Capital Markets Special Report

The **NAIC's Capital Markets Bureau** monitors developments in the capital markets globally and analyzes their potential impact on the investment portfolios of U.S. insurance companies. A list of archived Capital Markets Bureau Special Reports is available via the **index**.

Developments in the Derivatives Markets with Respect to Hedging Costs and Practices in the U.S. Insurance Industry

Derivatives are important to insurance companies' risk-management strategies, particularly with respect to the hedging of interest rate and equity risks, as well as other market risks. This special report focuses on U.S. insurers' use of derivatives for hedging purposes, developments in financial markets legislation and regulation since the financial crisis, and their effect on the means by which insurers hedge risk, as well as the potentially rising cost of hedging. For a detailed review of the insurance industry's overall derivatives exposure, please refer to the NAIC Capital Markets Bureau's Special Report titled, "Update on the Insurance Industry's Use of Derivatives – Exposure Trends through 2014," published Aug. 7, 2015.

Key Points:

- **The over-the-counter (OTC) derivatives markets still dwarf the exchange-traded markets, and the bulk of the insurance industry's derivatives exposure is in bilateral instruments; the tide is gradually turning, however, driven by regulatory forces in the U.S. and Europe.**

- **Many observers agree that the mandated changes to what is referred to by the U.S. Securities and Exchange Commission (SEC) and the U.S. Commodity Futures Trading Commission (CFTC) as the "swaps market" will increase hedging costs, and some predict that investors will change their hedging practices in response to the rising cost of swaps. There is some anecdotal evidence of these trends, but little quantitative evidence thus far. Still, the full effect of the federal Dodd-Frank Wall Street Reform and Consumer Protection Act (Dodd-Frank Act) and other regulatory changes will not be seen for some time, as the compliance schedule for significant components of the new regulatory regime will be phased in between December 2015 and December 2019.**

- **Changing market conditions — especially an expected, eventual turn in the interest rate cycle and an increase in markets' volatility — normally will lead to increased hedging costs for insurers, magnifying the impact of regulatory reform.**

Derivatives as Risk Management Tools

According to an April 2015 survey by the International Swaps and Derivatives Association (ISDA), of 375 institutional investors — including insurance companies — approximately 90% said derivatives are important to their risk-management strategy. Although the survey sample was somewhat self-selecting, such a high percentage is hardly surprising, because, by their

very nature, derivatives are instruments that transfer risk from one party to another, and are commonly used by many large institutions. Derivatives are financial instruments whose value is *derived* from the value of an *underlying* right or interest. As defined in *SSAP No. 86—Accounting for Derivative Instruments and Hedging, Income Generation, and Replication (Synthetic Asset) Transactions*, "derivative instrument" means an agreement, option or instrument, or a series or combination thereof:

a. To make or take delivery of, or assume or relinquish, a specified amount of one or more underlying interests, or to make a cash settlement in lieu thereof; or

b. That has a price, performance, value or cash flow based primarily upon the actual or expected price, level, performance, value or cash flow of one or more underlying interests. Ownership of an underlying interest – such as a bond, loan, commodity, equity, a group of such assets, or even a relationship between asset values (e.g., the spread between two indices)typically entails a bundle of risks, but a derivative does not transfer ownership; instead, it typically transfers a single "market" risk. In purchasing a bond, for example, the investor assumes interest rate, credit and possibly currency risk, whereas the buyer of a derivative instrument on a bond typically transfers only one risk. For example, the bond holder who purchases a credit default swap (CDS) transfers credit risk to the writer of the swap, but retains the other risks. Similarly, a bond holder who enters into an interest rate swap transfers interest rate risk but retains the other risks. Derivatives also make it possible to transfer risks over time. Futures and forward contracts, for example, transfer price risk over time by allowing a buyer or seller to lock in the price of an asset to be bought or sold on a future date. Similarly, swaps transfer risks such as interest rate or currency risk between instruments by exchanging floating-rate and fixed-rate cash flows, or cash flows in different currencies. The wide array of available derivative instruments affords investors a great deal of flexibility in the way they manage risk.

Hedging

As illustrated in Table 1, the primary use of derivatives among insurers is for hedging purposes. Further, a portion of the derivatives positions reported in the "Other" column in the table could represent additional hedges that fall outside of the strict definition of "hedging" under SSAP No. 86. Hedges can be constructed in different ways; for example, insurers may aggregate and hedge blocks of risk together (portfolio hedge) or they may hedge individual assets (specific asset hedge). Insurers hedge a variety of investment risks, including interest rate risk, equity risk, foreign exchange risk and credit risk. Most relevant for the insurance industry are interest rate risk and equity risk, which account for 56% and 23%, respectively, of the total notional value of derivatives used for hedging purposes across the industry as of Dec. 31, 2014. Hedging programs run the gamut from traditional asset-liability matching to mitigate interest rate risk, to dynamic hedging that targets multiple risk factors associated with the insurer's liabilities — often used with variable and equity-indexed annuities, and static hedging that targets major enterprise-wide exposures over long time horizons. Depending on the nature of the risk and the enterprise's strategic goals, an insurer may hedge to protect against true economic loss, or to protect against volatility in either generally accepted accounting principles (GAAP) or statutory capital.

