

TIAA-CREF institute

TRENDS AND ISSUES

ANNUITIES: NOW, LATER, NEVER?

Benjamin Goodman, Director,

Actuarial Consulting Services TIAA-CREF

Michael Heller, Vice President,

Actuarial Consulting Services TIAA-CREF

October 2006



FINANCIAL SERVICES
FOR THE GREATER GOOD™

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

EXECUTIVE SUMMARY

With the growing prominence of defined contribution plans as primary retirement funding vehicles, there is a concern that participants should be making appropriate decisions in drawing income from their account balances. One major question relates to the role of life annuities as an effective means of receiving retirement income. This paper examines the financial efficacy of receiving income through a life annuity versus systematic withdrawals from a participant's account. As a basis for comparison, we contrast the receipt of life annuity income to equivalent withdrawals made from an investment account, assuming that both the life annuity income and the investment account earnings reflect the same investment return (net of expenses). This form of comparison is done for both a typical fixed annuity and for a variable life annuity. Based on hypothetical future investment earnings rates, these illustrations show that the individual who utilizes systematic withdrawal is projected to run out of funds some time before reaching his or her life expectancy. In other words, there is more than a 50% chance that the individual would run out of money!

This comparison is then repeated for the variable life annuity, but this time based on actual S&P 500 investment experience over two different time periods: 1965 - 1989 and 1975 - 1999. Using real investment experience, we again see that, had an individual withdrawn (systematically) the same income as would have been payable from a variable life annuity, that individual would have run out of money before reaching his or her life expectancy. In other words, whether we use hypothetical or real investment experience, a comparison of life annuities versus systematic withdrawals (of equivalent amounts) demonstrates the financial efficacy of annuitization. Put another way, one can say that a life annuity is financially engineered to maximize the amount of living income to an individual.

Having demonstrated the value of utilizing a life annuity, we then go on to examine the efficacy of delaying the start of annuity income to a later age. Using examples based on both fixed and variable annuities, we show that the cost for delaying annuitization by five years (assuming a retirement age of 65) is about a 5% reduction in future income, while a delay of ten years might result in a 15% reduction in lifetime income. It's also noted that these relative reductions would be smaller in respect to individuals who retire at earlier ages. Still, while some people might feel that a 5% income reduction might be a fair trade for being given an extra five years to decide whether or not to annuitize (during which

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

time certain health issues may arise), there is clearly much less value in waiting ten years or more.

The paper also explores the potential impact on income if individuals postpone annuitization during a period of rising interest rates. Assuming interest rates rise by 0.25% each year, a five-year delay in annuitization results in a 7% gain in income. However, the latter result reflects the assumption that interest rates are the same both in the accumulation and annuity payout stage. In reality, some companies may use higher interest rates in their payout annuities, to reflect the higher rates generally associated with long-term fixed-income investments. If payout annuity interest rates are, indeed, higher than accumulating interest rates, the value of deferring annuitization may be lessened, unless interest rates rise significantly over a relatively short time period. Finally, we point out that the issue of postponing annuitization in a rising interest rate environment has no relevance to variable life annuities, as income under the latter type of annuity is always adjusted by the investment experience of the underlying assets.

TABLE OF CONTENTS

Introduction	3
The Life Annuity Principle – Fixed Account.....	3
The Life Annuity Principle – Variable Account	5
Delaying The Annuity – Simple Case.....	6
Delaying The Annuity – Interest Rates Rise.....	7
Conclusion	8
About The Authors	9
Exhibit 1: Life Annuity Principle – Fixed Annuity	11
Exhibit 2a: Life Annuity Principle – Variable Annuity At 7%	12
Exhibit 2b: Life Annuity Principle – S&P 1965-1989.....	13
Exhibit 2c: Life Annuity Principle – S&P 1975-1999.....	14
Exhibit 3: Delaying The Annuity – Fixed	15
Exhibit 4: Delaying The Annuity – Variable	16
Exhibit 5: Delaying The Annuity With A Rise In Interest Rates (Fixed)	17
Exhibit 6: Delaying The Annuity With A Rise In Interest Rates (Fixed)	18
Exhibit 7: Rising Interest Rates	19

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

INTRODUCTION

During the accumulation years, participants in defined contribution retirement plans need to be sure that they are making adequate contributions to their plan and that these contributions are appropriately allocated among various asset classes. Upon retirement, participants have to decide how to generate income from their account balances. One of the most important questions is whether or not to purchase a life annuity, for all or a portion of one's retirement income. As a life annuity guarantees payment of income as long as the participant lives, it can provide significant peace of mind. As we will demonstrate below, the life annuity also provides the maximum amount of living income. However, there are many retirees who are hesitant to purchase life annuities for a number of reasons, including: the loss of control of retirement assets; the loss of liquidity and flexibility; and the potential for early death (and consequently early loss of principal.) During the past few years there has been yet another reason for not purchasing a fixed life annuity: the belief that interest rates are currently low and that one can achieve better results by waiting to purchase the annuity when rates will be higher. (Whether rates will, in fact, be higher in a few years may be a subject for another paper.)

