

# **Technical Document – INCOME VALUE**

*Last Updated: March 7, 2012*

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## I. Summary & Objectives

### a. What is INCOME VALUE (“What”)

There has been demand for the fair market valuation of income annuity contracts for a variety of reasons. Until recently, each product manufacturer had a proprietary methodology to derive this value. The industry has since come together to define a standard methodology and approach to calculate this market value and has agreed to identify it as INCOME VALUE.

### b. This Document

Contained herein are the basic specifications and requirements for an insurance carrier to accommodate the calculation of INCOME VALUE on their administrative systems and be able to transmit that data to distributors or other users. It is assumed that Broker Dealers or other receivers of INCOME VALUE will leverage existing processes consistent with central clearing organizations like the DTCC. Ultimately, the timing and expectations about what is communicated with regard to INCOME VALUE will be determined and managed directly between the product manufacturer and the distributor.

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For more information about INCOME VALUE and related technical requirements, contact the following:

#### **Income Annuity Yield Curve & Valuation Methodology**

CANNEX Financial Exchanges

Phone: 416-926-0882 / 800-387-1269

Email: [cannex@cannex.com](mailto:cannex@cannex.com)

Contact: Actuarial Support

#### **Data & File Requirements**

Depository Trust & Clearing Corporation (DTCC)

Phone: 888-382-2721

Email: [insurancesupport@dtcc.com](mailto:insurancesupport@dtcc.com)

Contact: Insurance & Retirement Services

## II. Calculating INCOME VALUE (“How”)

### a. Overview

- i. INCOME VALUE is defined as the actuarial present value of remaining benefits from an annuitized contract.
  - The Discount Rate used for the present valuation is called the Income Annuity Yield Curve. This is a spot rate curve that is derived on a daily basis from the average payout results of the top income annuity providers in the industry.
  - Standard Mortality Tables and Improvement Scales are also used to derive the probability of survival and death.
- ii. INCOME VALUE can be used for the following products:
  - Immediate Fixed Annuities (IFAs). Also known as Single Premium Immediate Annuities (SPIA), Income Annuities, etc
  - Deferred Income Annuities (DIAs). Also known as Longevity Insurance.
  - Immediate Variable Annuities (IVA).
  - Any Deferred Annuity contract that has been Annuitized. These would include Variable Annuities (VAs), Single Premium Deferred Annuities (SPDA),

### b. Inputs / Variables

#### i. Policy Data

The following data elements of an annuity contract would be needed to derive INCOME Value (a complete description is provided in Appendix A of this document):

Data	Example(s)
Payout Type	Fixed, Variable
Current Payment Amount	\$1000.00
Payment Frequency	Per Month
Income Start Date	mm/dd/yyyy
Annuity Type	Single, Joint, Period Certain Only
Guarantee Type / Death Benefit	Life Only, Life with PC, Cash Refund
Resident State	CT
Date of Birth – Primary	mm/dd/yyyy
Gender – Primary	Female
Date of Birth – Secondary (for Joint)	mm/dd/yyyy
Gender – Secondary (for Joint)	Male
Primary Survivor Reduction (for Joint)	100%, Two Thirds
Secondary Survivor Reduction (for Joint)	100%, Two Thirds
Certain Period Qualifier	Annual
Certain Period	10 Years
Payment End Date (Certain Period Duration)	mm/dd/yyyy
Payment Increase Type (for Fixed)	Fixed Percentage (COLA), CPI
Payment Increase Amount	3.0%
Assumed Interest Rate (for Variable)	1.5%
Payment Levelization (for Variable)	Annual
Payout Change Date	mm/dd/yyyy
Payout Change Qualifier	\$ vs. %
Payout Change Amount	2.0%
Payout Change Direction	Increase vs. Decrease

