.07
t-stat				(−0.59)		(−1.91)	(−1.80)				(−2.01)		(−3.74)	(−3.71)
$\beta^{SMB}_{t-k,t}$				0.01		0.00	0.00				0.06		0.02	0.02
t-stat				(1.42)		(0.61)	(0.52)				(4.11)		(2.08)	(1.82)
$\beta^{HML}_{t-k,t}$				0.01		0.00	0.00				0.03		0.01	0.01
t-stat				(1.53)		(0.80)	(0.89)				(1.85)		(0.50)	(0.58)
$E[R_{t-k,t}]$					−0.00	0.01	0.01					−0.22	−0.17	−0.16
t-stat					(−0.17)	(0.43)	(0.42)					(−4.81)	(−4.35)	(−4.30)
$\sigma[R_{t-k,t}]$					0.14	0.14	0.15					1.92	1.91	1.83
t-stat					(0.77)	(0.91)	(0.95)					(5.33)	(5.32)	(5.23)
R^2	0.01	0.02	0.04	0.04	0.05	0.09	0.10	0.01	0.02	0.06	0.04	0.07	0.11	0.12

Table 4: TLCF and future volatility

This table reports the results of Fama and MacBeth (1973) regressions of future realized stock return volatility on firm characteristics. The key characteristic in our results is the ratio of TLCF to total assets. The controls are size, book-to-market, profitability, past market, SMB, and HML betas, past stock return, and past volatility. We use annual accounting variables from Compustat. Accounting variables in year t are used to forecast the volatility of monthly returns from January to December in year $t+1$ ($k = 12$) or in years $t+1$ to $t+5$ ($k = 60$). Backward looking variables are computed with the same k as the forward looking returns, i.e. when $k = 12$, then we use monthly returns in year t to compute the betas, average return, and volatility which are used to forecast returns for year $t+1$.

	$k=12$							$k=60$						
$\frac{TLCF}{TA}$	0.06	0.06	0.05	0.05	0.03	0.03	0.03	0.06	0.05	0.06	0.06	0.04	0.03	0.03
t-stat	(6.52)	(6.51)	(6.40)	(7.45)	(6.34)	(6.12)	(5.95)	(6.81)	(7.14)	(7.00)	(7.09)	(6.18)	(6.49)	(7.35)
$\frac{ITC}{TA}$		−0.27					−0.14		−0.31					−0.18
t-stat		(−16.02)					(−13.00)		(−17.08)					(−17.18)
$\frac{ITC}{TA} \times \frac{TLCF}{TA}$		1.25					0.39		1.76					0.85
t-stat		(4.63)					(2.12)		(4.07)					(3.15)
ME			−0.01			−0.00	−0.00			−0.01			−0.01	−0.00
t-stat			(−6.29)			(−6.23)	(−5.93)			(−6.86)			(−7.24)	(−6.70)
BE/ME			0.01			0.01	0.01			0.01			0.01	0.01
t-stat			(6.19)			(5.27)	(5.82)			(5.90)			(4.02)	(4.60)
$PROF/ME$			−0.01			−0.00	−0.01			−0.01			−0.01	−0.01
t-stat			(−6.35)			(−4.54)	(−4.82)			(−5.18)			(−4.44)	(−4.80)
INV/TA			0.02			0.01	0.03			0.02			0.02	0.04
t-stat			(1.36)			(1.29)	(3.52)			(2.12)			(2.39)	(5.52)
$\beta^{MKT}_{t-k,t}$				0.01		−0.00	−0.00						−0.01	−0.01
t-stat				(3.74)		(−4.24)	(−3.56)				(2.18)		(−4.88)	(−4.52)
$\beta^{SMB}_{t-k,t}$				0.01		−0.00	−0.00				0.01		−0.00	−0.00
t-stat				(4.68)		(−0.86)	(−0.98)				(6.72)		(−0.31)	(−0.44)
$\beta^{HML}_{t-k,t}$				−0.00		−0.00	−0.00				−0.00		−0.00	−0.00
t-stat				(−0.20)		(−1.11)	(−1.07)				(−0.17)		(−1.77)	(−1.77)
$E[R_{t-k,t}]$					−0.03	−0.02	−0.02					−0.03	−0.03	−0.02
t-stat					(−7.85)	(−6.84)	(−6.66)					(−12.98)	(−11.91)	(−11.64)
$\sigma[R_{t-k,t}]$					0.52	0.51	0.49					0.49	0.49	0.47
t-stat					(25.00)	(25.00)	(25.00)					(27.90)	(25.71)	(25.41)
R^2	0.07	0.10	0.14	0.15	0.31	0.34	0.35	0.08	0.12	0.15	0.17	0.33	0.37	0.39