Table 1: Insurance Industry Derivatives Exposure by Purpose / Strategy as of Dec. 31, 2014

	Purpose / Strategy					
Derivative Type	Hedging	Replication	Income Generation	Other	Total Notional Value ($mil)	% of Total
Swap	940,353	32,040	-	8,263	980,655	49%
Options	819,005	319	4,440	81,804	905,569	45%
Futures	63,365	0	-	1,497	64,862	3%
Forwards	62,595	-	-	1,363	63,958	3%
Total	1,885,318	32,359	4,440	92,927	2,015,044	100%
% of Total	94%	2%	0%	5%	100%	

Interest Rate Risk: The management of interest rate risk for insurers — particularly in the life sector — is a high priority. Life insurers are most exposed to interest rate risk by their very nature: they sell long-term products that protect customers from financial pain caused by either mortality, with products such as life insurance, or longevity (i.e., outliving one's retirement savings), with retirement products such as annuities. The insurer, which is obligated to pay cash on customers' policies years after issue, faces the challenge of investing premium payments so that sufficient funds will be available to meet those obligations in the distant future, while maintaining adequate surplus. This long-dated string of liabilities generally leads life insurers to invest mostly in long-term, fixed-income assets. The sensitivity of these assets and liabilities to changes in interest rates depends on duration, which is essentially the weighted average time to maturity of the assets' and liabilities' cash flows. By matching the duration of assets and liabilities, an insurer can largely immunize itself with respect to interest rate risk, but, in practice, assets with durations as long as some insurance liabilities may not always be available or desirable, leading to a so-called "duration gap" (i.e., the difference between the duration of assets and liabilities). In addition, the interest rate environment affects the behavior of policyholders and fixed-income borrowers, causing duration to change. For example, in the current low-rate environment, the guaranteed returns embedded in many annuity and cash-value insurance products are currently in the money, so policyholders have few higher-return alternatives and are likely to stay put. Generally, annuity and cash-value insurance policies have surrender penalties, adverse tax consequences and other economic disincentives for early withdrawal. Policyholders have historically treated these products differently from other investment products. However, when rates eventually rise and higher-yielding alternatives become more readily available, at the margin some customers will surrender their policies, thereby shortening the duration of those liabilities. On the asset side, the durations of bonds with embedded options — such as residential mortgage-backed securities or callable corporate and agency bonds — are subject to change due to borrower behavior as interest rates shift; mortgage prepayments and bond calls increase as rates fall, shortening the effective duration of those instruments. Because the behaviors of policyholders and borrowers can shift the duration profiles of insurer assets and liabilities in opposite directions, the duration gap can be exacerbated as interest rates change. Finally, the term structure of interest rates (i.e., the shape and slope of the yield curve) rarely shifts in parallel as rates rise or fall, but instead steepens, flattens or even inverts at various points in time. Therefore, changes in the market value of a fixed-income portfolio depend on the change in yield at each point along the yield curve that corresponds to the maturity of those assets' cash flows.

In terms of tools to manage interest rate risk, an analysis of statutory filing data as of year-end 2014 shows that, when hedging interest rate risk, insurers tended to favor interest rate swaps (60% of total interest rate risk hedges' notional value) as their principal duration-management tool. Options (36%), including interest rate caps (18%), as well as other vehicles such as

interest rate floors and swaptions — which are especially useful in hedging asymmetric exposures such as prepayment or surrender risk — were utilized as interest rate hedging tools. Futures, although often well suited to hedging generalized risks given their standardized terms, historically have played only a minor role in insurers' interest rate risk management.

Equity Risk: The bulk of the retail variable annuity business, in particular, is sensitive to equity markets, and certain variable annuity products' guaranteed minimum benefits increase the potential exposure if equity markets decline. Life insurers also are indirectly exposed to equity risk in businesses where fees are earned based on the fair value of assets under management; downturns and volatility in equity markets can thus hurt the revenues, as well as investment returns, on savings and investment products and services. Finally, companies may also be indirectly exposed to equity risk in that the funded status of pension and other postretirement benefit obligations could be hurt if equity returns fall short of expected long-term rate-of-return assumptions.

Futures, forwards and swaps are all examples of linear derivatives, whose value is a linear function of the price of the underlying. For example, the value of a futures contract tracks the price of the underlying dollar for dollar. Certain other derivative instruments are non-linear, because their payoff is asymmetric and changes with respect to multiple variables. An option, for example, is a non-linear derivative in that its value is determined by the distance between the option's exercise price and the price of the underlying, the expected volatility of the price of the underlying over the life of the option, and the time remaining to its expiration. Options are similar to the guarantees implicit in many life insurance and variable annuity contracts; one can identify what might be thought of as an "embedded option" by splitting the product's benefits into "normal" and "extra guarantee" benefits, where the latter is analogous to the payoff of an option. For example, if a contract's payout is based on the five-year return on the Standard & Poor's (S&P) 500 Index, with a guaranteed minimum of 3%, the guarantee is equivalent to a put option on the index, with a strike price that is 3% above the index's level at the beginning of the term. If the index return is less than 3%, the contract holder will receive the "normal" return on the index plus the "extra guarantee" benefit generated by the return on the put option.

To manage equity risk, the primary tools used by insurers as of Dec. 31, 2014, were put options (44%), call options (24%) and collars (12%). Foreign exchange (FX) risk was hedged primarily with currency swaps (58%) and forwards (32%), and credit risk was hedged mainly with CDS (87%).

