Modeling the Unemployment Risk in Insurance Products

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1.0 ACKNOWLEDGMENTS

This report came about as a result of a request by the Joint Risk Management Committee of the SOA/CIA/CAS to conduct research on the effects of unemployment on insurance sales and persistency. This research primarily focuses on the North American insurance market but may provide insight to actuaries, economists and other interested parties delving into this subject in other jurisdictions.

This report references Nathaniel Gaines' theoretical dissertation, "Actuarial Aspects of Unemployment Insurance," published in the 1955 CAS Proceedings (Gaines, 1955). In his paper, Gaines paid tribute to the work of the late H.J. Winslow and W.S. Wotinsky just as this paper similarly pays homage to the work done by Gaines.

The author would like to thank the members of the Project Oversight Group who provided direction and input to this research:

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The views expressed and techniques presented herein are solely the work of the author. The SOA, CIA and CAS are in no way responsible for any opinions expressed or approaches taken in this research. Individual practitioners are free to use the information presented and related research for their own purposes and at their own risk.

2.0 EXECUTIVE SUMMARY

This report starts a discussion on the interrelationships between the general levels of unemployment in the economy and the sale and persistency of insurance products. The study hypothesizes that insurance products experience reduced sales and persistency as the level of unemployment increases in a given economic environment. The study also acknowledges that different insurance products have varying levels of sensitivity to the underlying macroeconomic unemployment rate. The research presented here analyzed a range of insurance products, including casualty business, auto insurance, life and creditor business.

One key aspect of the research is the test of whether sales of insurance products correlate with the existing unemployment rate. Another key assertion is that actuaries can use statistics to predict future persistency of individual life insurance products. This analysis is based on historical data since the 1990s.

Some of the highlights from this research include the following:

- Evidence exists that supports a correlation between the sale of many insurance products and underlying unemployment rates.
- Statistics support a weak relationship between first-year lapse rates on life insurance products and the level of unemployment in the economy.
- There is little variation of life insurance lapse rates beyond the fifth policy year, regardless of the economic environment.
- Techniques to develop an unemployment incidence table are provided.
- Suggestions on pricing, valuation, stress testing and best practices around the unemployment risk are discussed.

Section 3 provides an overview of the government-mandated social programs surrounding unemployment insurance for individuals who have been involuntarily terminated from their jobs. Both U.S. and Canadian programs are discussed in the summary. Links to various statistics and government tables are provided within the Introduction as well as in the bibliography.

Section 4 provides various definitions of unemployment from the U.S. Bureau of Labor Statistics (BLS). Historical incidence rates of nationwide unemployment are provided for the period from 2004 to 2014. Readers can reference the BLS website for additional data by age, sex, region etc.

Sections 5 and 6 discuss the Consolidated Omnibus Reconciliation Act (COBRA) and the Affordable Care Act (ACT) as they pertain to unemployment benefits. Section 7 describes the Canadian landscape for employee benefits during unemployment.

Section 8 describes past research, while Section 9 introduces the business cycle that becomes a key driver of the sample incidence rates in Section 10. Section 11 then goes on to explain the current private programs available in the marketplace. Section 12 highlights potential opportunities for new product design that advance thinking on current product offerings. Sections 13 and 14 point out some considerations for pricing and valuation of an unemployment insurance product.

Section 15 delivers the key research within the report. There, readers can find data, statistics and charts on the correlations between the unemployment rate and historical sales of various insurance products.

The SOA LIMRA Persistency Studies in Section 16 were used as a benchmark to analyze the relationship between unemployment rates and life insurance persistency. The focus was on identifying relationships between first-year lapse rates and unemployment rates. Section 17 highlights stress testing considerations with regard to this risk, and Section 18 incorporates a number of author recommendations.

Section 19 summarizes the report and provides thoughts and recommendations for further consideration and research. The bibliography provides a listing of various documents and website links used to obtain information and data for research.

3.0 SOCIAL WELFARE SAFETY NETS

The connection between unemployment benefits and actuarial science extends back more than a century. The United Kingdom became the first country to introduce a scheme of prefunding unemployment benefits under the National Insurance Act of 1911. It was based on actuarial principles to determine contributions from employees, employers and taxpayers.

Nathaniel Gaines (1955) defined unemployment insurance as "a program which provides, in accordance with a definite formula, indemnity against wage loss resulting from involuntary unemployment."

Many resident workers in the United States and Canada are covered by some form of unemployment insurance benefit program provided they meet minimum eligibility requirements. The benefit generally consists of a weekly or biweekly payment of a predetermined amount for a period of weeks. It is payable as long as the individual continues to be unemployed but is looking for work (subject to a maximum period of weeks). In some limited cases in Canada, the self-employed may be covered as well. Persons receiving these benefits are often informally (sometimes pejoratively) said to be "on the dole." More formal terms for this type of insurance include "unemployment benefits" and "unemployment compensation."

Some countries use the Ghent system of welfare payments (named after the Belgium city of Ghent where there were municipal subsidies of union dues in the early part of the 20th century). Under this system, trade unions or other labor unions rather than the government provide the welfare benefits for unemployed workers. Some large U.S. and Canadian labor unions, such as the United Automobile Workers (UAW), have negotiated layoff benefits for their members where a significant percentage of the members' pre-layoff earnings continue to be paid by the employer during periods of work shortage. Since these types of contracts are negotiated frequently, this paper will not discuss them further.

3.1 The United States

The first U.S. unemployment insurance program originated in Wisconsin in 1932. The federal government later introduced a national program through Title 111 and Title IX of the Social Security Act of 1935.

In the United States, unemployment benefits are generally paid by the state or territory of residence. Unemployment insurance programs are administered in all 50 states, the District of Columbia, the U.S. Virgin Islands and Puerto Rico. Eligible workers typically receive some percentage of their working wage during a base period. The base period is usually defined as the first four completed quarters from the last five quarters. Many states limit the maximum benefit to 50% to encourage claimants to return to the workforce. The number of quarters worked and the earnings within those quarters determine the length and amount of the benefit. Benefits are based on the reported prior quarterly earnings of the unemployed individual. The formulas to determine the benefits vary by state. Interested readers are encouraged to visit state websites to learn more about how the current formulas work.

Funding for benefits comes from state and federal payroll taxes (unemployment insurance taxes) levied on employers. Once the unemployed worker receives them, the benefits are taxable. The standard benefit period used to be 26 weeks. However, the

American Recovery and Reinvestment Act of February 2009 extended benefits to as much as 99 weeks, depending on individual state legislation. There is typically a two-week waiting period before benefits begin, and benefits are not payable for the first week. The second week is used to determine eligibility, including the applicant's availability for work. Many states require periodic certification that the claimant continues to be eligible for benefits.

Applicants for unemployment insurance benefits generally must have worked for at least one quarter in the previous calendar year and been laid off through no fault of their own. Individual states may have other eligibility requirements surrounding wages earned or time worked. In addition, the conditions for denying unemployment differ by state. Generally, temporary workers and self-employed individuals are not eligible for benefits.

Some countries allow job-sharing and time reduction programs during periods of economic downturn to preserve workers' jobs. A number of U.S. states allow payment of benefits for the work time lost under such programs.

The Federal Unemployment Tax Act (FUTA) authorizes the Internal Revenue Service (IRS) to collect federal unemployment taxes to pay for the administration of state unemployment programs and job service programs. Under FUTA 50% of extended unemployment benefits during periods of high state unemployment are paid. States may also borrow funds from FUTA to pay unemployment benefits during periods of budget shortfall.

Federal unemployment rules fall under the jurisdiction of the U.S. Department of Labor, Employment and Training Administration (DOL). Individual state laws determine unemployment tax rates, eligibility and benefit parameters. State tax rates are set using actuarial experience rating techniques.

The Department of Labor issues the "Unemployment Insurance Weekly Claims Report" every Thursday. It provides a seasonally adjusted estimate of new unemployment claims for the preceding week. This statistic is widely watched as a barometer of the labor market and the economy as a whole.

The Office of Management and Budget provides an update twice a year on the current state and future economic expectations surrounding the unemployment insurance program.

3.2 Canada

Canada was the last western country to introduce an unemployment insurance program. It was established in 1940 after an earlier program was deemed unconstitutional. The government makes no tax contributions to the program; however, the Ministry of Human Resources and Social Development Canada (HRSDC) administers it.

The benefit length and amount is driven by prior wages to a maximum amount, how long the claimant worked (typically a minimum of 26 weeks prior to unemployment) and current unemployment in the region. The program takes on specific importance in the eastern provinces where seasonal work in industries such as fishing, forestry and tourism are prevalent. Unemployment rates can be particularly high during the winter months in these regions, and many workers can find work only during the warmer seasons. Special rules apply to those in the seafood industry, making it easier to qualify for benefits in the winter months.

The program also provides benefits for maternity (up to 50 weeks following the birth of a child) and other parental leave, compassionate care leave (to care for a terminally ill relative) and illness leave. Some of these benefits can also extend to the self-employed, provided they have paid into the program.
Approximately 40% of all unemployed workers receive benefits at any one time.

3.3 Other Countries

Descriptions of unemployment benefit programs for a number of other countries in the Organization for Economic Cooperation and Development (OECD) can be found in Appendix A.

4.0 Bureau of Labor Statistics Definitions

The U.S. Bureau of Labor Statistics (BLS) uses six definitions of **unemployment** to define different measures and severity of unemployment (Bureau of Labor Statistics, 2015a):

- **U-1:** Persons unemployed 15 weeks or longer, as a percentage of the civilian labor force
- **U-2:** Job losers and persons who completed temporary jobs, as a percentage of the civilian labor force
- **U-3:** The official unemployment rate—total unemployed, as a percentage of the civilian labor force
- **U-4:** Total unemployed plus discouraged workers, as a percentage of the civilian labor force plus discouraged workers
- **U-5:** Total unemployed, plus discouraged workers, plus all other persons marginally attached to the labor force, as a percentage of the civilian labor force plus all persons marginally attached to the labor force
- **U-6:** Total unemployed, plus all persons marginally attached to the labor force, plus total employed part time for economic reasons, as a percentage of the civilian labor force plus all persons marginally attached to the labor force

Clearly, the measures become more severe as the definition changes from U-1 to U-6. For the purposes of this report, U-3—the most commonly used definition—will be used unless otherwise stated.

Duration of unemployment is defined as the number of weeks that persons classified as unemployed have been looking for work. For persons on layoff who are counted as unemployed, duration of unemployment represents the number of full weeks they have been laid off. The data do not represent completed spells of unemployment.

Layoff is defined as the separation of an employee from an establishment that is initiated by the employer, an involuntary separation, or a period of forced unemployment.

Reentrants are unemployed persons who previously worked but were out of the labor force prior to beginning their job search.

Unemployment rate is defined as the number of unemployed as a percentage of the labor force.

Discouraged workers (from the Current Population Survey) are persons not in the labor force who want and are available for a job and who have looked for work sometime in the past 12 months (or since the end of their last job if they held one within the past 12 months), but who are not currently looking because they believe there are no jobs available or there are none for which they would qualify.