The purpose of this paper is three-fold: (1) to demonstrate that a life annuity is financially engineered to maximize the amount of living income payable to retirees; (2) to show the potential impact of deferring annuitization to a later age; and (3) to quantify the impact of delaying an annuity purchase during periods of rising interest rates.

THE LIFE ANNUITY PRINCIPLE – FIXED ACCOUNT

Exhibit 1 shows the financial impact of two retirement income strategies for a hypothetical 65-year-old: purchasing a fixed life annuity versus taking systematic withdrawals from the retirement accumulation. To make this an apples-to-apples comparison, we assume that each year's withdrawal is equal to the life annuity payment, and that both accounts have the same net investment earnings rate. As you can see, the 65-year-old who takes systematic withdrawals will run out of money in the 22nd year, even though life expectancy is 23 years.

This exhibit demonstrates two important aspects of the "life annuity principle": (1) **There is a *greater than 50% chance* that the retiree will run out of money if he or she takes a withdrawal equal to the life annuity payment.** In other words, there is a

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

greater risk (mathematically) of outliving income than the risk of dying young and losing the accumulation. (2) **A life annuity allows a retiree to maximize income.** Since most retirees want to be sure that they do not outlive their income, they would have to plan on withdrawals lasting quite a bit longer than just their life expectancy. For example, a 65-year-old might want to plan on having income last for at least 30 years, even if his life expectancy is only 23 years. Assuming a 5% interest rate, the withdrawal amount for this retiree would only be \$6,195 per year instead of the \$7,390 that the life annuity offers.

Of course, the person utilizing systematic withdrawal could have a better result if the investment fund earned more than the interest rate underlying the life annuity. However, it would have to be a lot more. To achieve 30 years of withdrawals of \$7,390, the account would have to earn over 6.8%, or almost 2% per year higher than the life annuity.

Note that this ‘life annuity principle’ applies at all interest rates. If we assumed a 7% interest rate instead of 5%, the annuity payment would be higher, as would the assumed withdrawal amount and earnings rate of the non-annuity account. The balance would again be depleted before life expectancy, and the non-annuity account would again have to earn 2% per year higher than the annuity interest rate to allow the money to last for 30 years.

The most often quoted downside of an annuity purchase is the potential for early death and consequent loss of principal. As is evident in Exhibit 1, if our hypothetical retiree has chosen a life annuity and died at any time during the first 22 years of retirement, there would be no death benefit payable to the estate. Under the systematic withdrawal scenario, there would be a sizable death benefit available, particularly in the earlier years. This differential in death benefits is, essentially, one of the primary trade-offs between a life annuity and non-annuity alternatives. Of course, the risk of not purchasing an annuity is the potential for outliving income. The concern regarding a potentially early death (and early loss of principal) can be managed and even eliminated by selecting a life annuity with a “guaranteed period”, which assures the annuitant that payments will continue to the estate for a minimum number of years, regardless of when the annuitant dies. This extra benefit feature comes at the cost of a slightly reduced level of income.

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

THE LIFE ANNUITY PRINCIPLE – VARIABLE ACCOUNT

The same principle also applies to a variable life annuity. The initial payment from a variable life annuity is calculated based on a specific mortality table and an Assumed Interest Rate (AIR). Each year, the payment changes based on the actual return of the underlying fund as compared to the AIR. If the fund return is higher than the AIR, the payment will increase and vice-versa (if lower.) The formula for the change is:

$$(1 + \text{Fund Return}) \text{ divided by } (1 + \text{AIR}), \text{ less } 1$$

For example, assuming an AIR of 4%, and an actual return of 10%, the increase will be:

$$(1.10 / 1.04) - 1 = 0.05769 \text{ or } 5.769\%.$$

Assuming an AIR of 4%, and an actual return of -5%, the change in payment will be:

$$(0.95 / 1.04) - 1 = -0.08654 \text{ or } -8.654\%.$$

Exhibit 2a compares the variable life annuity to systematic withdrawal from a fund that earns 7% each year. As is the case with a fixed annuity, we see that by making a withdrawal from the investment account equal to the amount paid from the variable life annuity, the retiree will eventually run out of money before attaining one's life expectancy. Furthermore, as both the variable annuity and systematic withdrawal funds are invested in the same underlying assets, it would be impossible to outperform the annuity return by 2% per year (unless the annuity issuer had a very high expense charge.)

