Determinants of Credit Quality for SplitShare Preferreds
or
$(r+d)(r-d) = r^2 - d^2$

SplitShare preferreds are becoming an increasingly important segment of the preferred share marketplace, due to the gradual disappearance of OperatingRetractible preferreds. Bank capitalization rules were revised to prevent banks from including retractible preferreds in their computations of Tier 1 Capital (extant issues, such as TD.PR.M and TD.PR.N, have been grandfathered; but even so, CIBC recently called for redemption[1] their two remaining issues, CM.PR.A and CM.PR.R). Additionally, changes in accounting rules eliminated the practice of classifying retractible issues as equity,[2] which made such issuance much less attractive for companies – the number of issuers declined from 114 in 1988 to 32 in 1997 and even fewer today.

However, there is huge investor demand for tax-advantaged income securities with a maturity date, which has caused some distortions in the marketplace. Some investors assume, for instance, that FixedResets will be worth $25 (at least 0 on every exchange date, since the dividend resets according to "prevailing market rates". The fact that this is not true[3] does not shake this belief – it will take a long period of FixedResets trading below par to accomplish that feat … and when that happens, watch out!

SplitShare preferreds meet that demand; but it is important to understand the nature of the risks incurred by investors in these issues. In this essay, I will first review some basic concepts of return calculation and statistical measurement; then describe a model for determining credit quality of split share corporation's preferreds and, finally, discuss the results of the model in terms of its sensitivities to various changes in input data. The spreadsheet is available for download at http://www.prefblog.com/xls/splitShareCreditQuality.xls. Note that the spreadsheet must be saved to your hard drive and run from there in order to work.

A Description of SplitShare Corporations

I have discussed the nature of split share corporations on many prior occasions,[4] so I will be brief in describing them here.

A split share corporation is set up by a promoter in order to earn management fees; notable promoters are Brompton Group,[5] Quadravest,[6] Mulvihill,[7] and Scotia Managed Companies.[8]

This corporation then sells whole units to investors in an initial public offering and invests the net proceeds in a portfolio of securities; the portfolio can consist of a single stock (e.g., BNS Split Corp. II is entirely invested in common stock of BNS[9]), a single sector of the market (e.g., Brompton Lifeco Split Corp is invested in an equally weighted portfolio of Canada's four largest publicly-listed life insurance companies[10]), a portfolio reflecting a fashionable investing style (Dividend 15 Split Corp. invests in high-yielding blue-chip Canadian equities[11]) or a broad market index (Sixty Split Corp.'s portfolio reflects the S&P/TSX 60 index,[12] although they are careful to avoid claiming the match is precise). The corporation usually pledges to liquidate on a certain date in the future (generally about seven years in the future), although there are some exceptions.

The whole units sold to investors are almost always comprised of one Capital Unit and one preferred share, which trade separately (whole units are not traded). The preferred share holder has a senior claim to the stated dividends and to the par value of his stock on liquidation; the capital unitholder gets whatever is left over. It is fair to say that the preferred shareholder gives up expected return in exchange for safety; the capital unitholder gives up safety in exchange for higher expected return.

Thus, for example, a SplitShare corporation might issue whole units for $25, comprised of a preferred share with a redemption value of $10 and a capital unit with no stated value. After expenses of the issue are met, the company invests its net receipts of $24 in the portfolio; the portfolio's dividends and capital gains are used to pay dividends to the capital unitholders and preferred shares, after payment of on-going expenses and management fees.

The preferred shares can be an attractive investment, providing a good rate of tax advantaged income with a well-secured, fixed-term investment and many SplitShares are regularly recommended in this newsletter, However, as I like to point out, it only counts as yield if you actually get the money, so investors should understand the various influences that can cause the issue to default.

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1 See http://micro.newswire.ca/release.cgi?rkey=1809283901&view=14730-0&Start=0&htm=0 (accessed 2010-12-11)

2 See Alastair Murdoch, *Management Reaction to Mandatory Accounting Changes: The Canadian Preferred Shares Case*, available on-line at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=133128 (accessed 2010-12-11) and my discussion at http://www.prefblog.com/?p=7950

3 While the dividend will be reset unless the issue is called, it will be reset based on government five year bonds; the credit spread will remain constant. Changes in the market with respect to the credit spread of the issuer over government bonds will not be reflected.

4 *Split Shares*, available on-line at http://www.himivest.com/media/moneysaver_0611.pdf; *Split Shares and the Credit Crunch*, on-line at http://www.himivest.com/media/moneysaver_0807.pdf; *Split Shares and Monthly Retractions*, on-line at http://www.himivest.com/media/moneysaver_0811.pdf and my seminar on Split Shares, available for a fee via http://www.prefletter.com/eMailVerification.php?path=vid

5 http://www.bromptongroup.com/

6 http://www.quadravest.com/

7 http://www.mulvihill.com/

8 http://www.scotiamanagedcompanies.com

9 http://www.scotiamanagedcompanies.com/mcapp/profile.do?com=BSC

10 http://www.bromptongroup.com/funds/lcs/overview/

11 http://www.dividend15.com/index.html

12 http://www.scotiamanagedcompanies.com/mcapp/profile.do?com=SXT

As noted, preferred shareholders have a senior claim on the company's assets, but the company's assets are comprised of a portfolio of common stocks that may perform well, poorly, or anywhere in between according to market conditions. While good conditions will be of great interest to the capital unitholders, only bad conditions can have an effect on the preferred shareholders; so in this essay we ask the questions – how bad must it get? What characteristics of the Split Share corporation are important?

To answer the first question, we will first look at statistical descriptions of investment returns and the nuances intrinsic to the operational paradigm of SplitShare corporations.

Average Returns and Realized Returns

Say that the expected annual return on the underlying portfolio of stocks is r. It is then very tempting to assume that the expected return for two years will be r^2, but this is not the case.

Assume that the return fluctuates, varying from the mean by a deviation d. In one of the years, the return is (r + d) and in the other year the return is (r – d). Then the two year return, R, is:

$$\begin{aligned} R &= (r + d)(r - d) \\ &= r^2 - rd + dr - d^2 \\ &= r^2 - d^2 \qquad (1) \end{aligned}$$

This may seem obvious, but remains a mystery to regulators; prospectuses routinely assume that constant returns, year in and year out, may be realized. For example, the prospectus for Dividend Select 15 (not a SplitShare corporation) states:[13] *Based on the current dividends paid by the Portfolio Shares, the Company is initially expected to generate dividend income of approximately 4.03% per annum. The Company would be required to generate an additional return of approximately 4.97% per annum, including from dividend growth, capital appreciation and option premiums from the Portfolio, in order for the Company to pay initial targeted distribution level and maintain a stable net asset value.*

The prospectus for Brompton Lifeco Split Corp[14] similarly states: *in order to achieve the Company's targeted annual distributions for the Class A Shares (which assumes that the Preferred Share distributions have been made), the Company will be required to generate an average annual total return (comprised of net realized capital gains, option premiums and dividends) on the Portfolio of 8.0%. The Portfolio currently generates dividend income of 2.3% per annum and would be required to generate an additional 5.7% per annum from other sources to return and distribute such amounts.*

In both cases (and I could go on endlessly!), an examination of the investment objectives of the funds and their various fees and expenses makes it apparent that the calculations assume a constant return; or, to put it another way, they are not referring to the annual return (r in Equation (1) above), but to the annualized value of the long-term return (R). At the very least, the impact of varying interim returns and interim cash flows is not addressed.

While I would certainly appreciate details of the calculations and disclosure of the attributes of the pricing model, I am loath to suggest that these disclosures should become a requirement for prospectuses. Very few people read prospectuses and even fewer understand them; further disclosures would simply add to the preparation cost and make it even less likely that the information in the prospectus will actually be read by the ultimate investor.

Instead, prudent investors will seek to understand how portfolio returns are distributed and how these distributions may affect the ultimate realized return. Generally, following statistical theory, the following descriptors are considered important:

- Standard Deviation
- Skew
- Kurtosis

Standard Deviation

A normal distribution occurs whenever there is a random process, and a normal distribution can be expressed as the limit of Pascal's Triangle[15]. Pascal's Triangle is created by writing "one" at the top of the triangle. Each successive row is one space wider than the row above; the number in each space is determined by adding the two numbers above it. Spaces along the right (left) edge will have no numbers that are above and to their right (left), and so are set equal to the single number above and to their left (right). Thus, we can write the first seven rows of Pascal's triangle as:

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1
1 6 15 20 15 6 1

Each number on the rows after the first is derived by adding the two numbers above it on either side, with the area outside the triangle defined as zeroes.

[13] See http://www.dividendselect15.com/PDF/DividendSelect15-%20English%20Final%20Prospectus.pdf (accessed 2010-12-11)

[14] See http://www.bromptongroup.com/funds/lcs/pdf/Lifeco_Split_English_prospectus_final.pdf (accessed 2010-12-11)

[15] See, for example, "UMKC Department of Mathematics and Statistics", online at http://cas.umkc.edu/mathematics/ExtraCaption.asp (accessed 2010-12-12)

As the triangle is continued downward, the distribution will get closer and closer to the normal distribution[16]. Various games are based on creating a triangle with nails[17] and letting a ball drop from the top to a bin at the bottom – as long as the game is fair, with the ball having an equal probability of falling on either side of each nail it hits, the distribution of balls over time falling into the bins defined by the bottom row will be in proportion to the number computed in the triangle – all the best prizes are at either end!

This illustrates the idea that the normal distribution relies on small random movements in turn, with each successive small movement being unrelated to the previous movement and having an equal probability of going either way. Unfortunately, this is not how markets work. The events of 2007–09, when so-called 'once in a lifetime'[18] deviations from normal behaviour bankrupted many banks and crippled others show that unconditional belief in the bell curve is unwarranted.