Employed persons (from the Current Population Survey) are persons 16 years and older in the civilian non-institutional population who, during the reference week, (a) did at least 1 hour of work as paid employees; worked in their own business, profession, or on their own farm; or worked 15 hours or more as unpaid workers in an enterprise operated by a member of the family; and (b) all those who were not working but who had jobs or businesses from which they were temporarily absent because of vacation, illness, bad weather, childcare problems, maternity or paternity leave, labor-management disputes, job training or other family or personal reasons, whether or not they were paid for the time off or were seeking other jobs. Each employed person is counted only once, even if he or she holds more than one job. Excluded are persons whose only activity consists of work around their own house (painting, repairing or housework) or volunteer work for religious, charitable and other organizations.

Job losers (from the Current Population Survey) are unemployed persons who involuntarily lost their last job or who have completed a temporary job. This includes persons who were on temporary layoff expecting to return to work, as well as persons not on temporary layoff. Those not on temporary layoff include permanent job losers and persons whose temporary jobs have ended.

Labor force (from the Current Population Survey) includes all persons classified as employed or unemployed in accordance with the definitions contained in the BLS glossary.

Marginally attached workers (from the Current Population Survey) are persons not in the labor force who want and are available for work, and who have looked for a job sometime in the prior 12 months (or since the end of their last job if they held one within the past 12 months), but who were not counted as unemployed because they had not searched for work in the 4 weeks preceding the survey. Discouraged workers are a subset of the marginally attached.

Table 1 reflects recent data over the past business cycle on U.S. unemployment rates for individuals aged 16 and older.

Table 1

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Jan	5.7	5.3	4.7	4.6	5.0	7.8	9.7	9.1	8.2	7.9	6.6
Feb	5.6	5.4	4.8	4.5	4.9	8.3	9.8	9.0	8.3	7.7	6.7
Mar	5.8	5.2	4.7	4.4	5.1	8.7	9.9	9.0	8.2	7.5	6.7
Apr	5.6	5.2	4.7	4.5	5.0	9.0	9.9	9.1	8.2	7.5	6.3
May	5.6	5.1	4.6	4.4	5.4	9.4	9.6	9.0	8.2	7.5	6.3
Jun	5.6	5.0	4.6	4.6	5.6	9.5	9.4	9.1	8.2	7.5	6.1
Jul	5.5	5.0	4.7	4.7	5.8	9.5	9.5	9.0	8.2	7.3	6.2
Aug	5.4	4.9	4.7	4.6	6.1	9.6	9.5	9.0	8.1	7.2	6.1
Sep	5.4	5.0	4.5	4.7	6.1	9.8	9.5	9.0	7.8	7.2	6.0
Oct	5.5	5.0	4.4	4.7	6.5	10.0	9.5	8.8	7.8	7.2	5.7
Nov	5.4	5.0	4.5	4.7	6.8	9.9	9.8	8.6	7.8	7.0	5.8
Dec	5.4	4.9	4.4	5.0	7.3	9.9	9.4	8.5	7.9	6.7	5.6

Source: Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," Table A-10, http://www.bls.gov/webapps/legacy/cpsatab10.htm, Jul. 2015.

5.0 Consolidated Omnibus Budget Reconciliation Act

The Consolidated Omnibus Reconciliation Act of 1985 (COBRA) was passed by the U.S. Congress and signed by President Ronald Reagan. One of its mandates was to allow some employees to continue health coverage once their employment had ended. Title X of the act amended the Internal Revenue Code (IRC) and the Public Health Service Act to deny tax deductions for health care contributions by employers with 20 or more equivalent full-time employees who failed to allow employees experiencing a qualifying event to maintain their benefits. This denial was later changed to an excise tax.

Qualifying events included the following:

- Death of the employee
- The employee's loss of eligibility due to voluntary or involuntary termination or a reduction in hours as a result of resignation, discharge (except for "gross" misconduct), layoff, strike or lockout, medical leave or a slowdown in business operations
- Divorce or legal separation that terminates the ex-spouse's benefits
- A dependent child reaching the age at which he or she is no longer covered

COBRA provides coverage for up to 18 months in most cases. However, utilization rates on this benefit can be low. The premiums are often quite expensive, which leads to low take-up rates following unemployment. Only 10% of eligible Americans used this benefit in 2006.

The American Recovery and Reinvestment Act of 2009, signed by President Barack Obama, provides a 65% subsidy to COBRA-eligible employees. The benefit was initially set at a maximum term of 9 months, but this was subsequently increased to 15 months. The benefit eligibility requires that

- the employee was involuntarily terminated;
- the terminated employee has no other group health insurance coverage; and
- the terminated employee is eligible to enroll in COBRA.

Further amendments to this act or state legislation are not covered in this paper.

6.0 Affordable Care Act

The Affordable Care Act (ACA), signed by President Obama, effectively taxes individuals without health coverage. If individuals are unable to find health coverage through an employer or individual plan, then can purchase coverage through a public marketplace. Insurers compete in this marketplace.

Failure to purchase coverage can result in tax penalties. There is a common misconception that unemployed individuals are exempt from tax penalties under the Affordable Care Act. In fact, the unemployed are also subject to the penalty unless they qualify for an exemption. However, the lower or nonexistent income of the unemployed or underemployed may provide sufficient subsidies and exemptions to make the penalty payment unnecessary.

7.0 EMPLOYEE BENEFIT PRACTICE IN CANADA

For Canada, unemployment data was drawn from Statistics Canada (2015), the national statistical agency. Table 2 provides the seasonally adjusted Canadian unemployment rates for all individuals aged 15 and older.

Table 2

	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014
Jan	7.3	7.0	6.6	6.3	5.9	7.3	8.2	7.7	7.6	7.0	7.0
Feb	7.4	7.1	6.4	6.2	5.9	8.0	8.2	7.7	7.6	7.0	7.0
Mar	7.3	6.0	6.4	6.1	6.1	8.1	8.2	7.6	7.4	7.3	6.9
Apr	7.2	6.8	6.3	6.1	6.1	8.2	8.1	7.6	7.2	7.2	6.9
May	7.2	6.9	6.1	6.0	6.1	8.5	8.1	7.4	7.3	7.1	7.0
Jun	7.3	6.8	6.1	6.1	6.0	8.6	7.9	7.4	7.3	7.1	7.1
Jul	7.0	6.6	6.3	6.1	6.1	8.6	8.1	7.2	7.3	7.2	7.0
Aug	7.0	6.7	6.4	6.0	6.1	8.7	8.1	7.3	7.3	7.1	7.0
Sep	7.0	6.7	6.4	5.9	6.2	8.3	8.0	7.2	7.4	6.9	6.9
Oct	7.1	6.7	6.2	5.9	6.1	8.3	7.8	7.3	7.4	7.0	6.6
Nov	7.2	6.3	6.3	6.0	6.4	8.4	7.6	7.5	7.2	6.9	6.7
Dec	7.1	6.6	6.1	6.0	6.8	8.5	7.6	7.4	7.1	7.2	6.7

Source: Statistics Canada, "Table 282-0087: Labour force survey estimates," http://www5.statcan.gc.ca/cansim/a26?lang=eng&id=2820087, Dec.2015.

Many employee benefit programs in Canada allow the employee to purchase individual life insurance coverage from the employer's carrier when employment benefits are terminated following job loss. Several court cases have provided contrary opinions on an employee's rights to long-term or short-term disability benefits following job loss. There is typically an extension of existing employee group supplementary health and dental benefits for a period of time following termination. Because of Canada's public health care system, the extension of these supplementary health benefits may seem less valuable to the Canadian job loser than for someone in a similar circumstance under the American private health care system.

8.0. PAST RESEARCH

As mentioned in the introduction, this paper references the theoretical work of Nathaniel Gaines (1955) in his paper, "Actuarial Aspects of Unemployment Insurance." Gaines developed formulas for the pricing of the unemployment insurance benefit. He defined **benefit costs** as total benefit disbursements and **covered earnings** as wages or earnings per man-week of covered employment multiplied by man-weeks of insured or covered employment. The **ratio of benefit costs to covered earnings** is simply the division of the two factors and produces a percentage of covered earnings available to pay unemployment insurance benefits. Gaines then went on to acknowledge the technical difficulties in performing these calculations stemming from "the lack of stability in the incidence of the unemployment risk." Essentially, because the unemployment risk changes throughout the business cycle, it is mathematically difficult to develop formulas to account for these changes.

Gaines dealt with these technical difficulties by making the following simplifying assumptions:

- The labor force is constant in size and composition.
- The probability of layoff is the same for all workers.
- The hiring and layoff probabilities are constant over a specified period of time.
- Hiring and layoffs occur continuously over specified time intervals.

Interested readers are encouraged to refer to Gaines' work, which takes a more dynamic approach in which the underlying unemployment decrement changes with the business cycle.

Readers may also find the joint Society of Actuaries and LIMRA publication *Guaranteed Uncertainty, Socioeconomic Influences on Product Development and Distribution in the Life Insurance Industry* (SOA 2011) helpful. While this work focused on the product development and marketing aspects of life insurance, underlying influences like unemployment and other socioeconomic factors were discussed.

A study by M. Harvey Brenner (1979) looked at the relationships between unemployment rates and both mortality and increases in cardiovascular disease, cirrhosis and suicides. Brenner documented his findings in "Mortality and the National Economy. A Review, and the Experience of England and Wales, 1936–76." His earlier work, "Economic Changes and Heart Disease Mortality" looked at the unemployed and underemployed and the effects of stress and less access to affordable health care on death and heart disease (Brenner 1971). That study used data from New York State and the United States between the years 1900 and 1967.

9.0 BUSINESS CYCLE

A **business cycle** can be defined as a period of macroeconomic expansion (expansion phase) of many economic activities that eventually trends into a contraction phase in which recessions typically occur. Cycles can vary in duration from 1 to 12 years. Gaines (1955) mentioned the effects of the business cycle when he wrote, "However, unemployment varies with business conditions. Because of lack of stability in the incidence of the unemployment risk, special problems are encountered in the preparation of actuarial estimates in unemployment insurance."

Unemployment benefits increase when unemployment is high and decline when unemployment is low. This serves to ensure more stable spending for that benefit within the business cycle.

The National Bureau of Economic Research's Business Cycle Dating Committee (NBER) has defined the postwar business cycles shown in Table 3.

Table 3

Peak	Trough	Cycle in Months Trough-to-Trough
Feb 1945	Oct 1945	88
Nov 1948	Oct 1949	48
Jul 1953	May 1954	55
Aug 1957	Apr 1958	47
Apr 1960	Feb 1961	34
Dec 1969	Nov 1970	117
Nov 1973	Mar 1975	52
Jan 1980	Jul 1980	64
Jul 1981	Nov 1982	28
Jul 1990	Mar 1991	100
Mar 2001	Nov 2001	128
Dec 2007	Jun 2009	91

Source: National Bureau of Economic Research, "US Business Cycle Expansions and Contractions," www.nber.org/cycles, 2015.