Exhibit 2b and 2c compare variable life annuity payments to systematic withdrawal using actual S&P 500 investment return history. The first exhibit assumes the individual retired in 1965, while the latter assumes a retirement date in 1975. In both examples, the systematic withdrawal scenario resulted in the full depletion of investment funds before life expectancy was reached. In other words, there was more than a 50% chance that the retiree would have outlived his or her income. Thus, the "life annuity principle" applies to all variable life annuities, regardless of the variation in the investment return of the underlying funds.

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

DELAYING THE ANNUITY – SIMPLE CASE

As demonstrated with these exhibits, the life annuity offers a greater living income than one can safely take on their own, due to the annuity carrier's ability to spread mortality gains and losses among a large group of annuitants. The (theoretical) remaining account balances of those who die are used, in essence, to pay income to those who continue to live. This concept is sometimes referred to as the "benefit of survivorship." Thus, those who 'know' they are going to live a relatively long time are best off joining the annuity pool immediately, to take advantage of those who join the pool and die at a relatively young age. Of course, no one truly knows how long he or she is going to live. In fact, those who 'know' they are not going to live very long, due to disease or extreme illness, are advised not to purchase a life annuity.

However, assuming an individual has decided to receive retirement income through a life annuity, a question often arises as to when such income should begin. In other words, one can begin receiving life annuity income immediately upon retirement or, alternatively, take systematic withdrawals from an investment account for a number of years and then begin the life annuity income. In particular, individuals who retire at a relatively young age often question the appropriateness of immediately beginning life annuity income, as they will be "locking in" a fair amount of their retirement account proceeds for a potentially very long time period. They are also aware that, the younger one's age, the lower the income payable from a life annuity (per \$1,000 of account balance.)

Let's first look at a simple example of a 65-year-old retiree who waits 5 or 10 years to purchase a life annuity. Again, in order to make a fair, apples to apples comparison, we assume that she takes withdrawals from the account equal to the life annuity payment, and that the account earns the same interest rate as the annuity. As you can see on Exhibit 3, waiting will negatively impact her future income. Delaying 5 years results in lifetime income after age 70 of \$7,025 instead of the \$7,390 that the age 65 annuity produces. This 5% loss might be considered a minimal cost of the 'call option' that the delay allows. The retiree might die during these 5 years, or may have other needs that require emergency funds that would not have been available had she purchased a life annuity at age 65. A 10-year delay is more costly, resulting in a reduction of income of over 15% (\$6,239 instead of \$7,390).

A delaying strategy will not work for variable annuities either. As shown on Exhibit 4, with a 4% AIR and 7% investment return, a 5-year delay will cost the retiree about 5%,

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

and a 10-year delay about 15%. Of course the delay strategy is a good idea for the estate of one who dies during the 5-year or 10-year period.

It's important to note that the relative impact of delaying annuitization is more related to age than to the number of years of delay. If we considered the impact on a 55-year-old retiree, we would see that a 5-year delay (from ages 55 to 60) would only result in a 2% cut in future income, while a 10-year delay would reduce future life annuity income by about 6%. In essence, there is a much greater reduction in future income associated with postponement of annuitization past age 70 as opposed to postponement at earlier ages.

DELAYING THE ANNUITY – INTEREST RATES RISE

As we mentioned earlier in this paper, recently some retirees have been delaying the purchase of a fixed life annuity because they feel that interest rates are very low, and they want to wait for these rates to increase before they 'lock in' the annuity.

We have already shown in Exhibit 3 that a 5-year delay strategy causes about a 5% loss of income from age 70 and on. However, that exhibit assumed that interest rates were unchanged during the entire period. What if interest rates rise during the 5-year or 10-year delay?

First we will address an increase only in the life annuity interest rate. In Exhibit 3, we had shown that a 5-year delay in annuitization (to Age 70), would have resulted in a remaining account balance of \$84,755. In order for this account balance to generate the same level of income as otherwise payable at age 65 (\$7,390 per year), the life annuity interest rate would have to be at least 5.65% per year. Thus, if the retiree thinks interest rates are headed upwards, it does not take much of an increase for this strategy to work. However, to generate a payment of \$7,390 at age 75 (reflecting a 10-year delay in annuitization), the life annuity interest rate would have to be 7.67%. This does not seem like a good bet, as one would be relying on an increase of more than 250 basis points to break even.