***Appendix A provides a more detailed description of policy data in DTCC POV format.***

ii. **Discount Rate**

- A specific set of rates are used to derive the present value of benefits as part of the calculation. Rather than use the U.S. Treasury curve as the standard measure, the industry wanted to use a set of rates that calibrate more specifically to the pricing and credit experience of insurance companies that support annuitized guarantees in the marketplace.
- The INCOME ANNUITY YIELD CURVE was created to provide a set of rates used for the INCOME VALUE calculation. Like the U.S. Treasury, the Income Annuity Yield Curve will provide a set of rates that stretch out at 30 years. These rates will be updated on a daily basis and will be interpolated down to the monthly level (i.e., a series of 360 rates). However, there are a couple of differences from the U.S. Treasury Curve:
  - The minimum duration in the Income Annuity Yield Curve will be 1 Year. Any benefit that (e.g., payment) that falls between months 1 to 11 months will apply the 1 Year rate.
  - The maximum duration in the Income Annuity Yield Curve will be 30 Years. Any benefit that falls beyond 30 Years will apply the 30 Year rate.
- The Income Annuity Yield Curve will initially be supported and made available by CANNEX Financial Exchanges ([www.cannex.com](http://www.cannex.com)), a service provider to the fixed annuity market in the U.S. A table of rates will be updated on a daily basis and loaded onto the CANNEX web site for download. Users of this data will be provided with a security credentials to access this data manually or have a process set up with CANNEX automatically have the data feed to the appropriate administrative system. This data will be made available in Excel format. CANNEX would be able to accommodate other file formats under special accommodation.
- ***Appendix B provides a summary of the methodology used to derive the Income Annuity Yield Curve***
- ***Appendix C provides an example of the Income Annuity Yield Curve table***

iii. **Mortality**

- The data used for the actuarial portion of the INCOME VALUE calculation is standard across the insurance industry and is made available by the Society of Actuaries (SOA). Chances are that each insurance company has processes in place to obtain and manage this data. If not, processes and procedures are available through the SOA web site or other actuarial sources.
  - **Gender:**  
Sex distinct tables will be used for in all cases including situations where unisex mortality rates may be used in pricing for certain states (e.g., Montana, Massachusetts) or fund types (e.g., qualified).

- Mortality Table:  
At this time, the A2000 is the commonly recognized and used table in the industry and will be applied to the INCOME VALUE calculation.
- Improvement Scale:  
Scale G will be applied for Male and G/2 for female
- Mortality Projection:  
Projections of mortality will be limited to a static basis only. In other words, a static projection of 12 years (= 2012 – 2000) is used to update the mortality table to the current year of valuation from the base year of 2000. In 2013, it will be projected 13 years and then 14 years in 2014 and so on. Dynamic projections are not used for income valuation.

### c. Calculation / Methodology

#### i. Immediate Fixed Annuities (IFA or SPIA) / Fixed Annuitization (Level Payments)

- This is considered the baseline methodology for the INCOME VALUE calculation since a large majority of annuitized contracts are on a fixed basis and provided in the form of an immediate income annuity product.
- Many contracts provide for the ability to modify the benefits at a future date. INCOME VALUE is calculated for the current level of benefits in place at the time of valuation and does not consider optional or conditional adjustments. However, scheduled adjustments are considered such as a fixed rate adjustment to a payment as defined and guaranteed by a contract.
- Summary of Calculation
  - (1) Depending upon the mode of payment (e.g., monthly), income payments and any death benefits are discounted back to the valuation date using a common industry benchmark for **economic value**. This benchmark is the Income Annuity Yield Curve.
  - (2) Then, the **probability of survival and death** is calculated for each payment period based upon common mortality tables and improvement scales.
  - (3) Finally, the economic values are **combined** with the survival and death probabilities to derive the INCOME VALUE.
- Details of Calculation
 

$x$  is the age of the annuitant(s) at the valuation date  
 $t$  is the time (e.g., months) between the valuation date and the income payment  
 $i$  is the discount rate for each income payment

  - (1) Economic Value of Income Payment =  $\text{Income Payment}(t) \cdot (1+i)^{-t}$   
 Economic Value of Death Benefit =  $\text{Death Benefit}(t) \cdot (1+i)^{-t}$

- (2) Probability of receiving income payment at time  $t$  = Survivorship Factor( $t$ )
- If the payment is not life-contingent, the survivorship factor is 1
  - If the payment is life-contingent, the survivorship factor is the probability of the annuitant surviving from the valuation date until time  $t$ 
    - For joint annuitants, the survivorship factor is the probability of either annuitant surviving until time  $t$

Probability of receiving death benefit at time  $t$  = Mortality Factor( $t$ )