Andrew G. Haldane of the Bank of England provided an entertaining anecdote about probability calculations and normal distributions in a February, 2009, speech: [19]

> *Back in August 2007, the Chief Financial Officer of Goldman Sachs, David Viniar, commented to the Financial Times:*
>
> *"We are seeing things that were 25-standard deviation moves, several days in a row"*
>
> *To provide some context, assuming a normal distribution, a 7.26-sigma daily loss would be expected to occur once every 13.7 billion or so years. That is roughly the estimated age of the universe.*
>
> *A 25-sigma event would be expected to occur once every 6 x 10^{124} lives of the universe. That is quite a lot of human histories. When I tried to calculate the probability of a 25-sigma event occurring on several successive days, the lights visibly dimmed over London and, in a scene reminiscent of that Little Britain sketch, the computer said "No". Suffice to say, time is very unlikely to tell whether Mr Viniar's empirical observation proves correct.*
>
> *Fortunately, there is a simpler explanation – the model was wrong.*

Several factors could have caused the model to be wrong: there could have been some new and unaccounted or influence on the operating environment that made previous computations nonsensical, or it could have been that data should not have been thought of as being normally distributed, and that the "actual" distribution, which statistics tries and often fails to capture, should have included some accounting for the two major adjustments to Standard Deviation, skew and kurtosis.

Skew

A gambler "investing" in 23-red on a roulette table may calculate his expected return as -5.26%[20] with a standard deviation of 583% but this analysis isn't very helpful. The 35-1 payoff if he wins skews the return potential to the point where the normal distribution assumed by the techniques heretofore discussed are simply not very helpful.

If we return our attention to Bay Street from the Vegas Strip, we may consider two simple portfolios: over 100 months, the first is expected to have 99 monthly returns of zero and one of 100% while the second has 99 instances of a two-percent return and one loss of 98%. These two portfolios have identical expected return (1% per month) and identical standard deviation (10%).

The difference between these portfolios may be described mathematically in terms of "skewness". There are various methods of calculating skewness, but they all involve taking the cube of the individual scenario's deviation from the expected value, rather than the square that is used for standard deviation, and then normalizing the value to express it in terms of the standard deviation[21]:

$$\text{skew} = \sum_s P(s)*[R(a, s) - E(a)]^3/(N-1)\ \sigma(a)^3$$

The two extreme portfolios used to illustrate the pitfalls of relying exclusively on standard deviation as a measure of risk may be differentiated by their skewness: the skewness of the first portfolio is positive, while the second is negative. Returning to consideration of bonds, we may say that the distribution of returns of a corporate bond will exhibit negative skewness: the degree to which we can outperform a comparable government bond until maturity is limited on the upside by the spread at which we made the purchase – say one or two percent – whereas our total return could conceivably be -100% if the bond defaulted with no recovery the day after purchase.

To illustrate skewness,

- chart 1 (Normal Distribution) has been prepared by calculating a normal distribution with a mean of 10 and a standard deviation of 2
- chart 2 (Positive Skewness) adjusts the data of chart 6a by halving the standard deviation for lower numbers; that is, the plots for values above and below the mean both have a normal distribution, but the standard deviation on the lower side is 1, while the standard deviation on the upward side is 2. Note that this will change the mean, standard deviation and other statistical properties of the distribution as a whole.
- chart 3 (Negative Skewness) reverses the adjustment of chart 6b

Skewness is often referred to as the "third moment" of the distribution due to its reliance on cubes.

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16 There is a marvelous javascript applet available online at http://binomial.csuhayward.edu/applets/appletNormApprox.html (accessed 2009-1-30)

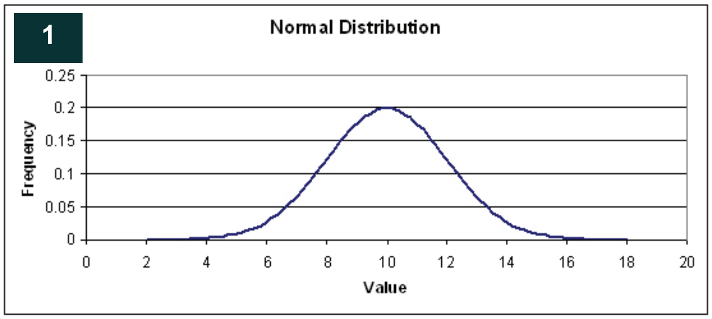
17 "The Pinball Game", Eric Hiob, available online at http://commons.bcit.ca/math/entertainment/pascaltr/index.html (accessed 2009-1-30)

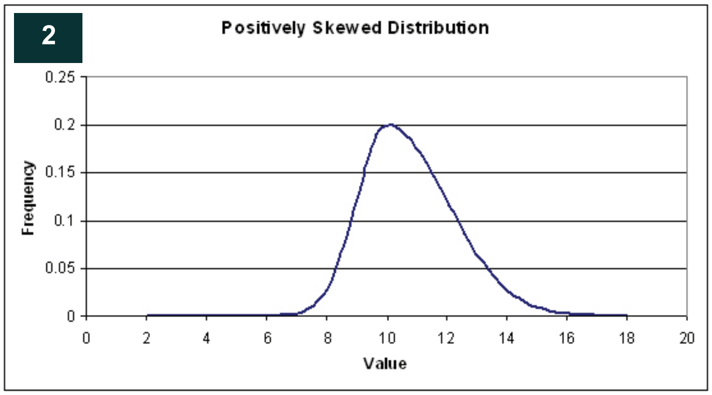
18 Or, perhaps, once in the history of the universe. There were some naïve claims of an eleven-standard deviation move in US financial common stocks in July 2008; see http://www.nakedcapitalism.com/2008/07/end-of-world-as-we-know-it.html and http://www.prefblog.com/?p=2406 for further discussion (both accessed 2009-2-10)

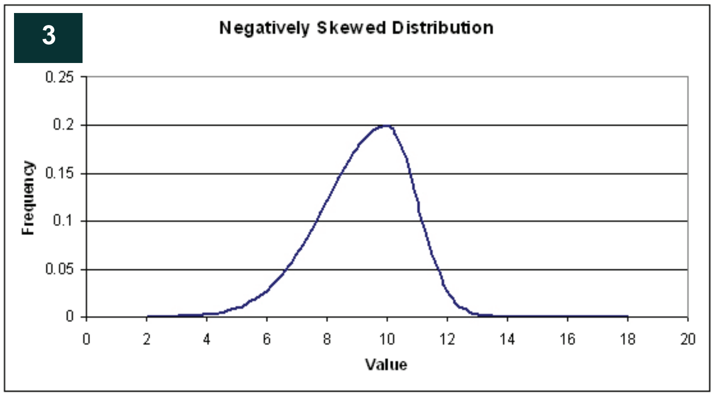
19 http://www.bis.org/review/r090219d.pdf (accessed 2010-12-11)

20 Roulette odds are ubiquitous on the internet. I used http://wizardofodds.com/roulette (accessed 2009-2-9)

21 Engineering Statistics Handbook at http://www.itl.nist.gov/div898/handbook/eda/section3/eda35b.htm (accessed 2009-2-10)







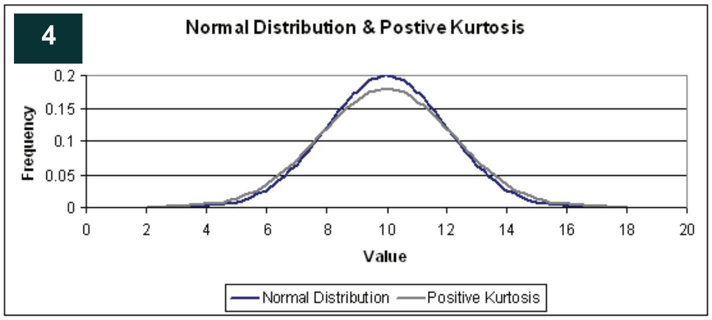
Kurtosis

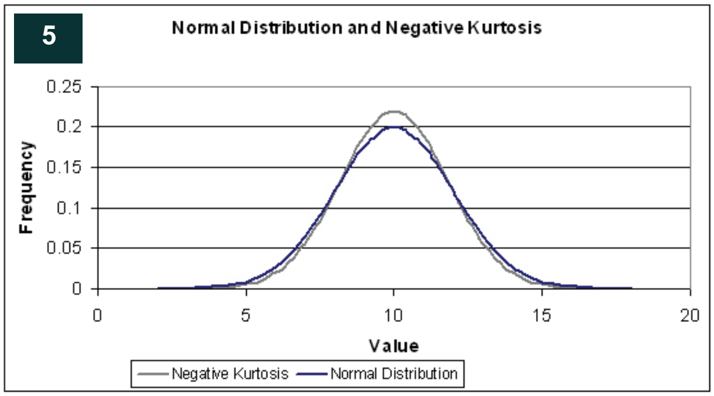
It will come as no surprise that there is a "fourth moment" of distributions, otherwise known as kurtosis, that is also an important measure of a distribution's deviation from normal:

$$\text{kurtosis} = \sum_s P(s)*[R(a, s) - E(a)]^4/(N-1)\ \sigma(a)^4$$

Since the kurtosis of a standard normal distribution is equal to three, the value is often presented after subtraction of three to normalize the statistic.

Charts 4 and 5 show the effect of changing the kurtosis of a normal distribution – in these examples the sign of the kurtosis has been determined after normalization. It will be noted that positive kurtosis implies a lower peak and fatter tails,[22] while negative kurtosis is identified by a higher peak and thinner tails.





[22] I told my girlfriend I needed an illustration of a fat tail for this issue and asked her to send me a recent photo. She got all mad at me for some reason, so you'll have to make do with my charts.

All these deviations from normal distribution are well known to the financial industry and many ponderous tomes have been written regarding how investment objectives can incorporate a knowledge of these deviations into portfolio construction. One approach is to optimize portfolios so that skewness can be maximized subject to a given level of mean and standard deviation[23]; other approaches to maximizing some outputs while minimizing others are commonplace.[24]

This recognition extends to performance measurement, where investment alternatives may be ranked on the basis of historical returns by the Sortino ratio, which emphasizes downside deviations, as opposed to the standard approach which treats all deviations from the mean as equally undesirable.[25]

In this essay, however, I will eschew any fancy modelling and descriptive statistics – in part because I have much less faith in them than was implied by the Goldman Sachs executive quoted above. Like many elements of financial theory, it is important to understand the concepts and how they may affect investment results on a qualitative basis; but are not much use quantitatively.