Of course, if life annuity interest rates increase, it is likely that the accumulation rate would increase as well. In Exhibit 5 we show results assuming rates climb by 25 basis points each year for 5 years. The accumulation rate is 5% during the first year, but then rises to 6% by the 5th year. The annuitization interest rate (start of Year 6) is 6.25%. As you can see, there is much to gain by delaying five years – income that is more than 7%

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

higher than that payable to the age 65 annuitant. For the 10-year delay, assuming rates remain at 6.25%, the result is again higher than the income payable to the retiree who annuitizes at age 65, in addition to the added flexibility.

Thus, we can say that if one truly knows that rates are on the rise, it can be advantageous to delay annuitization if the annuity being considered is a fixed life annuity.

Note that these illustrations assume that the 5% initial interest rate applies to both accumulating and payout annuities. In actuality, annuity carriers may use a higher life annuity interest rate than the interest rate applied to investment accounts in the accumulation stage. This differential in fixed-annuity interest rates may simply reflect the underlying investments. Given the relatively long periods of investment, it is common to invest the principal underlying life annuities in long-term fixed-income instruments, while accumulating annuity funds may be invested in shorter term securities. Thus, unless there is an inverted yield curve, long-term investments yield higher rates and the rate used to determine life annuity income may often be higher. Nevertheless, even if accumulating rates are 100 basis points lower than the payout rate, an increase of 25 basis points a year for 5 years will still result in a slightly larger payment for the 5-year delay strategy. However, a 10-year delay in annuitization will result in somewhat lower payments from age 75 until death. These results are shown on Exhibit 6. Furthermore, even if rates continue to climb 25 basis points a year (indefinitely), the account will be depleted in 23 years if the retiree never elects to purchase a life annuity (see Exhibit 7).

It's important to note that this issue of the potential impact of increasing interest rates does not apply to a variable life annuity. Assuming that the variable life annuity and the alternative fund are invested in the same underlying assets, any changes in interest rates will have the same relative impact on both the underlying assets and the consequent rates of return. So, if an individual is very concerned about the potential impact of rising interest rates, he or she may be best served by taking a combination of systematic withdrawals and variable life annuity income for a few years, followed perhaps by staged purchases of fixed-income life annuities.

CONCLUSION

While many people are reticent to give up control of their retirement assets for the promise of a lifetime stream of income, this paper demonstrates the financial tradeoff implicit in the purchase of a life annuity. If one compares the receipt of life annuity

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

income to equivalent withdrawals made from an investment account (assuming the same net underlying investment return), one can readily demonstrate that the latter account will be exhausted some time before reaching one's life expectancy. This type of comparison works equally well for both fixed and variable life annuities and at any interest rate or series of year-to-year investment returns (in the case of a variable annuity.) The implication of these comparisons is that, if one tries to "self-annuitize" and draw down the same level of income as payable under a life annuity, there will be more than a 50% chance that he or she will run out of funds while still alive. Consequently, an individual who does not annuitize will need to lower the amount of yearly income withdrawn from his or her retirement account in order to avoid the possibility of financial ruin. Thus, one can readily conclude that a life annuity, be it fixed or variable, provides the highest level of living income available to a retired individual.

Once convinced of the efficacy of choosing a life annuity for all or a portion of one's retirement income, a common follow-up question is: when should income begin? Assuming no expected significant change in interest rates, we see that a five-year delay, from age 65 to age 70, results in about a 5% loss in future income. Given the relatively small magnitude of this potential loss, some individuals may weigh this loss against the greater flexibility associated with non-annuitization. However, delaying the start of life annuity income from age 65 to age 75, a ten-year delay, can easily result in a 15% loss in future income. Given the sharper increase in mortality rates after age 70, one can conclude that it pays to begin life annuity income no later than at age 70.

If one firmly believes that interest rates are almost certain to increase significantly in the very near future, there may be good reason to postpone annuitization for at least a few years. However, this will depend on various factors, including how fast and how far interest rates change, and the rate of return associated with the investment account versus the underlying rate of return of the life annuity. Of course, the potential impact of change in the interest rate environment should not affect the timing of annuitization with a variable annuity.

ABOUT THE AUTHORS

Benjamin Goodman is Director, Actuarial Consulting Services of TIAA-CREF. His primary focus is on the development of participant advice and the pricing of retirement plan services. Benny graduated from Touro College in 1984 with a B.S. degree in

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

computer science with a specialization in mathematics. He is a Fellow of the Society of Actuaries and a Member of the American Academy of Actuaries.