- The mortality factor is the probability of surviving from the valuation date until time  $t-1$  but dying before time  $t$ 
  - For joint annuitants, the mortality factor is the probability of at least one annuitant surviving until time  $t-1$  but both having died before time  $t$

(3) Income Value for each payment period =

$$\text{Income Payment} \cdot (1+i)^{-t} \cdot \text{Survivorship Factor}(t) \\ + \text{Death Benefit}(t) \cdot (1+i)^{-t} \cdot \text{Mortality Factor}(t)$$

- Total Income Value (for all payment periods) =

$$\sum_t \left[ \begin{array}{l} \text{Income Payment} \cdot (1+i)^{-t} \cdot \text{Survivorship Factor}(t) \\ + \text{Death Benefit}(t) \cdot (1+i)^{-t} \cdot \text{Mortality Factor}(t) \end{array} \right]$$

**Note:** Consistent with current practices, the time period for life contingent payments will stop at age 115.

- Other Information and Assumptions:

(1) **Appendix D** provides an example of how the calculation is performed.

(2) The following elements are excluded from the calculation:

- a. State Premium Taxes
- b. Other Taxes (i.e., Qualified vs. Non-Qualified Funding)
- c. Compensation, Loads and other expenses specific to a carrier

(3) Variance in calculation between carriers:

It is recognized that there will be some minor differences in programming and assumptions used by insurance carriers in calculating INCOME VALUE. Since valuation is essentially different from annuitant to annuitant based on the specific profile of consumer and the type of contract they hold, this variance would be minor.

Examples of these differences include:

- a. Different rounding rules
- b. Age definition as of the Valuation Date
- c. Pivotal Date for the income value calculation
- d. Different methods to calculate Cash Refund and Installment Refund
- e. Monthly vs. Annual cash flow models

ii. **Fixed Annuitization with Inflation Adjustments**

- COLA / fixed Adjustments  
Merely apply the anticipated increase in payments in calculation as dictated by the terms of the contract.
- CPI Adjustment  
Apply the current CPI rate for changes in payments, again as dictated by the terms of the contract.

iii. **Deferred Fixed Income Annuity Contracts (e.g., DIA or Longevity Insurance)**

- Income Payments  
Match the discount rates to the point in time in the future when income payments begin. For example, if payments are deferred for 10 years, apply the 10 year discount rate from the Income Annuity Yield Curve on forward.
- Death Benefits  
Death Benefits available during the deferral and income period should align with the discount rates for that same time period.

iv. **Immediate Variable Annuities (IVA) / Variable Annuitization**

- Substitute the current AIR (Adjusted Interest Rate) currently in force instead of the full set of rates provided from the Income Annuity Yield Curve.  
*Note:* By using each carrier's AIR, there will be a variance of INCOME VALUE for similar products across the market

## d. Outputs

### i. Transmitting INCOME VALUE through DTCC

- INCOME VALUE can be accommodated on the Full Positions and Values file (POV) as defined and managed by the DTCC.
- Each distributor or user of this value will dictate what contract information should be passed on from the insurance carrier. Elements specific for INCOME VALUE should be:
  - (1) Value: A field already exists in the POV file for a value for the contract.
  - (2) Contract Value Qualifier: A new code called “INV” should be placed in this POV field.
  - (3) As of Date: Since there may be some variation in the frequency of updating INCOME VALUE, it is important to provide the date for which the current value has been updated.
- If necessary, contact the DTCC for additional information on transmittal processes and specifications.

## e. Summary

### i. Future Modifications to Methodology

- It is anticipated that over the course of time there may be some changes necessary to certain inputs or processes used to support the calculation of INCOME VALUE. Insurance carriers who are accommodating this calculation on their administrative systems should take this into account. Some examples of potential changes include:
  - Industry update of mortality tables used (e.g, from A2000 to “A2012”).
  - Common adoption of enhanced improvement scales (e.g., G2 for valuations being discussed by SOA).
  - Evolution of DIA pricing over time separate from SPIA which may result in the need for a different adjusted yield curve.
- It is assumed that there would be ongoing monitoring and a periodic review of the methodology by an industry committee to discuss best practices as well as propose and agree to any necessary modifications.