Sequence of Returns Risk

With equation (1) above, we showed that the variance from the mean (which we may think of as corresponding to standard deviation) can have an enormous effect on cumulative returns. Professor Moshe Milevsky of The Individual Finance and Insurance Decisions Center (IFID),[26] whose work was invaluable to the preparation of the appendix to the April, 2010, edition dealing with annuities, has stressed the point that in the presence of cash withdrawals, the sequence of return is also very important to the determination of overall investment results.[27]

Consider another two period investment scenario. Again, the periods have returns of (r + d) and (r – d), but we will now specify that we start with assets having value A and after the first period make a withdrawal of amount w.

In Case 1, the higher return occurs in the first period and the asset value at the end of period 1 is:

$$A (r + d) = Ar + Ad$$

After a withdrawal of amount w, we have:

$$Ar + Ad - w$$

And after realizing a return of (r – d) in the second period we have:

$$(Ar + Ad - w)(r - d)$$
$$= Ar^2 - Ard + Ard - Ad^2 - wr + wd$$
$$= Ar^2 - Ad^2 - wr + wd$$

When we perform the same computation for the case in which the lower return is realized first, we calculate an end value of:

$$Ar^2 - Ad^2 - wr - wd$$

By subtraction, we find that the first case results in an asset value at the end of period two that exceeds the value of the second case by 2wd. Thus, the terminal value will be affected by:

- The sequence of returns
- The size of the withdrawals
- The degree of variance from mean returns

The effect of Cash Income on Sequence of Returns

A problem with the above is that it is not particularly sophisticated. The model implicitly assumes that investments must be sold to realize cash for withdrawal, but this is not necessarily the case. Expected returns will generally have a cash component; most stocks will pay a dividend.

So for a more sophisticated look at sequence of returns risk, let's adjust the assumptions of the model so that:

- The return in any period is capital appreciation, c, and income, i, plus or minus the deviation from the norm, d (which affects only the capital appreciation component)
- The amount withdrawn at the end of the first period, w, is set equal to the expected cash income of the portfolio, Ai

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23 Hiroshi Konno, Hiroshi Shirakawa and Hiroaki Yamazaki, *A mean-absolute deviation-skewness portfolio optimization model*, Annals of Operations Research Volume 45, Number 1/December, 1993. Available at http://www.springerlink.com/content/j37p852u4071307n/ (accessed 2009-1-28)

24 *Mean-Risk Models Using Two Risk Measures: A Multi-Objective Approach*, published by The Centre for the Analysis of Risk and Optimisation Modelling Applications, available at http://www.carisma.brunel.ac.uk/papers/2006/CTR-51.DOC (accessed 2009-1-28)

25 *The Nature of Risk Management For Hedge Funds*, By Sara Statman, June 2005, http://www.statmanconsulting.com/NewWebsite/PDF/NatureHFRiskManagement.pdf (accessed 2009-1-27)

26 See http://www.ifid.ca/

27 See http://www.ifid.ca/pdf_newsletters/PFA_2007DEC_FEAST.pdf (accessed 2010-12-11)

Thus, at the end of the first period in the first case (in which the better return is first), the portfolio value is:

$A(c + i + d) = Ac + Ai + Ad$

The cash withdrawn is Ai, so for the next period we calculate

$(Ac + Ad)(c + i - d)$ (2)
$= Ac^2 + Aci - Acd + Adc + Adi - Ad^2$
$= Ac^2 + Aci + Adi - Ad^2$

And, performing a similar calculation for the second case, with the worse return being realized firs, we compute an end value of

$Ac^2 + Aci - Adi - Ad^2$

By subtraction, we find that the first case has again outperformed, but this time the difference is 2Adi; since Ai = w, this is the same value as calculated above.

However, it will be noted that the calculation implicitly assumes that the income, i, compounds and is paid as a constant percentage of portfolio value. While this may be a fair assumption in the very long term, it is not expected to happen very often in the short term; generally speaking, income on equities will increase (with luck!) in larger and less frequent jumps, while the income on fixed income is, er, fixed. In any event, the frequency of withdrawals may be assumed to be greater than the frequency of dividend increases.

Given this assumption, the portfolio value at the end of period 2 for the first case is not given by Equation (2), but by:

$(Ac + Ad)(c - d) + Ai$
$= Ac^2 - Acd + Adc - Ad^2 + Ai$
$= Ac^2 - Ad^2 + Ai$

And the calculation of the asset value at the end of period 2 for the second case is:

$(Ac - Ad)(c + d) + Ai$
$= Ac^2 + Acd - Adc - Ad^2 + Ai$
$= Ac^2 - Ad^2 + Ai$

Thus, an investor who withdraws only his income from the portfolio has insulated himself from Sequence of Return Risk – a very important result, as it provides a good theoretical rationale for the incorporation of fixed income in a portfolio.

The SplitShare Credit Quality Model

The model presented in this essay examines the effects of various factors on the default potential for preferred shares issued by SplitShare corporations. The following specifications are required:

- Expected price appreciation of the underlying portfolio
- The monthly return distribution of this expected price appreciation
- Expected dividend yield on the underlying portfolio
- The initial NAV of the fund (this is the whole unit value, comprised of the preferred share and the capital unit)
- The redemption value of the preferred share
- The annual dividend paid on the preferred share
- The Management Expense Ratio of the SplitShare corporation, expressed as a percentage of the whole-unit NAV
- The annual dividend paid on the capital units when the whole-unit NAV exceeds the NAV Test
- The annual dividend paid on the capital units when the whole-unit NAV is less than the NAV Test
- The dollar value of the NAV Test.
- The Whole-Unit par value (this can be important, because many SplitShare Corporations have a policy of paying out any excess to Capital Unitholders annually, as a special dividend)
- The term to maturity

The model computes results monthly, varying the return randomly about the mean in accordance with the selected monthly return distribution. It is this random selection of input data from a defined set of possibilities that gives this type of analysis its sobriquet of 'Monte Carlo'.

At the commencement of each simulation, the expected monthly dividend is calculated by multiplying the NAV by the specified underlying dividend yield. This value is stored and may be adjusted in the course of the simulation.

At the end of each month, the following calculation is performed. I have chosen to present this as a fragment of the VBA code used during the simulation.

```
(1) NAVPrior = NAV
(2) priceIncrement = NAV * (rtn * returnScalingFactor – 1)
(3) dividendIncrement = monthlyDividend
(4) NAVBefore = NAV + priceIncrement + dividendIncrement
(5) monthsExpense = NAV * MER/12
(6) If NAV > NAVTest Then
(7) CapDist = CapUnitDivAbove/12
(8) Else
(9) CapDist = CapUnitDivBelow/12
(10) End If
(11) extraDist = 0#
(12) If (Months – j) Mod 12 = 0 Then
(13) If NAV > WholeUnitValue Then
(14) extraDist = NAVBefore – WholeUnitValue
(15) End If
(16) End If
(17) cash = monthlyDividend – monthsExpense – CapDist – PFDDist – extraDist
(18) NAV = NAVBefore – monthsExpense – CapDist – PFDDist – extraDist
(19) monthlyDividend = monthlyDividend * (1 + cash/NAV)
```

Line (2) shows the price appreciation of the underlying securities. The value "rtn" is recovered by the software from the security template, which is an historical record of returns for an actual security, or may be a normal curve if the user so specifies. The "returnScalingFactor" has been previously calculated by the software to ensure that the expected return is as specified by the user; that is, the historical data is used only to adjust the distribution of monthly returns around the mean and has no influence on the mean itself.

In Line (4), the NAV before fees, expenses and distributions is calculated by applying the price return and the monthly dividend to the previous NAV. The monthly dividend has been previously calculated by the software and is initially equal to the initial NAV multiplied by the initial underlying dividend yield, and is adjusted monthly in Line (19).

Lines (5) through (16) calculate the variable monthly charges against the NAV: the management fee (MER), the Capital Unit Distribution (CapDist); and the possible special dividend (extraDist). Note that it is assumed that special dividends are paid annually, rather than monthly, and that the month chosen for payment is arbitrary (whole years prior to the maturity date)

Line (17) calculates the cash that will be in the portfolio, while Line (18) calculates the NAV after all adjustments. Note that the changes in NAV due to the underlying portfolio have already been incorporated in the latter value in Line (4).

Line (19) is the clever bit. It has been assumed that the securities held will pay a constant dividend regardless of their price. At the end of the month, prior to market action, the NAV will be comprised of two components:

$NAV = S + cash$

Where S is the value of the securities.

In order to raise the cash necessary for distributions (or, less often, to invest the excess cash held) the fund must take market action to change the cash amount to zero; no frictional costs are assumed, so a fraction "f" of the securities will be sold (or bought), and:

$F = 1 + f$

$FS = NAV = S + cash$

Therefore

$FS = S + cash$

$F = (S + cash)/S$

$F = NAV/(NAV – cash)$

$NAV = F (NAV – cash)$

$1 = F – (cash/NAV)$

$F = 1 + (cash/NAV)$

Since

(Prior Securities Held) * F = (New Securities Held)

Then, given a constant dividend rate on the underlying common stock:

(New Monthly Dividend) = (Prior Monthly Dividend) * (1 + cash/NAV)

Which is Line (19).

After these computations, the programme loops around as many times as are necessary to complete the number of months specified by the user until maturity, selecting a different value of "rtn" in Line (2) every time. When the simulation has completed, the NAV is compared to the Preferred Share Redemption value; if less, then the issue defaults and the severity of default is determined by the difference between the two values.

In each run, this process is repeated 8,191 times, using randomly selected values of "rtn". Why 8,191? That's the maximum array size in VBA that allows the use of embedded Percentile function, and I didn't feel it necessary to write my own version to allow for more runs. As will be seen, the results appear to be reasonably constant: there will be far more error in results due to deviation of actual realized returns from the user's estimate than there will be due to shortcomings in the mechanics of the simulation.

Reporting on the Spreadsheet

The spreadsheet is available for download at http://www.prefblog.com/xls/splitShareCreditQuality.xls. For instructions on using the spreadsheet, please refer to the 'Instructions' tab, and note that the spreadsheet will not run on-line; it must be saved to your hard drive and run from there. In this essay I will restrict myself to discussion of the outputs.

The tab "Choose Distribution" is a lightly modified version of a spreadsheet developed[28] by Peter Ponzo (aka "gummy"). It is not necessary to use this tab to run the credit quality simulations; the tab is provided as part of the package as a convenience to users who may wish to compare the broad characteristics of possible return distribution templates prior to selecting one for use in the main programme.