Michael Heller is Vice President, Actuarial Consulting Services of TIAA-CREF. He is responsible for managing a number of actuarial functions, primarily focused on providing advice and assistance in the design and funding of both defined benefit and defined contribution retirement plans. Michael graduated from the City College of New York in 1972 with a B.S. degree in mathematics. He is a Fellow of the Society of Actuaries, a Member of the American Academy of Actuaries and an Enrolled Actuary.

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

EXHIBIT 1: LIFE ANNUITY PRINCIPLE – FIXED ANNUITY

Withdrawal Equal to Fixed Annuity					
Assumptions:					
Age 65 with a \$100,000 accumulation, 5% interest					
Annuity 2000 Mortality Table, set back 18 months					
	Using Systematic Withdrawals				
	Annuity Payment	Beg of Year	Withdrawal	Interest	End of Year
65	\$7,390	\$100,000	\$7,390	\$4,631	\$97,241
66	\$7,390	\$97,241	\$7,390	\$4,493	\$94,344
67	\$7,390	\$94,344	\$7,390	\$4,348	\$91,302
68	\$7,390	\$91,302	\$7,390	\$4,196	\$88,108
69	\$7,390	\$88,108	\$7,390	\$4,036	\$84,755
70	\$7,390	\$84,755	\$7,390	\$3,868	\$81,233
71	\$7,390	\$81,233	\$7,390	\$3,692	\$77,536
72	\$7,390	\$77,536	\$7,390	\$3,507	\$73,654
73	\$7,390	\$73,654	\$7,390	\$3,313	\$69,577
74	\$7,390	\$69,577	\$7,390	\$3,109	\$65,297
75	\$7,390	\$65,297	\$7,390	\$2,895	\$60,803
76	\$7,390	\$60,803	\$7,390	\$2,671	\$56,084
77	\$7,390	\$56,084	\$7,390	\$2,435	\$51,129
78	\$7,390	\$51,129	\$7,390	\$2,187	\$45,927
79	\$7,390	\$45,927	\$7,390	\$1,927	\$40,464
80	\$7,390	\$40,464	\$7,390	\$1,654	\$34,728
81	\$7,390	\$34,728	\$7,390	\$1,367	\$28,706
82	\$7,390	\$28,706	\$7,390	\$1,066	\$22,382
83	\$7,390	\$22,382	\$7,390	\$750	\$15,742
84	\$7,390	\$15,742	\$7,390	\$418	\$8,770
85	\$7,390	\$8,770	\$7,390	\$69	\$1,450
86	\$7,390	\$1,450	\$1,450	\$0	\$0
87	\$7,390	\$0	\$0	\$0	\$0
88	\$7,390	\$0	\$0	\$0	\$0

Note: Using this mortality table, Life Expectancy at age 65 is approximately 23 years

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

EXHIBIT 2A: LIFE ANNUITY PRINCIPLE – VARIABLE ANNUITY AT 7%

Withdrawal Equal to Fixed Annuity

Assumptions:

Age 65 with a \$100,000 accumulation, 4% AIR, 7% earnings rate

Annuity 2000 Mortality Table, set back 18 months

			Using Systematic Withdrawals			
	Annuity Payment	Beg of Year	Withdrawal	Return	Earnings	End of Year
65	6,722	100,000	6,722	7%	6,529	99,807
66	6,916	99,807	6,916	7%	6,502	99,394
67	7,115	99,394	7,115	7%	6,460	98,738
68	7,321	98,738	7,321	7%	6,399	97,817
69	7,532	97,817	7,532	7%	6,320	96,605
70	7,749	96,605	7,749	7%	6,220	95,076
71	7,973	95,076	7,973	7%	6,097	93,200
72	8,203	93,200	8,203	7%	5,950	90,947
73	8,439	90,947	8,439	7%	5,776	88,284
74	8,683	88,284	8,683	7%	5,572	85,173
75	8,933	85,173	8,933	7%	5,337	81,577
76	9,191	81,577	9,191	7%	5,067	77,453
77	9,456	77,453	9,456	7%	4,760	72,757
78	9,729	72,757	9,729	7%	4,412	67,441
79	10,009	67,441	10,009	7%	4,020	61,451
80	10,298	61,451	10,298	7%	3,581	54,734
81	10,595	54,734	10,595	7%	3,090	47,229
82	10,901	47,229	10,901	7%	2,543	38,871
83	11,215	38,871	11,215	7%	1,936	29,592
84	11,539	29,592	11,539	7%	1,264	19,317
85	11,872	19,317	11,872	7%	521	7,966
86	12,214	7,966	7,966	7%	0	0
87	12,566	0	0	7%	0	0
88	12,929	0	0	7%	0	0

