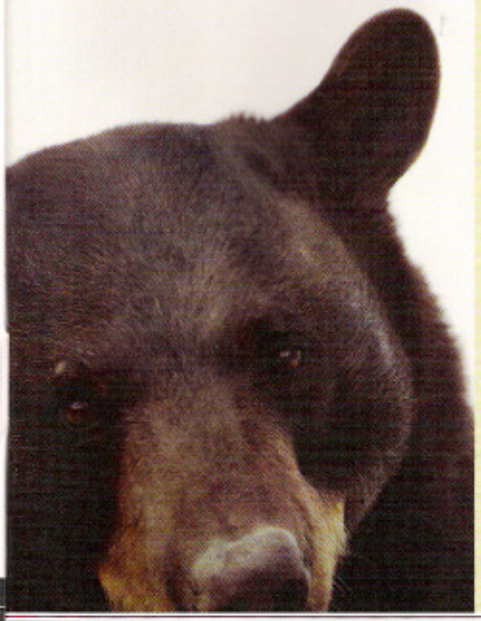

Optimizing Charitable Gift Annuity Risk Management:

Collaring the Bear and the Grim Reaper

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The increased popularity of charitable gift annuities from 1998 to 2002 could not have come at a worse time. With the stock market's three-year free fall, gift annuity pools with even limited equity exposure are likely to be significantly under-performing initial projections. It is highly likely that one-third or more of the gift annuities written during this time period will run out of money, even if financial markets return to historical norms going forward.

Effectively managing longevity and investment risks has become critically important for both existing and future gift annuities. The 2003 American Council on Gift Annuities (ACGA) survey revealed that 45 percent of the respondents had become more concerned with CGA risk over the last three years. To this point, however, charities have lacked a coherent and formal risk management model beyond choosing between self-insurance and reinsurance.

This paper provides a comprehensive assessment of gift annuity risks and illustrates the probability of expected outcomes and ultimate exhaustion using Monte Carlo analysis. Basic and advanced risk management strategies in the context of organizational risk tolerance will follow. To conclude, three case studies are presented to provide realistic situations and recommendations.

Charitable Gift Annuity Risks

Risk is simply the probability that actual outcomes will deviate in an unfavorable direction from what is expected. In the context of charitable gift annuities, the three greatest risks are 1) investment risk—that returns are less than expected, 2) longevity risk—that the annuitant lives longer than projected, and 3) timing risk—that poor investment returns occur in early years, possibly aggravated by contractual early withdrawals. A more detailed discussion of these three risks follows.

Investment Risk - Investment risk has various components. For any asset class, these risks include both systematic (non-diversifiable risks such as market, interest rate, purchasing power, currency and reinvestment risk) and unsystematic (diversifiable risks such as business, financial, default, international political and regulation risk).

Investment risk is best managed through diversified pools (to reduce unsystematic risk), asset allocation (to optimize an expected return for a given level of risk tolerance) and the concept of asset-liability matching (to reduce withdrawal timing risk). Most gift annuity pools take these first two strategies into consideration, but generally do not address the last strategy, which is widely used by commercial life insurance companies. Only a very small percentage of life insurance company fixed annuity reserves are invested in equities. In fact, the top 100 life insurance companies' reserve investments show 84 percent bonds and mortgages and 4.8 percent equities, the top 50 life insurance companies show 86 percent bonds and mortgages and 4 percent equities, and the top 5 annuity companies by premium have invested their reserves 91 percent bonds and mortgages and 2.3 percent equities.[1] Rather than assuming equity risk, insurance companies bundle various types of fixed income and real estate instruments to match the pool's assets to the projected liabilities. Using one annuity in a basic example, if the company issues a 30-year annuity certain, the company might purchase a 30-year Treasury STRIP to match the liability cash flows.

Insurance company actuaries build pool asset/liability models to project future cash flow needs. Charities, however, tend to invest every annuity in the same investment pool without regard to the expected timing of the liability. A small deferred annuity for a 45-year-old is invested in the same way as a very large immediate annuity on a 92-year-old. Investments should be constructed with a stronger emphasis on projected liability cash flows. It was fortunate for charities that investment returns from 1980 to 2000 were, on any historical basis, abnormally strong.

Longevity Risk - Longevity risk can also be separated into systematic components, such as the increase in life expectancy resulting from medical advances, and unsystematic, such as the differences between the actual health of annuitants and the average of the population, and statistical fluctuations in actual versus expected mortality. As the donor ages, longevity risk eventually exceeds investment risk. Because charitable gift annuities are built to annuitize—to make payments from earnings plus principal—as the donor ages, the portion of the payout attributed to earnings decreases as the portion attributed to principal increases.