Evolution of Derivatives Markets in the Dodd-Frank Era

An understanding of the potential future development of hedging costs and hedging behavior depends, in part, on an understanding of the evolving taxonomy, structure and regulatory framework of derivatives markets since the financial crisis. The changes in some derivatives markets have been profound, and many rules and regulations are not fully implemented or even finalized. Only over time will all the ramifications of these changes come to light. As markets continue to evolve, participants will need to stay on top of changing market dynamics and regulatory developments.

From a market structure perspective, derivatives fall into two broad categories: *exchange-traded* (listed) and *over-the-counter* (OTC). Listed derivatives, such as futures and listed options, are relatively fungible products with standard terms and uniform trading and settlement procedures that generally trade in domestic markets. In the U.S., for example, futures exchanges called *designated contract markets* (DCMs) facilitate anonymous trading, mostly through *central limit order books*. A DCM also serves the same purpose as a *central counterparty* (CCP) or *clearinghouse,* which acts as intermediary between the two participants in every trade that it clears and handles data reporting, trade confirmation and settlement. Futures markets are regulated by the CFTC.

OTC derivatives, historically, have been less fungible and are much more diverse in their terms and conditions, which are privately negotiated, ranging from highly customized, complex

contracts with long maturities to more standardized, shorter-dated, somewhat liquid instruments. Historically, OTC derivatives were *bilateral contracts* booked directly between parties, who, therefore, are exposed to each other, giving rise to *counterparty risk*. OTC derivatives were lightly regulated before the financial crisis; the federal Commodity Futures Modernization Act of 2000 (CFMA) clarified existing law so that most OTC derivatives transactions between "sophisticated parties" would not be regulated as futures under the Commodity Exchange Act of 1936 (CEA) or as securities under federal securities laws, but instead would continue to be overseen by federal regulators under general "safety and soundness" standards. However, because lawmakers believed that OTC derivatives and attendant counterparty risk exacerbated the financial crisis, and given that a major focus of financial reform (globally) was the minimization of systemic risk, one of the principal objectives of the Dodd-Frank Act was to essentially undo the CFMA and restructure derivatives regulation in a more comprehensive way. Title VII of the Dodd-Frank Act aims to reduce systemic risk by pushing as much of the derivatives market as possible — for products deemed to have sufficient standardization (and, therefore, liquidity) — toward a centrally cleared model; this has given rise to *centrally cleared* OTC contracts, which are still privately negotiated, but counterparty risk is pooled because all transactions must now be cleared through eligible CCPs, known as *derivatives clearing organizations* (DCOs).

To date, OTC derivatives markets still dwarf the exchange-traded markets: According to data from the Bank for International Settlements (BIS), as of June 2014, the respective total notional amounts outstanding of OTC and exchange-traded derivatives were $691 trillion and $29 trillion, although the percentages vary widely between different types of instruments. The tide is turning, however; by the end of 2014, about 77% of interest rate derivatives' notional value was centrally cleared. The volume of centrally cleared OTC derivatives is growing, as the Dodd-Frank Act and Basel III guidelines stipulate that all standardized "vanilla" OTC interest rate swaps are to be cleared by CCPs. The CFTC clearing mandate, which thus far encompasses four classes of interest rate swaps and two classes of CDS (shown in Table 2), was phased in during 2013 for most U.S. market participants, although certain non-financial firms that use swaps to mitigate commercial risk may elect the "end-user clearing exception." The Dodd-Frank Act further reduces systemic risk by subjecting derivatives market participants to heightened, more standardized regulation of margin and increased collateral requirements, a topic that will be discussed later in this report.

Table 2: Summary of Swap Classes Required to be Centrally Cleared

Class	**Specifications**
Fixed-to-Floating Swap	**U.S. dollar LIBOR; pound sterling LIBOR; yen LIBOR; euro EURIBOR**, tenor 28 days to 50 years. No optionality; no dual currencies; no conditional notional amounts.
Basis Swaps	**U.S. dollar LIBOR; pound sterling LIBOR; yen LIBOR; euro EURIBOR**, tenor 28 days to 50 years. No optionality; no dual currencies; no conditional notional amounts.
Forward Rate Agreements	**U.S. dollar LIBOR, pound sterling LIBOR, yen LIBOR euro EURIBOR**, tenor 3 days to 3 years. No optionality; no dual currencies; no conditional notional amounts.
Overnight Index Swaps (OIS)	**U.S. dollar (Fed funds), euro (EONIA), sterling (SONIA)**, tenor 7 days to 2 years. No optionality; no dual currencies; no conditional notional amounts.
North American Untranched CDS Indices	

CDX North America, investment grade (CDX.NA.IG) and high yield (CDX.NA.HY).
IG tenor 3-year, 5-year, 7-year and 10-year; HY tenor five-year.
European Untranched CDS Indices (separate clearing schedule)
iTraxx Europe, 5-year and 10-year tenors.
iTraxx Europe Crossover, 5-year tenor.
iTraxx Europe HiVol, 5-year tenor.
Source: Adapted from CFTC proposed clearing determination, July 24, 2012.