The tab "creditQuality" is the main screen of the spreadsheet. As noted in the "Instructions" tab, there are three steps to running a simulation:

- Download Data
- Characterize Data
- Do Monte Carlo analysis

Reporting on Model Characterization

There are two reporting fields that characterize the data. The first, labelled rather verbosely "Total Underlying Cumulative Return for Various Standards, Terms and Percentiles (Dividends held constant)", is found in cells A13:L18 and compares the modelled distribution of underlying returns with the standards imposed on insurance companies by regulators for capital adequacy determination purposes. For instructions on using the spreadsheet, please refer to the 'Instructions' tab. In this essay I will restrict myself to discussion of the outputs.

The row labelled "OSFI Old" is the old OSFI standard for insurance models. This standard was developed by the Canadian Institute of Actuaries[29] using the TSE 300 Total Return Index from January 1956 to December 1999 as the calibration dataset and specifies how bad the "left tail" of the return probability distribution must be in order meet OSFI's standards: an insurer can't behave like a split-share promoter and assume that returns will be constant, year in and year out! In order to pass OSFI's "Old" validation tests, for instance, it must be demonstrated that the model results in securities returns less than or equal to a loss of 24% on a one-year basis with a probability of at least 2.5%. Similarly, the five-year returns must be worse than -10% (cumulative) at least 10% of the time. Other numbers are as specified.

American regulators (the National Association of Insurance Commissioners) use recommendations from the American Academy of Actuaries.[30] The meaning of the numbers cited for each combination of percentile and probability is the same.

Finally, as I have often discussed in this newsletter, OSFI changed the capitalization requirements for segregated funds in October,[31] seeking to ensure that equity return experience since 1999, as well for periods prior to 1956, is appropriately reflected. As may be seen on the spreadsheet report, the new requirements drastically change the extreme results for total returns over a one-year horizon; for example, models must have a probability of at least 2.5% of a one-year return worse than -35%.

In all cases I have examined, the spreadsheet model is considerably more pessimistic than the standard requires for total returns over the long term. This is expected; it will be required that the model used by the spreadsheet holds dividends constant; it is only the price component of total return that compounds over time.[32] The lack of sophistication in the spreadsheet is excused by its intended purpose of investigating the credit quality of SplitShare preferreds, most of which will have a term to maturity of five years or less.

The table labelled "Underlying Cumulative Return Distribution" in cells K4:Q11 serves a similar purpose, but examines the entire distribution of model returns, not simply the left tail.

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28 See http://www.financialwebring.org/gummy-stuff/kurtosis.htm

29 Canadian Institute of Acutuaries, *CIA Task Force on Segregated Fund Investment Guarantees*, March 2002, available on-line at http://info.worldbank.org/etools/docs/library/83954/cia.pdf (accessed 2010-12-11). I don't know why I have to go to the World Bank to get a copy of an OSFI document – but I do!

30 American Academy of Actuaries, Recommended Approach for Setting Regulatory Risk-Based Capital Requirements for Variable Annuities and Similar Products, available on-line at http://www.naic.org/documents/committees_e_capad_lrbc_2_LCASDocFinal.pdf (accessed 2010-12-11). It will be noted that this report is freely available on the NAIC website. For all their faults, American regulators are much more thorough, competent and transparent than Canadian regulators.

31 OSFI, Revised Guidance for Companies that Determine Segregated Fund Guarantee Capital Requirements Using an Approved Model, October, 2010, available on-line (wow, OSFI, we investors are deeply honoured by your decision to trust us with this secret) at http://www.osfi-bsif.gc.ca/app/DocRepository/1/eng/guidelines/capital/advisories/sgfndreq_e.pdf (accessed 2010-12-11)

32 This is similar to the second model described in the section 'Sequence of Returns Risk'. Essentially, the first model in that section kept yield constant, regardless of price; the second model keeps the rate constant, regardless of price. Over the short term the second model is probably a better approximation to the truth - prices change faster than dividends!

Model results over all 8,191 simulations are examined at various time periods and the statistical description of this range of outcomes is presented.

These tables have been included as sanity checks on the data: users are encouraged to remember the old saw "Garbage In, Garbage Out" and verify that the potential for disastrous returns of the underlying securities is adequately estimated.

Reporting on SplitShare Default Potential

After the Monte Carlo simulation has been run, two tables are filled in. The first, in cells E35:G38, shows the Probability of Default, the Loss Given Default and the Expected Loss, in terms of both totals and percentages. The Total recorded for Probability of Default is the number of defaulting scenarios in the 8,191 simulations, while the two totals below represent dollar figures. Thus, for example, if there have been 1,388 Total Defaults and a Total Loss Given Default of $3,032, then each default, on average, resulted in a loss of $2.26 to the preferred share investors, which, given a $10 Preferred Share Redemption Value, implies a loss of 22.60% given default. However, since the Probability of Default is "only" 16.34%, the Expected Loss for an investor at the beginning of the period is "only" 3.70%.

The table in cells A40: Q42 shows the probability distribution of the final NAV. For example, if the 5th Percentile is 7.01, this means that in 5% of the simulations, the final NAV was $7.01 or less.

Reporting on Security Template

The "Security Tab" does not need to be examined in order to use the spreadsheet, but careful investors will review it. This tab shows the data downloaded from Yahoo! for the security specified in the "Download Data" stage of the "Credit Quality" tab and forms a preliminary calculation of returns.

Reporting on "example" Tab

When performing the Monte Carlo analysis, the software records the monthly results of the first simulation in the example Tab. Users are encouraged to review the example and ensure that they are in agreement with the methodology, which was discussed in the section "The SplitShare Credit Quality Model", above.

Credit Quality: The Base Case

Table 1 shows the "Base Case" used for illustrative purposes throughout this essay. Most of the rest of this appendix will simply change the parameterization of the Monte Carlo simulation in an effort to quantify how important each of these parameters are when determining credit quality.

Table 1: Base Case	
Start Date	12/08/02
End Date	12/08/10
Symbol	SLF.TO
Expected Annualized Return	7.00%
Underlying Dividend Yield	3.75%
Initial NAV	16.00
Pfd Redemption Value	10.00
Pfd Coupon	0.525
MER	1.50%
Cap Unit Div (above Test)	0.70
Cap Unit Div (below Test)	0.00
NAV Test	15.00
Whole Unit Par Value	25.00
Months to Redemption	60

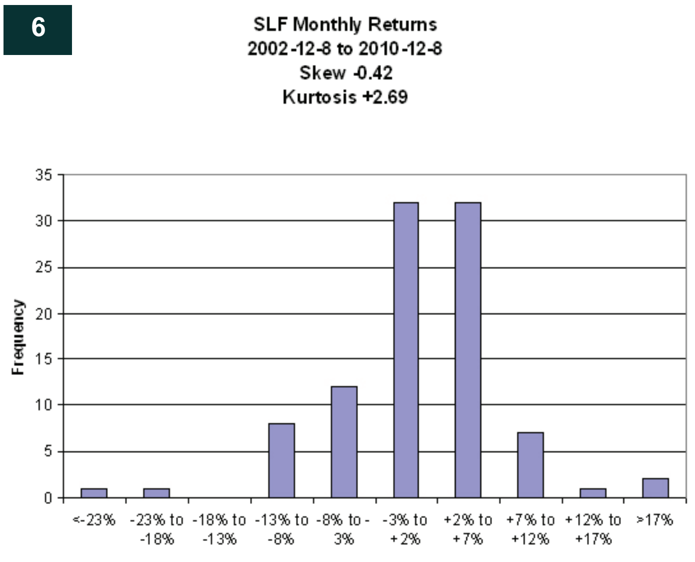
But what happens if we change nothing? Given the fact that we are performing a Monte Carlo analysis, we must not expect that we will ever get two runs with absolutely identical results. If we assume that 100 monthly returns are downloaded as the security template, and that these returns are all different, it is clear that we can get 100 different results after the first month of simulation. After two months, we have 100^2 different possibilities and after the base case term of 60 months, there are 10^{120} paths we could have taken – which is rather a large number.

Accordingly, ten separate Monte Carlo simulations were performed with identical specifications; the spreadsheet output for model characterization and default potential are recorded in Table 3. This procedure also serves as a check on the programming; an error could lead to results that were either too consistent or not consistent enough. A wide variance between runs might also mean that an insufficient number of simulations is performed in each run.

Table 3: Consistency Between Runs

	Std Dev	Skew	Kurtosis	1 Year, 5%	5 Years, 5%	10 Years, 5%	20 Years, 5%	PD	LGD	EL	5%-ile
SLF.TO	6.65%	-0.42	2.69	-28.29%	-33.99%	-29.41%	-18.24%	16.69%	-21.98%	-3.67%	7.05
SLF.TO	6.65%	-0.42	2.69	-27.32%	-34.35%	-29.47%	-19.82%	17.08%	-22.39%	-3.82%	6.97
SLF.TO	6.65%	-0.42	2.69	-26.69%	-34.82%	-30.59%	-17.43%	16.90%	-21.16%	-3.58%	7.24
SLF.TO	6.65%	-0.42	2.69	-26.84%	-33.64%	-39.31%	-20.18%	17.10%	-22.56%	-3.86%	6.92
SLF.TO	6.65%	-0.42	2.69	-28.07%	-34.21%	-30.58%	-17.69%	16.58%	-22.07%	-3.66%	7.00
SLF.TO	6.65%	-0.42	2.69	-27.75%	-35.44%	-29.06%	-18.77%	16.52%	-21.78%	-3.60%	7.14
SLF.TO	6.65%	-0.42	2.69	-26.26%	-33.36%	-29.77%	-16.97%	17.82%	-22.63%	-4.03%	6.81
SLF.TO	6.65%	-0.42	2.69	-26.82%	-34.03%	-28.84%	-17.02%	17.21%	-22.52%	-3.88%	7.00
SLF.TO	6.65%	-0.42	2.69	-27.70%	-35.31%	-30.21%	-18.04%	16.51%	-22.34%	-3.69%	7.01
SLF.TO	6.65%	-0.42	2.69	-27.50%	-33.18%	-30.60%	-18.61%	16.99%	-21.90%	-3.72%	7.07
Average	6.65%	-0.42	2.69	-27.32%	-34.23%	-30.78%	-18.28%	16.94%	-22.13%	-3.75%	7.02
StdDev	0	0	0	0.66%	0.77%	3.06%	1.09%	0.40%	0.45%	0.14%	0.12

6



How should one interpret the results for investment use? We have specified the term to maturity (5 years) and the coupon (5.25%) of the security; with a few more specifications we can calculate a yield[33], and we do this in Table 13.