Demographic trends and donor characteristics do not bode well for annuity pools based on past life expectancy tables. On a percentage basis, the fastest growing segment of our population is people over 100 years, followed by people over 90 and finally by people over 80. Scientific evidence suggests humans lived in Africa 130,000 years ago. From that point to 1850, male life expectancy reached 38 years and female life expectancy reached 40 years. In just 150 years, life expectancy jumped 100 percent to 75 for males and 80 for females.[2] Recent scientific advances mapping the human genome and developing more effective drugs suggest that trends toward greater longevity will continue.

It is also a fact that people who purchase annuities tend to live longer than the standard life expectancy tables (if they were not in good health, they would not choose a gift vehicle that only pays income over their lifetime). Additionally, those who have above average wealth live even longer because of better nutrition, working conditions, living conditions and quality of health care. A recent study sponsored by ACGA showed that gift annuitants lived longer than commercial annuitants at every age (3.1 years longer at age 65 down to 1.1 year longer at age 90).[3] In recommending rates, ACGA assumes all annuitants are females and further hedges the risk by reducing the actual ages by one and one-half years

For many years, the mortality rates of older Americans have been decreasing. Typically the annual rate of decrease is about one percent. For example, if the expected mortality rate for an 80-year-old male in 2003 is 0.08, the expected rate in 2004 is 0.0792, one percent lower. While this makes little difference over a year or two, the effect over many years is important. For an annuity issued today to a 50-year-old, the projected mortality rate at age 80 would be only 0.06, an absolute reduction of two percent in the rate. This requires the funds to earn two percent more on an absolute basis, or the payout to be two percent less to balance the annuity revenue and disbursements.

Observance timing also affects the perception of longevity risk. For example, many charities have had donors who died very soon after receiving the gift annuity, bringing an unexpected windfall. Other charities have had lower than expected mortality, but the initial mortality expectations are so low that these charities experience only small mortality losses. For gift annuity pools created in the last 10 years, this gives the misperception of little risk. Only pools that have existed for 30 years or more will experience donors living well beyond life expectancy.

Academic studies on annuities have attempted to determine the point at which longevity risk exceeds investment risk as the individual gets older—a longevity cross-over point. Annuitants who live longer than their life expectancy within a pool will, over time, receive their original contribution value plus interest plus payments made from early pool deaths. Of course, others will die without receiving even their original fund value. This results in a mortality profit of which surviving annuitants, or eventually the charity, will benefit with higher "returns" as a result of a mortality cross-subsidy *assuming* the surpluses remain in the pool.

To compensate for this mortality cross-subsidy, surviving annuitants would have to achieve an extra investment return,

known as mortality drag. Since mortality drag rises monotonically over time, it eventually becomes virtually impossible for the investment return to match or exceed that from an annuity. The UK-based Financial Services Authority (FSA) estimates that at age 60, the extra return required to account for mortality drag is one percent, but by age 75, it could be as high as four percent.[4] So from the charity's perspective, even stellar investment experience can be negated if an older annuitant lives too long. The effect of mortality drag on the organization's financial statements can be eliminated by establishing annuity liabilities that properly recognize expected mortality. Over time, the reduction of the liability compensates for the excess of annuity payout over the related investment earnings.

Timing Risk - One might assume that if investment returns are higher than expected and the donor dies exactly at life expectancy, no additional risk exists. In fact, timing risk can have dramatic effects. To illustrate this point, assume you invested $100 and had annual returns of negative five, one and eight percent, respectively. Then reverse the order of returns. You will find that in either case, the ending value is $103.63 and the average rate of return is 1.33 percent. Add a fixed six percent annual withdrawal rate ($6), however, and you would have an ending value of $84.6 and $86.2, respectively.

While this two percent difference may seem too small to worry about, consider a likely return during 2000-2002 of negative six percent in three consecutive years on a $500,000 gift made in 2000, with an 8.5 percent annuity payout ($42,500/year for a 77-year-old female). Assuming current ACGA recommended rates and assumptions at the time of gift, by 2003, the initial gift would have eroded to $295,300, thereby eliminating the entire charitable gift (the difference between the original gift and the present value of the life income liability). Note that the 2000 ACGA assumption of a six percent net return would result in a balance of $460,200 on the same day. Even if returns rebound markedly, the smaller principal value will probably not "catch up" because it must continue making the $42,500 payments (14.4 percent of the new principal value).

Additional CGA Risk Comments

In addition to investment, longevity and timing risks, charities should be cognizant of the impact of falling ACGA recommended rates, the law of large numbers and other advanced risks that might be present in unique situations.

ACGA Rate Risk - The ACGA does the charitable community a great service by recommending actuarially sound gift annuity rates. ACGA also diligently watches market forces and recommends rate changes when thought prudent. Charities should understand that these rate changes, while applicable only to new annuities, signal a greater impact on the expected results of existing annuities. If, for example, a charity wrote a gift annuity at a recommended rate of 7.5 percent three years ago, that annuity is frozen at a rate one percent higher than the current rates.