Another key precept of Title VII of the Dodd-Frank Act is that derivatives markets should be made more transparent, with pre-trade price transparency to create a level playing field. All standardized, liquid instruments subject to the central clearing mandate eventually will be required to trade on electronic venues, either the existing futures DCMs or new *swap execution facilities* (SEFs). U.S. DCM/SEF rules came into effect Oct. 2, 2013, requiring venues that give access to U.S. persons to register with the CFTC. Beginning Feb. 15, 2014, the first derivatives products were required to trade on these platforms, a process known as *made-available-to-trade* (MAT). All U.S. persons are now required to trade MAT instruments on registered SEFs or DCMs, in essence re-making a significant portion of the swaps market structure in the image of the futures market; in the first quarter of 2015, 55% of interest rate derivatives' average daily notional volume traded on SEFs. Trades must be reported to data repositories, and price and volume data is to be made public. Although the Dodd-Frank Act exempts commercial end users from most clearing and trading requirements, insurance companies generally will be considered financial end users, and, as such, they will not be able to take advantage of the exemption.

A Closer Look at Interest Rate Swaps: Life Under the Dodd-Frank Act

As Table 1 and Table 3 show, interest rate swaps are the derivatives most commonly used by insurers. In a typical interest rate swap, two counterparties exchange a series of payments based on a predetermined notional amount, frequency and maturity date; one party agrees to pay a floating series of payments based on an index, such as the London Interbank Offered Rate (LIBOR), in exchange for a series of fixed coupon payments, while the other party agrees to receive the floating series of payments in exchange for fixed coupons. Insurers employ interest rate swaps for several reasons:

- To manage duration, allowing them to better match their portfolio assets (insurance, annuity or pension) to liabilities, thereby reducing interest rate risk.
- To hedge specific assets or liabilities.
- To hedge the anticipated purchase of investments or issuance of debt.
- To create synthetic securities for replication of a cash market instrument.

Table 3: Insurance Industry Swaps Exposure by Type and Purpose / Strategy as of Dec. 31, 2014

	Purpose / Strategy					
Contract Type	Hedging	Replication	Income Generation	Other	Total Notional Value ($mil)	% of Total
Interest Rate	807,108	9,123	-	2,132	818,363	83%
FX	65,256	-	-	4,230	69,486	7%
Credit Default	11,323	22,641	-	966	34,930	4%
Total Return	38,758	275	-	863	39,897	4%
Other	17,907	-	-	71	17,978	2%
Total	940,353	32,040	-	8,263	980,655	100%
% of Total	96%	3%	0%	1%	100%	

The interest rate swaps market continues to evolve in the wake of the Dodd-Frank Act and its counterparts, such as the European Union (EU) 2012 European Market Infrastructure Regulation (EMIR), that were enacted in response to the financial crisis of 2008. Swap contracts increasingly will be required to centrally clear through the DCOs. These central clearinghouses require market participants to post collateral when they open a contract (*initial margin*) to cover potential counterparty default losses and require subsequent daily or intraday mark-to-market payments (*variation margin*), whereby losses from participants on the losing side of a trade are collected to safeguard gains to participants on the winning side of the trade. The margin requirements are intended to prevent any firm from creating an uncollateralized exposure so large that a default would have systemic consequences; in other words, the size of a firm's cleared positions are effectively constrained by the amount of collateral it can post, preventing it from posing too great a risk to its counterparties. Swap dealers and major swap participants (i.e., firms with substantial derivatives positions) will be subject to new and sometimes greater margin and capital requirements — imposed by their principal regulator — than the clearinghouses mandate. (Note that, to date, only one insurance company — MBIA Insurance Corp. — has registered with the CFTC as a major swap participant.) Non-centrally cleared swaps also will be subject to stricter margin requirements. Financial end users (including most insurers), while generally not the focus of margin regulations, will nonetheless be affected through their dealer relationships. Specific margin rules and requirements have been proposed and re-proposed by the CFTC, but the time frame for their implementation is uncertain.

Expected Impact of Swaps Market Changes on Hedging Cost and Behavior

Many observers agree that the mandated changes to the swaps market will affect institutional investors' hedging practices in two ways. First, there appears to be a general consensus that hedging costs are increasing, and will continue to increase, as centrally cleared swaps become more prevalent and the full impact of regulatory reform is felt. Second, some observers predict that some investors will change their hedging practices in response to the rising cost of swaps. This report cites research from several sources that provide insight into these changes and their ramifications: Greenwich Associates (a financial services research and consulting firm); the ISDA (which periodically surveys market participants); Sapient Corp. (a technology consulting firm); and NERA Economic Consulting.

In early 2015, Greenwich Associates published an analysis of the total cost of swaps based on conversations with more than 40 market participants. The report draws three main conclusions:

1. The total cost of swaps will rise as the market moves to standardized, centrally cleared swaps.
2. The swaps market will continue to be robust, but smaller than before the financial crisis.
3. Over the medium and long term, futures products will supplant some standardized cleared swaps trading, for cost reasons. However, futures and swaps are far from perfect substitutes, and switching from one instrument to another could entail other costs.