In the postwar era, there have been 11 completed business cycles with an average length of 69.5 months. The average time from trough to peak is 58.4 months. The current cycle began in July 2009 and is yet to be completed. The peak in Table 3 would be the height of business activity. The trough would be seen as the opposite of the peak, or a recessionary low. The last column, Cycle in Months Trough-To-Trough, refers to the number of months between the trough of one recession and the next trough.

The financial press's definition of a **recession** is two consecutive quarters of decline in real gross domestic product (GDP). The business cycle dating committee of the NBER considers other measures in addition to GDP, including gross domestic income (GDI) and the depth of decline in economic activity. According to the NBER, the unemployment rate can be a leading indicator for peaks in economic activity and a lagging indicator for the troughs in the business cycle.

The International Labor Organization (ILO) defines **unemployed workers** as "those who are currently not working but are willing and able to work for pay, currently available for work, and have searched for work." This is the definition used by most countries to conform to ILO standards. The definition of the unemployment rate is:

$$\text{Unemployment rate} = \frac{\text{Unemployed workers}}{\text{Total labor force}} * 100\%$$

The unemployment rate is determined in the United States, Canada and several other Western countries using labor force sample surveys based on the ILO definition. The BLS U-3 statistic is consistent with the ILO definition.

Armed with this information, Table 4 shows unemployment rates taken from the BLS data in the postwar era and matches them to the business cycles in Table 3.

Table 4

Trough Date	Unemployment Rate Trough (%)	Unemployment Rate Peak (%)
Oct 1949	5.9	3.9
May 1954	5.5	2.9
Apr 1958	6.8	4.1
Feb 1961	6.7	5.5
Nov 1970	5.9	3.5
Mar 1975	8.5	4.9
Jul 1980	7.6	5.8
Nov 1982	9.7	7.6
Mar 1991	7.5	5.3
Nov 2001	5.8	4.0
Jun 2009	9.6	4.6

Source: Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," Table A-10, http://www.bls.gov/webapps/legacy/cpsatab10.htm, Jul. 2015.

The unemployment trough coincides with the highest rate of unemployment sometime around the trough of the business cycle or the following year to account for the lag between the business cycle and the unemployment rate. The peak in the unemployment rate is the lowest level of unemployment during the business cycle.

Based on Table 4, Table 5 provides statistics for the postwar era on unemployment rates.

Table 5

Unemployment Rate Statistics	Trough (%)	Peak (%)
Average rate	7.23	4.74
Median rate	6.80	4.60
Minimum rate	5.50	2.90
Maximum rate	9.70	7.60
75th percentile rate	8.05	5.40

10.0 SAMPLE INCIDENCE TABLE

From the information in the Business Cycle section, we know that the average business cycle lasts 69.5 months with a peak at 58.4 months following the trough. Based on the NBER, the last trough was in June 2009. The average unemployment trough occurs six months after the business cycle trough.

A starting point to evaluate the unemployment risk starts with a base decrement table. Let us develop an example of such a table based on the information in the preceding paragraph. Assume conservatively that the 75th percentile of historic peak and trough

unemployment rates (as shown in Table 5) apply for the next six years (sufficient to cover one business cycle). Also, let's use a pro rata adjustment of rates between the peak and trough dates. We will assume that future business cycles will witness similar trends and changes in the unemployment rate over the course of the cycle.

Let us define the unemployment rate at any month (t) within the business cycle as U_t. From Table 5 we know that:

$U_{trough} = 8.05\%$
$U_{peak} = 5.4\%$

Therefore,

$U_t = U_{trough} + (U_{peak} - U_{trough}) * (m/58)$ during the expansion phase of the business cycle
$U_t = U_{peak} + (U_{trough} - U_{peak}) * (m/11)$ during the contraction phase of the business cycle

From these formulae, an entire sample table of U_t for each month of the business cycle can be developed from the previous assumptions, as shown in Table 6.

Table 6

Month	Rate (%)	Month	Rate (%)	Month	Rate (%)	Month	Rate (%)
Trough	8.05	19	7.23	37	6.41	55	5.58
2	8.00	20	7.18	38	6.36	56	5.54
3	7.96	21	7.14	39	6.31	57	5.49
4	7.91	22	7.09	40	6.27	58	5.45
5	7.87	23	7.04	41	6.22	Peak	5.40
6	7.82	24	7.00	42	6.18	60	5.62
7	7.78	25	6.95	43	6.13	61	5.83
8	7.73	26	6.91	44	6.09	62	6.05
9	7.68	27	6.86	45	6.04	63	6.27
10	7.64	28	6.82	46	5.99	64	6.49
11	7.59	29	6.77	47	5.95	65	6.70
12	7.55	30	6.73	48	5.90	66	6.92
13	7.50	31	6.68	49	5.86	67	7.14
14	7.46	32	6.63	50	5.81	68	7.35
15	7.41	33	6.59	51	5.77	69	7.57
16	7.37	34	6.54	52	5.72	70	7.79
17	7.32	35	6.50	53	5.67	Trough	8.05
18	7.27	36	6.45	54	5.63	72	Repeat

For example, the unemployment rate for month 10 can be determined as:

$U_{10} = 8.05\% + (5.4\% - 8.05\%) * (10/58) = 7.64\%$

The key for any actuary modeling this risk in the future is to peg where in the business cycle the modeling should start. Actual unemployment rates may be less or more than provided in the table at any given duration of the business cycle. An acceptable approach would be to compare unemployment rates at model start to unemployment rates in the base unemployment cycle and adjust decrements up or down based on the ratio of actual unemployment rates to the incident table rates. A more reasonable approach would be for the actuary to determine the duration since the last business trough or peak as published by the NBER Business Cycle Dating Committee. If unemployment rates are trending toward another peak, then it would be appropriate to grade the current level of unemployment to the peak rate over the estimated time to the next peak. Then the future monthly incidence would continue beyond the next peak based on the values in Table 6. Similarly, if the unemployment rates are increasing (between peak and trough), the actuary would prorate between the current unemployment level and rate at the trough point based on the estimated duration to the next trough. The cycle of rates in Table 6 would then repeat as far into the future as necessary for the actuarial work being done.

One important factor to keep in mind is that the insured unemployment rate is often substantially less than the general unemployment rate, as not all unemployed individuals qualify for unemployment insurance benefits, and others may have exhausted their benefits. The actuary should consider adjustments in the table to reflect this factor.

For actuaries trying to model incidence by age, sex, regions and so on, the BLS website may be helpful for the United States (Bureau of Labor Statistics 2015a) and the Statistics Canada website for Canada (Statistics Canada 2015).

11.0 EXISTING UNEMPLOYMENT PRODUCTS

Several key risks are associated with unemployment insurance products. One is that those most likely to claim will anti-select by purchasing the product to a larger extent. In a private insurance market, this would put upward pressure on pricing while making it unaffordable for others with a potential need for the product. This risk argues for a government program in which many workers make mandatory contributions in exchange for benefit coverage. The risk of price inflation from anti-selection is effectively reduced with this approach. Governments are also able to provide the programs in a much more cost-efficient manner than private insurers given the economies of scale from a compulsory statewide or nationwide program.

A second risk is that those who are on claim will have little incentive to return to work until their benefits expire. This risk is more difficult to manage. Another risk is that unemployment insurance benefits provide a safety net to workers and thus reduces job productivity.

Another argument for government-run unemployment insurance programs is that corporations benefit on a net basis from laying off employees. In other words, under the experience rating formulas, the increase in taxation from laying off an employee is less than the benefits paid to the employee on layoff. Under private programs with a full experience rating, a large portion if not all of the cost of the layoff benefits would be paid by the employer at the time of the next rate renewal.

Having said all this, some private insurers have dipped their toes in the unemployment insurance market. Private insurance products typically come with significant restrictions on benefit eligibility. This is not surprising as failure of the insurance company to properly underwrite the risk can result in the payout of many fraudulent claims.

Few insurers have been willing to take the chance of insuring unemployment risk for extended periods of time. The hazard risk, as well as the potential for “habitual” claimers creating long tails, has served to inhibit significant privatization of this coverage. Hazard risk can be defined as the propensity for those on claim to delay returning to work as long as they are receiving unemployment benefits. As an example, someone receiving unemployment benefits may have little incentive to return to the workforce if available jobs provide only marginal additional disposable income after taxes and the cost of work-related expenses such as transportation are taken into consideration.

At the time of this writing, only one private insurer in the United States is selling a stand-alone unemployment insurance benefit. The benefit offered is 25% or 50% of the pre-employment wage and subject to a cap of 100% of that wage when combined with state benefits.

Creditor insurance products have provided unemployment insurance coverage for some time. Credit card creditor insurance typically has unemployment insurance coverages built into the offering along with life insurance, disability insurance, hospitalization and property coverage. Some automotive creditor products also include a few months of unemployment insurance as well as life and disability benefits. These products often come with significant restrictions on eligibility.

One newer product is an automotive insurance product sold in dealerships whereby the purchaser can return the car under certain contingencies, including job loss, international job transfer and a number of other related scenarios. A division of a large automobile manufacturer recently offered a program in Canada where job loss in the first year following the purchase of a car allows the buyer to return the car to the dealership where it was originally purchased.

Many unemployment insurance products provide significant limitations and restrictions on eligibility for benefits as insurers seek to protect themselves from adverse risks. Policies typically require claimants to be working for a minimum number of hours per week for a stated minimum number of weeks in order to claim. There are maximum benefit and other limitations, including exclusion of seasonal or part-time work. In some cases, there are offsets against social security and disability income payments.

12.0 POTENTIAL NEW PRODUCTS

One potential public program that has been proposed in the United States as an alternative to government-run unemployment insurance is a mandated savings account for each worker that is available to provide funds at the time of unemployment. The intent would be to return unused funds at retirement.

Ideas for new private products would include offering an unemployment waiver (similar to a disability waiver on life policies) on various insurance products including home, auto and life insurance. Private insurers could offer it as a rider to interested applicants or provide it as a mandatory benefit and spread the cost among all insureds, thus making it more affordable. This would reduce the risk of unemployment-related lapse during periods of unemployment. Insurers might also want to limit the duration of the benefit while providing concise eligibility and underwriting requirements to control risk. Regulatory restrictions may prevent life and health insurance companies from offering such benefits, as unemployment insurance is a casualty product. Many permanent life insurance policies provide protection during periods of financial stress. These would include benefits such as premium holidays, policy loans and reduced paid-up benefits.

Any new products should also consider available government offsets. Similar to disability income business, the more the overall unemployment benefits (private and public) replace lost wages, the more likely it may be that claimants will remain on claim (hazard risk).