Further, ACGA rates have correctly dropped to reflect existing market conditions, which means that the original annuity has almost certainly experienced returns less than projected unless the bond portfolio experienced capital appreciation because of the falling interest rates. New annuities are issued at a lower rate based on reduced assumptions and have not experienced the poor market that led to the reduction. Charities should pay close attention to the fiscal "health" of existing annuities, especially in times of falling ACGA recommended rates.

"Law of Large Numbers" Effects on Longevity and Investment Risk - The law of large numbers states that the average of a large number of random variables tends toward the mean as the number of variables grows. This can be illustrated by the results of flipping a coin. If a coin is flipped ten times, there is only a 65 percent probability that the proportion of heads will be in the range from 0.4 to 0.6. However, if the coin is flipped 1,000 times, there is a 65 percent probability that the result will be in the range from 0.485 to 0.515. Thus the average of a large sample will tend to be close to the mean almost all of the time, while the average of a small sample will often be far from the mean. This result holds whenever the random variables have variances that are similar.

Accounting for life annuities recognizes both mortality and interest, so that the result is no gain or loss if the mortality and interest assumptions are both realized exactly. For example, suppose that an annuity of $1,000 at the beginning of each year is payable to a group of 90-year-olds, that the interest assumption is five percent, and expected mortality is 15 percent. Typical liability values would be $4,400 at age 90 and $4,200 at age 91. Using these values, if there are twenty annuitants at the beginning of the year, the charity holds a liability of $88,000. It pays $1,000 to each annuitant, leaving a balance of $68,000. If the charity earns five percent on its funds, it will have $71,400 at the end of the year. At this point, if mortality is exactly as expected, there will be 17 survivors, each requiring a liability of $4,200. The result is a total liability of $71,400, exactly the amount available, producing no gain or loss beyond the original gift portion of the annuity.

In the case of a typical pool of charitable annuities with 24 annuities and an average age of 80, the average number of deaths per year would be 1.7. The ideal liability for this pool would be based on the expected mortality, so it would be established to break even at 1.7 deaths. Of course it is impossible to have 1.7 deaths, so it is impossible to have a year that has no gain or loss from mortality. For purposes of illustration, suppose that the annuities each provide an annual income of $5,000, and that the total liability is $1,000,000. Suppose also that the invested assets of the fund perform exactly as expected, so that the only source of gains or losses is the difference between actual and expected mortality. The possible outcomes over a one-year period, along with related probabilities, are as follows:

Number of Deaths	Gain or (Loss)	Probability
0	(70,000)	18%
1	(28,000)	32%
2	13,000	27%
3	55,000	15%
4	97,000	6%
5 or more	138,000 or more	2%

As explained above, this experience assumes a release of liability in proportion to the expected mortality, so the gain or loss is not on a cash basis. Even though, over time, this illustrates the operation of a fund that is behaving exactly as expected, the fluctuations in the results are relatively large. For a small number of annuities, it is quite likely that there will be no deaths in a given year, resulting in frequent losses, offset over time by infrequent large gains. Charities need to consider whether fluctuations of this kind are acceptable to management (e.g., president, CFO, board, investment committee).

In contrast to the above illustration, a large fund can expect relatively small effects from statistical fluctuations. Consider the same basic assumptions, but for a fund with 2,400 annuities. In this case, the annual gains or losses from statistical fluctuations in mortality will generally be within plus or minus two percent of the fund (90 percent of the time). This is well within the range of fluctuation of the most conservatively managed investment portfolio, so unsystematic mortality risk is of less concern for such a large fund.

It is also important to note that not only do life insurance companies have annuity pools that benefit from the law of large numbers, they also have life insurance pools that offset the risk by benefiting from reductions in population mortality. Annuities insure against living too long, and life insurance insures against dying too soon. When offered together, these product lines exhibit negative risk correlation for the company's overall operations. A dread disease, like the plague for example, would cause the life insurance side to be highly unprofitable, but the annuity side to be highly profitable. Finding a cure for cancer or other dread diseases would have the opposite effect. Unfortunately, charities do not have the advantage of offsetting risks.

If we attempt to apply the law of large numbers to investment results, the sample size would be the number of financial reporting time periods. There is not sufficient time, within the planning horizon, for the number of observations to be large enough that the results are forced toward the average. For this reason, a charity that does not achieve perfect cash flow matching between assets and liabilities will necessarily have gains and losses from investment performance, and these may be significant.

Advanced Risks - Four additional unique risks are: when no pool exists to buffer losses, when some of the annuity reserve is used prior to the donor's death, when total expenses exceed the ACGA assumptions, or when rates offered were higher than ACGA suggested rates.