Table 5: TLCF and future market beta

This table reports the results of Fama and MacBeth (1973) regressions of future realized market beta on firm characteristics. The key characteristic in our results is the ratio of TLCF to total assets. The controls are size, book-to-market, profitability, past market, SMB, and HML betas, past stock return, and past volatility. We use annual accounting variables from Compustat. Accounting variables in year t are used to forecast the market beta of monthly returns from January to December in year $t+1$ ($k=12$) or in years $t+1$ to $t+5$ ($k=60$). Backward looking variables are computed with the same k as the forward looking returns, i.e. when $k=12$, then we use monthly returns in year t to compute the betas, average return, and volatility which are used to forecast returns for year $t+1$.

	$k=12$							$k=60$						
$\frac{TLCF}{TA}$	0.12	0.13	0.09	0.01	−0.12	−0.10	−0.07	0.20	0.16	0.17	0.15	0.06	0.06	0.02
t-stat	(2.34)	(3.87)	(1.89)	(0.07)	(−1.22)	(−1.05)	(−1.19)	(4.71)	(4.42)	(4.50)	(4.13)	(2.31)	(2.67)	(1.53)
$\frac{ITC}{TA}$		−1.20					−0.35		−1.19					−0.43
t-stat		(−4.24)					(−1.50)		(−8.91)					(−5.54)
$\frac{ITC}{TA} \times \frac{TLCF}{TA}$		0.71					−2.32		11.92					7.21
t-stat		(0.14)					(−0.45)		(2.70)					(2.05)
ME			−0.06			−0.02	−0.02			−0.05			−0.02	−0.02
t-stat			(−3.19)			(−2.18)	(−2.08)			(−3.85)			(−2.75)	(−2.63)
BE/ME			−0.07			−0.07	−0.07			−0.06			−0.05	−0.05
t-stat			(−3.15)			(−3.89)	(−3.81)			(−2.98)			(−3.17)	(−3.31)
$PROF/ME$			−0.02			0.01				−0.04			−0.02	−0.03
t-stat			(−1.21)			(0.76)	(0.25)			(−4.87)			(−3.49)	(−4.21)
INV/TA			0.26			0.22	0.28			0.17			0.18	0.22
t-stat			(1.73)			(1.52)	(2.16)			(2.12)			(2.19)	(2.67)
$\beta^{MKT}_{t-k,t}$				0.17		0.13	0.14				0.11		0.08	0.08
t-stat				(6.45)		(5.50)	(5.65)				(6.61)		(4.91)	(4.92)
$\beta^{SMB}_{t-k,t}$				0.03		0.01	0.01				0.04		0.02	0.02
t-stat				(1.53)		(0.51)	(0.42)				(2.93)		(2.03)	(2.16)
$\beta^{HML}_{t-k,t}$				−0.04		−0.03	−0.03				−0.03		−0.02	−0.02
t-stat				(−2.24)		(−2.23)	(−2.22)				(−2.37)		(−2.44)	(−2.56)
$E[R_{t-k,t}]$					−0.00	−0.01	−0.00					−0.04	−0.05	−0.04
t-stat					(−0.07)	(−0.18)	(−0.02)					(−1.30)	(−1.75)	(−1.57)
$\sigma[R_{t-k,t}]$					2.91	1.73	1.66					2.41	1.39	1.31
t-stat					(7.18)	(4.89)	(4.91)					(11.04)	(6.40)	(6.03)
R^2		0.01	0.03	0.07	0.07	0.11	0.12	0.01	0.02	0.04	0.11	0.11	0.16	0.17

Table 6: TLCF and future SMB beta

This table reports the results of Fama and MacBeth (1973) regressions of future realized SMB beta on firm characteristics. The key characteristic in our results is the ratio of TLCF to total assets. The controls are size, book-to-market, profitability, past market, SMB, and HML betas, past stock return, and past volatility. We use annual accounting variables from Compustat. Accounting variables in year t are used to forecast the SMB beta of monthly returns from January to December in year $t+1$ ($k=12$) or in years $t+1$ to $t+5$ ($k=60$). Backward looking variables are computed with the same k as the forward looking returns, i.e. when $k=12$, then we use monthly returns in year t to compute the betas, average return, and volatility which are used to forecast returns for year $t+1$.