13.0 PRICING

The pricing of an unemployment insurance product or rider involves two key elements: the weekly unemployment benefit and the average duration of unemployment. Actuaries can choose the weekly unemployment benefit offerings through the product development process. This benefit is typically determined by formula or set to a fixed amount. The formula approach could be a percentage of prior wages to a maximum cap as in the government-run programs. To this can be added amounts for expenses, commissions, taxes and profits, including investment income. Other considerations include anti-selection, hazard risk and maximum benefit duration levels. As the combination of the government benefit and private benefits begin to approach the level of pre-unemployment wages, claimants may have less incentive to return to work. The current level of unemployment in the economy, as well as predicted future levels, will also have a bearing on pricing.

The Bureau of Labor Statistics provides data on the second key element, average duration of unemployment. Table 7 shows the average duration of unemployment nationwide for both sexes as of August 2014. (Table 25 in Appendix A provides duration of unemployment for many OECD countries.)

Table 7

Age	Weeks
Total	31.2
16–19 years	16.8
20–24 years	23.0
25–34 years	29.5
35–44 years	35.7
45–54 years	38.2
55–64 years	39.6
65 years and older	49.1

Source: Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," May, 2015. http://www.bls.gov/web/empsit/cpseea36.htm.

Both unemployment rates and duration of unemployment can be used to set claim costs in pricing an unemployment insurance product. Let us develop a very simple unemployment insurance product. Assume the following:

Average weekly benefit = $X
Average duration of unemployment = Y weeks
Average frequency of claim (effectively the insured unemployment rate) = Z%

Now assume that the following annual unemployment rates are expected over the next three years and are used to set the frequency (based on a developed incidence table):

Year	Unemployment Rate
T	P%
T+1	Q%
T+2	R%

Giving equal weight to all three years of exposure produces an average unemployment rate of:

(P% + Q% + R%)/3 = Z%

Using a frequency of Z% assumes we are only pricing the product with a rate guaranteed for the next three years and giving 100% credibility to the projected unemployment rate over the next three years from the assumed incidence table.

Average claims cost = $X * Y weeks * Z% frequency = $A (ignores present value of future cash flows)

Assuming a target loss ratio of B%,

Premium = $A/B% = $C

A target loss ratio of B% implies that roughly (100 – B)% is available for commissions, other expenses, profit and taxes.

Incorporating the unemployment rate into the pricing of other products would involve estimating expected lapse rates under various unemployment scenarios. (See the Persistency section for more information on the correlation between unemployment and lapse rates.) To the extent that the unemployment rate influences the sale and persistency of new products, we can make adjustments to the amortization of the up-front product development/marketing expenses.

14.0 VALUATION

Valuation of an unemployment product would operate similarly to pricing with more conservative assumptions added to address inherent risk. This may include an incident table that reflects longer unemployment durations, more anti-selection and deeper shocks to the economy, including higher levels of unemployment. Given the relatively new history of analyzing this risk coupled with the launch of new products and riders, actuaries should exercise caution in the valuation of products with unemployment benefits until such time as the industry or companies develop credible data on insured unemployment experience.

Similar to pricing, valuation of other products could entail more conservative expense and lapse rates to reflect the influence of the unemployment rate on those factors. (See the Persistency section for more details on the correlation between unemployment and lapse rates.)

Along with the incidence rates, actuaries may want to consider correlation factors that show more sensitivity to the underlying unemployment rates for valuation purposes to address the risk of this factor.

The lapse rates used in the valuation should also be adjusted to reflect changes in the unemployment rate during future business cycles. It is important that the assumptions used to value the business be internally consistent. For instance, low interest rates may reflect a period of high unemployment as governments try to stimulate the economy and GDP. High unemployment rates may also be consistent with less persistency of the underlying business and more claims on products like disability insurance.

15.0 PREDICTIVE MODELING

The key question this paper asks is, why should actuaries care about unemployment and underemployment? And why should the incidence and recovery from unemployment be modeled?

The answer lies in the fact that the accuracy of business planning, pricing or risk modeling of future sales or in-force business will be impacted by business cycles and the general state of unemployment or underemployment in the economy.

How does an insurer concerned about the effects of unemployment on the sale and persistency of insurance products model this factor? From a sales perspective, the insurer would consider the correlation between the product being analyzed and the unemployment rate.

For actuaries trying to develop correlation factors between products and the underlying business cycle, a good starting point would be to gather data on industry or company sales and persistency of the product(s) being studied. Determining such inputs on an annual or more frequent basis would be the first step in the process. The next step would be obtaining unemployment rates of similar frequency—as presented in this paper or from publicly available information—for the two variables to do a regression analysis.

Examination of data from the Insurance Information Institute (2015) on sales over the last business cycle (2004 to 2014) revealed correlations between the change in the unemployment rate and the sales of various insurance products—that is, auto, casualty, life and creditor insurance.

15.1 Automobile Insurance

Automobile insurance is required in all states and territories of the United States and Canada, so it would seem that unemployment would have little effect on the sale or persistency of such products. However, unemployed individuals may let insurance expire on their automobile or decide not to drive a car if there is another insured car available in the household. We know that a proportion of drivers are uninsured. The Statistics Brain website indicates that 16% of all drivers nationwide were uninsured as of April 28, 2013 (Statistic Brain Research Institute, 2013). It would be reasonable to assume that some drivers who are unemployed or underemployed may drop their coverage. Many people drive to work, and getting to work becomes a primary reason for owning a car. Table 8 and Chart 1 show data on insurance premiums by year taken from Insurance Information Institute (IIS) statistics and adjusted by consumer price index (CPI) factors.

Table 8

Year	Insurance Premium ($ Billions) from IIS*	CPI from IIS*	Adjusted Premium ($ Billions)	June Unemployment Rate from BLS (%)**
2004	92.9	323.2	92.9	5.4
2005	94.4	329.9	92.5	5.1
2006	95.3	331.8	92.9	4.6
2007	95.0	333.1	92.2	4.6
2008	94.5	341.5	89.5	5.8
2009	95.0	357.0	86.0	9.3
2010	97.7	375.2	84.2	9.6
2011	100.4	388.7	83.5	8.9
2012	103.4	402.5	83.1	8.1
2013	107.4	419.4	82.8	7.4
2014	112.3	437.2	83.0	6.1

*CPI is taken from the Insurance Institute website for automobile insurance and used to normalize premium to 2004 dollars.
Source: Insurance Information Institute, "Auto Insurance," http://www.iii.org/fact-statistic/auto-insurance, 2015.
**Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," May, 2015. http://www.bls.gov/web/empsit/cpseea36.htm.

Adjusted premium is the actual premium divided by the ratio of the CPI for a given year and the CPI in 2004. This is done to neutralize the year-to-year effects of inflation and place all premium on a 2004 dollar basis.

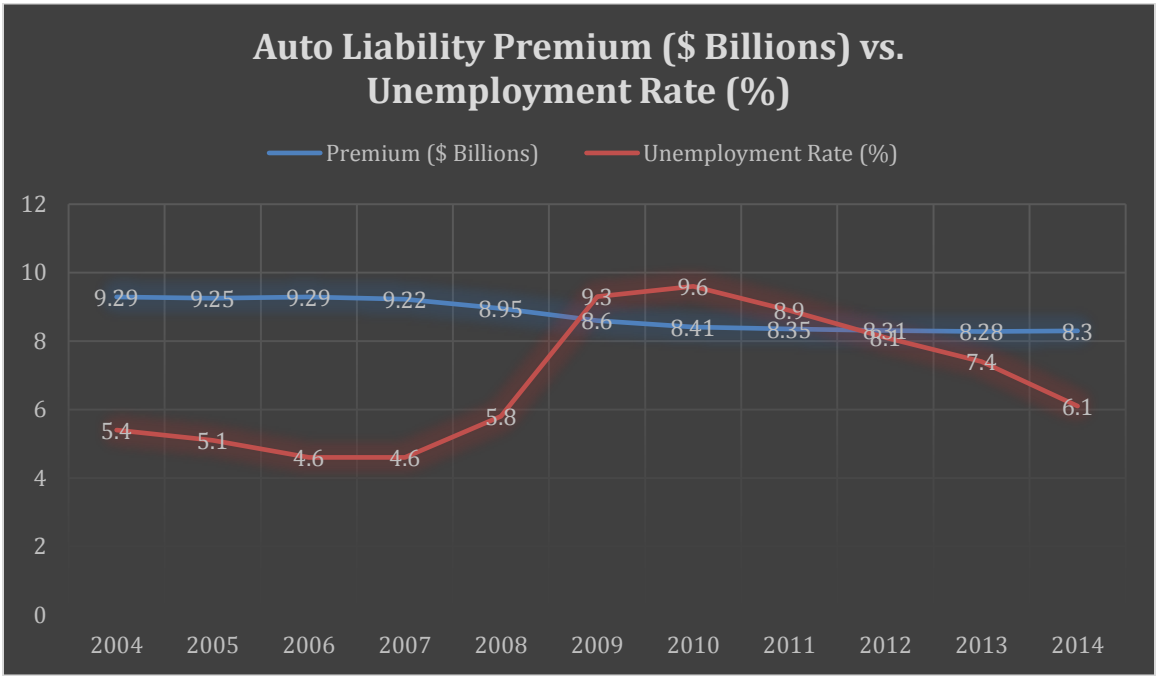
Using the adjusted premium and unemployment data as variables, several statistics can be developed, as shown in Table 9. (See Appendix B for explanations of the various statistics.)

Table 9

Statistic	Result (%)
Correlation	–78.2
Covariance	–0.6
R-Squared	61.1
Pearson	–78.2
Slope	–0.2

The –78.2% correlation factor suggests a strong relationship between unemployment risk and liability insurance on automobiles.

Chart 1



Similarly, Table 10 and Chart 2 apply for private automobile collision insurance.

Table 10

Year	Insurance Premium ($ Billions) from IIS*	CPI from IIS*	Adjusted Premium ($ Billions)	June Unemployment Rate from BLS (%)**
2005	64.7	329.9	64.7	5.1
2006	65.1	331.8	64.8	4.6
2007	64.7	333.1	64.1	4.6
2008	64.1	341.5	61.9	5.8
2009	62.6	357.0	57.9	9.3
2010	62.6	375.2	55.0	9.6
2011	62.9	388.7	53.4	8.9
2012	64.6	402.5	53.0	8.1
2013	67.5	419.4	53.1	7.4
2014	71.1	437.2	53.6	6.1

*Source: Insurance Information Institute, “Auto Insurance,” http://www.iii.org/fact-statistic/auto-insurance, May,2015. CPI is used to normalize premium to 2005 dolalrs.

**Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," May, 2015. http://www.bls.gov/web/empsit/cpseea36.htm.

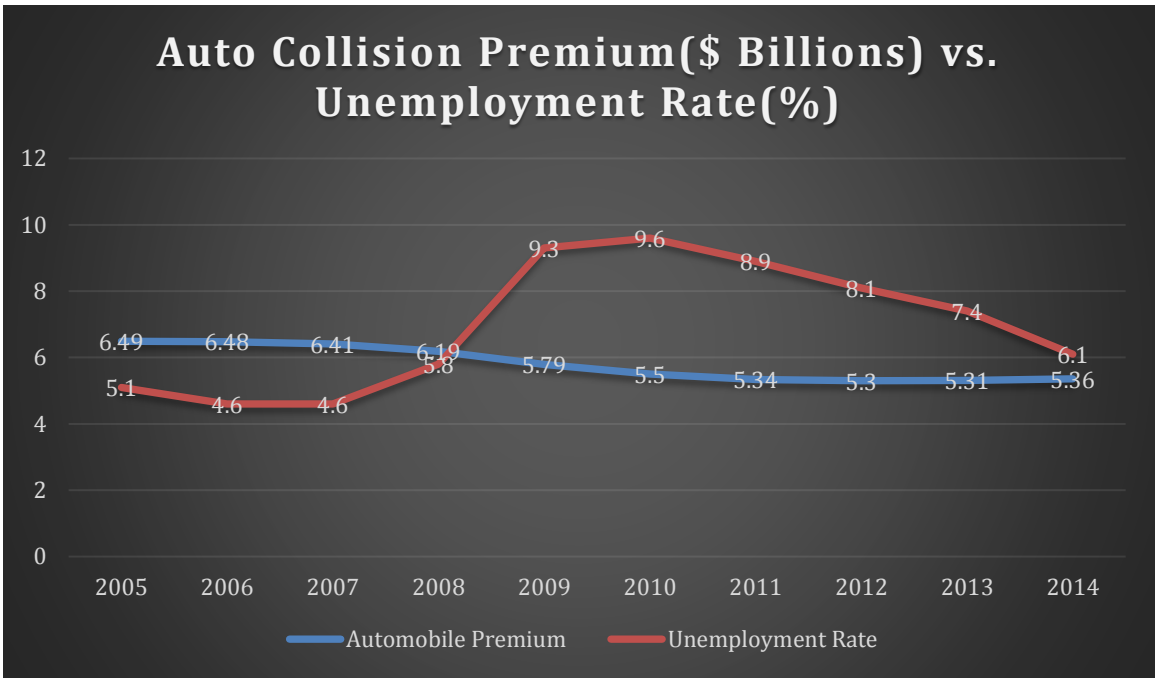
Table 11 shows the corresponding statistics.

Table 11

Statistic	Result (%)
Correlation	–75.1
Covariance	–0.7
R-Squared	56.5
Pearson	–75.2
Slope	–0.2

Again, a strong relationship between the unemployment risk and collision insurance is demonstrated.

Chart 2



15.2 Casualty

Table 12 shows inflation-adjusted changes in premium year-over-year going back to 1975 alongside the June unemployment rate for the corresponding year.

Table 12

Year	Inflation Adjusted Premium Change (%) *	June Unemployment Rate (%) **
1975	1	8.8
1976	16	7.6
1977	13	7.2
1978	5	5.9
1978	3	5.7
1980	–3	7.6
1981	–5	7.5
1982	–2	9.6
1983	0	10.1
1984	5	7.2

1985	18	7.4
1986	19	7.2
1987	7	6.2
1988	1	5.4
1989	0	5.3
1990	0	5.2
1991	–1	6.9
1992	0	7.8
1993	5	7.0
1994	2	6.1
1995	2	5.6
1996	2	5.3
1997	1	5.0
1998	0	4.5
1999	0	4.3
2000	3	4.0
2001	7	4.5
2002	13	5.8
2003	8	5.4
2004	2	5.5
2005	–3	5.1
2006	1	4.6
2007	–3	4.6
2008	–4	5.8
2009	–5	9.3
2010	0	9.6
2011	1	8.9
2012	2	8.1
2013	4	7.4
2014	3	6.1

* The inflation adjusted premium was estimated from a graph on the Insurance Information Institute's website (http://www.iii.org/fact-statistic/property-casualty-insurance-cycle, May 2015. It normalizes to 1975 levels.
**Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," May, 2015. http://www.bls.gov/web/empsit/cpseea36.htm.

Table 13 shows the corresponding statistics.

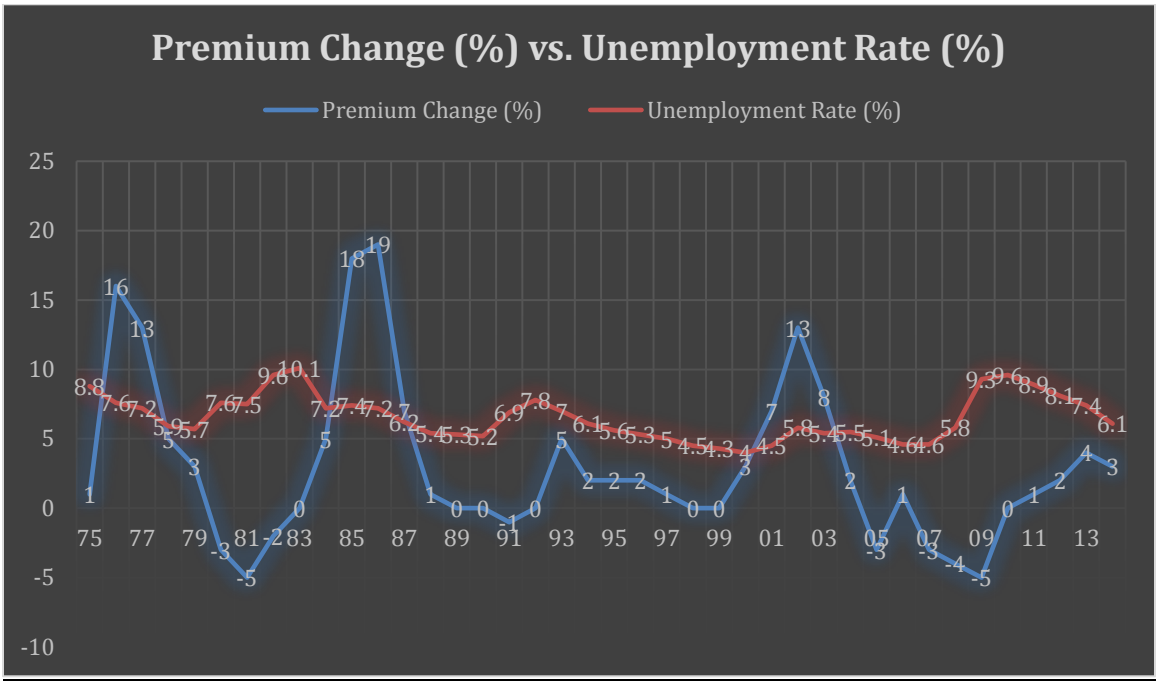
Table 13

Statistic	Result (%)
Correlation	–1.4
Covariance	–0.0
R-Squared	0.0
Pearson	–1.4
Slope	–5.1

The conclusion to be drawn, as illustrated in Chart 3, is that there is little correlation between overall casualty insurance premium changes and the underlying unemployment risk.

Chart 3 shows the relationship over the time-frame studied of the inflation adjusted casualty premium change and the corresponding unemployment rate.

Chart 3



15.3 Life Insurance

Life insurance sales data from the OECD for the United States is presented in Table 14, along with CPI-adjusted sales and the corresponding June unemployment rate for the given years.

Table 14

Year	U.S. Life Sales ($ Billions)	June CPI from BLS*	CPI Adjusted Sales ($ Billions)	June Unemployment Rate (%)
1983	229,400	99.5	229,400	10.1
1984	251,800	103.7	262,429	7.2
1985	301,800	107.6	326,369	7.4
1986	376,052	109.5	413,846	7.2
1987	428,373	113.5	488,647	6.2
1988	658,301	118.0	780,699	5.4
1989	559,655	124.1	698,022	5.3
1990	660,925	129.9	792,357	5.2
1991	621,413	136.0	849,369	6.9
1992	654,071	140.2	921,616	7.8
1993	705,008	144.4	1,023,147	7.0
1994	731,673	148.0	1,088,318	6.1
1995	763,639	152.5	1.170,401	5.6
1996	795,115	156.7	1,252,206	5.3
1997	891,694	160.3	1,436,568	5.0
1998	994,961	163.0	1,629,936	4.5
1999	1,055,045	166.2	1,762,296	4.3
2000	1,157,516	172.4	2,005,586	4.0
2001	1,173,018	178.0	2,098,464	4.5
2002	1,400,299	179.9	2,531,797	5.8
2003	1,582,879	183.7	2,922,361	5.4
2004	1,665,142	189.7	3,174,648	5.5
2005	1,743,736	194.5	3,408,610	5.1
2006	1,710,090	202.9	3,487,209	4.6

2007	1,993,593	208.4	4,175,525	4.6
2008	2,039,112	218.8	4,483,997	5.8
2009	2,029,504	215.7	4,399,638	9.3
2010	2,035,562	218.0	4,459,824	9.6
2011	2,154,851	225.7	4,887,938	8.9
2012	2,229,817	229.5	5,258,472	8.1
2013	2,289,921	233.5	5,373,835	7.4

Source: Organization for Economic Cooperation and Development, "Short-Term Labour Market Statistics: Harmonised Unemployment Rates," http://stats.oecd.org/index.aspx?queryid=36324, Dec.2015.
*CPI is used to normalize to 1983 dollars.

Statistics from this table are presented in Table 15.

Table 15

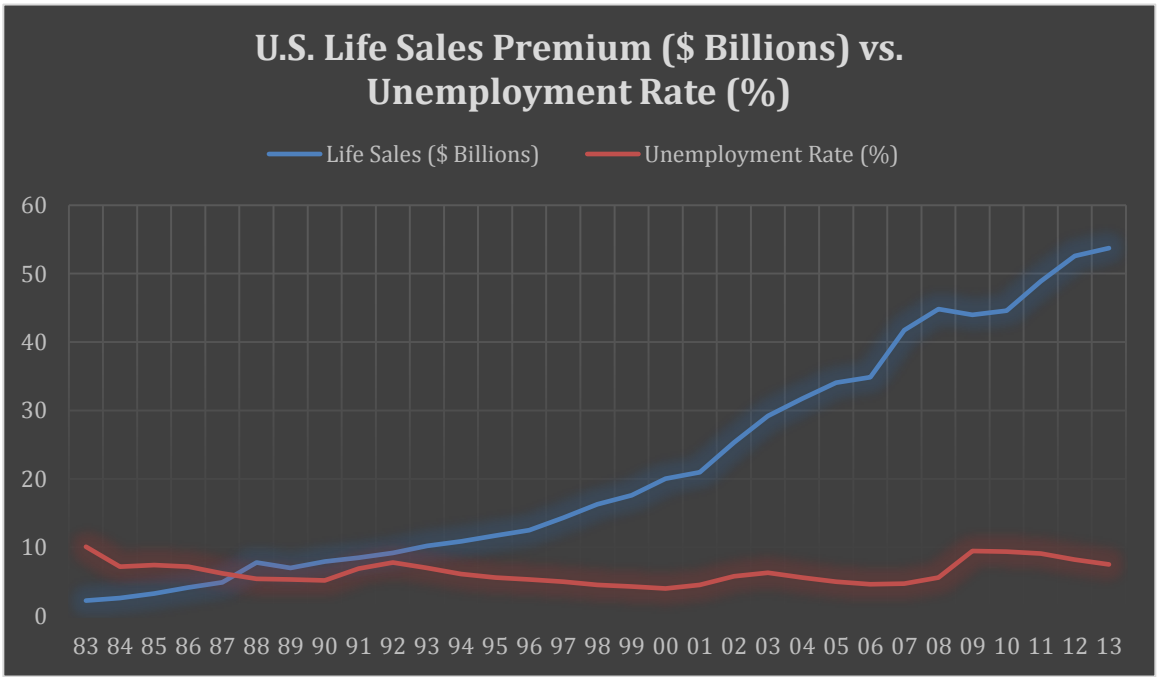
Statistic	Result (%)
Correlation	16.9
Covariance	0.4
R-Squared	2.8
Pearson	0.8
Slope	16.7

The statistics suggest some positive but not very strong dependence between life sales premium and unemployment risk. While this may seem counterintuitive, it may be that life sales are influenced by other factors such as competition during leaner economic times. Individuals who buy permanent insurance may also experience unemployment rates at different levels than those that affect the general population.