For some charities, the organizational structure or existing policies do not provide an unrestricted general pool. Community foundations, for example, typically add the entire remainder interest to a particular donor fund. Colleges and universities may have similar policies. This eliminates any benefits of a pool, because losses in one annuity cannot be buffered by gains in another. If a particular gift annuity exhausts its allocable reserve, the payments must be made from the charity's current operating budget or from an operating reserve since the charity's policies generally will not allow it to make withdrawals from another donor's fund or from the gift annuity pool. This policy can exacerbate the pool's risk because early deaths—those with the largest mortality gains—are withdrawn, leaving a pool made up of longer-lived donors—those with the largest mortality losses. This policy can become troublesome, because it is not unlikely that an individual will live long enough to draw down the entire surplus for his or her annuity. Even when an unrestricted endowment exists outside the gift annuity reserves, sometimes multiple departments or schools have multiple "claims" on the assets, making withdrawals cumbersome if not impossible.

Using a portion of the annuity reserve, having administration and investment fees that exceed 1.5 percent, or offering rates higher than ACGA recommendations, all reduce the ability of the gift portion to serve as a risk buffer. This can substantially increase the probability of annuity exhaustion, and should nearly always be avoided. Charities may not be aware that past administrations withdrew some surplus, or offered higher rates, and should review the pool to assess the potential under-funded liability. The only exceptions are for charities that have a large, easily accessible mature pool with strong reserves, or for charities that have reinsured the liability with commercial annuities.

Quantifying Expected Outcome and Exhaustion Probabilities

This analysis assumes two self-insured investment pools:

- Conservative Growth (30 percent large cap stocks, 15 percent small cap stocks, 50 percent bonds and 5 percent cash)
- Balanced Growth (40 percent large cap stocks, 25 percent small cap stocks, 30 percent bonds and 5 percent cash)

A 77-year-old female was issued $100,000 annuities in 1998, 1999, 2000, 2001 (8.5 percent ACGA suggested rate), and 2002 (8.2 percent ACGA suggested rate). All annuities are assumed to have been issued on January 1st of each year, using annual end-of-period payments. Total administration and investment expenses follow the ACGA assumption of 100 basis points. Table 1 shows the likely returns for the two portfolios from 1998 to 2002.

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Table 1—Total Returns on Two Hypothetical Portfolios

Investment Assumptions	1998 Returns	1999 Returns	2000 Returns	2001 Returns	2002 Returns
Total Stock Index	23.26	23.81	(10.75)	(10.97)	(20.96)
Total Bond Index	8.58	(.76)	11.39	8.43	8.26
Total Cash Index	5.38	5.01	6.29	4.17	1.65
Total Administration and Investment Expenses	(1.00)	(1.00)	(1.00)	(1.00)	(1.00)
Assumed Net Returns					
Conservative Growth	14.03	9.58	.17	(1.51)	(6.22)
Balanced Growth	16.96	14.50	(3.26)	(4.39)	(11.06)

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Monte Carlo Simulations

In Monte Carlo simulations, a computer program generates random numbers to simulate the outcome of a process that is being modeled. For example, in the case of an annuity, the computer could simulate the return on investments and the mortality experience over a given time period. The speed of the computer calculation allows the process to be repeated thousands of times with different random numbers, creating a distribution of anticipated results from the process. Thus, for example, if a $10,000 loss is considered to be the threshold of financial problems, and five percent of the simulations produce a loss of $10,000 or more, a manager can evaluate whether the risk can be accepted. The method is especially useful when no overall theory exists to develop a mathematical model of the probability distribution of outcomes, such as when different types of events interact, as is the case with the interaction of investment returns, mortality and timing in the case of charitable gift annuities.

Monte Carlo simulation is a powerful, widely-used tool for evaluating risk, but there are some potential pitfalls in its use. The validity of the simulated results is totally dependent on the assumptions of the simulation. Using average total return numbers (for domestic equities especially) very often incorrectly skews the analysis by masking the market's downturns for the measured period. As an analogy, consider the story of the man who drowned in a lake with an average depth of only two feet; he just happened to step into the one area that was actually twenty feet deep. Additionally, the risk is often understated because, by definition, unanticipated events are not modeled by the assumptions. Computer programmers may also weaken the simulation by selecting assumptions by the mathematical ease of applying them, rather than on the basis of how well they fit the real world. For example, it is not unusual to see investment returns modeled by independent log-normal random variables, even though the log-normal distribution has been clearly shown to understate the probability of extreme events in the investment market, and successive returns do not follow the assumption of independence. When ease of programming is the basis for the choice of assumptions, the results cannot be expected to project real-world outcomes.

When one considers the number of cases simulated in Monte Carlo analysis, which typically runs into the thousands, the number may seem very impressive. If, however, one is most interested in extreme events that have a very low probability, but could have a devastating financial effect, the number of relevant observations may be a small fraction of the total number of simulated cases. These are also the events that are most difficult to model with existing theories of investment and mortality outcomes.

Monte Carlo simulation can provide insight into the results to be expected when random events affect the outcome of a process. The method cannot be expected to model the effects of changes in the underlying probabilities, such as when medical advances reduce the mortality of the population as a whole. Used wisely, however, this method is a valuable tool for risk management.

