Duration Tool: A Simple Operational Primer
The Kailash Modifications and Methodology

Introduction:

The next two pages attempt to make short work of the substantial effort the Kailash team put into building what we believe to be the most empirically rigorous yet practical approach to calculating equity duration. In work done by Dechow, Sloan and Soliman, *Implied Equity Duration: A New Measure of Equity Security Risk,*[1] the authors do a tremendous job creating a method to create a directional link between equity prices and changes in rates. As noted in their work, when it comes to measuring the risk associated with equities, many legacy academic models failed to produce the robust *ex-ante* outcomes hoped for at the time of their release.

While academics and practitioners embrace the same methods for calculating duration and risk in fixed income, Kailash sought to bridge the gap between their academic theory and practice. The major problem in estimating equity duration vs. bond durations is that the size, rate, and terminal cash-flows are not fixed in the world of equities. The academics used a modified two-stage forecasting model that could be oversimplified to consist of the following:

The Academic Theory:

Dechow, Sloan, and Solimans' work can be summarily explained as per the below. The first term represents the duration formula for the finite forecasting period we describe in Part I. The second term represents the calculation of the terminal value duration. Simplistically the T+(1+r)/r) is the total number of years (T) that were used in the finite calculation tacked on to the duration of the perpetuity. This number is then multiplied by the percent of the starting market-cap that is unexplained by the finite period of discounted cash flows.

$$D = \frac{\sum_{t=1}^{T} t \times \frac{CF_t}{(1+r)^t}}{P} + \left(T + \frac{(1+r)}{r}\right) \times \frac{\left(P - \sum_{t=1}^{T} \frac{CF_t}{(1+r)^t}\right)}{P}$$

The authors note that while this *"…estimation procedure for implied equity duration represents a simple approximation based on relatively crude forecasting assumptions … the resulting duration estimates have strong empirical predictive power."*

Part I: Finite Period Duration

Using book value due to its perceived stability, the authors approximate the future cash distributions for a finite period. In choosing book value, the researchers sought to bring a stable starting point to estimating future cash flows. Their calculation followed the logic that trailing book value, increased by the rate of sales growth and then multiplied by starting ROE, served as a solid approximation for the first year's cash flows. For this finite period, the rate of sales growth (which drives the rate of growth in book value), as well as the firms' ROEs, would both be normalized to a static number using a linear step model. After creating this finite series of estimated cash flows, the authors follow a traditional DCF methodology using an assigned cost of capital. The only final modification being the conversion of these finite period calculations of discounted FCFs into a duration statistic for the finite period.

[1] SSRN, 551644

Part II: Terminal Value Duration

After creating this series of finite period cash flows and their associated duration statistic, the authors then look at the percent of the starting market cap unexplained by the finite period cash-flow analysis. This residual value is treated, in their work, as the terminal value. This terminal value's duration is then converted to the remaining piece of the duration calculation following a more traditional *(1+r)/r* formula. In their academic work, the goal was to ensure that the ordinal distributions were congruent with the actual sensitivity to *Δr.* Their emphasis proved successful but left some space for improvements in the actual associated nominal calculation of the potential change one might suggest is associated with *Δr.*

After significant attempts, Kailash settled on using the final year's discounted cash flow statistic from the Finite Period as the subsequent perpetuity cash flow. This allowed a less constrained determination of the ending sensitivity that Kailash felt more readily approximated the methodologies used in practice for bonds. The final benefit to this alteration in Kailash's view is that the terminal cash flow assumption would be more restrained and hence realistic than a purely academic approach which contemplated enormous step-changes for the sake of period conformity.

A Brief Summary of The Impact of the Kailash Alterations:

Kailash believes the final result is a model that while loaded with inevitable imperfections is as practical as anything we have seen. With bond yields plummeting and academics, Warren Buffett, and common sense challenging the notion that the traditional 60/40 portfolio represents the safety and income it once did, understanding duration risk in equity portfolios strikes us as critically important. Kailash was determined to modify the work to drive daily utility into the compelling theoretical findings they present.

Kailash used the work described as the basic framework for our estimation of equity duration. In our estimation method, we sought to better identify securities that would have outsized negative and positive impacts from unusual changes in interest based on the historical data. In the formula on the prior page, you will note that if we use a terminal growth rate *r* of just 3%, the calculation becomes T + (1.03/.03) or roughly T + 34. That coefficient is then multiplied by the residual market cap that could not be explained by the finite cash flow estimation period. This then creates a situation where, even using only a 3% discount rate, the longest duration an equity could achieve would be 34 + T[2] if we assume that 0% of the value is explained in the finite period of cash flow estimation.

Said another way: While the ordinal distribution in their work still holds, in terms of actually creating an estimation of duration, the problem became altering the calculation set to attempt a duration coefficient appropriate to some of today's most speculative and loss-making equities. Such speculations benefit from the rapid curative powers of finite period calculations of book and ROE in the original setup, which must normalize within the allotted time frame. This created the odd outcome that even firms with negative book value and ROEs would appear to have sub 49-year durations using a 3% discount rate.

For users wondering how we remedied firms with low to negative book value firms due to repurchases, the question is a good one. In situations where adding back the treasury stock offered a higher level of book value, the model will automatically pull in the higher value. If that should fail to remedy a situation with negative book value either due to firm cancelling treasury stock or due to large losses, the model sums the total trailing five years repurchases and adds that figure back to book. In situations where neither method can swing a firm's book value into positive territory, the model will return "N/A" as this method cannot provide a reliable estimate of duration.

[2] T + 34 = 49 in the methodology used by Kailash, as our finite period of estimation is fixed at 15 years, assuming 0% of the market cap is explained by the finite period; in other words for equities where duration > 15.

The Interface:

For investors or allocators interested in loading entire equity portfolios to see value-weighted duration statistics, please contact your salesperson at Kailash Concepts. In this release, we have created a workable template for investors to enter individual tickers and see a given stock's equity duration. This interface allows users to alter assumptions around terminal ROEs, growth, and discount rates.

The exhibit below displays what the user will see for a given equity. Fields in gray are fixed fields that cannot be manipulated. The fields in peach are the ones that can be adjusted by the users. Kailash believes the notes under *Description* combined with the information above should make the calculation method clear, but as always, please reach out to your Kailash Concepts salesperson if you have any issues or questions.

Fig. 1: Kailash Proprietary Equity Duration

WSM	Inputs	Description
ROE	47%	*Current Earnings / Prior Year Book Value*
Terminal ROE	12%	*Assumes ROE normalizes to 12%*
Sales Growth	8%	*Trailing 1-Year Sales Growth*
Terminal Growth	2%	*Assumes sales growth normalizes to 2%*
Years to Terminal	15	*Calculations of cash flows are estimated for next 15 years*
Discount Rate	6%	*All cash flows are discounted back at a 6% rate*
Market Value	10,070	*Current market cap*
% Mcap Unexplained	53%	*% of market cap not explained by the 15 years of discounted cash flows*
Duration	24	*Duration = 15 year DCF + Unexplained market cap*

Definitions

*FCF = (ROE - BV Growth) * BV-1*
BV Growth = Sales Growth
ROE normalizes at 1/15th of spread to terminal
Sales growth normalizes at 1/15th of spread to terminal
TV = Market Cap - 15 year DCF
TV Cash Flows = Unexplained market cap divided by 15th year discounted cash flow

Source: Kailash Capital

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