As shown in that table, if we change the Call Price of the security from its redemption value to its expected value (given an expected loss of 3.75% as indicated in Table 3) then the estimated yield on the security changes dramatically: given a reasonable pricing assumption of 10.20, we find that while the yield when calculated normally is 4.80%, the default-adjusted yield is 4.12%. Is this good enough for us? We can decide then; but at least this credit analysis has given us some quantitative estimates to work with, rather than a mere DBRS credit rating.

Table 13: Normal and Default-Adjusted Yield Calculation

	Normal Yield Calculation	Default Adjusted Yield
Current Price	10.20	10.20
Call Price	10	9.625
Settlement Date	2010-12-10	2010-12-10
Call Date	2015-12-10	2015-12-10
QuarterlyDividend	0.13125	0.13125
Cycle	3	3
Pay Date	10	10
Include First Dividend?	1	1
First Dividend Value	(blank)	(blank)
Current Yield	5.1%	5.1%
Annualized Quarterly Yield to Call	4..80%	4.12%

Effect of Changing Security Template

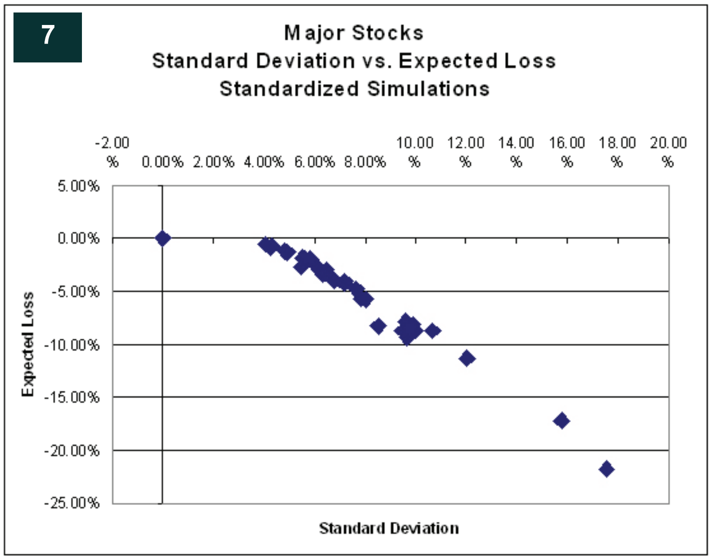
As shown in Table 2, changing the distribution of returns about the mean can have a dramatic effect on the expected loss due to default. If the SplitShare's underlying investments behave like the phlegmatic utilities ENB and TRP, then the expected loss due to default is less than 1% (given our other Base Case assumptions), while if the behaviour resembles that of the manic miner TCK.B, the expected loss increases to over 20%, implying an expected value at maturity of less than $8 – possibly much less, given that the 5th percentile for final value is a derisory $1.21.

It will be remembered that no return assumptions are causing this change; these differences are due solely to the distribution of returns, since the expected return through the period is constant at the base-case value of 7% p.a.

So why does it change? The best answer I have is Standard Deviation. As shown in Chart 7, there is a very good agreement between Expected Loss and the Standard Deviation of monthly returns.

Thus, an investor's first instinct should be to prefer split share preferreds with a diversified portfolio of underlying investments; an inspection of Table 2, shows that very good results are achieved when broad ETFs are the underlying investment (as is effectively the case with, for example, Sixty Split); failing that, utilities have a good track record.

However, a word of caution is in order. Teck Corporation had a near-death experience during the period and its stock price gyrated accordingly – but it did not actually go bankrupt or suffer the indignity of a takeover at rock-bottom prices. The table of securities listed as examples exhibits survivor bias (how would a split share based on Enron have done?) and, more insidiously, past performance is no guarantee of expected returns. Investments must be monitored and diversified; if lightning strikes, one is perfectly entitled to grumble, but if one bad investment wipes you out you have no-one to blame but yourself.



[33] See the yield calculator at http://www.telusplanet.net/public/kbetty/ytc.xls and the discussion of this calculator at http://www.himivest.com/media/moneysaver_0607.pdf

Table 2: Effect of Distribution Assumptions											
	Std Dev	Skew	Kurtosis	1 Year, 5%	5 Years, 5%	10 Years, 5%	20 Years, 5%	PD	LGD	EL	5%-ile
ABX.TO	9.99%	0.32	1.63	-38.12%	-47.05%	-44.88%	-33.98%	27.81%	-31.24%	-8.69%	4.75
BCE.TO	5.49%	-1.54	8.34	-24.95%	-28.17%	-20.27%	-7.89%	13.22%	-20.19%	-2.67%	7.67
BMO.TO	6.46%	0.09	1.20	-24.46%	-31.79%	-25.48%	-10.32%	14.77%	-19.67%	-2.91%	7.58
BNS.TO	4.95%	-0.35	0.89	-18.97%	-19.61%	-11.65%	9.17%	8.59%	-15.13%	-1.30%	9.02
CM.TO	6.43%	-0.61	1.12	-26.56%	-30.85%	-24.92%	-9.70%	15.59%	-20.59%	-3.21%	7.35
CNQ.TO	9.90%	0.03	-0.08	-37.20%	-47.53%	-43.83%	-33.98%	26.65%	-30.45%	-8.12%	5.02
CNR.TO	5.85%	0.05	-0.11	-22.05%	-25.18%	-18.59%	-0.26%	11.71%	-17.04%	-1.99%	8.34
CVE.TO	5.50%	0.30	-0.28	-20.70%	-26.29%	-22.26%	-10.70%	11.72%	-15.54%	-1.82%	8.47
ECA.TO	7.65%	-0.38	0.41	-30.78%	-38.38%	-34.03%	-20.57%	19.40%	-24.45%	-4.74%	6.40
ENB.TO	4.32%	-0.34	0.24	-15.50%	-14.62%	-4.37%	23.01%	6.04%	-12.31%	-0.74%	9.73
G.TO	12.03%	0.81	3.72	-42.07%	-52.73%	-50.88%	-39.92%	30.84%	-36.74%	-11.33%	3.82
MFC.TO	9.68%	-0.27	7.82	-41.70%	-50.68%	-48.86%	-40.94%	27.75%	-33.65%	-9.34%	4.41
POT.TO	10.68%	0.26	2.42	-39.37%	-47.44%	-44.90%	-31.94%	26.48%	-33%	-8.74%	4.60
RCI-B.TO	7.22%	0.19	0.45	-26.89%	-34.36%	-28.32%	-15.11%	17.98%	-22.22%	-4%	6.82
RIM.TO	15.78%	0.30	0.83	-52.41%	-61.52%	-58.07%	-49.69%	38.48%	-44.53%	-17.13%	2.30
RY.TO	5.60%	-0.01	1.81	-20.54%	-22.82%	-13.56%	6.77%	11.49%	-17.20%	-1.98%	8.33
SLF.TO	6.65%	-0.42	2.69	-28.29%	-33.99%	-29.41%	-18.24%	16.69%	-21.98%	-3.67%	7.05
SU.TO	9.49%	-0.42	2.31	-38.53%	-48.35%	-45.05%	-35.94%	27.38%	-31.67%	-8.67%	4.78
T.TO	7.16%	0.09	1.40	-28.15%	-35.20%	-39.57%	-17.70%	18.47%	-22.77%	-4.21%	6.75
TCK-B.TO	17.54%	0.47	5.75	-60.65%	-66.84%	-63.88%	-57.27%	42.91%	-50.77%	-21.79%	1.51
TD.TO	6.01%	-0.05	1.06	-22.85%	-26.32%	-19.28%	0.56%	13.38%	-19.01%	-2.54%	7.85
TLM.TO	7.85%	-0.55	0.53	-31.27%	-40.16%	-36.37%	-24.65%	21.71%	-25.86%	-5.61%	6.00
TRI.TO	6.32%	-1.30	3.97	-27.06%	-31.83%	-25.82%	-8.18%	15.04%	-22.30%	-3.35%	7.25
TRP.TO	4.05%	0.08	-0.28	-14.08%	-12.73%	-3.23%	18.99%	4.52%	-11.33%	-0.51%	10.15
XEG.TO	6.78%	-0.54	1.17	-27.28%	-35.09%	-29.78%	-15.54%	17.95%	-22.19%	-3.98%	6.93
XFN.TO	4.81%	-0.32	2.31	-18.54%	-19.27%	-10.44%	10.33%	8.33%	-14.07%	-1.17%	9.13
XGD.TO	9.59%	0.19	0.94	-36.47%	-46.45%	-52.29%	-31.70%	26.57%	-29.63%	-7.87%	5.04
XIT.TO	8.00%	0.33	3.96	-31.00%	-40.14%	-36.50%	-26.37%	22.26%	-26.06%	-5.80%	5.95
XIU.TO	4.22%	-1.08	3.42	-16.42%	-16.84%	-5.34%	18.53%	6.37%	-13.99%	-0.89%	9.57
XMA.TO	8.51%	-0.82	2.96	-35.42%	-45.17%	-44.21%	-34.92%	26.49%	-31.02%	-8.22%	4.93
XRE.TO	4.84%	-1.40	5.69	-20.48%	-22.22%	-14.82%	6.71%	11.77%	-16.01%	-1.88%	8.46
Constant	0.00%	-1.01	-2.04	6.82%	34.20%	70.04%	152.90%	0.00%	0	0.00%	14.97

Another feature of the security selection process is the ability to bypass actual results and substitute a normal distribution. This is accomplished by entering "*xxxx" in the security selection field (Cell D3), where "xxxx" represents 100 times the desired standard deviation expressed as a percent. The software will then generate return figures that reflect this standard deviation and use them for analysis – for example, *1754 will generate a return distribution with a standard deviation of 17.54%, while the "constant" line in Table 2 was produced by entering *0000.