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

EXHIBIT 2B: LIFE ANNUITY PRINCIPLE – S&P 1965-1989

Withdrawal Equal to Fixed Annuity

Assumptions:

Age 65, Male with a \$100,000 accumulation

Annuity 2000 Mortality Table, set back 18 months, 4% AIR

		Using Systematic Withdrawals				
	Annuity Payment	Beg of Year	Withdrawal	Return	Earnings	End of Year
65	6,722	100,000	6,722	12.45%	11,613	104,891
66	7,268	104,891	7,268	-10.06%	-9,821	87,802
67	6,286	87,802	6,286	23.98%	19,548	101,064
68	7,493	101,064	7,493	11.06%	10,349	103,920
69	8,002	103,920	8,002	-8.50%	-8,153	87,765
70	7,040	87,765	7,040	4.01%	3,237	83,962
71	7,041	83,962	7,041	14.31%	11,007	87,929
72	7,739	87,929	7,739	18.98%	15,220	95,411
73	8,853	95,411	8,853	-14.66%	-12,689	73,868
74	7,265	73,868	7,265	-26.47%	-17,630	48,973
75	5,136	48,973	5,136	37.20%	16,307	60,144
76	6,776	60,144	6,776	23.84%	12,723	66,091
77	8,069	66,091	8,069	-7.18%	-4,166	53,856
78	7,201	53,856	7,201	6.56%	3,061	49,716
79	7,379	49,716	7,379	18.44%	7,807	50,144
80	8,403	50,144	8,403	32.42%	13,532	55,273
81	10,699	55,273	10,699	-4.91%	-2,189	42,385
82	9,783	42,385	9,783	21.41%	6,980	39,582
83	11,420	39,582	11,420	22.51%	6,339	34,501
84	13,453	34,501	13,453	6.27%	1,320	22,368
85	13,747	22,368	13,747	32.16%	2,773	11,394
86	17,469	11,394	11,394	18.47%	0	0
87	19,899	0	0	5.23%	0	0
88	20,135	0	0	16.81%	0	0
89	22,615			31.49%	0	0

Note: Using this mortality table, Life Expectancy at age 65 is approximately 23 years

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

EXHIBIT 2C: LIFE ANNUITY PRINCIPLE – S&P 1975-1999

Withdrawal Equal to Fixed Annuity

Assumptions:

Age 65, Male with a \$100,000 accumulation

Annuity 2000 Mortality Table, set back 18 months, 4% AIR

	Annuitant Payment	Beg of Year	Using Systematic Withdrawals Withdrawal	Return	Earnings	End of Year
65	6,722	100,000	6,722	37.20%	34,699	127,977
66	8,868	127,977	8,868	23.84%	28,396	147,505
67	10,560	147,505	10,560	-7.18%	-9,833	127,113
68	9,424	127,113	9,424	6.56%	7,720	125,409
69	9,656	125,409	9,656	18.44%	21,345	137,097
70	10,997	137,097	10,997	32.42%	40,882	166,982
71	14,002	166,982	14,002	-4.91%	-7,511	145,468
72	12,803	145,468	12,803	21.41%	28,404	161,069
73	14,946	161,069	14,946	22.51%	32,892	179,016
74	17,606	179,016	17,606	6.27%	10,120	171,530
75	17,990	171,530	17,990	32.16%	49,378	202,918
76	22,862	202,918	22,862	18.47%	33,256	213,313
77	26,042	213,313	26,042	5.23%	9,794	197,065
78	26,350	197,065	26,350	16.81%	28,697	199,412
79	29,596	199,412	29,596	31.49%	53,475	223,291
80	37,419	223,291	37,419	-3.17%	-5,892	179,979
81	34,839	179,979	34,839	30.55%	44,340	189,480
82	43,733	189,480	43,733	7.67%	11,179	156,926
83	45,277	156,926	45,277	9.99%	11,154	122,803
84	47,884	122,803	47,884	1.31%	981	75,900
85	46,646	75,900	46,646	37.43%	10,950	40,204
86	61,640	40,204	40,204	23.07%	0	0
87	72,942	0	0	33.36%	0	0
88	93,535	0	0	28.58%	0	0
89	115,641			21.04%	0	

Note: Using this mortality table, Life Expectancy at age 65 is approximately 23 years

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

EXHIBIT 3: DELAYING THE ANNUITY – FIXED

Withdrawal Equal to Fixed Annuity
 Age 65 with a \$100,000 accumulation, 5% interest
 Annuity 2000 Mortality Table, set back 18 months