### III. Other Requirements for INCOME VALUE

#### a. Frequency (“When”)

- Ultimately, it would be up to the user of INCOME VALUE (I.e., distributor) and the insurance carrier to agree as to the timing and frequency of updating the value.
- However, it has been agreed that a general practice would be for the valuation to change on a **Monthly Basis** for an in-force contract. The timing of this valuation would also as part of the standard practice for the insurer for other types of products that are updated on a monthly basis (e.g., **End of Month** valuation).

#### b. Users of INCOME VALUE (“Who”)

- INCOME VALUE can be applied in a number of scenarios both external to the client or internally for the advisor or distribution firm. Ultimately, INCOME VALUE can be transmitted to any party. Since the usage of INCOME VALUE would be predominately external to the insurance carrier, common standards for transmitting this data were defined leveraging DTCC processes.

#### c. Auditing & Validation

- CANNEX will provide an updated table of sample valuations along with the Income Annuity Yield Curve on its web site. Each carrier can calibrate the results of their INCOME VALUE calculation against this table. The scenarios initially included in this table include the following:
  - Single Life 10 years, Male 55
  - Single Life 10 years, Male 70
  - Single Life 10 years, Male 85
  - Single Life 10 years, Female 55
  - Single Life 10 years, Female 70
  - Single Life 10 years, Female 85
  - Single Life 0 year, Male 55
  - Single Life 0 year, Male 70
  - Single Life 0 year, Male 85
  - Single Life 0 year, Female 55
  - Single Life 0 year, Female 70
  - Single Life 0 year, Female 85

#### d. Outsourcing of INCOME VALUE Calculation?

- If the carrier chooses to outsource the process for deriving the INCOME VALUE calculation, it is assumed that the exchange of data between the two parties would be similar to the DTCC POV format. The DTCC is able to make an accommodation for “Gender” in one of its records (the only data element necessary for INCOME VALUE that has historically been absent from the POV file. Contact DTCC for more information on this accommodation.

**e. Disclosures & Communication of INCOME VALUE**

- If INCOME VALUE is to be made available on external reports to the client, it is assumed that the appropriate disclosures would be provided by each party that communicates this data. Naturally, such disclosures would have to be review and approved by each party before making it available.
- A sample disclosure statement has been drafted by the industry working committee that helped defined the standards for INCOME VALUE and is available either through RIIA or the CANNEX web site along with other marketing and communications material.
- Other material available for training and education of advisors and other distributors about INCOME VALUE include:
  - FAQ Document
  - PowerPoint presentation describing INCOME VALUE
  - Other advisor tools

**Appendix A – Input Data Necessary from an In-Force Policy for INCOME VALUE**

Field Name	POV Record	POV Field	Opt/Cond/Mand	Description	Options
Payment Start Date	13/11	3722	Mandatory	Date	
Payout Type	13/11	3706	Mandatory	Code List	F - Fixed V - Variable
Annuity Payout Amount	13/11	3701	Mandatory	Amount	
Annuity Payment Amount Qualifier	13/11	3702	Mandatory	Code List	KN - Gross Amount/Payout WH - Withheld Amount HP - Hypothetical Payout Amount LA - Liquidated Amount PL - Partial Liquidation Amount
Annuity Payment Frequency Code	13/11	3703	Mandatory	Code List	BD - Yearly BM - Bi-Monthly BW - Bi-Weekly CC - Cycles EL - Single Lump Sum ID - Inception to Date MO - Monthly SA - Semi-Annual SP - Quarterly YD - Calendar Year to Date CD - Contract Year to Date
Payment Start Date	13/11	3722	Mandatory	Date	
Payment End Date	13/11	3723	Optional	Date	
Lives Type (i.e., Annuity Type)	13/11	3705	Conditional	Code List	S - Single J - Joint
Payout Option (i.e., Guarantee Type)	13/11	3704	Mandatory	Code List	PC - Period Certain Only LO - Life Only LC - Life with Certain Period IR - Life with Installment Refund CR - Life with Cash Refund TI - Lessor of Period Certain or Life LR - Life with Return of Premium
Residence State		3852			
Date of Birth - Primary Annuitant	13/09	3811	Optional	Date	