For our analysis, we used a Monte Carlo simulator that calculated asset class returns on a year-by-year basis by randomly selecting returns on the basis of an assumed distribution of investment results. This attempts to better simulate the future than a constant or fixed rate of expected return (e.g., equities will appreciate at 10.6 percent each and every year). First, we create an investment simulation by respective asset classes and then we simulate mortality results on the basis of the assumed probability of death. If the annuitant survives, we produce another random investment return and then simulate the mortality results and so on. For charitable gift annuities, the simulation takes a fixed withdrawal from the portfolio at the end of each period. It repeats this calculation a large number of times—1,000 times per life in our analysis. For a person with a 20-year life expectancy, the simulator makes 20,000 calculations. From this data, it projects the exhaustion probability—that the fund would have less than $1 at death—and the expected range of ending balances. Table 2 shows these calculations for the two aforementioned CGAs.

Table 2—Exhaustion Probabilities for a Single-Life Annuity to a 77-Year-Old Female

Monte Carlo Analysis Summary Using Random Investment and Mortality Simulator	Exhaustion Probability	25 Percent Probability of This Ending Balance or Greater	50 Percent Probability of This Ending Balance or Greater	25 Percent Probability of This Ending Balance or Lower	10 Percent Probability of This Ending Balance or Lower
1998 Conservative Growth	23 percent	$54,856	$32,949	$3,280	($27,947)
1998 Balanced Growth	22 percent	$62,640	$36,569	$7,914	($28,920)
1999 Conservative Growth	36 percent	$42,036	$18,371	($14,002)	($45,497)
1999 Balanced Growth	37 percent	$43,235	$17,582	($16,393)	($52,440)
2000 Conservative Growth	38 percent	$39,607	$13,084	($18,942)	($50,691)
2000 Balanced Growth	45 percent	$34,886	$5,228	($28,236)	($62,574)
2001 Conservative Growth	31 percent	$51,944	$23,147	($8,351)	($42,216)
2001 Balanced Growth	33 percent	$54,295	$22,218	($13,811)	($52,687)
2002 Conservative Growth	21 percent	$70,437	$41,317	$10,739	($22,968)
2002 Balanced Growth	20 percent	$80,370	$46,854	$11,621	($27,696)

All balances are in current dollars assuming a three percent inflation rate. Life expectancy was understated using the 1983(a) life expectancy table (typically one to two years less than the new 2000 Annuity Table). However, the balances are understated as they do not reflect the stock market gains through 9/30/03. Both variables may cause an exhaustion percentage error of plus or minus two percent.

In the worst year and investment option, 2000 Balanced Growth, it is important to understand that there is a 10 percent probability that the charity will experience a $110,574 loss. Further, this chart can be extrapolated to larger annuities. For example, a $1,000,000 CGA written in 2000 invested in the Balanced Growth pool would have a 43 percent exhaustion probability and the same expected ending balance in Table 2 multiplied by 10. There is a 10 percent probability that the charity will experience a $1,105,740 loss or more.

Table 3 shows the probability of a new CGA written on July 1, 2003, using the suggested ACGA rates. It assumes the same 77-year-old female, a $100,000 7.4 percent CGA and the same investment and expense assumptions. An additional scenario is added to simulate the model ACGA assumptions (six percent gross investment returns—assuming a 7.31 standard deviation, one percent for expenses and 1.5 year age set-back using the Annuity 2000 table).

Table 3—Exhaustion Probability for Current (2003) ACGA Rates

Monte Carlo Analysis Summary Using Random Investment and Mortality Simulator	Exhaustion Probability	25 Percent Probability of This Ending Balance or Greater	50 Percent Probability of This Ending Balance or Greater	25 Percent Probability of This Ending Balance or Lower	10 Percent Probability of This Ending Balance or Lower
2003 Conservative Growth	5 percent	$108,845	$77,836	$45,766	$14,986
2003 Balanced Growth	5 percent	$147,306	$97,447	$56,090	$21,016
2003 ACGA Assumptions	18 percent	$63,367	$35,821	$11,036	($15,248)

All balances are in current dollars assuming a three percent inflation rate.

To a great extent, this model assumes that history is representative of the future in terms of both return and risk. It is important to note that current bond rates in particular are at historical lows, and equity prognosticators are forecasting slightly lower than average returns for the next decade or so. The Balanced Growth allocation has an assumed 10.23 percent gross expected rate of return, with 14.62 percent being optimistic and 6.01 percent being pessimistic. The Conservative Growth portfolio has an assumed 8.87 percent gross expected rate of return, with 12.15 percent being optimistic and 5.69 being pessimistic. Interestingly, an annuity written in 2002 was also projected to have a five percent exhaustion probability. After only one year of poor returns, the exhaustion probability is now 20 percent.