These conclusions and investor concerns have been raised in numerous studies dating back to the infancy of the Dodd-Frank Act. Thus far, there is some anecdotal evidence supporting each of these assertions, but a full analysis might not be possible before 2017. Even then, quantifying the impact of the regulatory changes will not be easy; transaction costs in the swaps market are difficult to analyze because multiple factors influence funding costs (driven by collateral requirements) and trading costs (implicit in bid-offer spreads, supplemented by other downstream costs). In addition to transaction costs, insurers and other buy-side parties are likely to face additional administrative costs and capital expenditures as they establish systems and hire staff to handle new, complex pre-trade and post-trade analytical, reporting and compliance processes. If the costs of hedging with swaps increase to such an extent that they outweigh the benefits, some investors may indeed change their behavior and hedge with other

instruments, such as futures, or even choose not to hedge at all. Futures and swaps are quite different, however, even though their market structures are converging on the futures model. Most respondents to the aforementioned ISDA survey said the cost of hedging via derivatives had increased in recent years: 40% noted a small increase and 13% reported a substantial one. Increased cost was the respondents' biggest concern (62%) with regard to their ability to use derivatives to manage risk. Much of the cost of hedging can be attributed to collateral (initial margin and variation margin) and liquidity (the bid-ask spread), supplemented by a few other factors. Thus far, there is some anecdotal, but little quantitative, evidence of rising costs in response to adverse changes to both factors, not enough to reliably project the impact on the insurance industry.

Insurers participating in the derivatives markets also are likely to incur additional operating and capital costs in the years ahead as they assess the impact of regulatory changes on their business and technology infrastructure. According to a 2011 report by Wipro Technologies, a global IT consulting and outsourcing company, the Dodd-Frank Act will have "medium to high business impact for Investment Banks, Brokerages, Custodians and Asset Managers based on the areas of impact identified in derivatives trading" and have an impact on the functional areas involved: workflow for new and legacy instruments; connectivity between the many old and new counterparties and service providers; risk management, data management and reporting systems; and the operational infrastructure. Insurers, although not specifically mentioned in the report, also will be affected, either directly as large institutional investors, or indirectly through their dealings with asset managers, custodians and broker-dealers.

Collateral

With respect to collateral requirements, most market participants will be required to post more collateral than in the past, in part because, until recently, there was little, if any, margin requirement for most counterparties, especially large ones. In the past, bilateral OTC derivatives could result in very high levels of leverage. The imposition of tighter margin regulation, however, represents a significant change and will result in a material reduction in leverage. Because initial margin must be maintained for the life of the trade, it has to be either borrowed or made unavailable to invest elsewhere; hence, it has an associated opportunity cost, or cost of funding, that negatively affects the return profile of the associated trading position or hedge.

For non-centrally cleared swaps, under new guidelines established by the Basel Committee on Banking Supervision and the board of the International Organization of Securities Commission (BCBS/IOSCO), firms can go through a complex modeling process to determine appropriate initial margin levels, or they can opt to use fixed percentages determined by the type of instrument and its tenor, as shown in Table 4. For interest rate swaps terminating in five or more years — as many insurance company interest rate swaps do — the initial margin requirement is 4% of notional exposure. In addition, posted collateral other than cash typically is subject to varying "haircut" requirements (Table 5), by which an asset's value is discounted — depending on asset type — for crediting purposes. Swap participants also will have to post variation margin, which will be marked to market on a daily basis.

Table 4: Prudential Regulators / CFTC Standardized Initial Margin Schedule for Uncleared Swaps

Asset Class	Initial Margin Requirement (% of notional exposure)
CDS 0–2 years	2
CDS 2–5 years	5
CDS 5+ years	10
Commodity	

15
Equity
15
FX
6
Interest Rate 0–2 years
1
Interest Rate 2–5 years
2
Interest rate 5+ years
4
Other
15

Source: Bank for International Settlements.

Table 5: Prudential Regulators / CFTC Standardized Initial Margin Eligible Collateral and Haircuts

Asset Class	Haircut (% of Market Value)
Cash in same currency	0
High-quality government and central bank debt securities: residual maturity < 1 year	0.5
High-quality government and central bank debt securities: 1 year ≤ residual maturity ≤ 5 years	2
High-quality government and central bank debt securities: residual maturity > 5 years	4
High-quality corporate\covered bonds: residual maturity < 1 year	1
High-quality corporate\covered bonds: 1 year ≤ residual maturity ≤ 5 years	4
High-quality corporate\covered bonds: residual maturity > 5 years	8
Equities included in major stock indices (e.g., S&P 500)	15
Gold	15
Additional (additive) haircut on asset in which the currency of the derivatives obligation differs from that of the collateral asset	8

Source: Bank for International Settlements.

Proposed CFTC margin rules for non-centrally cleared swaps also could have profound effects on insurance companies, most of which probably will be considered “financial end users.” Financial end users with “material swaps exposure” — defined in the re-proposed rules as those entities and their affiliates having an average daily aggregate notional value of $3 billion of non-centrally cleared swap products over the June through August period of the previous year — will be required to exchange initial margin with dealers; all others may be required to post initial margin where appropriate. The re-proposed rules are seen as onerous by market participants and observers: initial margin, which is to be segregated and held by a custodian and not rehypothecated (i.e., re-pledged as collateral) or re-used for other purposes, is to be calculated using a 10-day historical value-at-risk (VaR) model. VaR is a statistical method used to measure and quantify the maximum expected loss within a firm or portfolio, with a given confidence level,

over a specific time frame. There are numerous approaches to calculating VaR, but, in general, calculated VaR increases with time horizon; in a model that assumes normally distributed returns, VaR is a square root function of time, so a longer time horizon results in a larger VaR. Market observers regard the CFTC's proposed rules — with the 10-day VaR calculation — as much more stringent than the EU counterparts (also not finalized), and, therefore, expect the final version to be less onerous and more in harmony with the EU.