Graphically, the adjusted sales premium and unemployment rate are presented in Chart 4.

Chart 4 illustrates the movement between US life insurance sales premium and the unemployment rate.

Chart 4



Similarly, Table 16 shows data from the OECD for life insurance sales along with unemployment rates from Stats Canada.

Table 16

Year	Can Life Sales (CA$ Billions)	June CPI from Stats Canada*	CPI Adjusted Sales (CA$ Billions)	June Unemployment Rate (%)
1984	19,072	60.6	19,072	11.5
1985	20,661	63.0	20,960	10.6
1986	23,800	65.6	25,764	9.7
1987	27,269	68.5	30,824	8.9
1988	27,174	71.2	31,927	7.8
1989	29,569	74.8	36,498	7.6
1990	32,443	78.4	41,972	8.2
1991	34,652	82.8	47,346	10.4
1992	31,940	84.0	44,274	11.3
1993	28,033	85.6	39,598	11.5
1994	28,758	85.7	40,670	10.5
1995	30,083	87.6	43,487	9.6
1996	30,232	88.9	44,350	9.7
1997	29,914	90.4	44,624	9.2
1998	28,101	91.3	42,336	8.4
1999	47,156	92.8	72,212	7.7
2000	54,693	95.4	86,101	6.9
2001	55,792	97.8	90,040	7.3
2002	60,872	100.0	100,448	7.8
2003	74,425	102.8	126,253	7.7
2004	87,125	104.7	150,528	7.3
2005	98,647	107.0	174,178	6.8
2006	109,536	109.1	197,200	6.3
2007	136,059	111.4	250,116	6.1
2008	113,654	114.4	214,554	6.2
2009	75,537	116.5	145,216	8.4
2010	85,746	119.9	169,652	8.2
2011	94,037	121.7	188,849	7.6
2012	97,030	122.8	196,622	7.4
2013	98,514	125.2	203,530	7.2

Sources: Organization for Economic Cooperation and Development, "Short-Term Labour Market Statistics: Harmonized Unemployment Rates," http://stats.oecd.org/index.aspx?queryid=36324, Dec.2015; Statistics Canada.
*CPI is used to normalize to 1984 dollars.

Statistics from this table are presented in Table 17.

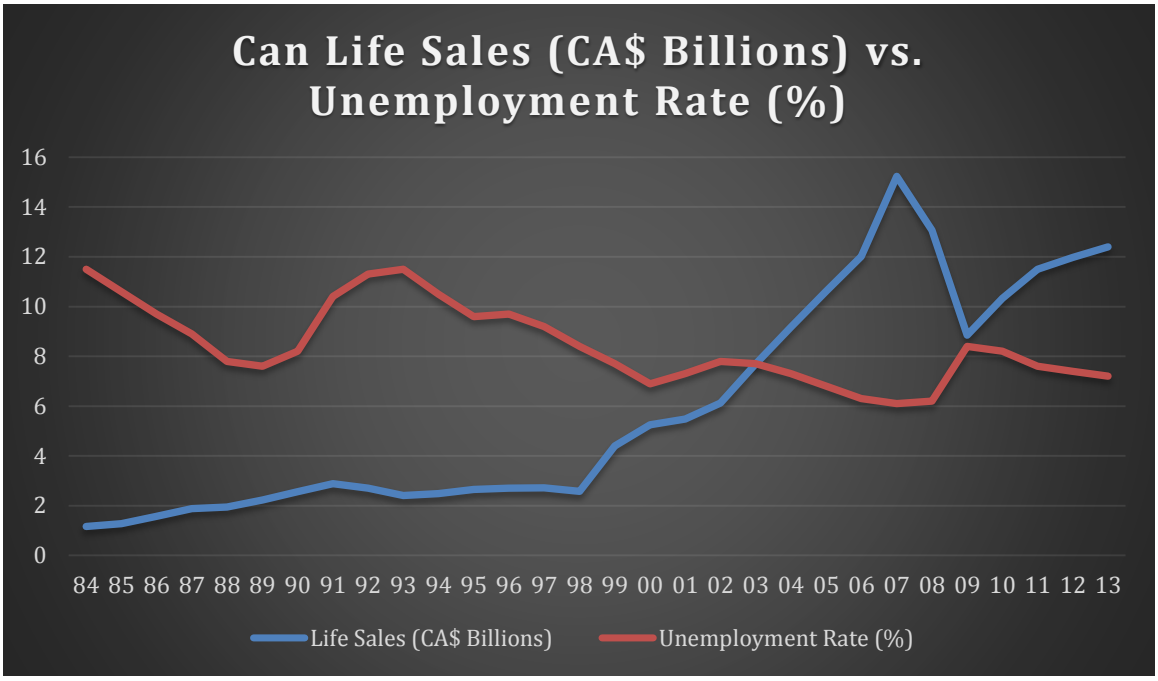
Table 17

Statistic	Result (%)
Correlation	–73.9
Covariance	0.0
R-Squared	54.6
Pearson	–73.9
Slope	–3.3

Canadian data suggest that unemployment risk has a much stronger influence on insurance sales. Chart 5 graphically presents the Canadian life adjusted premium and unemployment rate.

Chart 5 reveals the pattern between Canadian life insurance sales and the unemployment rate.

Chart 5



15.4 Creditor Insurance

Creditor insurance has shown some of the strongest correlations to the underlying economic risk. This is not surprising given that creditor insurance sales are totally dependent on the underlying loan. When loans dwindle in tough economic times, creditor insurance sales premiums also plummet. Data from the Insurance Information Institute along with BLS unemployment data are presented in Table 18 for credit life premium and Table 20 for credit health products.

Table 18

Year	Ins Premium ($ Billions) from IIS*	CPI from BLS**	Adjusted Premium ($ Billions)	June Unemployment Rate from BLS***
2004	1.5	189.7	1.5	5.4
2005	1.6	194.5	1.6	5.1
2006	1.6	202.9	1.5	4.6
2007	1.6	208.4	1.5	4.6
2008	1.6	218.8	1.4	5.8
2009	1.2	215.7	1.1	9.3
2010	1.2	218.0	1.1	9.6
2011	1.2	225.7	1.0	8.9
2012	1.2	229.5	1.0	8.1
2013	1.0	233.5	0.8	7.4
2014	1.0	238.3	0.8	6.1

Sources:*Insurance Information Institute, http://www.iii.org/fact-statistic/life-insurance;
**CPI used to normalize to 2004 dollars
***Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," May, 2015. http://www.bls.gov/web/empsit/cpseea36.htm.

Statistics from this table are presented in Table 19.

Table 19

Statistic	Result (%)
Correlation	–63.5
Covariance	–32.6
R-Squared	40.4
Pearson	–63.5
Slope	–9.9

Clearly, the unemployment risk has a strong relationship to the sales of creditor life insurance, as shown in Chart 6.

Chart 6 provides a view on creditor life sales and the underlying unemployment rate.

Chart 6

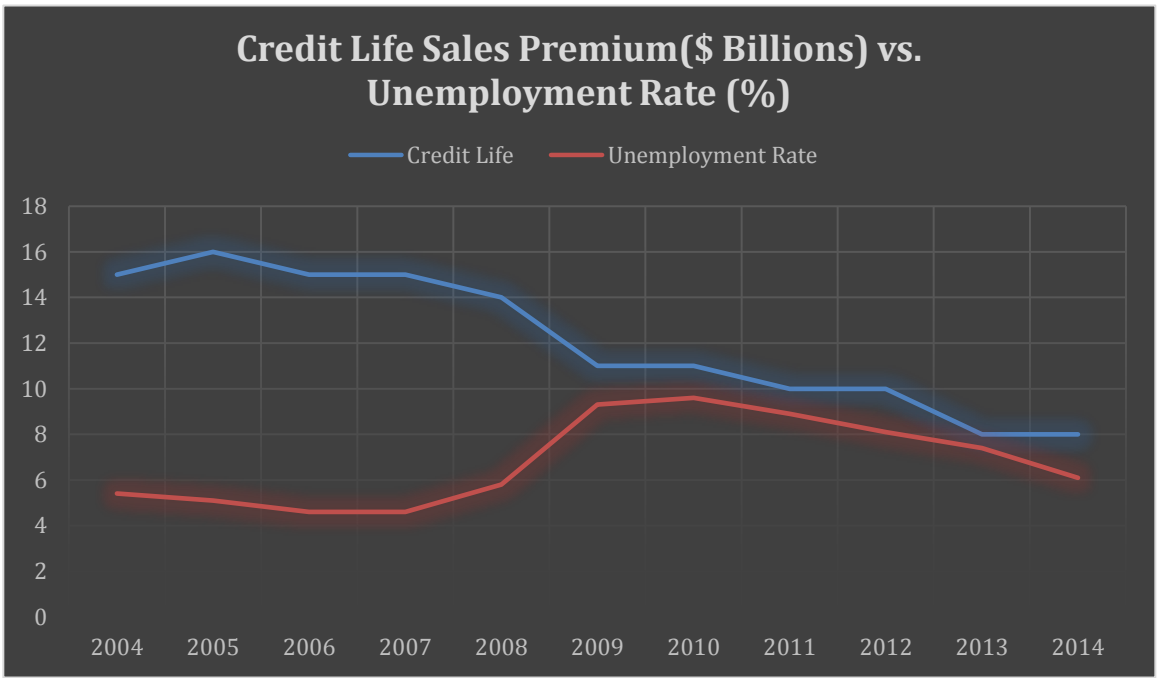


Table 20 below provides the relevant data over a recent 11-year period for creditor health insurance sales premium and the unemployment rate.