To my dismay, the spreadsheet's analysis of normal curves indicated that these curves had a non-zero kurtosis. As far as I can tell, this is a reflection of sampling frequency. To test the hypothesis a wrote some code that provided distributions based on 10, 100, 1,000 and 10,000 data points and tested them, as shown by the following code fragment:

```
For tsCounter = 0 To tsSize – 1
testArray(tsCounter) = Application.WorksheetFunction.NormInv(1 – ((tsCounter + 1)/(tsSize + 1)), 0.05, 0.04)
Next tsCounter

tsAv = Application.WorksheetFunction.Average(testArray)
tsSD = Application.WorksheetFunction.StDev(testArray)
tsSkew = Application.WorksheetFunction.Skew(testArray)
tsKurt = Application.WorksheetFunction.Kurt(testArray)
```

Results are shown in Table 12 – it may be seen that the calculated standard deviation reaches the desired level of 4% as the sampling frequency increases, but kurtosis is still significantly non-zero even with 10,000 data points. However, whether this is a failing of the software or an unavoidable consequence of the laws of statistics is a question that I have not yet investigated thoroughly.

It is important to remember, however, that all the promoter's estimates of required returns are based on simulations with "*0000" – so be warned!

Table 12: MS-Excel NormInv(), StDev() & Kurt() Interaction

Elements	Average	SD	Skew	Kurtosis
10	5.00%	3.32%	0.00%	-67.24%
100	5.00%	3.86%	0.00%	-31.76%
1000	5.00%	3.98%	0.00%	-9.28%
10000	5.00%	4.00%	0.00%	-1.96%

Period Dependence

It is also important to note that the characteristics of any particular issue are not stable. I was unable to use my SLF base-case for the following comparisons, as it was only began publicly trading in 2000[34], so BNS was used as a template using rolling eight year periods as shown in Table 4.

The perils of taking models based on historical data – particularly when based on a relatively short period - is well illustrated by the change in sign of skew for BNS. For all rolling eight year periods to 2007-12-8, the skew was positive. Then ... something happened.

Table 4: Effect of Time Periods on Return Template and Results

Issuer	Start	End	Std Dev	Skew	Kurtosis	1 Year, 5%	5 Years, 5%	10 Years, 5%	20 Years, 5%	PD	LGD	EL	5%-ile
BNS	12/08/02	12/08/10	4.95%	-0.35	0.89	-18.90%	-20.67%	-12.61%	6.55%	8.52%	-15.25%	-1.30%	9.00
BNS	12/08/01	12/08/09	4.91%	-0.28	0.91	-18.52%	-20.47%	-11.60%	10.65%	9.36%	-14.71%	-1.38%	8.86
BNS	12/08/00	12/08/08	4.52%	-0.29	1.09	-16.34%	-16.87%	-6.40%	15.57%	6.58%	-13.13%	-0.86%	9.54
BNS	12/08/99	12/08/07	4.83%	0.34	0.77	-16.78%	-17.22%	-5.83%	20.12%	6.96%	-13.19%	0.92%	9.46
BNS	12/08/98	12/08/06	5.03%	0.32	0.39	-17.81%	-18.11%	-9.76%	13.04%	8.27%	-14.35%	-1.19%	9.14
BNS	12/08/97	12/08/05	6.57%	0.42	4.69	-24.97%	-30.46%	-25.15%	-9.34%	14.85%	-20.19%	-3.00%	7.50
BNS	12/08/96	12/08/04	6.85%	0.27	3.58	-26.10%	-33.65%	-29.83%	-18.95%	16.43%	-21.28%	-3.50%	7.18
BNS	12/08/95	12/08/03	7.04%	0.26	3.03	-27.15%	-34.18%	-29.43%	-17.72%	17.37%	-22.28%	-3.87%	6.97
BNS	12/08/94	12/08/02	7.04%	0.28	3.11	-26.20%	-35.98%	-30.29%	-17.44%	19.52%	-23.02%	-4.49%	6.62
BNS	12/08/93	12/08/01	7.31%	0.23	2.93	-28.69%	-36.60%	-30.38%	-20.34%	20.94%	-23.24%	-4.87%	6.48

[34] See http://www.sunlife.com/Global/About+us/Our+history?vgnLocale=en_CA (accessed 2010-12-11)

Expected Return

It should be clear that increasing Expected Return will be good for the credit quality of the preferreds (and very good for holders of the capital units!), but how good? Since the base case is expected to default only when return distributions are in the left tail of the analysis, we cannot expect a 1:1 increase – but how much of an increase can be expected?

The results of changing expectations is shown in Table 5, while the results are plotted in Chart 8. Chart 8 also plots the regression line, which has a slope of about 0.4; that is to say, a 1% increase in expected return throughout the period is associated with a 0.4% improvement in Expected Loss at the end of the period.

While significant, the effect pales beside that shown earlier for standard deviation; ideally, a splitShare corporation will have boring stocks as its underlying investment.

8

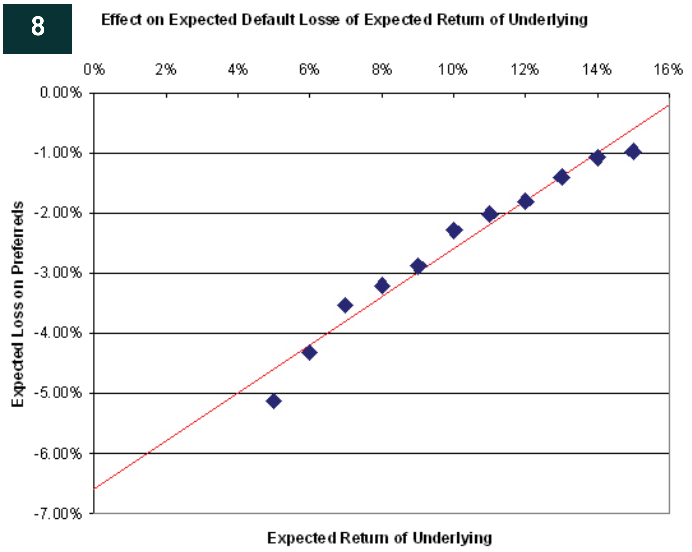


Table 5: Effect of Varying Expected Return of Underlying Securities

ExpRet	1 Year, 5%	5 Years, 5%	10 Years, 5%	20 Years, 5%	PD	LGD	EL	5%-ile
5%	-28.78%	-39.13%	-37.85%	-30.78%	21.74%	-23.61%	-5.13%	6.39
6%	-28.2	-35.92	-33.25%	-25.86%	19.14%	-22.54%	-4.32%	6.77
7%	-27.27%	-34.39%	-31.04%	-18.86%	16.38%	-21.63%	-3.54%	7.11
8%	-27.40%	-31.28%	-25.65%	-10.32%	14.70%	-21.82%	-3.21%	7.28
9%	-26.36%	-29.51%	-22.77%	-0.16%	13.66%	-21.17%	-2.89%	7.63
10%	-25.40%	-27.42%	-16.33%	7.35%	11.16%	-20.49%	-2.29%	8.08
11%	-24.80%	-24.48%	-12.15%	22.29%	10.08%	-19.95%	-2.01%	8.25
12%	-24.28%	-21.17%	-5.67%	33.35%	9%	-20.07%	-1.81%	8.58
13%	-23.39%	-18.54%	-1.31%	49.27%	7.37%	-19.18%	-1.41%	9.05
14%	-22.59%	-17.32%	5.01%	76.01%	6.02%	-17.71%	-1.07%	9.63
15%	-22.54%	-15.10%	7.79%	96.50%	5.24%	-18.70%	-0.98%	9.89

Dividend Yield

To underscore the point made above regarding expected return, we can look at the effect of changing the dividend yield; results of this exercise are reported in Table 6 and plotted in Chart 9.

Chart 9 also plots a regression line that is of great interest: the slope is about 0.4, the same as reported for Expected Return. This indicates that the effect of keeping the dividend constant while increasing return is about the same as keeping return constant, but increasing the proportion paid as dividend!

This chart also serves to illustrate the importance of Sequence of Return risk, discussed earlier: a higher cash component of return helps the portfolio to weather financial storms, because there will be less of a requirement to sell stock into a depressed market.

9

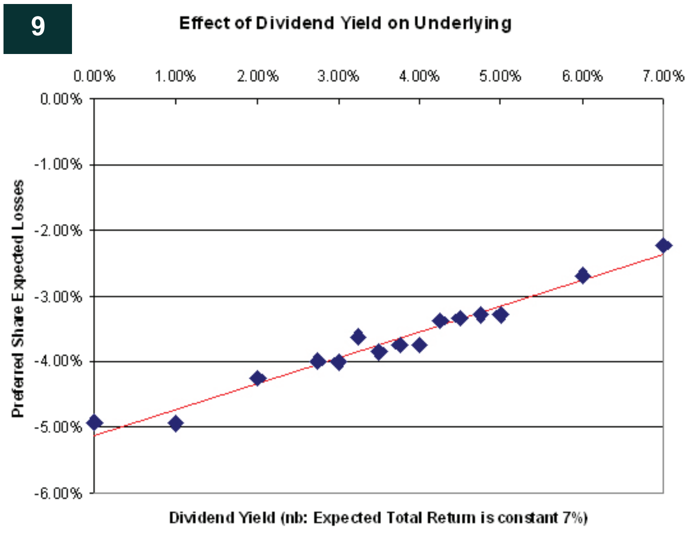


Table 6: Effect of Dividend Yield of Underlying on Preferred Share Expected Losses								
UnderlyDiv	1 Year, 5%	5 Years, 5%	10 Years, 5%	20 Years, 5%	PD	LGD	EL	5%-ile
0	-28.67%	-42.72%	-44.75%	-37.42%	19.68%	-25.01%	-4.92%	6.42
1%	-28.41%	-40.25%	-38.62%	-25.52%	20.13%	-24.59%	-4.95%	6.39
2%	-27.95%	-37.73%	-35.89%	-24.36%	18.14%	-23.40%	-4.25%	6.70
2.75%	-28.16%	-37.01%	-33.19%	-19.36%	17.29%	-23.16%	-4%	6.87
3%	-27.26%	-35.31%	-33.22%	-20.02%	17.46%	-23.03%	-4.02%	6.86
3.25%	-27.38%	-35.07%	-30.93%	-18.81%	16.84%	-21.55%	-3.63%	7.10
3.50%	-27.42%	-34.72%	-30.59%	-20.31%	17.13%	-22.48%	-3.85%	6.98
3.75%	-27.05%	-34.47%	-30.97%	-19.38%	17.23%	-21.76%	-3.75%	6.98
4.00%	-27.76%	-33.70%	-28.23%	-17.16%	16.98%	-22.08%	-3.75%	6.97
4.25%	-26.88%	-33.73%	-28.49%	-18.11%	15.75%	-21.45%	-3.38%	7.22
4.50%	-27.75%	-34.40%	-29.08%	-17.10%	15.96%	-20.98%	-3.35%	7.27
4.75%	-27.28%	-33.13%	-28.43%	-19.14%	15.94%	-20.61%	-3.29%	7.29
5%	-27.18%	-32.39%	-28.94%	-18.38%	15.54%	-21.16%	-3.29%	7.29
6.00%	-26.44%	-30.37%	-25.48%	-16.42%	14.08%	-19.10%	-2.69%	7.73
7%	-26.31%	-30.12%	-23.93%	-16.52%	12.66%	-17.69%	-2.24%	8.04

Asset Coverage

Asset coverage is a very important determinant of default risk, as reported in Table 7 and plotted in Chart 10.