Wait 5 years then annuitize

Immediate Annuity			Withdraw, then annuitize		
	Payment	Balance	Beginning Balance	Payment	Ending Balance
65	\$7,390	\$0	\$100,000	\$7,390	\$97,241
66	\$7,390	\$0	\$97,241	\$7,390	\$94,344
67	\$7,390	\$0	\$94,344	\$7,390	\$91,302
68	\$7,390	\$0	\$91,302	\$7,390	\$88,108
69	\$7,390	\$0	\$88,108	\$7,390	\$84,755
70	\$7,390	\$0		\$7,025	\$0

Wait 10 years then annuitize

Immediate Annuity			Withdraw, then annuitize		
	Payment	Balance	Beginning Balance	Payment	Ending Balance
65	\$7,390	\$0	\$100,000	\$7,390	\$97,241
66	\$7,390	\$0	\$97,241	\$7,390	\$94,344
67	\$7,390	\$0	\$94,344	\$7,390	\$91,302
68	\$7,390	\$0	\$91,302	\$7,390	\$88,108
69	\$7,390	\$0	\$88,108	\$7,390	\$84,755
70	\$7,390	\$0	\$84,755	\$7,390	\$81,233
71	\$7,390	\$0	\$81,233	\$7,390	\$77,536
72	\$7,390	\$0	\$77,536	\$7,390	\$73,654
73	\$7,390	\$0	\$73,654	\$7,390	\$69,577
74	\$7,390	\$0	\$69,577	\$7,390	\$65,297
75	\$7,390	\$0		\$6,239	

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

EXHIBIT 4: DELAYING THE ANNUITY – VARIABLE

Withdrawal Equal to Fixed Annuity
 Age 65 with a \$100,000 accumulation, 4% AIR, 7% earnings rate
 Annuity 2000 Mortality Table, set back 18 months

Wait 5 years then annuitize

	Immediate Annuity		Withdraw, then annuitize		
	Payment	Balance	Beginning Balance	Payment	Ending Balance
65	\$6,722	\$0	\$100,000	\$6,722	\$99,807
66	\$6,916	\$0	\$99,807	\$6,916	\$99,394
67	\$7,115	\$0	\$99,394	\$7,115	\$98,738
68	\$7,321	\$0	\$98,738	\$7,321	\$97,817
69	\$7,532	\$0	\$97,817	\$7,532	\$96,605
70	\$7,749	\$0		\$7,372	\$0

Wait 10 years then annuitize

	Immediate Annuity		Withdraw, then annuitize		
	Payment	Balance	Beginning Balance	Payment	Ending Balance
65	\$6,722	\$0	\$100,000	\$6,722	\$99,807
66	\$6,916	\$0	\$99,807	\$6,916	\$99,394
67	\$7,115	\$0	\$99,394	\$7,115	\$98,738
68	\$7,321	\$0	\$98,738	\$7,321	\$97,817
69	\$7,532	\$0	\$97,817	\$7,532	\$96,605
70	\$7,749	\$0	\$96,605	\$7,749	\$95,076
71	\$7,973	\$0	\$95,076	\$7,973	\$93,200
72	\$8,203	\$0	\$93,200	\$8,203	\$90,947
73	\$8,439	\$0	\$90,947	\$8,439	\$88,284
74	\$8,683	\$0	\$88,284	\$8,683	\$85,173
75	\$8,933	\$0		\$7,584	

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

EXHIBIT 5: DELAYING THE ANNUITY WITH A RISE IN INTEREST RATES (FIXED)

Withdrawal Equal to Fixed Annuity
 Age 65 with a \$100,000 accumulation
 5% initial interest for accumulation and payout
 All rates increase 25 basis points a year for 5 years

Annuity 2000 Mortality Table, set back 18 months

Wait 5 years then annuitize

Immediate Annuity			Withdraw, then annuitize		
	Payment	Balance	Beginning Balance	Payment	Ending Balance
65	\$7,390	\$0	\$100,000	\$7,390	\$97,241
66	\$7,390	\$0	\$97,241	\$7,390	\$94,569
67	\$7,390	\$0	\$94,569	\$7,390	\$91,974
68	\$7,390	\$0	\$91,974	\$7,390	\$89,448
69	\$7,390	\$0	\$89,448	\$7,390	\$86,982
70	\$7,390	\$0		\$7,936	\$0