Table 20

Year	Insurance Premium ($ Billions) from IIS*	CPI from BLS**	Adjusted Premium ($Billions)	June Unemployment Rate from BLS (%)***
2004	1.6	189.7	1.6	5.4
2005	1.5	194.5	1.5	5.1
2006	1.4	202.9	1.3	4.6
2007	1.4	208.4	1.3	4.6
2008	1.3	218.8	1.1	5.8
2009	1.0	215.7	0.8	9.3
2010	0.9	218.0	0.8	9.6
2011	0.9	225.7	0.8	8.9
2012	1.0	229.5	0.8	8.1
2013	1.0	233.5	0.8	7.4
2014	1.0	238.3	0.8	6.1

Sources:*Insurance Information Institute, http://www.iii.org/fact-statistic/life-insurance;
**CPI used to normalize premium to 2004 dollars.

***Bureau of Labor Statistics, "Labor Force Statistics from the Current Population Survey," May, 2015. http://www.bls.gov/web/empsit/cpseea36.htm.

Statistics from this table are presented in Table 21.

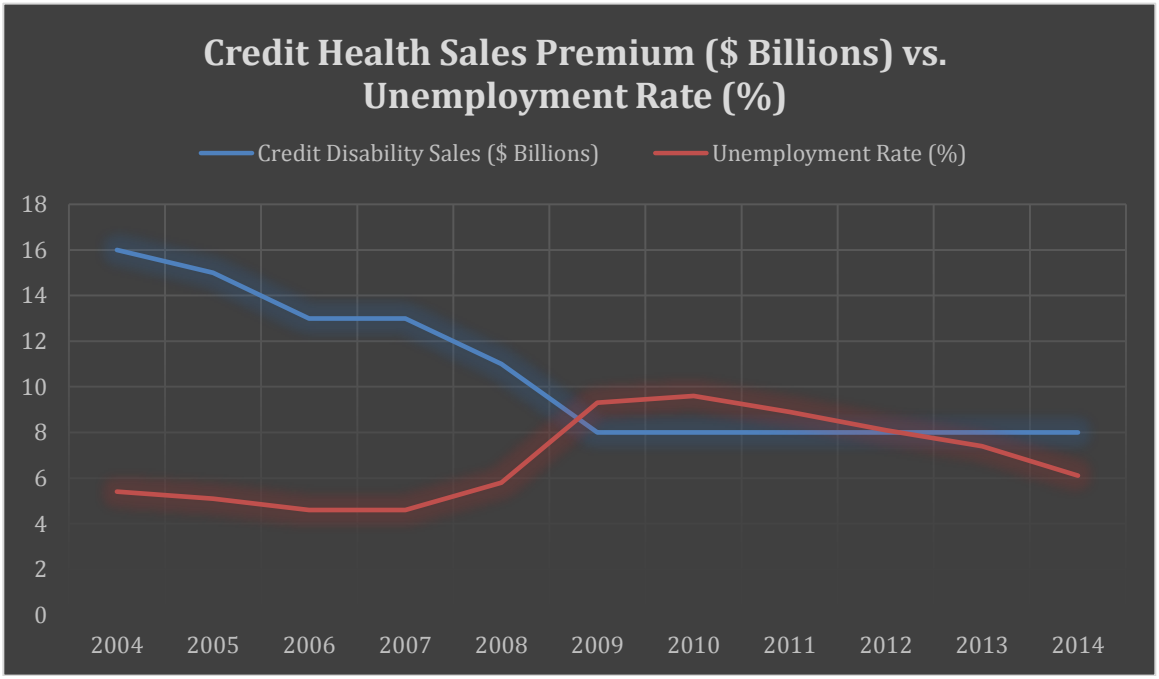
Table 21

Statistic	Result (%)
Correlation	43.6
Covariance	47.3
R-Squared	19.0
Pearson	43.6
Slope	3.6

Chart 7 illustrates that disability creditor insurance appears to be reasonably influenced by the unemployment risk.

Chart 7 shows creditor disability sales and the unemployment rate over the 2004-2014 timeframe.

Chart 7



15.5 Sample Sales Planning Calculation

How do we use the statistics to predict future sales? Let's assume that a company had sales of a given product in the current year of $X. The company believes that next year's sales will be fully influenced by the unemployment rate. Define S% as the statistically determined slope for this product:

S% = – Change in sales in the next year / Change in unemployment rate

The company expects a Y% increase in the unemployment rate over the next year, so expected sales for next year, $E, can be defined as follows:

$E = $X * (1 + S%*Y%)

Sales projections for other years can be made using the same formulae.

16.0 PERSISTENCY

Let's now look at the question of whether persistency of permanent insurance products impacted by economic factors like unemployment. Persistency is less of a concern for casualty and group insurance contracts, which tend to be more short term in nature.

It's a fair assumption that some individuals have let their life insurance policies lapse because of the inability to pay premiums due to financial constraints. The larger question surrounds the magnitude of unemployment lapse risk contained in the overall lapse rate. Being able to quantify this dynamic and changing risk and separate it from the more static lapse risk should lead to more accurate modeling and results.

A 2004-2005 report on U.S individual life persistency from the SOA, in conjunction with LIMRA, showed that reasons for term insurance lapse on a policy basis can be explained and apportioned in the following manner:

- Lapse for full surrender or nonpayment of premium 9.9%
- Death 0.2%
- Converted to another insurance plan 0.9%
- Expiry/maturity 0.1%
- Total lapse 11.1%

Similar statistics exist for whole life, universal life, variable life and flexible premium products.

Theoretically, full surrender or nonpayment of premium could be divided further into economic and noneconomic lapse. Future research may highlight the split between the economic (unemployment-related) and noneconomic reasons for the lapse, allowing actuaries to predict future lapse rates with greater accuracy.

The SOA has conducted persistency studies going back to the 1990s. (The studies from 2001 onward are available online at the SOA website.) Lapse rates for life insurance products from those studies show very little variation for the fifth and later years across business cycles going back more than 20 years. Presumably, insureds who have paid premiums for more than five years see their insurance as an investment and are less willing to let it expire. Additionally, those purchasing permanent insurance may experience unemployment to a lesser degree than the general population.

The research in this paper focused on the first-year lapse rate to test whether there was any correlation between first-year lapse rates of life insurance products and the underlying unemployment rate in the economy. Lapse rates taken from the SOA's *2007–2009 U.S. Individual Life Insurance Persistency* study (SOA, December 2012) are shown in Table 22. For some earlier studies, exact numbers were not available. In those cases, values were estimated from the SOA's graph.

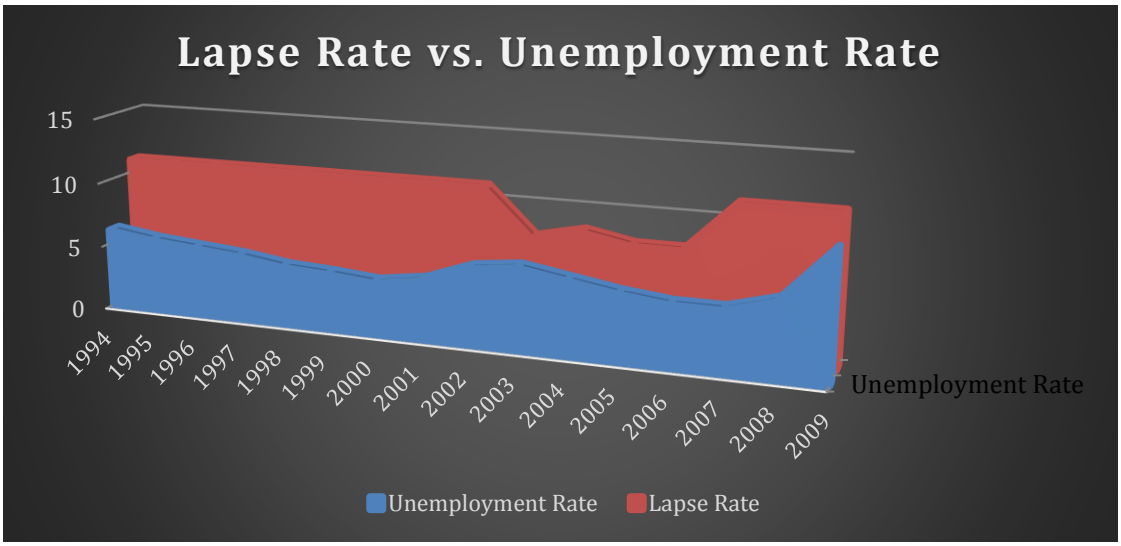
Table 22

Year	June Unemployment Rate (%)	First-Year Lapse Rate (%)
1994	6.1	11.0
1995	5.6	11.0
1996	5.3	11.0
1997	5.0	11.0
1998	4.5	11.0
1999	4.3	11.0
2000	4.0	11.0
2001	4.5	11.0
2002	5.8	11.0
2003	6.2	7.5
2004	5.6	8.3
2005	5.0	7.6
2006	4.6	7.6
2007	4.6	11.2
2008	5.6	11.2
2009	**9.5**	**11.2**

Source: Society of Actuaries, *2007–2009 Life Insurance Persistency Update*, https://www.soa.org/Research/Experience-Study/Ind-Life/Persistency/2007-09-US-Individual-Life-Persistency-Update.aspx, 2009.

Chart 8 below shows the general pattern of movement in the life insurance lapse rate against the unemployment rate over a fifteen year period.

Chart 8



SOA persistency studies were not conducted for every year shown in the data. For years where no study was performed, lapse rates were interpolated from the prior and following studies. In some cases, studies extended over several years; thus, the same lapse rates were used for all years in a given study. Some values were only available in chart form. In those cases, a visual estimation of the values was used.

Statistics from the data are shown in Table 23.

Table 23

Statistic	Result (%)
Correlation	4.4
Covariance	8.0
R-Squared	0.2
Slope	3.8
Trend	541.7

The statistics suggest that the unemployment rate has a slight influence on first-year life insurance lapse rates. However, the influence may not be enough for actuaries to consider incorporating its influence into their modeling.

16.1 Sample Persistency Calculation

How do we incorporate the statistics into predictions of future lapse rates? Let's assume that a company had first-year lapse rates of a certain product in the current year of A%. The company believes that next year's lapse rate will be influenced fully by the unemployment rate. Define S%, the statistically determined slope for this product's lapse rate, as:

S% = % Change in unemployment rate year-over-year

Then the expected lapse rate for next year, B%, can be defined as:

B% = A% * (1 + S%)

Projections of lapse rates can be made for other years using the same formulae.

17.0 STRESS TESTING

While the previous Pricing and Valuation sections apply to unemployment-specific products and riders, stress testing involves a broader spectrum of insurance offerings. Actuaries may consider the correlations between a company's products and the underlying level of unemployment in the economy when planning the modeling of this risk.

In assessing their risk profile, insurers should consider the effects of future changes on unemployment and whether such changes create a material risk with respect to the capital needs and future solvency of the organization. The economic risk of changes in the employment level could be part of any strategic planning exercise. Including risk modeling of this parameter in stress and scenario testing can be prudent.

Much of stress testing is focused on the determination of appropriate levels of economic capital adequacy under various adverse scenarios. However, higher levels of unemployment may trigger reduced sales, which consequently implies a reduced need for up-front capital in most situations. Similarly, higher unemployment rates may produce increased lapse rates with reductions in capital needs. Higher unemployment may imply that products have a shorter life expectancy, leading to less than sufficient time to earn an adequate and priced-for return on equity.