Gender - Primary					Contract Party Record (13/09): 109 bytes of filler;
Date of Birth - Secondary Annuitant	13/09	3808	Mandatory	Code List	G2 - Annuitant/Insured HC - Joint Annuitant/Insured HD - Contingent Annuitant/Insured
Gender - Secondary					Contract Party Record (13/09): 109 bytes of filler;
Primary Survivor Reduction Type	13/11	3711	Conditional	Code List	P - Percentage Specified H - Two Thirds R - One Third
Primary Survivor Reduction %	13/11	3712	Conditional	Percentage	
Joint Survivor Reduction Type	13/11	3713	Conditional	Code List	P - Percentage Specified H - Two Thirds R - One Third
Joint Survivor Reduction %	13/11	3714	Conditional	Percentage	
Certain Period Qualifier	13/11	3717	Conditional	Code List	BD - Yearly BM - Bi-Monthly BW - Bi-Weekly EL - Single Lump Sum MO Monthly SA - Semi-Annual SP - Quarterly
Certain Period	13/11	3707	Conditional	Number	
Certain Period Qualifier	13/11	3717	Conditional	Code List	BD - Yearly BM - Bi-Monthly BW - Bi-Weekly EL - Single Lump Sum MO Monthly SA - Semi-Annual SP - Quarterly
Payment Increase Percentage	13/11	3708	Optional	Percentage	
Assumed Interest Rate	13/11	3709	Optional	Percentage	

Levelization Indicator	13/11	3710	Optional	Code List	Y - Yearly Levelization M - Monthly Levelization S - Semi-Annual Levelization Q - Quarterly Levelization N - No Levelization
Payout Change Date	13/11	3860	Opt/Cond	Date	
Payout Change Amount	13/11	3861	Opt/Cond	Amount	
Payout Change Qualifier	13/11	3862	Opt/Cond	Code List	DO - Dollars P1 - Percent
Payout Change Direction	13/11	3863	Opt/Cond	Code List	D - Decrease I - Increase

## **Appendix B – Income Annuity Yield Curve Methodology (Adjusted Yield Curve)**

- An Adjusted Yield Curve (i.e., Income Annuity Yield Curve) will be updated on a daily basis.
- A sample of **ten (10) carriers** in each of **six (6) SPIA contract types** is used to derive the spreads as well as the adjusted yield curve. The amount of premium required to produce \$1,000 per month payout is taken from the 10 top carriers (ranked #3 through #12, details below) for the following contract types.
  - Life with 10 Year Certain
  - Male and Female
  - Ages 55, 70 and 85

An average premium is calculated for each of the six (6) SPIA contract types.

- For each of the six (6) SPIA contract types mentioned above, the top twelve (12) payout results for Life with 10 Year Certain contracts will be generated from the independent SPIA exchange that CANNEX supports with the first two (2) results being omitted from the calculation. Therefore, **results #3 through #12** for the six (6) SPIA quotes would be used each day to derive the appropriate results. This approach of eliminating the top two (2) results is similar to other benchmarks like the Lipper Indices where the top and bottom sets of results are excluded from the calculation to eliminate outliers. Note that the **ten (10) carriers** may vary in the six (6) SPIA quotes.
- The Treasury Rates for 1, 5, 10 and 30 years are used as the base yield curve (these are spot rates based on Semi-Annual compounding frequency). These four (4) key Treasury rates are currently obtained from the Bloomberg website. The **objective** is to derive four (4) spreads when added to the base yield curve which will derive the Adjusted Yield Curve (i.e., Income Annuity Yield Curve).
- Through a statistical optimization process, multiple valuations of the six (6) contract types are derived using the standard INCOME VALUE methodology using a wide range of spreads. At the end of the iterative process, the set of valuations that demonstrate the smallest amount of total variance from the six (6) average premiums are used and the corresponding four (4) spreads form the basis of the Adjusted Yield Curve (i.e., Income Annuity Yield Curve).
- The four (4) spreads are added to the Treasury Rates for 1, 5, 10 and 30 years. These spot rates are then interpolated for Years 1 through 30. Rates beyond 31 years will apply the year 31 rate. These interpolated spot rates (based on Semi-Annual compounding frequency) are then converted to effective annual spot rates, which are further converted to annual forward rates which represent a format most conducive for generating the discounting factors used in the present value calculations. The Annual Forward Rates are converted to Monthly Forward Rates which would align most closely with a monthly payout amount when income valuation is calculated. Forward rates beyond 361 months will apply the month 361 rate.
- The table of both Monthly and Annual Forward Rates as well as Annual Sport Rates will be made available along with the following reference data:
  - A comparison of the Adjusted Yield Curve to the U.S. Treasury curve for the 1, 5, 10 and 30 year durations
  - An audit table of Income Valuation results for a sample set of contracts so that the carrier can validate the correct application of the adjusted yield curve as well as the formula to calculate income valuation.