Impact of Investment Constraints

The two hypothetical portfolios assume investment flexibility that many states do not or did not allow (e.g., California and New York in particular). The charitable community worked very hard to liberalize gift annuity regulations to subject annuity pools to some form of prudent investment standard. A typical constrained CGA allocation would be 20 percent equity, 70 percent fixed and 10 percent cash. Following the same assumptions, but substituting this allocation for a January 1, 2000, annuity, the exhaustion rate would be 29 percent, with a 10 percent probability of an ending balance of $76,235 or more and a 10 percent probability of an ending balance of ($58,375) or less.

Even though some states now allow higher equity weightings, a charity should be very cautious about immediately changing the investment allocation based on the comparison between a constrained and unconstrained investment allocation. Because of the various risks involved and donor accountability, forced investment collaring may be more prudent than the prudent investor standard.

Risk Management Strategies

The risk management process involves establishing objectives, identifying loss exposures, selecting an appropriate blend of risk management techniques, implementing the strategies and then monitoring the plan. This process also involves quantifying risk to show which concerns are rational and which are irrational (consider, as an analogy, that people irrationally believe that flying is a riskier mode of transportation than driving). First, it is necessary to establish a charity's risk tolerance. Next, an optimal blend of risk management strategies can be designed to limit the down-side risk while maximizing the expected future value.

Determining a Charity's Risk Tolerance

The risk management plan should probe the notion of tolerable and intolerable probable outcomes. Further, it should explore self-insurance tolerance vs. reinsurance risk tolerance. Interestingly, when asked how risk tolerant a charity is with a gift annuity pool, most would say that they are risk averse. Ironically, very few do anything but assume all the risk by self-insuring—the most risky strategy by far. In fact, even life insurance companies won't automatically issue an immediate annuity of $1 million. Typically, a home office actuary will review the pool's characteristics and determine if that is a prudent risk to assume, or if part of the risk should be covered with another insurance company (the true definition of "reinsurance.") These are $50+ billion companies, yet charities unknowingly accept similar risks for gift annuities. The real questions charities should ask are: What is the maximum tolerable loss that we could sustain on a single gift annuity? If we experienced that loss, how would we make the payments?

"Collaring" Risk

Once intolerable risk has been identified, techniques can be implemented to "collar" the upside and downside potential. As with put and call option hedging for a single stock position, the purpose of collaring techniques is to shrink the range of expected outcomes. In its simplest form, it might be selecting a more conservative asset allocation to smooth any potential volatility. While this hedges investment risk, it does not provide a hedge against longevity risk.

Risk Management Techniques

The risk continuum for charitable gift annuities ranges from retention, to reduction, to transfer,and then to avoidance. Retention is the highest risk/highest reward option, and avoidance is the lowest risk/lowest reward option.

Risk retention—This means that a charity self-insures all the risks that have been mentioned. In its purest form, this will provide the largest expected up-side and the largest expected down-side future values.

Risk reduction—A charity employs risk reduction when it reduces ACGA rates, self-insures only males or unhealthy donors, or maintains a large surplus reserve relative to the current liabilities. Please note that these reduction strategies, especially reducing ACGA rates, may be cumbersome relative to state gift annuity regulations. For example, some states require an approved rate table or require rates offered to be consistent in some form (e.g., all 75-year-old females will be offered the same rate, or will be offered current ACGA recommended rates). It also might cause a donor to inquire about what amount triggered the rate reduction and to make multiple smaller gifts, or still worse, the donor may "shop" the entire gift to at least receive ACGA rates.

To reduce risk, the charity may also increase the minimum age to offer a gift annuity since older annuitants, even with higher recommended ACGA payouts, have less overall risk. The charity could also choose to build a reserve by withdrawing only the actuarial value at the donor's death, thereby leaving surpluses to buffer future pool experience.

Risk transfer—A charity may transfer nearly all the investment and longevity risks to an insurance company by purchasing an immediate annuity to back all or some portion of the liability (reinsurance). Or, a charity can transfer the risk to another charity—e.g., a community foundation—where the referring charity may still receive some future benefit.

Risk avoidance—Finally, a charity may choose not to offer gift annuities at all, or may not accept very large annuities or annuities funded with illiquid assets.

Gift Annuity Pool Risk Strategies

Pool risk can be analyzed on a statistical basis to determine where particular annuities or groups of annuities might pose unacceptable levels of risk. For example, the analysis might look at the year the annuities were written, gender, size in relation to the pool, asset allocation and expected cash flow needs. Based on these characteristics, individual annuities can be selected for specific risk management strategies, the pool's investment allocation might be adjusted overall or the pool could be split to better match cash flow needs to groups of life expectancies, and a risk management plan can be created for the pool and new CGAs.

Advanced Risk Management Strategies

For the sophisticated risk manager, the following strategies can further mitigate gift annuity risk.