	$k=12$							$k=60$						
$\frac{TLCF}{TA}$	0.74	0.64	0.67	0.52	0.24	0.22	0.18	0.60	0.50	0.54	0.48	0.22	0.19	0.15
t-stat	(2.98)	(2.97)	(2.83)	(2.79)	(1.61)	(1.58)	(1.41)	(4.87)	(5.11)	(4.73)	(4.67)	(3.71)	(3.56)	(3.47)
$\frac{ITC}{TA}$		−4.72					−2.32		−4.60					−2.57
t-stat		(−10.82)					(−6.68)		(−13.39)					(−12.74)
$\frac{ITC}{TA} \times \frac{TLCF}{TA}$		22.83					9.94		23.04					8.19
t-stat		(3.27)					(1.35)		(3.54)					(2.26)
ME			−0.24			−0.15	−0.14			−0.25			−0.16	−0.15
t-stat			(−6.72)			(−7.28)	(−7.36)			(−6.60)			(−7.31)	(−7.28)
BE/ME			0.11			0.04	0.05			0.12			0.07	0.09
t-stat			(3.56)			(1.19)	(1.47)			(6.23)			(4.44)	(5.75)
$PROF/ME$			−0.10			−0.03	−0.04			−0.09			−0.04	−0.05
t-stat			(−3.15)			(−1.20)	(−1.51)			(−4.88)			(−2.76)	(−3.19)
INV/TA			−0.48			−0.48	−0.20			−0.17			−0.15	0.18
t-stat			(−1.69)			(−1.53)	(−0.64)			(−1.38)			(−1.32)	(1.70)
$\beta^{MKT}_{t-k,t}$				0.11		0.02	0.04				0.08		0.01	0.02
t-stat				(2.51)		(0.53)	(0.93)				(3.15)		(0.26)	(0.79)
$\beta^{SMB}_{t-k,t}$				0.14		0.05	0.04				0.14		0.06	0.05
t-stat				(4.38)		(1.98)	(1.85)				(6.08)		(4.23)	(4.12)
$\beta^{HML}_{t-k,t}$				0.02		0.01	0.01				−0.00		−0.01	−0.01
t-stat				(0.67)		(0.47)	(0.48)				(−0.05)		(−1.06)	(−1.02)
$E[R_{t-k,t}]$					−0.35	−0.27	−0.26					−0.36	−0.29	−0.27
t-stat					(−3.68)	(−2.87)	(−2.80)					(−7.16)	(−5.95)	(−5.69)
$\sigma[R_{t-k,t}]$					6.80	5.27	4.89					6.12	4.77	4.42
t-stat					(14.34)	(10.41)	(9.96)					(15.50)	(12.01)	(11.46)
R^2	0.01	0.03	0.05	0.07	0.10	0.15	0.15	0.03	0.06	0.09	0.13	0.19	0.24	0.25

Table 7: TLCF and future HML beta

This table reports the results of Fama and MacBeth (1973) regressions of future realized HML beta on firm characteristics. The key characteristic in our results is the ratio of TLCF to total assets. The controls are size, book-to-market, profitability, past market, SMB, and HML betas, past stock return, and past volatility. We use annual accounting variables from Compustat. Accounting variables in year t are used to forecast the HML beta of monthly returns from January to December in year $t+1$ ($k=12$) or in years $t+1$ to $t+5$ ($k=60$). Backward looking variables are computed with the same k as the forward looking returns, i.e. when $k=12$, then we use monthly returns in year t to compute the betas, average return, and volatility which are used to forecast returns for year $t+1$.