Centrally cleared swaps are subject to the margin requirements of the DCO. Because DCOs base initial margin calculations on quantitative modeling rather than a fixed grid, a representative initial margin assumption is hard to determine, and will change according to market conditions and calculation methods. The Chicago Mercantile Exchange (CME), for example, uses five-day VaR, so the proposed OTC initial margin calculated with 10-day VaR would be greater than the CME's initial margin requirement by a factor of , or approximately 1.4 times.

As an additional consideration, insurance companies — as so-called end users of derivatives — will not be directly subject to initial margin and variation margin requirements for cleared swaps, and may not be subject for uncleared swaps. Rather, they will be subject to whatever margin requirements are dictated by the swaps dealers or brokers with whom they are trading. Dealers that account for a large portion of trading volume benefit from *portfolio margining,* in which their collateral requirement is reduced to the extent that they have offsetting positions on their books, giving dealers competing for an end user's business an opportunity to pass some savings on to the customer. However, because end users' activity tends to be directional, they typically have fewer offsets, as in the case of life insurers, which tend to be natural receivers of fixed interest rate swap payments. Ultimately, then, dealers and brokers will have discretion in assigning collateral requirements according to how they want to allocate risk exposure.

A "deep dive" into margin requirements among various participants and instrument types is beyond the scope of this report, but, in the interest of providing a crude estimate of the potential impact on the insurance industry of margin requirements on swaps trading, if the industry's $807 billion notional value of interest rate swaps were made subject to an initial margin requirement of between 1% and 4% of notional, insurers collectively would be required to post additional collateral of approximately $8 billion to $32 billion. The hypothetical cost to the insurance industry of those funds — if converted to cash, assuming a foregone return on those assets of an estimated 3% per year (based on the approximate average yield on investment-grade corporate bonds year-to-date through May 31, 2015) would be $242 million to $968 million. This represents approximately a 0.6 to 2.6 basis points (bps) annual negative return impact on the total cash and invested assets for the portion of the insurance industry that uses derivatives. The cumulative drag over 10 years would be 7 bps to 26 bps. A conservative approach, considering only the opportunity cost of reallocating some corporate bond holdings to Treasury securities to raise the required amount of acceptable collateral, would result in about 118 bps of foregone return, based on Bloomberg's current 10-year single-A corporate bond yield spread (as of July 20, 2015), and, therefore, probably would have no more than a 1 bp impact on annual portfolio return unless credit spreads widen materially.

Sapient Global Markets, a financial technology consultant, made its own attempt at quantifying the impact on hedging costs post-Dodd-Frank Act; the results of its June 2013 study illustrate the significant impact of the Dodd-Frank Act and BCBS/IOSCO legislation on clearing costs, again because of higher initial margin requirements. Through backtesting, using returns on a hypothetical portfolio based on the Barclays U.S. Aggregate Bond Index from October 2011 through September 2012, and assuming a hedging strategy with an objective of reducing portfolio duration by 2%, the study showed a significant drag on portfolio return in the new environment ranging from between ~20 bps to ~62 bps for centrally cleared trades, depending on the product, and up to ~91 bps for traditional bilateral OTC trades; meaning, once the

BCBS/IOSCO recommendations take effect, the use of customized, uncleared swaps will jump from being the least to the most expensive way to hedge.

In December 2014, National Economic Research Associates, Inc. (NERA), an economic consulting firm, issued a study analyzing the CFTC's proposed margin requirements for bilateral swaps. NERA estimates that, under the proposed rules, initial margin requirements totaling $24.5 billion would impose $206 million in annual opportunity costs on covered swap entities (i.e., dealers and major swap participants) under normal market conditions, although that figure rises to $436 million in times of stress. NERA estimates proposed variation margin requirements would require covered firms to hold an additional $10 billion in collateral, for an incremental variation margin opportunity cost of $205 million under normal market conditions, potentially rising to much higher levels under market strain. While the focus of the study was not insurers but covered swap entities, it is illustrative of the opportunity cost on any entity that may be subject to the proposed margin requirements. More important is NERA's assertion that the proposed rules are pro-cyclical —becoming more costly as financial market stress increases — because the rules require monthly initial margin model recalibration, and because firms must post variation margin daily in cash, thereby necessitating that firms hold highly liquid, risk-free assets that potentially far exceed their margin requirements (pre-funding) in order to cover potential variation margin losses in a fast-moving market and to prevent a liquidity crunch. Here, it is important to note that the proposed CFTC rule requires all financial end users (how most insurers will be classified) to post variation margin daily.