Stop-Loss Technique - A charity may want to self-insure all gift annuities, but would review the pool periodically to assess the financial condition of particular annuities. If the present value of the asset drops to some specified ratio with the present value of the liability (e.g., 110 percent of the current liability), the charity may choose to execute a stop-loss trigger to collar the downside at that point. *Caveat:* If the fund drops below 110 percent as a result of market fluctuations, it might not be possible to execute this strategy in time to prevent a drop below 100 percent. Also, this would involve real-time monitoring of the fund, which the charity might not be in a position to efficiently carry out.

Phased Risk Transfer Hedging - Rather than implementing the risk management plan immediately (e.g., commercial annuity rates might be excessively high due to low interest rates), the strategy could be implemented over time to smooth out natural market variances. In essence, this strategy is similar to a dollar-cost averaging investment approach.

Reinsurance Company Selection - Generally, charities that choose a reinsurance option should select companies that receive the highest safety rating from at least two of the major rating agencies. In addition to the ratings, the charity should review the company's current portfolio as additional due

diligence (for example, a large portion of the bond portfolio invested in low quality bonds could be a warning sign). These selection criteria will generally result in the safest selection and should reduce the default risk to less than two-tenths of one percent.[5] This is especially important for young annuitants.

For older annuitants, however, the charity might choose to modestly relax the selection criteria if there is a significant premium reduction. For example, a 90-year-old annuitant would only require the company to make payments for three to four years on average. The default risk cited above was for a 30-year period. Clearly, if there is not enough of a premium spread, prudence would suggest staying with most solid companies.

Most states have an insurance guaranty fund that provides certain protections in case an insurance company becomes insolvent. In some cases, the guaranty may apply only to individual policyholders, and may not protect corporate policyholders. The charity should investigate what state's laws would apply to a particular reinsurance arrangement, and determine whether they would be protected by a guaranty fund in case of insurance company default.

Optimum Reinsurance Percentage - An immediate life-only annuity is nothing more than a market basket of fixed income instruments (usually on the long end of the yield curve) with inherent longevity insurance. Some recent financial planning research suggests that for a personal retirement portfolio, having 25-50 percent of a retirees' portfolio in an immediate income annuity minimizes the probability that the person will run out of money. This also reduces portfolio volatility at the cost of reducing the long-term "upside" potential.[6] For most individuals, a defined benefit pension plan or Social Security annuity effectively serves this role.

By performing a similar analysis, and using an annuity as the long bond portion of the portfolio, exhaustion probabilities went down as the amount reinsured went up. Further, if the charity felt more comfortable with a higher equity weighting because some portion of the longevity risk was transferred, the majority of the time the portfolio experienced a higher ending life expectancy value with lower volatility if the expected return increased by at least two percent.[7] The optimal reinsurance amount will differ by charity based on risk tolerance, but the fact that less than seven percent of charities reinsure any gift annuities shows that the use of risk transfer is quite low relative to other industries with similar risks (e.g., the prevalence of corporations purchasing annuities to guarantee a retiree's defined benefit payout).[8] Charitable gift annuities certainly have more surplus built-in than corporate pension obligations, but CGAs do not benefit from investment economies of scale or the law of large numbers from which many corporations benefit.

Asset-Liability Matching Investment Strategies - An especially effective risk-reduction strategy, as it relates to investment and timing risk, is asset-liability matching. In its simplest form, a charity that has a 30-year fixed payment obligation would purchase a bond to exactly match the required payments at the required time. Insurance companies design their portfolios similarly where they calculate the timing of expected claims for multiple lines of business, and then invest the premium payments in primarily fixed income portfolios to match the expected cash flows.

By choosing not to invest in an asset that exactly matches the required payments, an entity is choosing to speculate. For gift annuities, the charity believes it can exceed the guaranteed return over time and, therefore, will experience an investment profit (note that an underwriting profit is built in to the required premium, assuming a guaranteed investment). If, however, the entity experiences an investment loss, it may eliminate any underwriting profit and then may require a withdrawal from the reserved surplus.

This directly relates to charitable gift annuities in two ways. First, that a conservative portfolio should be designed using fixed income investments to match the annuity payments—not doing so may generate either investment gains or losses. Second, this further suggests that a "one-size-fits-all" investment pool may not be prudent if the annuity pool has a wide age spread for its large annuities. For example, nearly every pool has the same investment allocation such that a 55-year-old, $500,000 deferred annuity would be invested in the same way as an 88-year-old, $500,000 immediate annuity. If these same gifts were charitable remainder annuity trusts, they most certainly would be invested very differently, yet gift annuities share many of the same risks. Suggesting an optimal bifurcated pool, or a customized investment allocation for especially large annuities, is beyond the scope of this paper. However, we believe this would be an interesting topic for research.

Case Studies

The following three case studies illustrate a multi-faceted risk management approach tying together strategies presented in the article and the effects of implementing them.

Case Study #1—Small charity, no pool.