**Appendix C – Sample table of rates from the Income Annuity Yield Curve**

/\*\*\*\*\* Income Annuity Yield Curve \*\*\*\*\*/

Date [yyyy mm dd] : 2012 2 14

Year	Treasury Rate	+	Spread	=	Income Annuity Yield Curve
1	0.170000		0.33442509		0.50442509
5	0.820000		0.50894315		1.32894315
10	1.940000		1.31684217		3.25684217
30	3.080000		0.83565272		3.91565272

The above percentages are based on Semi-Annual compounding frequency.  
 Linear interpolation will be used to derive the entire yield curve.

/\*\*\*\*\* Annual Rates \*\*\*\*\*/

Rates beyond 31 years will apply the 31 year rate.

Year	Interpolated Spot Rates	Annual Spot Rates	Annual Forward Rates
1	0.00504425	0.00505061	0.00505061
2	0.00710555	0.00711817	0.00918998
3	0.00916684	0.00918785	0.01333998
4	0.01122814	0.01125965	0.01750062
5	0.01328943	0.01333358	0.02167192
6	0.01714523	0.01721872	0.03686898
7	0.02100103	0.02111129	0.04478151
8	0.02485683	0.02501129	0.05273159
9	0.02871262	0.02891873	0.06071925
10	0.03256842	0.03283360	0.06874457
11	0.03289783	0.03316839	0.03652233
12	0.03322723	0.03350324	0.03719377
13	0.03355664	0.03383815	0.03786548
14	0.03388604	0.03417311	0.03853747
15	0.03421545	0.03450812	0.03920972
16	0.03454485	0.03484319	0.03988225
17	0.03487426	0.03517831	0.04055505
18	0.03520366	0.03551349	0.04122812
19	0.03553307	0.03584872	0.04190146
20	0.03586247	0.03618400	0.04257507
21	0.03619188	0.03651934	0.04324896
22	0.03652128	0.03685474	0.04392312
23	0.03685069	0.03719018	0.04459755
24	0.03718010	0.03752569	0.04527225
25	0.03750950	0.03786124	0.04594723
26	0.03783891	0.03819685	0.04662247
27	0.03816831	0.03853252	0.04729799
28	0.03849772	0.03886824	0.04797378
29	0.03882712	0.03920401	0.04864984
30	0.03915653	0.03953984	0.04932618
31	0.03915653	0.03953984	0.03953984

The Annual Forward Rates are converted to Monthly Forward Rates.

/\*\*\*\*\*\* 361 Monthly Forward Rates \*\*\*\*\*\

Forward rates beyond 361 months will apply the 361 month rate.