Liquidity

With respect to market liquidity, 36% of the ISDA survey participants said liquidity has deteriorated, compared to only 6% who said it has improved, but more than half were either undecided or saw no change. The results were similar with respect to the number of dealers providing quotes on derivatives trades over the past year. However, among those that said liquidity has deteriorated, 65% said the impact on their ability to manage risk has been negative, 34% said there was no impact or had no opinion, and less than 1% said liquidity has improved. Typically, market liquidity is measured in terms of data such as average bid-ask spread, the number of market makers providing quotes, volume, average trade size, number of trades and the time to exit a position. Much of this data is inconsistent and elusive, however. For example, according to Bloomberg, from March through September 2014, the average bid-ask spread on a five-year plain-vanilla interest rate swap was 0.9 bp, down from 1.3 bps in the same period a year earlier. While the tightening could be attributed to better price discovery since the advent of SEF markets, bid-ask spreads in liquid swap products have been extremely tight for some time. A 2014 white paper by McKinsey & Co. suggested that tight spreads reflect the ease with which dealers can offset risk, or that dealers use swaps as a loss leader to gain more lucrative business. Other metrics depict a changing marketplace, but do not necessarily show that liquidity is compromised. According to the ISDA, based on data over six quarters ending with the first quarter of 2015, the total average daily notional volume of interest rate derivatives peaked at $588 billion not long after the SEF regime was introduced; first quarter 2015 volume of $505 billion remained 14% below the peak. The volume decline over the past four quarters reflects increasing average daily trade counts, up 11% year over year, but declining average trade size, down 23%. A rising trade count and falling size could be symptomatic of reduced liquidity, echoing similar trends in U.S. bond markets where those wishing to trade in size increasingly have to execute those orders piecemeal. This pattern also could reflect the "futurization" or "electronification" of much of the interest rate derivatives market — where there could be disincentives to trading large blocks — even though trade count and trade size trends are consistent for SEF and bilateral trading alike. Finally, although anecdotal evidence in the ISDA survey suggests that the number of market makers is falling, the number of these registered swap dealers as of June 22, 2015, had grown to 105 from the inaugural group of 65 announced at the beginning of 2013.

Geographic fragmentation has also been cited as detrimental to swaps market liquidity. More than half of the ISDA survey respondents agree that derivatives markets are fragmenting along geographic lines as a result of differing regulatory frameworks in key jurisdictions, and that this fragmentation is hindering their ability to manage risk. Two key provisions of the CFTC proposal are cited as driving this geographic split: the $3 billion material swaps exposure threshold, which subjects financial end users to initial margin requirements (the BCBS/IOSCO threshold is 8 billion euro), and the cash-only requirement for variation margin. Evidence of fragmentation is mixed; for instance, according to ISDA, the cleared euro interest rate swaps market is largely fragmented into U.S. and non-U.S. liquidity pools. This split was first observed in October 2013 after the CFTC's SEF regime came into force; euro interest rate swap volume is now transacted almost exclusively between European counterparties. The market for U.S. dollar interest rate swaps has remained much more global, however, and far less fragmented. ISDA data show that market share remained fairly evenly split between U.S.-only, European-only and cross-border trading through the end of 2014, with cross-border trading actually increasing into December.

Evaluating the Alternatives: No Easy Task

The new world of derivatives trading introduces multiple "off the rack" alternatives to the negotiated, bespoke solutions of the pre-Dodd-Frank era, adding more complexity to the decision-making process. Given new margin requirements, an array of choices and the emergence of order-driven trading (competitive bidding) on multiple platforms, derivative transactions will have to be evaluated in terms of liquidity, ease of execution and overall cost, as much as their ability to hedge a risk or express a view.

As an example alternative, consider deliverable swap futures (DSFs): These instruments are, as their name indicates, futures contracts on standardized, exchange-traded interest rate swaps. One of the key advantages touted by proponents of DSFs is their lower cost of collateral; the requirement is based on two-day VaR, compared to five-day VaR for cleared swaps, so (assuming normally distributed returns) the potential cost of collateral saving is approximately 37%. Liquidity is a concern, however, as volumes and open interest on the three exchanges listing swap futures have been light, although they are growing slowly. In addition, holders must *roll* futures every three months (i.e., sell the maturing contract and buy the next contract), thus entailing additional transaction costs, as well as some additional price risk, depending on supply and demand. Holders who do not roll their contracts take delivery of the underlying swap, and thus become subject to higher margin requirements.

To do this, insurers and other investors will need technology solutions, which are only beginning to emerge, that can compare a given interest rate swap to alternatives — such as swap futures, Eurodollar futures, Treasury futures or cash Treasury instruments — not only in terms of price, but also their liquidity, execution cost, cost of carry and other instrument-specific risk-and-return factors. Several SEFs and clearinghouses have launched tools that can help traders compare some of these alternatives, but more integration will be needed. Institutions will have to analyze and compare the alternatives within the context of their own portfolios, across multiple clearinghouses and intermediaries with disparate margin requirements, risk calculations and collateral haircuts, incorporating benefits offered by those counterparties such as portfolio margining and other capital efficiencies.

Larger insurers and other large institutions faced with significantly higher collateral requirements — in an environment where high-quality liquid assets could become increasingly scarce — may also need to invest in collateral optimization systems or services, because pre-funding with cash, accessing the repo market or pledging whatever assets are on hand may become too costly. Collateral optimization identifies the best mix of assets to meet margin requirements and minimize excess collateral, which helps keep costs down.

Imperfect Hedges

With bilateral swaps, firms can tailor a hedge to their specific needs, but in the futures and SEF markets, contracts are standardized. As such, there might not be a futures contract to match the

desired underlying risk or the required time period for a hedge; hence, the hedge and the underlying asset or liability may be imperfectly correlated, creating the potential for excessive gains or losses from hedging. This is called *basis risk*. In addition, using inexact hedges could prevent insurers from taking advantage of hedge accounting under Financial Accounting Standards Board Statement No. 133, Accounting for Derivative Instruments and Hedging Activities, and/or SSAP No. 86, which both require that a hedge be "highly effective" — something that already is a high hurdle for most insurers' hedging positions.