An interesting feature of the data is the relative exposure to the underlying asset that is experienced by the preferred shareholders – in the mid-range of the asset coverage (about 1.5:1) the expected loss increases by about 1% or about $0.10, for every dollar lost by the the company as a whole. This has implications for the treatment of the preferred shares as a basket of stocks on which the preferred shareholders have written a covered call, a concept that I discussed in my seminar on SplitShare preferreds.[35]

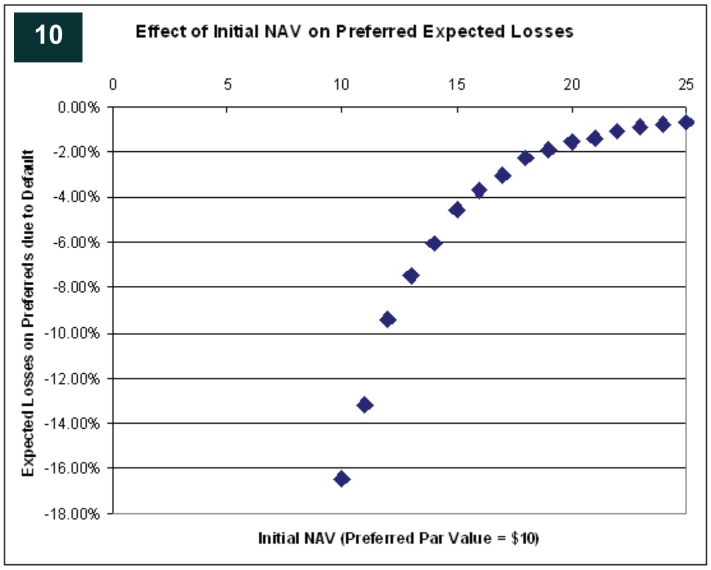


Table 7: Effect of Asset Coverage on Preferred Expected Losses				
InitialNAV	PD	LGD	EL	5%-ile
10	50.34%	-32.69%	-16.46%	3.88
11	42.41%	-31.15%	-13.21%	4.28
12	34.27%	-27.50%	-9.42%	5.13
13	29.07%	-25.78%	-7.49%	5.55
14	23.95%	-25.21%	-6.04%	6.01
15	20.24%	-22.51%	-4.56%	6.63
16	16.29%	-22.74%	-3.70%	6.99
17	14.30%	-21.23%	-3.03%	7.43
18	11.28%	-20.09%	-2.27%	8.02
19	9.67%	-19.79%	-1.91%	8.42
20	8.36%	-18.46%	-1.54%	8.83
21	7.56%	-18.09%	-1.37%	9.00
22	6.13%	-17.42%	-1.07%	9.53
23	5.24%	-16.23%	-0.85%	9.90
24	4.54%	-16.71%	-0.76%	10.20
25	4.26%	-15.58%	-0.66%	10.37

35 Available (for a small charge) via http://www.prefletter.com/eMailVerification.php?path=vid

Effect of MER

This is the relationship most likely to cause consternation amongst my parsimonious friends at Financial Webring Forum![36]

It is often assumed that MER has little, if any, effect on the credit quality of preferred shares, since the cost is seemingly borne entirely by the Capital Unitholders. However, the constant requirement for cash increases the Sequence of Returns risk for the SplitShare corporation, with the result that the regression line plotted in Chart 11 has a slope of about -0.7% – that is, an increase in MER of 1% will increase the expected loss on the preferreds by about 0.7%.

It will be noted that this does not imply that the full MER is effectively being paid by the preferred shareholders, since Expected Loss is a one-time only event experienced at the maturity of the issue, while the MER is charged to the fund annually – but the strength of the relation is very clear, with an Adjusted R-square of 94%.

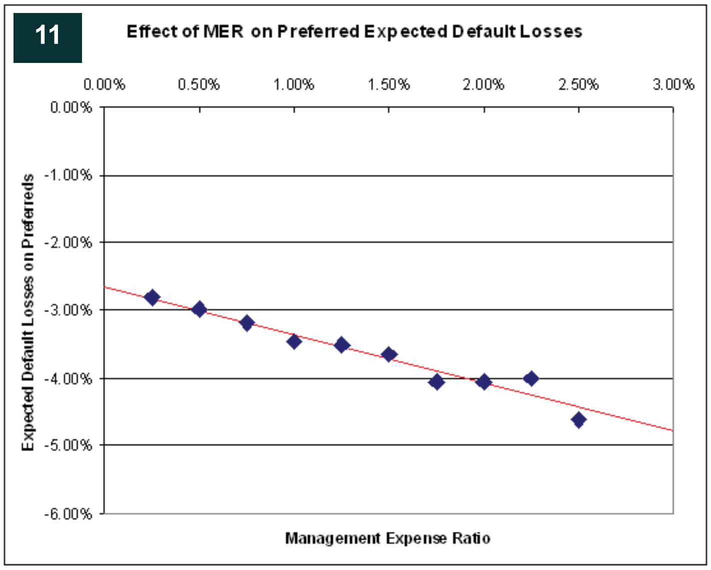


Table 8: Effect of MER on Expected Losses

MER	PD	LGD	EL	5%-ile
0.25%	13.30%	-21.21%	-2.82%	7.52
0.50%	14.10%	-21.24%	-2.99%	7.44
0.75%	15.07%	-21.19%	-3.19%	7.31
1.00%	15.85%	-21.85%	-3.46%	7.14
1.25%	16.05%	-21.88%	-3.51%	7.15
1.50%	16.42%	-22.18%	-3.64%	7.15
1.75%	17.32%	-23.39%	-4.05%	6.86
2.00%	17.75%	-22.84%	-4.05%	6.85
2.25%	17.76%	-22.52%	-4.00%	6.87
2.50%	19.94%	-23.19%	-4.62%	6.58

Capital Unit Dividends (above NAV Test)

Intuitively, one would not expect a large relationship between the Capital Unit Dividends paid above the NAV Test benchmark, since the critical area for default risk is between the NAV Test and the preferred redemption value. However, there is a noticeable effect; this is due to the requirement to sell securities in order to raise funds for distribution, and to the fact that these dividends exert a downward influence on the NAV when paid, restraining the NAV from reaching higher levels from which it would be harder to fall.

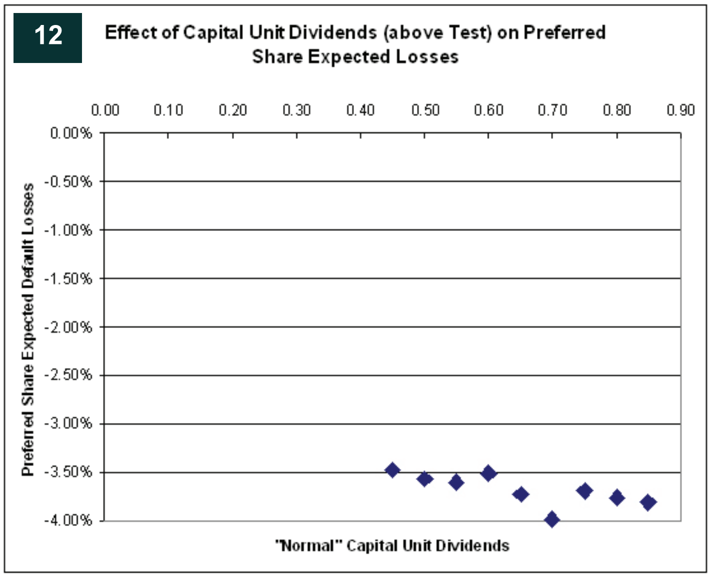


Table 9: Effect of Capital Unit Dividends (above Test) on EL

Div	PD	LGD	EL	5%-ile
0.45	15.39%	-22.59%	-3.48%	7.14
0.50	16.36%	-21.82%	-3.57%	7.20
0.55	16.46%	-21.93%	-3.61%	7.09
0.60	16.41%	-21.42%	-3.51%	7.18
0.65	16.71%	-22.28%	-3.72%	6.97
0.70	17.60%	-22.69%	-3.99%	6.92
0.75	17.08%	-21.58%	-3.69%	7.05
0.80	16.91%	-22.22%	-3.76%	7.03
0.85	16.71%	-22.78%	-3.81%	7.00

[36] http://www.financialwebring.org/forum/

NAV Test

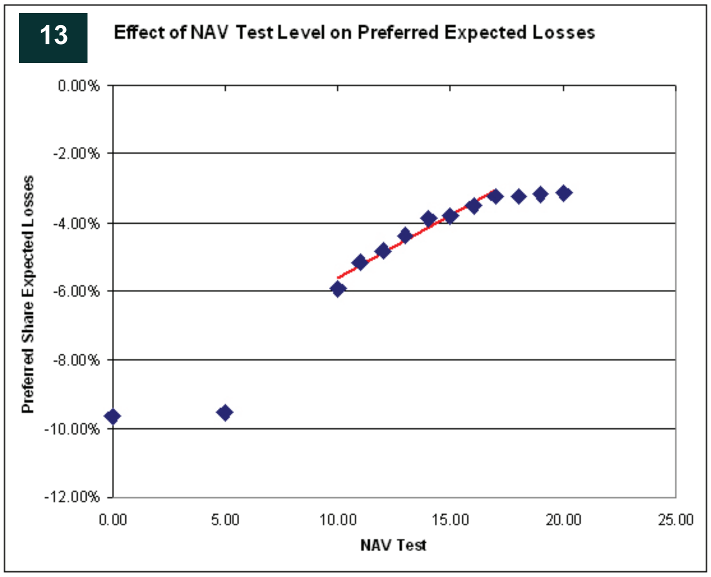
A very important determinant of credit quality is the presence of a NAV test on capital distributions. When the whole-unit NAV of the Split Share corporation is above the NAV Test level, the corporation pays distributions to capital unitholders, as noted above; but when NAV falls below this level, these distributions are suspended (there is no automatic suspension of preferred share dividends; at least, not in any prospectus I've ever seen).