Monthly i Forward Rates	Monthly i Forward Rates	Monthly i Forward Rates	Monthly i Forward Rates
1 0.00041991	92 0.00429154	183 0.00326427	274 0.00364259
2 0.00041991	93 0.00429154	184 0.00326427	275 0.00364259
3 0.00041991	94 0.00429154	185 0.00326427	276 0.00364259
4 0.00041991	95 0.00429154	186 0.00326427	277 0.00369660
5 0.00041991	96 0.00429154	187 0.00326427	278 0.00369660
6 0.00041991	97 0.00492435	188 0.00326427	279 0.00369660
7 0.00041991	98 0.00492435	189 0.00326427	280 0.00369660
8 0.00041991	99 0.00492435	190 0.00326427	281 0.00369660
9 0.00041991	100 0.00492435	191 0.00326427	282 0.00369660
10 0.00041991	101 0.00492435	192 0.00326427	283 0.00369660
11 0.00041991	102 0.00492435	193 0.00331835	284 0.00369660
12 0.00041991	103 0.00492435	194 0.00331835	285 0.00369660
13 0.00076262	104 0.00492435	195 0.00331835	286 0.00369660
14 0.00076262	105 0.00492435	196 0.00331835	287 0.00369660
15 0.00076262	106 0.00492435	197 0.00331835	288 0.00369660
16 0.00076262	107 0.00492435	198 0.00331835	289 0.00375059
17 0.00076262	108 0.00492435	199 0.00331835	290 0.00375059
18 0.00076262	109 0.00555576	200 0.00331835	291 0.00375059
19 0.00076262	110 0.00555576	201 0.00331835	292 0.00375059
20 0.00076262	111 0.00555576	202 0.00331835	293 0.00375059
21 0.00076262	112 0.00555576	203 0.00331835	294 0.00375059
22 0.00076262	113 0.00555576	204 0.00331835	295 0.00375059
23 0.00076262	114 0.00555576	205 0.00337242	296 0.00375059
24 0.00076262	115 0.00555576	206 0.00337242	297 0.00375059
25 0.00110493	116 0.00555576	207 0.00337242	298 0.00375059
26 0.00110493	117 0.00555576	208 0.00337242	299 0.00375059
27 0.00110493	118 0.00555576	209 0.00337242	300 0.00375059
28 0.00110493	119 0.00555576	210 0.00337242	301 0.00380458
29 0.00110493	120 0.00555576	211 0.00337242	302 0.00380458
30 0.00110493	121 0.00299374	212 0.00337242	303 0.00380458
31 0.00110493	122 0.00299374	213 0.00337242	304 0.00380458
32 0.00110493	123 0.00299374	214 0.00337242	305 0.00380458
33 0.00110493	124 0.00299374	215 0.00337242	306 0.00380458
34 0.00110493	125 0.00299374	216 0.00337242	307 0.00380458
35 0.00110493	126 0.00299374	217 0.00342647	308 0.00380458
36 0.00110493	127 0.00299374	218 0.00342647	309 0.00380458




85 0.00429154	176 0.00321019	267 0.00364259	358 0.00402041
86 0.00429154	177 0.00321019	268 0.00364259	359 0.00402041
87 0.00429154	178 0.00321019	269 0.00364259	360 0.00402041
88 0.00429154	179 0.00321019	270 0.00364259	361 0.00323674
89 0.00429154	180 0.00321019	271 0.00364259	
90 0.00429154	181 0.00326427	272 0.00364259	
91 0.00429154	182 0.00326427	273 0.00364259	



**Appendix D – Sample of the INCOME VALUE Calculation**

/\*\*\*\*\* Mortality Table & Projection Scale \*\*\*\*\*/

The entire projected mortality table is shown below.

Age	----- MALE -----		
	Annual Mortality Rates	Annual Projection Scale	Annual Projected Mortality
0	0.00208000	0.01500000	0.00173499
1	0.00081500	0.01500000	0.00067982
2	0.00045400	0.01500000	0.00037870
3	0.00036700	0.01500000	0.00030613
4	0.00032100	0.01500000	0.00026776
5	0.00029100	0.01500000	0.00024273
6	0.00027000	0.01500000	0.00022522
7	0.00025700	0.01500000	0.00021437
8	0.00029400	0.01250000	0.00025281
9	0.00032500	0.01000000	0.00028808
10	0.00035000	0.00750000	0.00031977
11	0.00037100	0.00500000	0.00034934
12	0.00038800	0.00250000	0.00037652
13	0.00040200	0.00240000	0.00039057
14	0.00041400	0.00230000	0.00040272
15	0.00042500	0.00220000	0.00041391
16	0.00043700	0.00210000	0.00042611
17	0.00044900	0.00200000	0.00043834
18	0.00046300	0.00180000	0.00045310
19	0.00048000	0.00160000	0.00047086
20	0.00049900	0.00140000	0.00049068
21	0.00051900	0.00120000	0.00051158
22	0.00054200	0.00100000	0.00053553
23	0.00056600	0.00100000	0.00055925
24	0.00059200	0.00100000	0.00058493
25	0.00061600	0.00100000	0.00060865
26	0.00063900	0.00100000	0.00063137
27	0.00065900	0.00100000	0.00065114
28	0.00067500	0.00230000	0.00065660
29	0.00068700	0.00360000	0.00065790
30	0.00069400	0.00490000	0.00065427
31	0.00069900	0.00620000	0.00064873
			