	$k=12$							$k=60$						
$\frac{TLCF}{TA}$	0.12	0.13	0.09	0.01	−0.12	−0.10	−0.07	0.20	0.16	0.17	0.15	0.06	0.06	0.02
t-stat	(2.34)	(3.87)	(1.89)	(0.07)	(−1.22)	(−1.05)	(−1.19)	(4.71)	(4.42)	(4.50)	(4.13)	(2.31)	(2.67)	(1.53)
$\frac{ITC}{TA}$		−1.20					−0.35		−1.19					−0.43
t-stat		(−4.24)					(−1.50)		(−8.91)					(−5.54)
$\frac{ITC}{TA} \times \frac{TLCF}{TA}$		0.71					−2.32		11.92					7.21
t-stat		(0.14)					(−0.45)		(2.70)					(2.05)
ME			−0.06			−0.02	−0.02			−0.05			−0.02	−0.02
t-stat			(−3.19)			(−2.18)	(−2.08)			(−3.85)			(−2.75)	(−2.63)
BE/ME			−0.07			−0.07	−0.07			−0.06			−0.05	−0.05
t-stat			(−3.15)			(−3.89)	(−3.81)			(−2.98)			(−3.17)	(−3.31)
$PROF/ME$			−0.02			0.01				−0.04			−0.02	−0.03
t-stat			(−1.21)			(0.76)	(0.25)			(−4.87)			(−3.49)	(−4.21)
INV/TA			0.26			0.22	0.28			0.17			0.18	0.22
t-stat			(1.73)			(1.52)	(2.16)			(2.12)			(2.19)	(2.67)
$\beta^{MKT}_{t-k,t}$				0.17		0.13	0.14				0.11		0.08	0.08
t-stat				(6.45)		(5.50)	(5.65)				(6.61)		(4.91)	(4.92)
$\beta^{SMB}_{t-k,t}$				0.03		0.01	0.01				0.04		0.02	0.02
t-stat				(1.53)		(0.51)	(0.42)				(2.93)		(2.03)	(2.16)
$\beta^{HML}_{t-k,t}$				−0.04		−0.03	−0.03				−0.03		−0.02	−0.02
t-stat				(−2.24)		(−2.23)	(−2.22)				(−2.37)		(−2.44)	(−2.56)
$E[R_{t-k,t}]$					−0.00	−0.01	−0.00					−0.04	−0.05	−0.04
t-stat					(−0.07)	(−0.18)	(−0.02)					(−1.30)	(−1.75)	(−1.57)
$\sigma[R_{t-k,t}]$					2.91	1.73	1.66					2.41	1.39	1.31
t-stat					(7.18)	(4.89)	(4.91)					(11.04)	(6.40)	(6.03)
R^2		0.01	0.03	0.07	0.07	0.11	0.12	0.01	0.02	0.04	0.11	0.11	0.16	0.17

Table 8: TLCF factor

This table reports results using portfolio sorts based on TLCF/TA and ME. Stocks are sorted in the following way. For the univariate sort in Panel A, there are a total of four portfolios. Portfolio 0 contains all the firms with zero TLCF/TA; all other firms are sorted into portfolios 1,2, and 3 such that each portfolio contains 1/3 of positive TLCF/TA firms. For the double sort in Panel A, the breakpoints along the TLCF/SIZE dimension are formed exactly as in the univariate sort. At the same time, breakpoints along the SIZE dimension are formed independently of TLCF/TA breakpoints, so that 1/3 of all firms lies between each of the breakpoints. We then form 4x3=12 portfolios, with each containing all firms falling within the appropriate TLCF/TA and SIZE breakpoints. We compute a TLCF factor as univariate portfolio 4 minus portfolio 1. We regress the SMB factor, the TLCF factor, as well as the 25 ME and B/E double sorted portfolios, 10 profitability sorted portfolios, 10 investment sorted portfolios, 10 Earnings/Price sorted portfolios, and 49 industry portfolios provided on Ken French's website on the Fama and French 3-factor model. In the first row of the bottom panel, we report the alpha and t-statistic for the SMB and TLCF factors; for the portfolios, we report the root mean square error of the alphas, and of the t-statistics. In the second row of the bottom panel, we repeat exactly the same exercise but replace the ME factor in the Fama and French 3-factor model by the TLCF factor.

Panel A: Sort on TLCF

	Univariate sort			
	P0	P1	P2	P3
	1.40	1.27	1.46	1.98
	Bivariate sort			
	P0	P1	P2	P3
S1	1.69	1.46	1.75	2.29
S2	1.37	1.25	1.40	1.49
S3	1.15	1.08	0.90	1.21

Panel B: α from two different 3-factor models

			RMSE				
	TLCF	SMB	FF25	PROF10	INV10	EP10	IND49
α_{FF3}	0.36	0.00	0.15	0.18	0.11	0.06	0.27
t-stat	2.60		1.77	2.25	1.50	0.85	1.47
α	0.00	-0.03	0.17	0.21	0.12	0.07	0.28
t-stat		-0.27	1.33	1.19	1.28	1.28	1.62