Watching the Greeks: Potential Hedging Cost Increases as Market Cycles Turn

One lesson learned from the financial crisis was that hedging programs are important tools that generally work well if managed properly. According to consulting firm McKinsey & Co., hedging programs saved the insurance industry about $40 billion in September and October 2008, offsetting more than 90% of the industry's increase in hedged liability over that period. However, market forces can interact in ways that put programs under stress in some instances, or at least increase their cost.

The "Greeks"

As previously mentioned, life insurers tend to have the greatest sensitivity to market risks, particularly equity risk and interest rate risk (as well as its cousin, credit spread risk). Within the life sector, while most product categories have at least a modest sensitivity to interest rate movements, certain products are more sensitive than others: fixed deferred annuities, for example, are highly sensitive to interest rate changes; equity-indexed annuities are most sensitive to equity market risk; variable annuities with guarantees are highly sensitive to both. Historically, management of these risks, rate risk in particular, was fairly straightforward, generally involving some form of asset-liability matching. That changed, however, in the past two decades with the advent and rapid evolution of variable annuity products, especially as they began to incorporate various living benefit guarantees in response to the 2000 stock market crash. New features, such as guaranteed minimum income benefits and guaranteed lifetime withdrawal benefits, greatly increased insurers' risk exposure at a time of increased financial market volatility, causing reinsurers to withdraw from the market and forcing variable annuity providers to develop more sophisticated risk-management capabilities, both on the product and investment side. Consequently, after addressing various actuarial, behavioral and some market risk through product design and pricing, variable annuity providers developed hedging programs to mitigate the remaining market risk. These comprehensive hedging programs measure the different types of risk exposure and then purchase financial instruments — options and other derivatives — to offset them. Often called "three Greek" hedging programs in reference to the "Greek" letters commonly associated with the key market input variables used in option math, these programs target equity risk (delta), volatility (vega) and interest rate risk (rho). Table 6 shows instrument types used in hedging and which "Greeks" they may address.

Table 6: Derivative Instruments and the "Greeks" They Address

Type	**Description**	**Example**	**Delta**	**Vega**	**Rho**	**Hedge Example**
Swap	An exchange between parties of risks associated with two instruments	Interest rate swap,				
		Variance swap				

Yes
Yes
Receive fixed in an interest rate swap as a hedge against falling rates
Futures
Holder has obligation to buy or sell underlying at specific time and price
Stock index futures, Treasury futures
Yes

Yes
Sell S&P 500 futures to hedge equity risk
Options
Holder has the right to buy or sell underlying at specific time and price
Call and put options on stock indices
Yes
Yes
Yes
Buy S&P 500 puts to hedge equity risk
It follows, then, that derivative instruments have “Greeks” of their own; in other words, their value is influenced by changes in interest rates and market volatility, as well as other factors. Therefore, the cost of certain common derivative instruments could rise as a result of increases in interest rates or market volatility, both of which — until the past week — have tended to remain near historic low levels and are expected by many to trend higher in the next 12 months. Table 7 illustrates the effect of changes in interest rates and volatility — or rho and vega sensitivity — on selected derivative instrument types that are especially relevant to insurers. If short-term interest rates rise and markets remain more volatile in the months ahead, insurers are likely to encounter higher hedging costs associated with some of these derivative instruments.

Table 7: Select Derivative Instruments — Rate and Volatility Sensitivity

Type

Description

Volatility

Interest Rates

Interest Rate Swap

Holder receives fixed rate (pays floating rate)

N/A

Value decreases as floating interest rate rises; can become a liability as variation margin is exchanged

Equity Index Options

Long put option

Option price increases with increase in volatility (positive vega)

Option price decreases with increase in rates (negative rho); longer-dated options most sensitive

Equity Index Options

Long call option

Option price increases with increase in volatility (positive vega)

Option price increases with increase in rates (positive rho); longer-dated options most sensitive

Breakage

Breakage — or hedge ineffectiveness — also can be a significant cost. According to a 2009 report by McKinsey & Co., most insurers faced record levels of breakage in their hedging strategies; while most carriers reported breakage of less than 2% before 2008, some carriers experienced much higher breakage (as much as 30%) in 2008. Hedge breakage cost the U.S.

insurance industry was more than $4 billion in September and October 2008 alone, amounting to about 10% of the total aggregate savings that the industry's hedging programs would have achieved if they were fully effective.

The various regulatory changes to financial markets resulting from post-crisis legislation are having many effects on markets and may drive changes in investor behavior with regard to many factors, including market liquidity, rising volatility, collateral scarcity and financing costs. Adverse changes to any of these factors could reduce hedge effectiveness and lead to elevated breakage cost. For example, the decision to purchase a cleared, listed interest rate swap or sell a futures contract instead of a bespoke swap because of margin considerations could lead to increased basis risk and other costs.

Conclusion

The effect of the Dodd-Frank Act and other regulatory changes, particularly with respect to derivatives — especially OTC derivatives such as the swap contracts that historically were the preferred hedging instrument for insurers managing interest rate risk — is potentially significant, although, so far, there is little quantifiable evidence of materially higher hedge costs for insurers. It is also possible that hedging costs for insurers could increase as global economic and market conditions change, resulting in higher interest rates and increased market volatility.

The NAIC Capital Markets Bureau will continue to monitor trends and developments in the derivatives markets and publish additional research as deemed appropriate.

Questions and comments are always welcomed. Please contact the Capital Markets Bureau at **CapitalMarkets@naic.org**

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