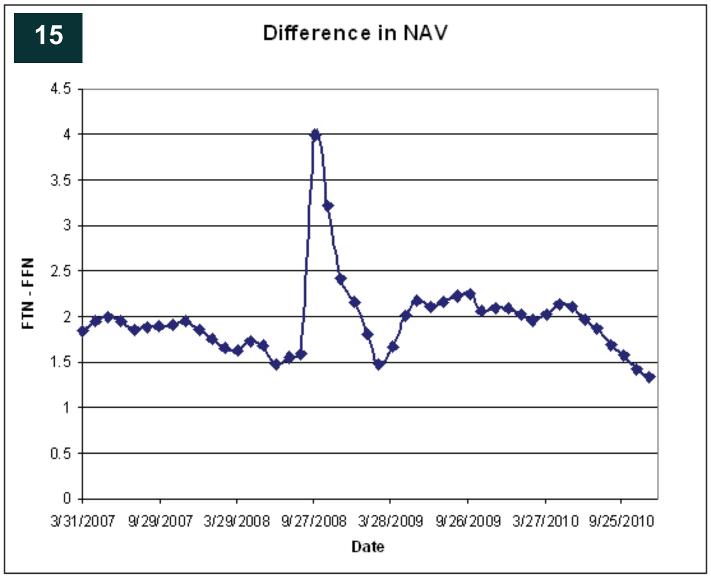
The effect of the level of the NAV Test is reported in Table 10; note that a NAV test of 0, as recorded in the top row, indicates that capital unitholders received dividends for as long as the company exists; in other words, that there is no NAV test. Chart 13 plots the data, with a regression line shown in the area of greatest interest, between $10 and $17 dollars. It is clear that even a minimal NAV test, in which capital unit dividends are suspended only when the NAV reaches the preferred redemption price, is much better than nothing.

One current example of the value of a NAV test is currently given by the two Financial 15 Splits, FTN and FFN. The former has a NAV slightly above the $15 test; the latter is slightly below; the two corporations have very similar mandates. The effect of the NAV test is shown by the decreasing difference in NAV illustrated in Chart 15.

Table 10: Effect of NAV Test for Capital Unit Dividends on Preferred Expected Losses

NAVTest	PD	LGD	EL	5%-ile
0.00	30.25%	-31.82%	-9.63%	4.50
5.00	31.12%	-30.63%	-9.53%	4.84
10.00	26.13%	-22.64%	-5.92%	6.22
11.00	23.64%	-21.87%	-5.17%	6.51
12.00	21.72%	-22.22%	-4.83%	6.66
13.00	19.78%	-22.19%	-4.39%	6.77
14.00	18.07%	-21.54%	-3.89%	7.02
15.00	17.41%	-21.85%	-3.80%	6.92
16.00	15.86%	-21.98%	-3.49%	7.15
17.00	15.03%	-21.61%	-3.25%	7.29
18.00	14.77%	-21.89%	-3.23%	7.38
19.00	14.50%	-21.90%	-3.18%	7.30
20.00	14.37%	-21.78%	-3.13%	7.39
100.00	14.15%	-22.82%	-3.23%	7.28





Term to Maturity

The effect of Term to Maturity is fraught with interest although, as noted in the section "Reporting on Model Characterization" the assumption that the dividends per share paid by the underlying securities do not change grows steadily more dubious with increasing term.

Readers of this newsletter and of PrefBlog[37] will recall the recent term extension of PIC.PR.A which was approved by preferred shareholders on September 30.[38] This term extension was for seven years, and at the time the reorganization was proposed the whole unit NAV was only 19.94 (compared to a Preferred Redemption value of 15.00) – and, importantly, capital unitholders were receiving $0.60 per annum with no NAV test. The Management Expense Ratio is about 1.12%.

These data allow us to compute an expected loss of about 13.5% for the preferred shareholders, implying redemption proceeds seven years hence of not $15, but $12.03. In turn, this allows the calculation of a net expected yield of 3.21% – a far cry from the 5.75% coupon that I am sure most approving shareholders thought they were voting for.

As it happened, there was a mass retraction of preferred shares after the approval, which caused a rise in the Asset Coverage, as the capital units were consolidated in response to the retraction, as discussed in the last issue and on PrefBlog.[39] The increase in NAV to about $23 made a great change to credit quality, as shown in Table 16.

One way or another, the effect of increasing term on the base case used throughout this essay is recorded in Table 11 and plotted – together with a plot for an issue of more dubious credit quality – in Chart 14.

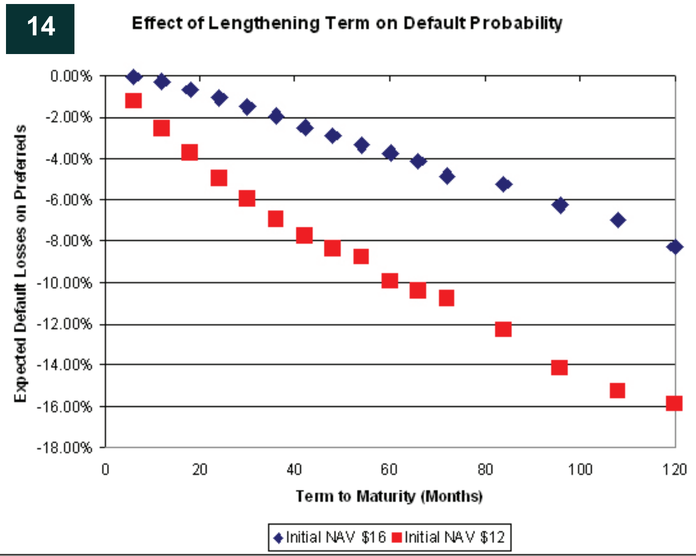
Table 16: Effect of Reorganization on Credit Quality of PIC.PR.A

	Before Retraction/ Consolidation	After Retraction/ Consolidation
Initial NAV	20.00	23.00
Pfd Redemption value	15.00	15.00
Pfd Coupon	0.8625	0.8625
MER	1.12%	1.12%
Cap Unit Div (above Test)	0.60	0.60
Cap Unit Div (below Test)	0.00	0.00
NAV Test	0.00	0.00
Whole Unit Par Value	26.88	26.88
Months to Redemption	84	84
Probability of Default	48.05%	39.04%
Loss Given Default	-41.16%	-35.44%
Expected Loss	-19.78%	-13.84%
Expected Redemption Price	12.03	12.92
Yield to Expectations	3.21%	4.02%

Table 11: Effect of Term Extension of Preferred Expected Losses (Initial NAV $16)

Months	PD	LGD	EL	5%-ile
6	0.62%	-6.30%	-0.04%	12.02
12	2.78%	-9.76%	-0.27%	10.68
18	5.24%	-12.59%	-0.66%	9.91
24	7.54%	-14.23%	-1.07%	9.31
30	9.23%	-16.14%	-1.49%	8.85
36	11.46%	-17.31%	-1.98%	8.33
42	13.76%	-18.32%	-2.52%	7.99
48	14.91%	-19.30%	-2.88%	7.66
54	15.92%	-21.09%	-3.36%	7.30
60	16.95%	-21.98%	-3.72%	7.07
66	17.82%	-23.14%	-4.12%	6.76
72	20.35%	-23.94%	-4.87%	6.44
84	20.88%	-25.13%	-5.25%	6.18
96	23.55%	-26.48%	-6.24%	5.82
108	24.61%	-28.39%	-6.99%	5.37
120	27.68%	-29.84%	-8.26%	4.98

14



[37] See http://www.prefblog.com/?p=11939

[38] See http://www.prefblog.com/?p=12519

[39] See http://www.prefblog.com/?p=12718

Effect of Covered Call Writing Programmes

None.

I have no doubt but that covered call writing can be an excellent manner in which to improve investment returns, particularly since indications are that a mechanical strategy can maintain performance while dampening the Standard Deviation of monthly returns[40] (at least, when measured in October 2006) – which, as readers should by now be aware, is highly desirable.

However, I have never seen any indication whatsoever that any Canadian SplitShare Corporation has any skill whatsoever in executing such a strategy. Should any sponsor or manager choose to publish their performance figures against benchmarks suitable for the underlying portfolio, I will be very happy – not to mention surprised – to review these numbers and determine whether my evaluation requires adjustment. Until then, while investors are of course more than welcome to adjust the parameterization of the Split Share Credit Quality Spreadsheet to suit themselves, I will simply assume that the strategy is just another marketting gimmick.

Conclusion

The spreadsheet remains – as does everything else I produce – a work in progress. Quantitative investment management is a process of continual tinkering as new patterns in the raw data are discovered and exploited while – occasionally – old ones disappear.

One Beta Tester (several readers of PrefBlog very kindly responded to my request[41] for testing of cross-platform compatibility and ease of use) asked for: *the ability to conduct sensitivity analysis on the assumptions (instead of re-running the spreadsheet multiple times)*. Frankly, I'm not sure that that's even possible within a Monte Carlo format, but I'll think about it!

Another interesting idea is to turn the spreadsheet upside down and use it as a pricing model for Capital Units.

I personally would like to see a number of generated graphs … and perhaps a dividend growth model that will allow for an attempt to be made to increase the confidence one may have in longer-term projections.

Any suggestions and comments are welcome and, as always, full credit will be given when improvements in the spreadsheet are made.

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40 See Callan Associates, *An HistoricalEvaluation of the CBOE S&P 500 Buy Write Index Strategy*, October 2006, available on-line at http://www.cboe.com/micro/bxm/Callan_CBOE.pdf (accessed 2010-12-11)

41 See http://www.prefblog.com/?p=13306