110	0.58400400	0.00000000	0.58400400
111	0.65100700	0.00000000	0.65100700
112	0.72562200	0.00000000	0.72562200
113	0.80833600	0.00000000	0.80833600
114	0.89963300	0.00000000	0.89963300
115	1.00000000	0.00000000	1.00000000

DISCOUNT & SURVIVAL FACTORS

Note: PA = age of Primary Annuitant @ Beginning Of Month  
 tPx is for PA:  
 Contract & Gender: Male, Single Life with 10 Year Certain  
 Age: 85 years and 0 months

Mth	PA	Discount	tPx	Pay Index	PV
0	85	1.00000000	1.00000000	1.00000000	1.00000000
1	85	0.99958026	1.00000000	1.00000000	1.99958026
2	85	0.99916070	1.00000000	1.00000000	2.99874097
3	85	0.99874132	1.00000000	1.00000000	3.99748228
4	85	0.99832211	1.00000000	1.00000000	4.99580439
5	85	0.99790308	1.00000000	1.00000000	5.99370747
6	85	0.99748422	1.00000000	1.00000000	6.99119169
7	85	0.99706554	1.00000000	1.00000000	7.98825723
8	85	0.99664703	1.00000000	1.00000000	8.98490426
9	85	0.99622870	1.00000000	1.00000000	9.98113296
10	85	0.99581055	1.00000000	1.00000000	10.97694351
11	85	0.99539257	1.00000000	1.00000000	11.97233609
12	85	0.99497477	1.00000000	1.00000000	12.96731085
13	86	0.99421655	1.00000000	1.00000000	13.96152741
14	86	0.99345892	1.00000000	1.00000000	14.95498633
15	86	0.99270186	1.00000000	1.00000000	15.94768819
16	86	0.99194538	1.00000000	1.00000000	16.93963356
17	86	0.99118947	1.00000000	1.00000000	17.93082304
18	86	0.99043414	1.00000000	1.00000000	18.92125718
19	86	0.98967939	1.00000000	1.00000000	19.91093657
20	86	0.98892521	1.00000000	1.00000000	20.89986178
21	86	0.98817161	1.00000000	1.00000000	21.88803339
22	86	0.98741858	1.00000000	1.00000000	22.87545196
23	86	0.98666612	1.00000000	1.00000000	23.86211808
24	86	0.98591424	1.00000000	1.00000000	24.84803232
25	87	0.98482608	1.00000000	1.00000000	25.83285840



360	114	0.31243948	0.00000140	1.00000000	121.99864192
361	115	0.31143146	0.00000129	1.00000000	121.99864232
362	115	0.31042669	0.00000117	1.00000000	121.99864268
363	115	0.30942516	0.00000105	1.00000000	121.99864301
364	115	0.30842686	0.00000094	1.00000000	121.99864330
365	115	0.30743179	0.00000082	1.00000000	121.99864355
366	115	0.30643992	0.00000070	1.00000000	121.99864377
367	115	0.30545125	0.00000059	1.00000000	121.99864394
368	115	0.30446578	0.00000047	1.00000000	121.99864409
369	115	0.30348348	0.00000035	1.00000000	121.99864419
370	115	0.30250435	0.00000023	1.00000000	121.99864426
371	115	0.30152839	0.00000012	1.00000000	121.99864430
372	115	0.30055557	0.00000000	1.00000000	121.99864430

Actuarial Present Value (APV) = 121.998644300

For Monthly Income \$1000.00, calculated Income Value = \$ 121998.644300 [= \$ 121998.64 (rounded) ]

**Appendix E – Sample of INCOME VALUE Audit Tables**

/\*\*\*\*\*\* Income Value Audit Table \*\*\*\*\*\

Date [yyyy mm dd] : 2012 2 14

	Income Value -----
Single Life 10 years, Male 55 :	222102.30
Single Life 10 years, Male 70 :	166728.08
Single Life 10 years, Male 85 :	121998.64
Single Life 10 years, Female 55 :	231947.17
Single Life 10 years, Female 70 :	175492.65
Single Life 10 years, Female 85 :	122794.18
Single Life 0 year, Male 55 :	219752.92
Single Life 0 year, Male 70 :	157148.04
Single Life 0 year, Male 85 :	88773.32
Single Life 0 year, Female 55 :	230475.42
Single Life 0 year, Female 70 :	169214.13
Single Life 0 year, Female 85 :	92044.20