Wait 10 years then annuitize

Immediate Annuity			Withdraw, then annuitize		
	Payment	Balance	Beginning Balance	Payment	Ending Balance
65	\$7,390	\$0	\$100,000	\$7,390	\$97,241
66	\$7,390	\$0	\$97,241	\$7,390	\$94,569
67	\$7,390	\$0	\$94,569	\$7,390	\$91,974
68	\$7,390	\$0	\$91,974	\$7,390	\$89,448
69	\$7,390	\$0	\$89,448	\$7,390	\$86,982
70	\$7,390	\$0	\$86,982	\$7,390	\$84,567
71	\$7,390	\$0	\$84,567	\$7,390	\$82,001
72	\$7,390	\$0	\$82,001	\$7,390	\$79,275
73	\$7,390	\$0	\$79,275	\$7,390	\$76,378
74	\$7,390	\$0	\$76,378	\$7,390	\$73,300
75	\$7,390	\$0		\$7,606	

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

EXHIBIT 6: DELAYING THE ANNUITY WITH A RISE IN INTEREST RATES (FIXED)

Withdrawal Equal to Fixed Annuity
 Age 65 with a \$100,000 accumulation
 Initial Payout rate = 5%, Initial Accumulation rate = 4%
 All rates increase 25 basis points a year for 5 years

Annuity 2000 Mortality Table, set back 18 months

Wait 5 years then annuitize

Immediate Annuity			Withdraw, then annuitize		
	Payment	Balance	Beginning Balance	Payment	Ending Balance
65	\$7,390	\$0	\$100,000	\$7,390	\$96,315
66	\$7,390	\$0	\$96,315	\$7,390	\$92,705
67	\$7,390	\$0	\$92,705	\$7,390	\$89,154
68	\$7,390	\$0	\$89,154	\$7,390	\$85,649
69	\$7,390	\$0	\$85,649	\$7,390	\$82,172
70	\$7,390	\$0		\$7,497	\$0

Wait 10 years then annuitize

Immediate Annuity			Withdraw, then annuitize		
	Payment	Balance	Beginning Balance	Payment	Ending Balance
65	\$7,390	\$0	\$100,000	\$7,390	\$96,315
66	\$7,390	\$0	\$96,315	\$7,390	\$92,705
67	\$7,390	\$0	\$92,705	\$7,390	\$89,154
68	\$7,390	\$0	\$89,154	\$7,390	\$85,649
69	\$7,390	\$0	\$85,649	\$7,390	\$82,172
70	\$7,390	\$0	\$82,172	\$7,390	\$78,708
71	\$7,390	\$0	\$78,708	\$7,390	\$75,063
72	\$7,390	\$0	\$75,063	\$7,390	\$71,226
73	\$7,390	\$0	\$71,226	\$7,390	\$67,188
74	\$7,390	\$0	\$67,188	\$7,390	\$62,938
75	\$7,390	\$0		\$6,531	

TRENDS AND ISSUES

www.tiaa-crefinstitute.org

EXHIBIT 7: RISING INTEREST RATES

Withdrawal Equal to Fixed Annuity

		Payment	Rate	Earnings	Ending Balance
1	\$100,000	\$7,390	4.00%	\$3,704	\$96,315
2	\$96,315	\$7,390	4.25%	\$3,779	\$92,705
3	\$92,705	\$7,390	4.50%	\$3,839	\$89,154
4	\$89,154	\$7,390	4.75%	\$3,884	\$85,649
5	\$85,649	\$7,390	5.00%	\$3,913	\$82,172
6	\$82,172	\$7,390	5.25%	\$3,926	\$78,708
7	\$78,708	\$7,390	5.50%	\$3,923	\$75,241
8	\$75,241	\$7,390	5.75%	\$3,901	\$71,753
9	\$71,753	\$7,390	6.00%	\$3,862	\$68,226
10	\$68,226	\$7,390	6.25%	\$3,802	\$64,638
11	\$64,638	\$7,390	6.50%	\$3,721	\$60,970
12	\$60,970	\$7,390	6.75%	\$3,617	\$57,197
13	\$57,197	\$7,390	7.00%	\$3,487	\$53,294
14	\$53,294	\$7,390	7.25%	\$3,328	\$49,233
15	\$49,233	\$7,390	7.50%	\$3,138	\$44,981
16	\$44,981	\$7,390	7.75%	\$2,913	\$40,505
17	\$40,505	\$7,390	8.00%	\$2,649	\$35,765
18	\$35,765	\$7,390	8.25%	\$2,341	\$30,716
19	\$30,716	\$7,390	8.50%	\$1,983	\$25,309
20	\$25,309	\$7,390	8.75%	\$1,568	\$19,488
21	\$19,488	\$7,390	9.00%	\$1,089	\$13,187
22	\$13,187	\$7,390	9.25%	\$536	\$6,334
23	\$6,334	\$6,334	9.50%	\$0	\$0
24	\$0	\$0	9.75%	\$0	\$0
25	\$0	\$0	10.00%	\$0	\$0