One area of stress testing to consider would be greater minimums and maximums in the unemployment rates experienced over a business cycle. Other tests might include testing a variety of structural shocks like the U.S. credit crisis of 2008. Compressed or expanded business cycle time frames are another possibility. Continuing periods of high or low unemployment or underemployment also provide thought for modeling.

Other structural problems in the economy can include inefficiencies in the labor market, such as mismatches between supply and demand for labor. The effect of disruptive technologies and globalization on the supply and demand curve are other factors to be contemplated. Frictional unemployment—including an individual's voluntary desire to join the labor force as dictated by minimum wages, for example—can influence sales and persistency. Seasonal unemployment and hidden unemployment may be more difficult to quantify and argue for more conservative approaches in estimating. Government policies on employment and fiscal intervention such as the kind undertaken following the U.S. credit crisis might also be considered with regard to future levels of unemployment. Double-dip recessions might also be modeled.

Another example to consider would be scenarios like the Eurozone crisis, where unemployment levels in certain European countries have reached levels approaching 25% and have remained high for periods of time. Actuaries may want to model a sustained high level of unemployment for such a period of time.

As in valuation, stress testing can include increasing the correlation coefficients between product sales or persistency and the underlying unemployment rates. Care should be taken with lapse rate adjustments, as some products are lapse-supported, and increased lapses may reduce product risk. More refined testing can vary unemployment rates by region or state/province.

The unemployment risk assessment may mean using a different incidence of unemployment within and outside of North America. Appendix A provides some information on unemployment insurance programs in other countries.

18.0 AUTHOR RECOMMENDATIONS

Actuaries have traditionally focused on movements in interest rates as the major external economic risk affecting product profitability. This is not surprising given that significant profits are derived from investment income. The external risk of changes in the unemployment rate may also be considered. This risk is more closely tied to consumer behavior because levels of unemployment will impact future sales and persistency of insurance products.

The challenge with this risk is that insurers have no power over it. The economy, like the movement in interest rates, is a risk exposure that management cannot control. Hence, this creates more problems with the objectivity of future predictions.

Development of best practices with regard to the modeling of this risk—including the incorporation of best practices in pricing, valuation, risk management, investment liquidity and product development—can be prudent. Integrating the risk assessment around the larger annual stress testing process could also be a good best practice. Projecting potential results over the next three

to five years, consistent with other risk management protocols, can provide insight to potential corporate risk as the underlying economy changes.

Actuaries may consider the presumed correlations between the unemployment risk and the product(s) being modeled. While this paper sets out some acceptable actuarial techniques for decrementing and assessing the risk, actuaries should be free to consider other techniques that are justifiable as reasonable actuarial practice.

The splitting of lapse rates, particularly on lapse-sensitive products, between economic and noneconomic lapses can be a sound best practice. Risk mitigators may include allowing insureds to waive premiums during periods of unemployment in order to keep their insurance in force.

The setting of materiality levels with respect to the tolerance of the unemployment risk could be determined and assessed at least annually. The identification of related controls and governance for this risk may be documented and presented to the board of directors when the risk exposure reaches material levels.

Actuaries can feel free to use incidence and termination rates that are more conservative than presented here if the risk assessment suggests that this risk plays a significant role in the future soundness of the product(s) being marketed.

19.0 CONCLUSIONS

This paper has delved into data and actuarial techniques surrounding the unemployment risk. However, the discussion on this topic is by no means over. This research has highlighted opportunities for addressing the risk and provided techniques to model the risk in a more dynamic way.

In many cases, the statistics show a correlation or relationship between the sales of insurance products and the underlying labor market environment. The relationship to first-year lapse rates and later life insurance products is less strong.

Future research should provide opportunities to update the underlying decrements and data, including the correlation coefficients on the various products. Future studies may focus on insured unemployment data rather than population-based statistics. Also, future decrements may potentially vary by region and occupation class.

Predictive modeling techniques applied to insured data, including the use of behavioral economics, may provide greater insight into future sales and persistency of insurance products. While the data here were primarily focused on the United States (except for the Canadian life sales), one could postulate that similar results would be found for Canadian-related data.

In summary, the research has shown that it is prudent to consider the unemployment risk as the business cycle changes. The techniques described provide a road map of acceptable actuarial approaches to modeling this risk as it applies to traditional insurance products.

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21.0 APPENDIX A: Unemployment Programs in Other Countries

This appendix gives a brief summary of unemployment insurance in other countries. Interested readers can visit government websites of those countries for more details, and links to those websites are provided.

Table 24 shows the unemployment rates by country provided by the OECD as of the second quarter of 2014.

Table 24

Country	Unemployment Rate (%)	Country	Unemployment Rate (%)
Australia	5.961	Luxembourg	6.067
Austria	5.000	Mexico	4.961
Belgium	8.500	Netherlands	7.000
Canada	7.000	New Zealand	5.600
Chile	6.200	Norway	3.300
Czech Republic	6.133	Poland	9.200
Denmark	6.467	Portugal	14.367
Estonia	7.600	Slovak Republic	13.400
Finland	8.567	Slovenia	9.500
France	10.233	Spain	24.667
Germany	5.000	Sweden	7.967
Greece	26.833	Switzerland	4.410
Hungary	8.033	Turkey	9.567
Iceland	5.133	United Kingdom	6.300
Ireland	11.667	European Union	10.267
Israel	6.065	G-7 Nations	6.423
Italy	12.567	OECD-Total	7.381
Japan	3.600		
Korea	3.667		

Source: Organization for Economic Co-operation and Development, "Short Term Labour Market Statistics: Harmonized Unemployment Rates (HURs)," http://stats.oecd.org/index.aspx?queryid=36324, June,15.

Similarly, the OECD provides statistics on the average duration of unemployment in months for various countries, as shown in Table 25.

Table 25

Country	Unemployment Duration (Months)	Country	Unemployment Duration (Months)
Australia	9.0	Slovak Republic	31.7
Canada	4.9	Switzerland	15.2
Czech Republic	17.4	United States	8.4
Finland	9.9	Europe	15.3
Hungary	17.6	G-7 countries	8.1
Norway	6.0	OECD countries	8.4
Poland	11.8		

Source: Organization for Economic Co-operation and Development, "Short Term Labour Market Statistics: Harmonized Unemployment Rates (HURs)," http://stats.oecd.org/index.aspx?queryid=36324, June,,2015.

Readers can check current OECD labor statistics at the link provided in the Bibliography for more up-to-date and complete data.

Argentina

http://ftp.iza.org/dp3579.pdf
The government uses an active unemployment assistance program for heads of households.

Australia

https://www.humanservices.gov.au/customer/services/centrelink/family-tax-benefit

Australia's unemployment program separates benefits between younger members of the labor force and more established labor force participants. It also applies an asset test to the seasoned labor force participants to qualify for benefits.

China

http://www.clb.org.hk/en/view-resource-centre-content/110107
The level of benefit is somewhere between the minimum wage and the living allowance.

European Union

http://europa.eu/youreurope/citizens/work/finding-job-abroad/transferring-unemployment-benefits/index_en.htm
Each member country has its own program. Certain rules apply to those who work in one member country but are resident in another.

Finland

http://www.kela.fi/web/en/unemployment
Finland has a two-payer system involving the government and unions (Ghent system).

France

http://www.pole-emploi.fr/candidat/le-montant-de-votre-allocation-@/suarticle.jspz?id=4125
France uses a Ghent system in which the unions and employers share the payment of benefits.

Germany

http://www.oecd.org/els/soc/29730499.pdf
Germany uses contributions from employers and employees. It also increases the duration of benefits for older workers to reflect the increased difficulty these workers have in obtaining suitable employment.

Greece

http://www.xperthr.com/international-manual/greece-employee-rights/6906/
Greece provides unemployment insurance benefits to salaried workers through a system of coupon collection. The more coupons collected, the greater the benefit will be. There is also a clawback, or reduction of benefits, for prior claims in the recent past.

Ireland

http://www.welfare.ie/EN/PAGES/unemployed.aspx
Irish claimants can remain on claim indefinitely. They may also be eligible for a rent allowance, mortgage interest supplement, medical card and fuel allowance.

Italy

http://www.oecd.org/els/soc/29733117.PDF
Italy has a number of programs to assist employers in dealing with unemployed workers. These include job-sharing programs, incentives for other employers to hire the unemployed and redundancy funds for employers experiencing financial challenges.

Japan

https://www.justlanded.com/english/Japan/Japan-Guide/Jobs/Employment-insurance
The Japanese system is funded by employee and employer contributions. Benefit durations vary by age, eligibility, how long the employee has paid in and the reasons for leaving employment.

Mexico

http://www.social-protection.org/gimi/gess/ShowTheme.action;jsessionid=b920a5ccd7e69d31c5d3595b3e77a4faabf2f856d2535cb57607b97af7179826.e3aTbhuLbNmSe34MchaRahaKbNz0?th.themeId=2667
Benefits are only available in Mexico City.

Netherlands

http://www.oecd.org/els/soc/29736028.PDF
The program is funded by employee contributions. Older workers may also get a special benefit. The program differs between the European mainland and Caribbean Netherland countries.

New Zealand

https://www.ssa.gov/policy/docs/progdesc/ssptw/2010-2011/asia/newzealand.html
The unemployment insurance benefit is dependent on the person's age, income and family status (including number of children).

Spain

http://www.oecd.org/els/soc/29729431.PDF
Spain uses a system of contributory and noncontributory benefits. Noncontributory benefits apply after the contributory benefits are exhausted.

Sweden

http://www.nordsoc.org/en/Sweden/Unemployment1
Sweden uses a combination of the Ghent system (union benefits), which are voluntary and generous, and a comprehensive system with less generous benefits that are paid by taxpayers.

Saudi Arabia

http://www.saudinf.com/main/h814.htm
Saudi Arabia provides its citizens with free unemployment benefits funded through oil revenues.

United Kingdom

http://ec.europa.eu/employment_social/empl_portal/SSRinEU/Your%20social%20security%20rights%20in%20UK_en.pdf
The United Kingdom is credited with the first unemployment insurance program, which came about in 1911. The current system provides benefits to the unemployed and uses a more complex formula when both breadwinners in the household are unemployed. It also uses a clawback system based on savings.

22.0 APPENDIX B: STATISTICAL DEFINITIONS

Correlation: A statistical relationship between two or more random variables. Stronger correlations tend toward +1 or –1.

Covariance: A statistical value representing how much two random variables move together.

Pearson (or Pearson product moment correlation coefficient, *r*): Measure of the strength and direction of the linear relationship between variables; calculated as the covariance of the variables divided by the standard deviations.

R-Squared: The square of the Pearson product moment through the data points. Also known as the coefficient of determination, or how well data fit a statistical model.

Slope: The steepness of the linear regression line through given data points; reflective of a variance ratio.