In 2003, Charity A was eager to start a gift annuity program; however, its board was very hesitant given the prolonged equity bear market. After setting a maximum potential loss at $25,000, the charity used Monte Carlo probability outcomes to develop a policy that they would reinsure female gift annuitants at $200,000 or more and male gift annuitants at $250,000. As their pool grew to 50 annuitants, they would likely double their risk retention limit. They selected a portfolio allocation of 45 percent equity, 50 percent fixed and five percent cash for their self-insurance pool and 100 percent broadly diversified equity for the remainder after reinsurance (the annuity purchase results in a de facto 75 percent fixed allocation).

Case Study #2—Large charity, small pool, one large problem annuity.

In late 2002, Charity B became increasingly concerned about a $450,000 annuity on a 78-year-old female written in December 1998. While they had eight other annuities, the next largest was only $100,000. A Monte Carlo analysis showed an exhaustion probability of 72 percent and a present value of the asset of 96 percent of the present value of the liability. Charity B did not have an easily accessible reserve, and determined that reinsuring 50 percent of the gift would create the longest stream of payments to limit the downside loss. Further, they planned to keep any future remainder interests in the pool to begin building a reserve. They also created a new policy to invest gifts of $200,000 or more for annuitants over 75 in a 35 percent equity, 55 percent fixed, 10 percent cash pool (others would be invested 60 percent equity, 35 percent fixed and five percent cash). Any annuities greater than $500,000 would be reinsured only to the point it limited their downside loss to $50,000 (using a 90 percent Monte Carlo probability test).

Case Study #3—Large charity, medium size pool.

Charity C had a pool of more than 90 annuitants, and the pool had existed for more than 10 years. They were interested in determining which, if any, of the annuities posed significant downside risk and the general statistical characteristics of the pool. They suggested a risk tolerance loss of 10 percent of the original gift, so a spreadsheet sensitivity analysis was run to identify annuities approaching that level. Of the 90 annuities, 31 had current asset present values less than 110 percent of the current liability in the conservative analysis (using a discount

rate of 5.3 percent—the conservative expected net blended rate of return) and 17 had current asset present values less than 110 percent of the current liability in the optimistic analysis (using a discount rate of 7.42 percent—the optimistic expected net blended rate of return). Of these, seven annuities were especially problematic as they were large and had a low asset to liability ratio. Using Monte Carlo analysis, exhaustion rates ranged from nine to 77 percent for various annuities under the optimistic scenarios and from 21 to 82 percent under the conservative scenarios.

A recommended risk retention limit was set at $300,000 for all annuities (the mean annuity plus one standard deviation derived from this specific charity's pool) where some level could be reduced or transferred and $500,000 was the maximum self-insurance limit (the mean plus two standard deviations—95 percent of all their annuities should fall within this range).

Another interesting finding was that two annuitants represented almost 50 percent of the entire reserved pool and had life expectancies beyond 23 years. The other 50 percent of the reserves all had life expectancies of 12 years or less. By carving out the two long lives and using asset/liability matching strategies, the portfolio could be designed to reduce risk and better match the expected cash flows for the pool. The relatively large uncertainty in the lengths of the lives of two individuals would require that the investments be of much longer duration than the average life expectancy. When the number of annuities is larger, for example around 10 annuities, it is possible to protect against the risk of longer survival while keeping the portfolio fairly close to the expected duration. A simulation of 10 identical annuities with typical mortality for annuitants starting at age 75 showed an average duration of 5.3, while a duration of 6.1 covered the most unfavorable cases 90 percent of the time. Asset/liability matching becomes an increasingly powerful technique as the pool grows larger; it may not have much effect with smaller, less predictable pools.

Note that in each of these case studies, the charities were not subject to state investment constraints. These requirements create additional risk management complexity that is beyond this article's scope, but additional strategies could be used to counter-balance this inflexibility (e.g., calculate the amount that would need to be carved out from the charity's non-annuity endowment pool and invest it more aggressively in a "side-account" so that the overall allocation—combining the endowment and gift annuity pool—would achieve the target).

Parallel Risk Management Applications

Charitable remainder annuity trusts have precisely the same investment, longevity and timing risks as charitable gift annuities written during this period. While they do not have the risk of a negative expected value, they certainly do have trustee litigation risk if prudent steps were not taken to extend the payment period so that the income beneficiary could continue receiving payments and the charitable beneficiary could receive the remainder. Both CRATs and CGAs would also share some donor relations risk where a donor, or donor's family, assumes that a particular project will be funded with the remainder interest (e.g., a memorial scholarship fund named for the donor's mother).

Conclusion

We hope that this paper provides a much deeper understanding of the complex facets of charitable gift annuity risk management, and that it can take the dialogue beyond the self insurance vs. reinsurance debate. Most importantly, charities should use this framework to discuss potential risk issues relating to existing pools and to create sound, considered policies for future annuities. If our analysis proves correct, a large number of gift annuities written during between 1998 and 2002 have an uncomfortably high probability of exhausting within the next decade. However, charities can act now to collar this risk to a tolerable level.